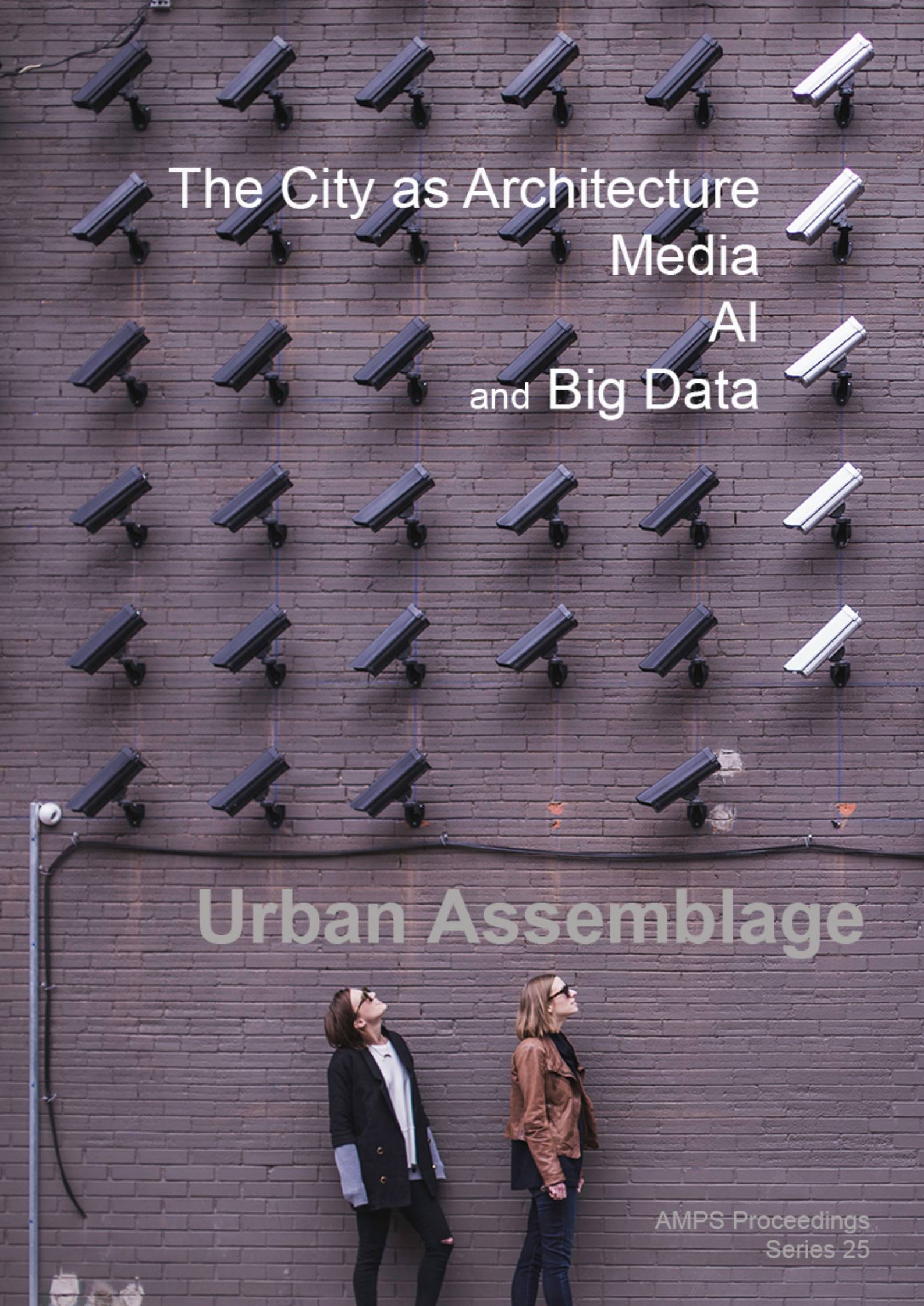
The City as Architecture
Media
AI
and Big Data
Urban Assemblage
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Urban Assemblage: The City as Architecture, Media, AI and Big Data

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INTRODUCTION

Urban Assemblage: The City as Architecture, Media, AI and Big Data

The central idea underpinning this volume is that cities are today characterised by assemblages: unstructured collections of elements that include people, machines, and physical and digital manifestations of architecture and design. Such elements are characterised by an evolving relationship, where roles and internal hierarchies change over time. All elements of the public life are interconnected with technology and artificial intelligence (AI).

The built environment has become a site for the production, processing and sharing of information daily through the software interlaced with it. It is also a place designed, envisaged and increasingly built through data-based digital architecture, planning and construction. Advanced parametric modelling envisages data in both building design and city management. Augmented reality mediates our experience of the city with layers of information. Digital infrastructure interconnects our city and building services. The result is a series of complex interactions of people, place and data and the establishment of the ‘digital city’, ‘smart buildings’ and ‘intelligent’ urbanism.

Today, the potential for technology and data to alter how we design, live and experience our cities is obvious and everywhere. However, there are concerns. GIS, Google Maps and Facebook all offer interconnected information on urban life. They are also conduits for the collation of personal data and its misuse. The assumption of digital access for all leads some to worry about issues of social exclusion. Sociologists highlight the dangers of the digital dependency of future generations. 3D printed buildings threaten job losses in the construction industry. The idea of parametric urbanism is an anathema to many for whom city is a place of interpersonal interaction.

This volume collects 30 chapters that explore the notion of urban assemblages in critical ways and through different lenses. Taking an interdisciplinary approach, case studies, theoretical analyses and thought-provoking articles are combined into themes that include socio-political aspects of cities, digital and physical in heritage, art and history, planning and human-centred technological approaches to the city and the public realm.

In taking on these themes, the papers presented here from the Urban Assemblage conference at the University of Hertfordshire offer a fascinating engagement with some of the most significant issues informing how we understand the contemporary ‘hybrid’ city.

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metaPLACE: PROTOTYPING CO-DESIGNED URBAN MEDIA FOR PARTICIPATORY PLACEMAKING

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INTRODUCTION

China and Australia are very different economies and cultures. We follow dissimilar political ideologies. Our populations dramatically differ in size and makeup. However, we do share common futures characterised by rapid urbanisation. In 2019 urbanisation in China reached 60% with projected rates of 70% for 20301 when one in eight people on earth will live in a Chinese city2. However, by 2014, Australia recorded rates of urbanisation approaching 90%3 with 90 per cent of people living in just 0.22 per cent of the country's land area4. These high levels of urbanisation present major challenges for urban planning and the sustainability of liveable urban places in both societies.

'metaPLACE' is an Australian Research Council5 funded project aiming to deploy participatory urban media (large and small interactive screens, installations, façades, and devices) to test how co-designed public interfaces could help urban planners better understand what citizens desire for the places where they live, work, and play. Urban media is proliferating rapidly, especially in emerging Asian megacities such as Chongqing6. Using Chongqing as a case study, metaPLACE tests the theoretical assumption that participatory urban media can act as a co-designed interface between diverse Urban Media Stakeholders (UMS) including urban planners, architects, local governments, artists, designers, academics, developers, and the citizen communities they serve.

We aim to identify reproducible approaches to co-designing urban media for participatory engagement between UMS and citizens and increase the capacity of Australia-China design partnerships to manage pressing regional urban placemaking problems. Our research questions are:

1.Could Australia-China design collaboration, Smart urban media, and participatory design generate synergies that leverage the social wisdom of citizens for designing better urban futures through innovative approaches to placemaking?

2.In a changing global urban paradigm where China's role is more significant than ever, can Australia's western-centric design profession meet the challenges of collaboration related to China's inherently collective cultural context?

These questions call attention to our socio-cultural ontologies, urban media ecologies, and the "near-total Anglo-European hegemony over global design discourse and knowledge production and dissemination" 7. This paper discusses the merits and deficiencies of our research methods and design-led insights from a cohort of Chongqing's UMS participating in a co-design workshop during December 2019. We also include comments on how COVID19 redirected the research.

RESEARCH METHODS

Our research methods apply the collaborative principles of Metadesign8 (Figure 1) and co-design9. A two-day co-design workshop was held at Chongqing's Dimensions Art Center (DAC)10. We (CI's, RA) collaboratively planned activities with DAC to seed local ideas for prototyping participatory urban media engaging citizens (Active Users) to contribute to placemaking and liveability outcomes. At our initial planning meeting DAC expressed concerns about the framework we'd adapted from Fischer, Giaccardi, et al's schema, Meta-Design: A Manifesto for End-User Development11. Despite the experimental nature of the workshop, it still needed to align with local social and cultural processes and expectations. Factors that influenced the level of commitment participants could or would invest included trust, hierarchy, deference, social context, pre-existing relationships, and 'face'12. A reformulated and more structured approach was co-designed with DAC to reflect local expectations and complex local socio-cultural and professional relational processes. This refined our methodology and was based on two sets of focus questions developed to explore (1) Purpose/Planning/Policy, and (2) Design/Deployment (Table 1).

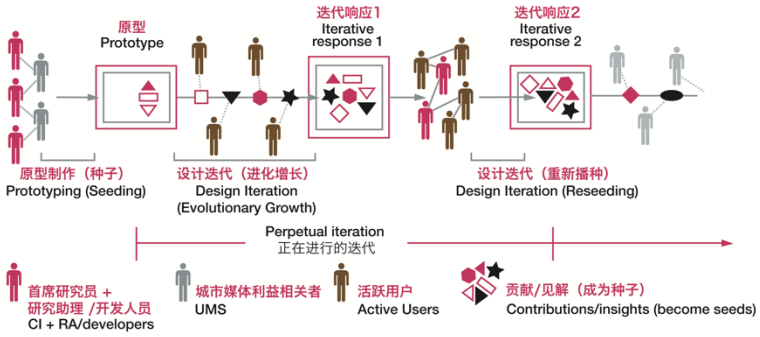

Figure 1. Schema adapted from Fischer, Giaccardi, Ye, et.al (2004) Meta-Design: A Manifesto for End-User Development

Purpose/Planning/Policy	
1	Who are the key stakeholders in Chongqing that can benefit from this concept? How would any potential stake-holders benefit?
2	What kind of data could be gathered that would be useful for city planning? List potential questions that would be the most useful to urban planners. These might be site specific or more general.
3	What are the issues, opportunities, and challenges that this prototype raises?
4	What are the considerations that should guide the scope of public participation? Who drives the process? Who own and manages the data gathered?
5	Where should the data be held? In Public? Online? Situated? How can the data be accessed and used?
Design/Deployment	
1	What are potential locations, events, and urban contexts where such interfaces could be used in useful and meaningful ways?
2	What kinds of technologies or structures could be used for delivering questions or other forms of engagement in such interfaces?
3	Who can participate? How do they participate? Who can see the outcomes?
4	How can such interfaces be utilised by artists/designers to create opportunities for innovative public art or design?
5	What local cultural symbols or other considerations could be useful for developing engaging public interfaces?
6	If this is new to Chongqing people, what would be the best ways to promote and facilitate the interaction? How to encourage people to participate?

Table 1. Two sets of questions developed for focusing UMS on: (1) purpose, planning, and policy as they might relate to urban media, and (2) concepts for design and deployment of media architecture and urban media installation in Chongqing's public space

Participants on Day 1 included six urban planners from Chongqing's Urban Planning Bureau, the Australian Consulate's representative in Chongqing, four architects, four artists/cultural workers, and five artists who are professors, three of whom are based at Sichuan Fine Arts Institute (SFAI). Four design managers, three design academics (including the authors) were in attendance. The cohort also included an anthropologist, and ten design students from Chongqing Technology and Business University (CTBU), and a design technologist who is our research assistant. Participants on Day 2 included four cultural workers, one local architect, two local design managers, one design academic from University of Sydney, one design academic from SFAI, the anthropologist, our design technologist, six design students from CTBU, and six UNSW Art and Design students. Semi-structured interviews were conducted by UNSW students working as assistant facilitators over both days.

The extent we were deviating from local norms was evident on Day 1 in the DAC director's opening remarks suggesting that, although not unprecedented, the experimental nature of the workshop may not work as anticipated. However, an icebreaker where participants made rapid portraits of three others to introduce themselves, created an atmosphere of active relaxed interaction. Emphasising non-hierarchical collaboration, we explained our agenda, the aims and significance of the research, international precedents, and our progress to date. We then distributed design materials and questions from each set to five self-organised small groups and encouraged active design-led responses. The resulting maps, sticky notes, diagrams, and drawings were installed in the space for analysis and discussion. A unexpectedly extended session of analytical discussion followed with each group reporting their findings to the cohort who in turn offered comment and critique.

Throughout Day 2 groups collaborated on prototypes based on artifacts and discussions from Day 1. They were asked to: (1) conceptualise use of urban media as a response to the focus questions; (2) engage in artistic playful exploration of interactivity and experimental formats; and (3) produce rapid paper prototypes of their ideas. As is customary in Chongqing, we planned a long break for social interaction over a banquet lunch. This provided a second space for expanding on the discussion and workshop activities, and importantly, acknowledgement of UMS participation.
In the following sections we translate and interpret insights generated by participants using verbatim quotes, notes, mappings, and diagrams produced in the workshop, photographic qualitative data, semi-structured audio-visual interviews, and summaries produced by DAC. Our intent is to amplify the collective, collaborative voice of the participants.

Equitable participation

Urban development commonly focuses on the visible and attractive aspects of the city with less attention given to inconspicuous or 'forgotten' places and the communities who inhabit them. This reveals the potential for encouraging equitable participation of elderly, disabled, ethnic minorities, and low-income groups through a more directed local community approach to placemaking. While crowds in Chongqing's downtown public spaces are larger and data gathering could be conducted efficiently at scale, strengthening local community engagement through citizen-derived data could be more beneficial - particularly to vulnerable community groups whose voices are under-valued, or remain otherwise unheard.
"Although all citizens have opportunities to speak, the voices of some special groups are limited. The benefits of interactive media could flow to parts of the community including the disabled, ethnic minorities, the elderly, and low-income groups who have less opportunity to have their views heard." [Workshop participant]
On Day 2 participants co-designed prototypes modelling situated interfaces targeting the needs of elderly and disabled citizens, children, and even the environment itself (Figure 2).

Figure 2. Workshop participants paper prototyping for equitable participation

Environment and Interface

Healthy environments were considered a priority. Some participants identified opportunities for advancing community engagement with greening places, permaculture, and other environmentally friendly activities. This expedited paper prototyping based on the rhizomic branching of mycelium, and exploration of interfaces echoing to the relationships between different species of plants in the environment (Figure 3).

Urban media doesn't have to be screen-based. Interfaces such as digital pin boards could prove useful and novel. Generating more positive interactions between people was considered very important. Interfaces inquiring about people's everyday experiences with questions like "How do you feel?", "How's your day going?" would allow audiences to express their emotional response to a place, registering their moods and feelings, while simultaneously generating useful data about the real impact of local urban conditions. Other useful types of data suggested by participants include: (1) time spent in places at different times of the day, (2) flow patterns, (3) age demographics, (4) motivations and preferences for using a particular place, and (5) encouragement of "positive social behaviours and activities".

Figure 3. Workshop participants paper prototyping interfaces echoing to the relationships between different species of plants in the environment

Barriers

Some participants perceived barriers to using urban media for diagnosing placemaking problems. They expressed concerns about privacy, surveillance, and the already pervasive presence of screens in Chongqing.

"…if our urban space or architectural skin is equivalent to a media, then all risks and issues that occur in other media formats will arise at the scale of the city". [Workshop participant]

Questions about who should control urban media, who would use the data, and the danger of monopolies emerging are important considerations. The current formatting of large urban screens in Chongqing's commercial hubs was discussed in relation to their one-way messaging and lack of interaction. The kinds of publics exposed to urban media was also explored. Participants noted many who traverse downtown public spaces are tourists and others who may not be interested in the specifics of urban development. Their responses, attitudes, and observations may not provide useful or precise decision-making data for placemaking. The sheer size of Chongqing's urban public is a pre-existing challenge to management of any decision-making mechanisms about public resources and generation of genuine value. Public participation with large screens offers just one pathway forward and local community-based approaches to urban media as a tool for informing placemaking was reiterated.

Small screens

The ubiquity of mobile phones was seen as one way, to engage Chinese audiences. Participants cited Weixin's (WeChat)13 capacity for discussion groups of up to 5000 members. The penetration of Weixin into the everyday life of Chinese people creates opportunity for discussing micro-topics

related to local community placemaking. Data gathering through this familiar mechanism is likely to generate more reliable responses and was seen as an advantage over large public screens in spaces where audiences are more fluid and possibly less connected to the place being investigated.

"The behaviour pattern of the Chinese is staring closely at the screen of the mobile phone. Therefore, the primary interaction with information in China is carried out through our own palms.
[Workshop participant]

This theme was reiterated numerous times throughout the workshop. The prevailing perspective is that daily life in China revolves around commercial entertainment and political agents that publish a deluge of information. Although people screen out much of this, the mobile screen creates a focus and therefore Weixin and its group discussion tools offer a way to circumvent the shutting down of attention that occurs around public urban media. Moreover, the emergence of the COVID19 pandemic has changed the way public space is used. There was a strong sentiment that the mobile interface was more attractive as a means of progressing the trajectory of this research.

Responses to our prototype

To stimulate discussion, participants explored a prototype interface via their smartphones and iPads we provided (Figure 4). The prototype is a bilingual iteration of a situated interface for community engagement (Figure 5) tested during a study in Chatswood, Sydney in 201414. It posed six exploratory questions as exampled (Figure 6) and results were projected as data visualisations in the workshop space. Responses to the prototype were mixed. In principle the prototype was design was seen as having potential for generating placemaking data. However, participants felt management of questions and topics needed careful consideration.

Some noted the Chinese public is more familiar with a top-down one-way public information process. Therefore, it may not be easy for citizens to express their feelings or concerns about a place and have it visualised on a public screen. It was suggested there may be a contradiction between using urban media to canvas public opinion and everyday public behaviours in China. At its heart, that contradiction is rooted in traditional culture with its inherent orientation for seeking agreement. This potentially conflicts with modern management of public space which is focused on expectations of diverse options for different city and community stakeholders. Therefore, participants anticipated significant impacts on the meaning and accuracy of information transmission in this type of public context.

Figure 4. Participants were encouraged to explore our prototype interface via their smartphones and iPads we provided

Figure 5. Situated interface for community engagement tested in Sydney, 2014

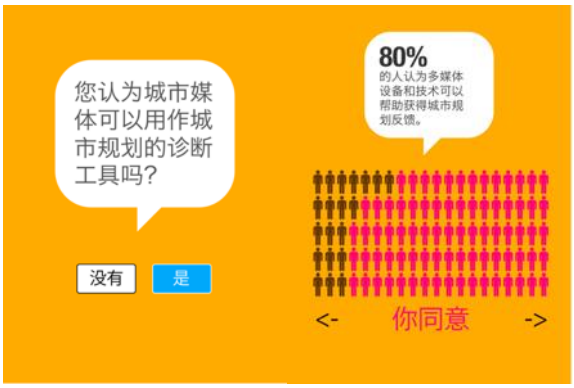

Figure 6. Prototype interface (as presented in the workshop) requesting a yes/no response to the question: "Do you think urban media can be used as a diagnostic tool for urban planning? and polar visualisation of results (iPad format)

The prototype interface introduced at the workshop requested 'yes' or 'no' responses to its questions. The resulting data is then presented as a polar visualisation. Participants felt this is incongruent with typical Chinese behaviours, because in the words of one participant,

"…'yes' or 'no' is not a Chinese choice, because when asked any question, we always answer 'OK'." [Workshop participant]

This prompted concerns about whether urban media could create community engagement. One observation was Chinese people may not feel comfortable investing too much when interacting with public forms of urban media. Entertainment and game-like interfaces were thought to have more potential for generating realistic and manageable contributions to the local placemaking context. Some participants advanced potential new research questions asking, (1) How do deep culturally embedded processes influence transmission of information? and (2) How can we create a stronger, more open discussion culture using less a politically sensitive approach?

Ownership and scope of public participation

The workshop participants thought the most appropriate owners of urban media processes were urban planners, local government, and universities engaged in research on this topic. Management of the data generated should be the responsibility of those managing the process with government and researchers having access to the data. It was noted that agents who own and manage the data must be respectful of the freedom and privacy of citizens. There was a strong preference for approaches that

respond to public demand. Participatory urban media should enable citizens and local community organisations to interact with local government more directly. This should be supported by professional institutions and universities providing supervision and creative interactivity that is engaging and beneficial to the public's personal lived experience of the city.

Opportunities for artists and designers to use urban media for local storytelling and data visualisation was seen as having significant scope for presenting placemaking initiatives in playful interfaces that encourage public sharing and interaction in non-threatening ways. However, artists and designers would still need to pose questions about placemaking that are relevant to the site and audience, and to do so in a manner that leverages appropriate technologies, aims, planning, and policy that clearly directs the scope of public participation. Social media and mobile phones emerged again with assertions that artists, designers, and researchers must acknowledge those requirements and develop interfaces that encourage and engage people in a grass-roots way. This would depend on establishing a sense of participation in the community on small screens driven by providing real benefits from their participation process through selection of relevant topics and questions, useful options, and display of data in real-time as a feedback loop or reward for participation.

Cultural and generational considerations

Unsurprisingly, local culture emerged as a significant consideration. Chongqing's local identities as "The Mountain Capital", "The Hotpot Capital", "The 3D City", and "The City of Fog" were cited as potential traditional or retro concepts that could have value in developing participatory concepts for placemaking. Generational factors also emerged with younger participants arguing against assertions by older participants that young people only watch mobile phones. Younger participants said they do pay attention to large public screens and if deployed in engaging conceptual ways young people in Chongqing would engage with participatory placemaking processes. They asserted that if handled properly, public screens informed by participatory data could relax people, and do so while obtaining useful data. Through interaction it may be possible to "better understand not only the emotional temperature of citizens, but also the problems they face" [Workshop participant] in traversing the urban places they occupy.

RETHINKING CO-DESIGN

We started out to see if Sino-Australian co-design could advance ideas about shared urban futures by using participatory urban media. However, this mode of co-design depends on mutual willingness to be open to unfamiliar ways of understanding co-design processes. Rapidly urbanising megacities in the

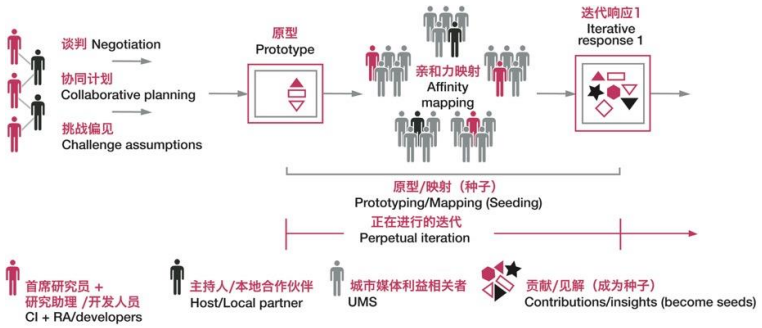

Figure 7. Re-negotiated co-design workshop process reflecting the expectations of local UMS

Asia region such as Chongqing are increasingly saturated with urban media. Yet discourse around this phenomenon is dominated by Western understandings of design and social processes. Reflecting on our research methods, it became apparent our process required significant augmentation to accurately signify the actual configuration of interactions between all participants, researchers included. The representation of straightforward co-operation in our schema (Figure 1) renders invisible the complex cultural dynamics, hierarchies, traditions and power relations underpin interactions between participants and participants, and participants and researchers present in the study (Figure 7).

CONCLUSION

Our intent for this workshop was to create a co-design space of sufficient 'Chongqingness' to hear the priorities, observations, opinions, questions, concerns, and collaborative design ideas of participating UMS. Despite the limitations discussed, we have been able to leverage UMS insights to base subsequent iterative development of our prototype on:

- emphasising accessibility for mobile devices while retaining the potential to visualise data on larger public screens.
- developing 'gamified' question formats using sliders, emojis, and multiple-choice questions as alternatives to yes/no responses.
- designing a flexible and accessible content management system enabling planners, community groups, and other UMS to quickly implement polling about relevant local placemaking issues.

Figure 8. Iteration of the prototype drawing on insights from workshop participants

The international lockdowns and border closures as a response to COVID19 stalled the planned testing of situated iterations of our prototype in-the-wild. Moreover, as 2020 progressed high-level bilateral tensions emerged between Australia and China further challenging our progress. These unanticipated conditions have reinforced UMS preferences for mobile devices as the interface for participatory placemaking. Despite ongoing challenges, we anticipate remote and situated testing in-the-wild of new iterations of our prototype post-2022.

Although this research tests new approaches to participatory placemaking through co-design, it is also about testing design processes in contexts where non-western design practices are brought to bear. Globally there is now an urgent need for more research investigating how participatory urban media can contribute to placemaking post-COVID19. Should we choose to, this offers unprecedented opportunities to learn, as much as apply existing expertise, while re-evaluating how Euro-centric

design cultures like that of Australia can participate collaboratively in designing our shared post-western urban futures.

ACKNOWLEDGEMENTS

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SMART CITIES AND ELDERLY ACCESS TO INFORMATION

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INTRODUCTION

This paper reviews the literature on smart city developments in the United States and how these initiatives intersect with the needs of the elderly American community, with an emphasis on mobility, safety and security. A *Smart City* is an urban environment that uses information and communication technology (ICT) and the internet of things (IoT) to track and enhance performance efficiency of city operations and quality of services provided to citizens.[1] This paper explores two smart city domains: 1) Smart mobility, which aims to improve city transportation services and operations; and 2) Smart safety and security, which addresses challenges associated with maintaining a safe environment for its citizens, as well as issues with protecting big data.

In these initiatives, the elderly are left out of discourse, as smart cities tend to target younger cohorts with heavier smart technology involvement. However, the aging population is increasing as Baby Boomers (anyone born between 1946 and 1964) transition into old age, causing the need for smart cities to adapt and accommodate. Challenges concerning privacy, systemic oppression, algorithmic biases, and accessibility are heavily impacting the elderly's daily interactions and activities within smart cities.

Smart City Development

Smart city development focuses on economic competitiveness, sustainability, and quality of life, across six domains: economy, environment, government and education, living and health, mobility, safety and security.[2] This is achieved through the use of smart technologies such as smart devices, smart homes, and GPS devices. ICTs share information across systems; and IoT systems provide networks of digital sensors and connected technologies.[3] Through these, smart cities technology supports an interconnected system that can be applied to monitor and improve services in any urban environment.

Smart Cities and the Elderly

The elderly, defined as 65 and older, are a growing population projected to comprise 20% of US citizens, they are rarely discussed in the context of similarly growing smart cities.[4]

To access a smart city, a smart device is usually needed, yet to date, only 61% of the elderly own a smartphone in the US[5] and over 80% of said users are in wealthier income brackets.[6] Affording the means to connect to smart city applications is a growing challenge, as elderly poverty (making $12,000 or less annually) will increase from 14.1% to 40% by 2030.[7] Accessibility to smart devices

without financial security is extremely challenging and alienating for 39% of the aging. This increasing wealth disparity directly affects how one can function within a smart city. Currently 8 in 10 U.S. residents 65 years and older are living in cities or urban areas.[8] Yet U.S. smart cities have failed to accommodate for the challenges older adults might face as residents.[9]

Projections suggest 70% of the world will be living in smart cities by 2050,[10] and 1.5 billion people will be elderly.[11] Older adults are more active and social than people assume, a GPS study conducted in New York City,[12] found that the elderly spend 40% of their time outside of their immediate residential area. Nationally, 6 million out of 35 million people 70 and older, and only 7% of those 65 to 69 years of age do not drive increasing the need for public transportation, and information through smart devices.[13] A further need is to address inclusivity and accessibility to smart cities and their services.

Two areas of smart mobility services are prominent: traffic management and public transport. To date, the emphasis has been on using smartphones and traffic sensors to manage traffic. The goal is to provide personalized transportation services to smart city residents via analysis of residents' habits.[14] Attention to the elderly is particularly important in this domain as 19% of drivers are elderly, yet, they were involved in over 65% of fatal accidents in 2018.[15] The remaining 81% must rely on public transportation, walking, or biking. Smart city strategies to improve mobility include ride share applications and public transit tracking exclusively supported via smart devices.[16] This leaves many aging people without the ability to properly use transportation.

Smart city safety and security concerns focus on law enforcement, cybersecurity, and tapping into streams of data to maintain public safety.[17] Citizens are able to track crimes reported in real time using any smart device leaving over a third of the elderly unaware of the safety hazards.[18] Yet, safety and security risks for the elderly include: starving, falling inside the home, being assaulted and/or scammed, and becoming socially isolated.

As Baby boomers dramatically increase the elderly population, smart cities will need to acknowledge and include technologies that take their income, abilities, and limitations into consideration when considering mobility as well as safety and security.

SMART CITIES

There are over 115 definitions of smart cities based on the vision of the government and developers.[19] With the increasing population, smart cities' growing popularity, and the advancement of technologies and networks, smart city adoption rates are projected to increase, and the market value is expected to grow to $820.7B by 2025.[20] Smart Cities, have close amenities, transportation, and social activities which attract younger generations. These aspects of urban areas are also appealing to the elderly community, especially active elderly.[21] By 2030 people over the age of 60 will outnumber children and account for half of metropolitan consumption growth.[22] However, some elderly do not have the ability to access the features of the city that most able-bodied citizens may interact with easily.[23] Decisions are often made unilaterally by able-bodied developers and planners based on the city government's definition and goals, excluding elderly citizen participation.[24] This results in the failure to fully consider what an inclusive smart city should be. To change this, Götzelmann and Kreimeier,[25] proposed a digital twin smart city model for the elderly to experience while seated/walking-in-place using the HMD-HTC Vive VR system. They considered this essential when designing smart cities beyond modifications of existing facilities.

Despite high rates of technology acceptance, smart city developers omit those without access to smart technologies, including around 70% of older adults who need assistance and/or do not feel confident when using a smart device.[26]

MOBILITY

Currently, mobility excludes some communities such as the aging. Basic needs such as benches, inclusive transportation technologies, and even sidewalks are overlooked.[27] Most research studies the mobility of public and private vehicles and few research explores more eco-friendly modes of travel in smart cities. There is no official definition for smart mobility; however, So, An, and Lee,[28] define 6 stages more progressive smart mobility: Level 0: Base Infrastructure (Supply of Base Infrastructure); Level 1: Individual Digitization (Digitization of Individual Transportation Modes); Level 2: Partial Integration (Integration of Public Transportation Modes); Level 3: Full Integration (Integration of Public and Private Transportation Modes); Level 4: Personalized Integration (Personalized User Services Based on Users' Preferences and Experiences); Level 5: Mobility Transformation (Evolution of Transportation and Mobility Services).[29]

Mobility by car

Most smart mobility initiatives and goals integrated as part of the smart city concept center around vehicles and connecting via the Internet of Vehicles (IoV). Congestion, air pollution, and poor quality public transportation are a few of the challenges smart city planners and developers face when formulating and implementing smart technology in cities. Yet, people centric aspects of mobility are neglected further marginalizing some communities.

The elderly cannot drive without risking their safety and the safety of others. This means that smart mobility discourse has an opportunity to include various forms of travel.

Older drivers are most likely to be in car accidents after young/new drivers. Drivers over 70 years of age are keeping their licenses for longer, so the rate of older drivers is increasing.[30] From 1997 to 2018 minor progress has been made with a 15% decrease in fatal car accidents involving those 70 and older, but the licensed elderly population has increased by 66%.[31] Public transportation is a likely solution to this challenge.

Most elderly drive within a city, raising their chances of being in a car crash despite the fewer miles driven and only driving during the day.[32] Drivers with poor memory, vision, mobility, and/or medical conditions were more likely than others to limit their driving.[33] Many aging individuals are also prescribed medication that can impair their driving capabilities.[34] Huisingh et al.[35] found that these functional challenges are associated with car accidents. As driving becomes more difficult, the elderly are forced to depend on alternate modes of transportation, which calls for further discourse.

Mobility by Bus

Smart City vehicle support also addresses buses. Smart bus stops (SBS) have been explored to improve public transit.. Rodrigues et al.[36] created a prototype for testing and deployment to initiate smarter bus stops in Portugal. The main features of the SBS include: connection to the bus stop via smart devices; various ways to interact with the SBS (e.g. motion, touch, facial recognition, or voice); speakers to inform users of the status of buses (e.g. delayed); cameras and sensors to count bus stop inhabitants; a screen to interact with (e.g. play games, find information, buy tickets); alternative bus stop/route recommendations; and a screen for the bus driver (GPS, updates, etc.).

SBSs come with privacy concerns such as data collection, use, storage, how long it is stored, and behavior tracking. Rodrigues et al.,[37] aim to improve urban bus systems however it may not be feasible for metropolitan environments. Features such as counting bus stop inhabitants to relay information to the bus/bus driver over the network and vice versa may result in unpredictable schedules.[38]. The bus may skip an empty stop, which leads to a chance of people mistaking the bus schedule times, especially those without mobile smart devices to track the bus live.

The elderly will not have efficient access to services in a fully developed smart city because most services optimally function with a smart device. Those that do have access are at higher risk of facing safety, privacy, and security challenges. This may be in part due to dearth of digital literacy, cognitive impairments, and/or habitual interactions that have not adapted to newer systems. Those that cannot safely navigate their home, the city, or technology due to disability and/or old age are at higher risk of being a victim of a crime or accidents.[39]

SMART SAFETY AND SECURITY

Ristvej, Lacinák, and Ondrejka[40] describe the idea of a Safe City as a feature intertwined with the smart city concept, that includes a broad range of aspects and activities linked to public spaces from crime prevention to physical protection of surroundings, and accessibility to structures. Safe City ensures the protection of society, property, environment, their informational, cybernetic,[41] and physical safety. Smart safety and security use a variety of technologies, ICTs, and IoT to prevent crime and cyberattacks. Facial recognition software is being employed by law enforcement and large public facilities as security measures to prevent crime, and/or catch wanted criminals; in response to school shootings, a New York school district began implementing this technology.[42] Gun detection systems and companies such as "ShotSpotter" often use audio surveillance calibrated to detect loud pulse sounds.[43] Shots can be identified and reported to the police via microphones and IoT.

Agencies tap into streams of data such as social media, and crowdsource information to predict and combat crime creating a new field called Crowdsourcing Criminology.[44]

Cities, such as San Diego, California, have also implemented LED smart streetlights with sensors, in combination with video surveillance to prevent crime.[45] Light allows better visualization of surroundings, ultimately increasing confidence.[46]

A top priority in safety and security initiatives is Cybersecurity. Blockchain technology uses cryptography to protect Big Data.[47] Data breaches and hacking have proven to be fairly common such as accessing home security systems, CCTV cameras, Zoom, Twitter, and the Marriott Hotel Chain.[48]

Home safety as an objective resulted in the proposal of Smart Homes/Smart Home Devices. The Oxford English Dictionary defines a smart home as homes equipped with lighting, heating, and electronic devices that can be controlled remotely via phone or computer. Smart homes use sensors and software, like Ring, to act as an assistant, security system, and/or monitor.[49]

Subsequent emergency responses are based on home systems detecting anomalies and relaying that information.[50] According to the CDC 36 million older adults fall annually causing around 32,000 deaths, and 1 in 5 falls cause a serious injury.[51] Anagnostopoulos et al.,[52] suggested an IoT algorithm for an altimeter sensor that can validate if a person has fallen or bent over as there is little discussion of verifying hazardous situations. As a result, these technologies provide elderly people with the opportunity to live at home more independently.[53]

Risks Associated with Smart City Technologies

While some smart city technologies aim to maintain a safe city, some pose risks to residents. Misidentification of an elderly person especially BIPOC and women risk them facing a traumatic and false arrest/detainment.[54] Facial recognition has the potential to be a great aid in combatting crime; however, implicit biases in its algorithms place certain social and racial groups at risk.[55] Failing to fully ensure a computer's assessments are accurate can lead to unnecessary police encounters. Historical systemic oppressions have the opportunity to be heavily enforced.

In addition, audio surveillance poses opportunity for mistakes. There is research about audio surveillance and gunshot detection but little about gunshot verification. This raises questions about

how microphones differentiate loud pulse noises such as shots from construction or a scream. This may negatively impact children, elderly, and construction workers in the area, especially those from minority groups.

Crowdsourcing and social media as a method of criminal investigation also have their dangers, such as investigating or accusing the wrong person under the public's recommendation. This can be a threat to the elderly on social media, especially those that are infamous.

Streetlights have changed from dim lighting to bright LED lights, however, this may have a negative impact on crime. If lights are too intense, visibility can be limited by glares and shadows, making dark places appear darker and dangerous.[56] The visually impaired elderly, are at higher risk of assault or robbery. Based on the "Broken Windows" theory; the more a place appears to have crime, more crime will occur.[57] In contrast, low lighting is often used in wealthier areas with low crime rates.[58] Cyber-resiliency and public safety are major goals for city planners, developers, and officials, as well as smart city residents. However, accessing solutions like smart homes and its devices are costly and intrude on privacy. Smart safety and security measures taken in other areas such as home safety, privacy, and accessibility/financial security are not inclusive to all citizens.

CONCLUSION

Smart cities potentially offer many solutions to daily infrastructural challenges. Yet, developers and planners are not creating people-centered designs, smart city designs require more inclusivity, and Americans need to investigate smart cities and their domains further. Mobility initiatives currently focus on vehicles, and not citizens. The proposed projects to help the elderly are not fully inclusive, may infringe on privacy, and require access to resources and capabilities that older adults may not have. Mobility domains call for further exploration to include other modes of transportation excluding vehicles. Safety and security goes beyond cybersecurity and crime; it includes home safety, physical safety, and financial security. The underdeveloped and exclusionary safety measures place the aging at risk of death, homelessness, and/or serious injury. Based on the evidence present accessibility, inclusivity, and the quality of life of residents are underprioritized. There is little discourse in America about smart cities, and especially the domains of smart mobility and smart safety and security. The elderly population will soon outnumber younger generations; the population of cities are also increasing. Smart cities are growing around the world, which calls for much needed discourse in the U.S. Yet, smart cities may not be able to meet their full potential because they are not meeting the needs of certain populations, particularly the elderly.

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BIOPHILIC PROTOTYPES: SENSORY EXPERIENCES OF THE SPECULATIVE INTERIOR ARCHITECTURE

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INTRODUCTION

The advancements that are being made in technology aids us in many ways, such as in interior architecture, so that we feel close to nature while also being indoors. However, in the age of technology, what is a desirable relationship between nature and humans? The answer may be a balanced symbiotic relationship rather than one that is either nature-centric or anthropocentric; that is, a goal to have indoor artifacts that may be generating an impression of a balanced symbiotic relationship. The artificiality in the artifacts could be offset by providing a feature in nature, including ambient signals. In biophilic prototypes, four elements are required: being indoors, having ambient signals, being (seemingly) random, and incorporating the aesthetics of roughness. First, if a media project locates the outdoors, then there is a considerable chance that there will be some aspect of nature, such as wind. To appreciate nature in the media projects (artifacts), the "indoor setting" (having limited access to nature) is a key condition in biophilic media. For the second and third elements, when information technology helps to provide unpredictable data to a media project, the project can generate incalculable activity patterns, as if nature is producing the fortuitous ambient signals. As a result, such artificially made (seemingly) random activity patterns in the media project can give an impression to people experiencing it that they are close to nature. Lastly, the aesthetics of roughness (AofR) comes from the Eastern (specifically Korean) philosophy of architecture, and I propose that this appears when innovation represents nature. This means that a media project using the aesthetics of roughness is the reflection of how we see nature. Although our interpretation has a limitation, and the project may, therefore, give an impression of incompleteness, taking everything into account, when a media project fulfills all of the above, it can be called a biophilic prototypes: a biophilic architectural prototype based on the speculation of one Korean, a woman, regarding the future living spaces.

According to National Human Activity Pattern Survey (NHAPS), about 87% of Americans spend their time indoors and an additional 6% in vehicles[1]. The statistics in the survey, which was conducted from 1992 through 1994, demonstrate that humans can be called an "indoor species." However, even though we spend most of our days indoors, it is common for us to have green plants around us as indoor decorations. Why do we place these plants in our offices and homes?

Clearly, plants have been necessities for survival throughout human evolutionary history, both as food resources and water sources can be identified because they are generally near to plant growth. The environment of evolutionary adaptation (EEA) refers to the environmental condition to which a

species was naturally selected to adapt. Taking a theoretical approach, humans have adapted during their evolutionary history to living close to greenery. In short, an urge to be connected to nature, specifically to vegetation, may relate to human history and may be expressed as a form of biophilia.
Psychoanalyst Erich Fromm coined the term biophilia in 1973, describing it as "the passionate love of life and of all that is alive." Biologist Edward Wilson subsequently used and popularized the term to describe the urge among humans to associate with other life forms. In *Biophilia* (1984), Wilson introduced multilayered conversations about the strength of biophilia. He considered that "artifacts are incomparably poorer than the life they are designed to mimic," meaning that the artifacts are reflections of our thoughts about nature[2]. However, Wilson also proposed that biophilia can include an urge to associate with a quasi-life as a mutated form of biophilia, such as mechanophilia (the love of machines) (Smith 1981). For example, we may want to associate with artifacts that are representations of what we perceive in nature, because we want to feel that we are close to nature. Therefore, Wilson's hypothesis implies that when we have limited access to nature, we may use artifacts to fulfill the biophilia through mutated forms of biophilia.

BIOPHILIC PROTOTYPES

The author suggests using the term "biophilic prototypes" to describe projects that draws poetic nature into our living spaces. More specifically, biophilic prototypes refers to an indoor prototype media project that allows residents to feel they are close to nature by being reminded of a certain element in nature through human-made materials that simulate ambient signals based on information data. Although finding the relationship between health, environmental, and economic benefits is a goal that has been pursued for a long time in many civilizations, the appearance of the biophilia hypothesis contributed to the coining of the term "biophilic design." Biophilic design is a concept that is used in the architecture to increase the exposure of residents to their natural environments by simulating sensorial experiences of nature through including the natural resources and conditioning the flow of activity of the residents. To illustrate further, in the 1990s, an issue around the relationship between the quality of working environment and workers' productivity emerged along with the green building movement[3]. Research in this area has found that the quality of a working environment not only indicates the financial benefits that result from improvements in productivity but also addresses the issues around better health and well-being at their workplaces.
Furthermore, researchers have subsequently focused on discovering the characteristics of nature that can improve the quality of the living and working environments. For example, Kellert (2008) roughly categorizes nature into six biophilic design elements with 70 attributes[4]. In addition, Browning and his colleagues (2014) classify nature into 14 different patterns to achieve the goals in biophilic design[5]. This variety of categorizations shows that we comprehend nature in terms of various focal viewpoints. In short, there may still be uncharted characteristics that make nature feel like nature. The followings are existing biophilic prototypes examples that attempt uncharted qualities, ambient signals and unpredictability in nature.

RANDOMNESS OF AMBIENT SIGNAL: *AMBIENTROOM* (ISHII, ET AL. 1998)

In 1998, Ishii, Brygg, and their colleagues created a physical architectural project called "ambientROOM." This experimental information-based installation presents a new interface between humans and digital information in an indoor setting with the view that "ambient signals" can let people palpate invisible digital information. To demonstrate this, the researchers simulated ambient signals in nature, which are aspects we easily overlook: For instance, when you have an in-person meeting, even if you know that wind is blowing around, you may not pay any attention to its speeds

and directions unless this information is important for you to consider at the given moment: this wind is an ambient signal.

In *ambientROOM* installation, indoor events are all interpreted as numerical information. The information is then transferred to human-made devices that generate the auditory and visual representations. These representations are ambient signals that transform digital information into sensory experiences.

To illustrate an example of *ambientROOM*, the researchers chose to include a hamster wheel, and as a hamster spins the wheel, its activity information is transferred to a motor in a shallow water tank. The motor vibrates the water in the tank according to the transferred information that is transferred. A lamp reflecting off of the water then lets a rippling shadow fall on the ceiling and an adjacent wall. This rippling shadow is also an ambient signal, providing a visual experience.

By looking at the random rippling shadow on the wall, people not only see a poetic appearance of water but also receive the activity information of the hamster. In other words, the ambient signal on the interior wall is not a literal presentation of nature but a reflection that triggers the image of a connected event (hamster's activity) in a viewer's mind and surroundings.

UNPREDICTABLE DATA AND NATURE: SMART BULB DESIGN PROPOSAL *SILK* (2015) BY SAFFRON

A smart device is an electronic device, such as Bluetooth, Zigbee, Wi-Fi, near field communication (NFC), and more, that is connected to other devices via wireless technology. The exponential growth of connected devices results in the third wave, the "Internet of Things (IoT)," in everyday lifestyles. When we have smart household appliances, what should we call our living spaces?

According to Cook and Das (2004), the living environment that is supported by smart devices is called the smart environments[6]. In other words, smart environments appear when computational systems in smart devices share tasks autonomously and perform everyday ones accordingly. In the case of a smart indoor environment, the analysis of data from sensors and input from residents helps in monitoring these indoor environments to provide better living conditions.

In 2015, a company called Saffron proposed a smart light bulb design called *Silk* (bulb). *Silk* involved a smart lighting system that would allow residents to sleep soundly at night without disrupting their circadian rhythms. Circadian rhythms are one of the biorhythms that regulating the human body: in the morning, a person's metabolic system becomes active (e.g., blood pressure and body temperature rise), but in the evening, the body goes into a resting mode (e.g., blood pressure and body temperature drop). What sets the *Silk* bulbs apart from other color-changing light emitting diode (LED) bulbs (e.g., the Philips Hue light bulb) is that they automatically adjust their color temperatures to match the sun's color information throughout the day as well as at night in an office or a home. Such an adjustment lets residents have enough brightness while they do their daily indoor tasks. However, although Saffron began a fundraising campaign to build the initial *Silk* production through Kickstarter for $100,000[7], the company was not able to reach its goal in the required 45 days.

By looking at the design proposal for the *Silk* bulb, we learn that this indoor light bulb media project can generate ambient signals based on the daily data of the sun, to condition a better indoor environment for the health of residents. It is evident that this type of indoor lifestyle promotes both the transformation of nature and the value of the natural light to address health issues.

Overall, biophilic prototypes contain ambient signals and simulate unpredictable sensorial experiences in nature. The examples above are artifacts that have been individually installed in a building. What if the building itself can then simulate nature while generating ambient signals based on the unpredictable data information that is transferred?

AESTHETICS OF ROUGHNESS DEFINITION OF NATURE IN EAST ASIA

Translation of the term "nature" in East Asia first appeared at the start of the 20th century; however it was nearly 50 years before the term truly embodied its present-day meaning and incorporated the alien concepts from Western literature[8] [9]. Consequently, the word nature reflects how the East Asian countries comprehend humans and nature in complex connotations, including states of artlessness or situations that happen without human involvement. Along with the sophisticated meaning of the word nature, two major notions, "non-duality (不二思想)[10]" in Buddhism and the "nature of non-action (無爲自然)[11]" in Daoism, have contributed to the concept of nature in modern Korea (Joseon dynasty, 14th-19th centuries)[12]. While pursuing non-duality and the nature of non-action, how did the people of the Joseon dynasty overcome the separation of outside and inside in their living spaces?

AESTHETICS OF ROUGHNESS IN TRADITIONAL KOREAN ARCHITECTURE: HANOK

"Han" means "Korea" and "ok" means "house". Traditionally, hanoks were built with the following four elements: wood, stone, clay, and paper[13]. Iron was used only for hinges and locks. Although a hanok refers to a house both a neowa-jib (a wood shingle-roofed house) and a giwa-jib (a tile-roofed house), the word commonly implies a giwa-jib (a tile-roofed house) in Korea[14].

The term "aesthetics of roughness (엉성함의 미학)" was first used by a historian of Korean architecture, Seok-Jae Lim (2010), when he described the architecture of the Joseon Dynasty. Lim roughly defines the term as an impression of incompleteness and unsophisticatedness in hanoks, which are built in various sizes. Lim considers that the word hanok reflects the aesthetics of roughness because, in the past, Koreans took into account the view of letting nature be as it is by preserving the original figures of the building materials, for instance, through the use of a ceiling crossbeam, which is a central structure that balances the loads between the roof and the foundation.

Unlike the traditional Chinese and Japanese architecture[15], in traditional Korean architecture, the main crossbeam keeps exposing its original tree trunk figure[16]. This means that the architecture combines the manufacture of materials while maintaining the original shapes of the trees. This tendency indicates that traditional Korean architecture aims to achieve both design techniques and living harmony with nature.

However, comparing a roughly refined bent wooden crossbeam to standardized sleek wooden materials would show that the crossbeam looks unfinished, because human rules do not tailor it exactly. Essentially, should we consider only something that is shaped in a tailored form as complete? Learning from traditional Korean architecture broadens the idea of inviting nature into a house to incorporate the conservation of the characteristics of nature through the roughness in their design. Therefore, the aesthetics of roughness may mean a design that has functionality as well as including the impression of incompleteness.

AESTHETICS OF ROUGHNESS IN BIOPHILIC PROTOTYPES: *POT NO.5* (2019)

The term nature in this project implies the nuances of plants. These nuances of plants are related to the inconspicuous signs of the plant which generate a phenomenon called "plant-blindness". This phenomenon appears through the subtle movements and ethereal senses in static vegetation, such as moss and trees, which is easily dismissed in comparison to more animated living species, including insects and animals. In other words, the random and subtle motion is an ambient signal in plants.

Figure 1. Pot No.5 (2019)[17]

"Pot No.5 (2019)" is an object that has been designed based on the speculative design approach by considering the future interior architecture design that may remind humans of feelings they have when they are close to nature. This project is small enough to be handheld as a prototypical design for an interior wall-scale project. The design functions as an "alternative plant" that moves in unexpected directions, changing its forms according to both preloaded random numerical values and a user's physical interaction with it.

The project consists of pink mesh fabric, a long shape-changing alloy[18], a microcontroller, a 9-v battery, and a white acrylic box that can be handheld. On the top of the acrylic box, three different sizes of pink fabric form three arches because the pink fabric wraps loosely around three shape-changing alloy arches. However, since these arches are connected as one long alloy, the two edges of the alloy easily attach to a microcontroller, which is inside the white acrylic box and has a battery. This battery gives enough electric power to operate the microcontroller.

When a microcontroller is turned on by a battery, a pre-installed code inside the microcontroller generates random numbers for two uses. One random number is for controlling the strength of electricity, and another set of random numbers is for the duration of the electricity use. Based on these numerical values, electricity goes through the shape-changing alloy and alters the alloy's motion and shapes. Because of the movement of the alloy, each pink fabric arch appears to alter its speed and shape randomly. Moreover, when the code operates to stop providing electricity to the shape-changing alloy, the alloy stops moving and returns to some extent to its previous form. In another case, when the user alters the shape of the pink fabric arch by grabbing it, the device can still move and reform its shape at a slow speed that is randomly selected.

The subtle motion in the flexible arch figures of *Pot No.5* gives a hint of animation as plants do. Furthermore, the unpredictable directions and reformations resulting from the project produce a sense of nature's randomness. Due to the scale of the current *Pot No.5*, some designers may consider that it

conveys a roughly sketched idea of nature that can be used for the bigger scale of a complete project; that is, some may say it is a prototype. In terms of future consideration, *Pot No.5* employs an ambient signal of plants in the form of design prototypes for interior architecture by awakening plant-blindness. A wall-scale of this as a future work will allow for the investigation of how we understand the physiological relationship to a wall that provides ambient signals of plants.

CONCLUSION

The biophilia hypothesis refers to the belief that humans have an urge to be connected to nature. To accommodate this urge, the architecture industry uses a concept of biophilic design to improve the physical and mental health of residents in indoor environments by simulating sensorial experiences of nature, placing the natural resources in these environments, and conditioning the flow of activity of the residents. In this paper, the author proposes the term "biophilic prototypes" for indoor biophilic media projects that use real-time data to trigger a feeling of being close to nature by actuating human-made devices with simulated ambient signals from nature. Based on the biophilia hypothesis and the related previous discourses, the author uses existing examples that have features of biophilic prototypes, such as *ambientROOM* (1998), by Ishii and Brygg, and the smart bulb design proposal *Silk*, by Saffron
(2015). The author explains "what makes nature feel like nature" by introducing the notion of the aesthetics of roughness that is used in traditional Korean architecture. The aesthetic of roughness in media practices has at least two meanings for roughness: roughly assembled materials and roughly sketched ideas about nature. This paper addresses the latter. By considering the aesthetics of roughness, the author introduces her research project, *Pot No.5* (2019), to define biophilic prototypes.

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NOTES

[1] Neil and his colleagues' research is about air quality in residential locations regarding the relationship between human activities and pollutant exposure, specifically tobacco smoke. Because human activities influence on the timing and location of the pollutant exposure, the researchers collected where and how many hours people spend the most in a day. The statistic value objectively shows that we spend about 93% of a day in enclosed spaces.
[2] Edward Wilson *Biophilia* (1984, 115).
[3] Romm and Browning *Greening the building and the bottom line* 1994.
[4] Kellert (2008) suggests there are two basic dimensions of biophilic design, such as organic or naturalistic dimension and place-based or vernacular dimension. And the two dimensions are related to six biophilic design elements: Environmental features, natural shapes and forms, natural patterns and processes, light and space, place-based relationships, and evolved human-nature relationships (3-19). The total subsequent elements in those categories are about 70 designs.
[5] William and his colleagues suggest 14 biophilic design patterns considering spaces: visual connection with nature, non-visual connection with nature, non-rhythmic sensory stimuli, thermal and airflow variability, presence of water, dynamic and diffuse light, connection with natural systems, biomorphic forms and patterns, material connection with nature, complexity and order, prospect, refuge, mystery, and risk/peril.
[6] Diane Cook and Das Sajal Kumar *Smart environments* (2004, 3).
[7] "Silk by Saffron-Smart LED Lighting-Bring Sunlight Inside." *Kickstarter.* Accessed May 2021. https://www.kickstarter.com/projects/364176964/silk-by-saffron-smart-led-lighting-bring-sunlight/description.
[8] Casper Bruun Jensen and Atsuro Morita *Multiple nature-culture, diverse anthropologies* (2019), 5-6.
[9] For instance, the Japanese translation of the word nature required either creating a new word by combining Chinese characters or borrowing from ancient Chinese words that were no longer commonly in use (Satsuka 2015, 19-20). The word nature in the East Asian countries (China, Japan, and Korea) is equivalent to "自然 (ziran; shizen; jayeon)" which all refers to a state of artlessness or a situation that happens without human involvement. Consequently, this word reflects how the East Asian countries comprehend humans and nature.
[10] From AD372, Buddhism began spreading religious teachings in ancient Korea, and one of these teachings was non-duality. This term describes a view of the whole world as a single world, even though the world seems to be made of multiple objects and beings standing by themselves and contrasting with others by being independent static substances. In other words, non-duality in Buddhism is a state in which being one does not create any conflicts, and dichotomies do not appear to be one. Seen from this perspective, the separation between one and another is caused by selfishness and avarice, not by human nature (Lim 2010) To put this simply, humans and nature are not separate or independent, but interconnected as one.
[11] On the other hand, the concept of 自然 comes from Taoist Laozi. The central idea of the Taoist (or Daoist) is the nature of non-action, which means letting nature be as it is. To do this, Daoism encourages humans to live by the flow of nature because human life is just a small part of an immeasurable scale of nature. This suggests that nature and humans are not opposing counterparts. In short, Daoism seeks a harmonious human life with (and in) nature.
[12] Because of Korea's geolocational and geographical characteristics, the understandings of nature among the people are heavily influenced by both Buddhism and Daoism (Lim 2010). The combination of these two promotes thoughts; I and others are one, are not separate. An extension of this notion appears in the concept of exterior and interior. To illustrate, greed in humans causes the idea of defining the outdoors and enforcing the indoors to meet our needs, although outdoor and indoor spaces were initially just one space.
[13] Nani Park and Rober Fouser *Honok: The Korean house* (2014)
[14] Sang-Hyeon Lee *Read hanok joyfully, build hanok happily* (2007, 18).
[15] According to Que and his colleagues (2016), during feudal society (475BC to 1911AD), many architectural characteristics emerged from beam-lifted frame to through-type frame wooden structures and the construction form and standard material requirements of wooden structures. At this time, the ancient Chinese officially published a set of standard rules for building structures including the sizes of wooden components. This standardization in sizes and styles of wooden components for constructing buildings influenced far-reaching countries, such as Japan. Standardizing wooden components means that crossbeam shape amphora, square, or straight rectangles in traditional Chinese and Japanese architecture.
[16] Nam-Chull Joo *Korea Architecture History* (2006)
[17]Documentation may show you how it subtly and slowly moves randomly.
https://www.youtube.com/watch?v=XzasAPI1_RM
[18] A shape-changing alloy is a shape-memory alloy, which can be deformed when cold and reformed shape when heated. In *Pot No.5*, electricity heats the alloy to reform the alloy.

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THE ARCHITECTURE STUDENT AS *CYBERFLÂNEUR:* COMPOSITIONAL, SOCIAL AND TECHNOLOGICAL MODALITIES IN REPRESENTING THE URBAN EXPERIENCE

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INTRODUCTION

A frame announces “send to” with the choices “your story” or “close friends”; these are the options offered by a smartphone, displayed over a photograph of the State Library from the 1920’s. This student’s photographic submission reveals more than just these options. In 2021 architectural representation looks different from what it did 10 years ago or at other times and with previous generations. This change in our experience of the city is due to the transformational role of computers and augmented reality. This research project considers the concept of TIME and how technological developments and a universal synchrony makes the world, and our experience of it, similar in any particular slice of time. The enquiry is premised on the idea that computers have become the mediators in the complex interactions between people, place and data. The computer in this scenario refers to the smartphone and how it has the capacity to generate, analyse and distribute data. The smartphone carriers are students, here described as *cyberflâneurs.* The places are a selection of buildings of an urban typology built at very particular times. The data is architectural representations (i.e. manipulated photographs & short films) produced by students. The focus of the project is to show that there are similar creative outputs in any given moment in time by comparing visual material produced by the device to highlight this universal synchrony. It could be argued that these methods of capturing data on buildings and cities are a contemporary reflection of the way we conceptualise architecture and live in cities.

Figure 1. State Library by Dian Lucas.

Time

In this text, the term "contemporary" is used in the way that Bourriaud[1] describes it as only an indefinite present, to today and nothing else, yet also implying that "contemporary" will be similar, but also different from the previous or the next "contemporary". The gathered visual material from student projects has allowed for the extrapolation of information about synonymous concepts such as: concurrent, contemporariness, *genius saeculi*, nowness, parallel, sameness, similarity, "spirit of the time", synchrony, synergy, universal and *zeitgeist.*

A distinction is made between continuous time that happens in chronological order, and two isolated moments in history, seen through contemporary eyes, which is explored in this study. The students produced representations of 100-year-old buildings and 50-year-old buildings; The dates are rounded-off and represent different generations and how a building's use or meaning can evolve over time.

Place

In the Italian architecture magazine *Domus*[2], Gauteng is listed as the second largest metropolitan area in Africa with a population of 13.4 million people, just below Lagos with 14 million. Note that Gauteng is historically made up of Johannesburg, Pretoria and surrounding townships as originally planned by the apartheid government. Because of their proximity and dissolved borders, it can today be seen as one urbanity. The site of investigation is the central business districts of Johannesburg and Pretoria. Even though the South African city has very low densities, the central business districts can be comparable to cities with much higher densities.

For comparison, the typology of a compact, vertically stacked structure was selected as representing a universal contemporary inner-city architecture. A good example of 20th century urban typologies are Emanuel Christ and Christoph Gantenbein's book *Review No111. Typology – Paris, Delhi, São Paolo, Athens*[3] who sees most of the buildings that constitute the modern city as standard solutions. The students could choose one building each as the artefact under scrutiny from a curated list built either around 1920 or 1970. The buildings are all public with either a commercial or residential function and constitutional or corporate owner. Some are still in use, some are abandoned, and one structure[4] was imploded just after the students' recording.

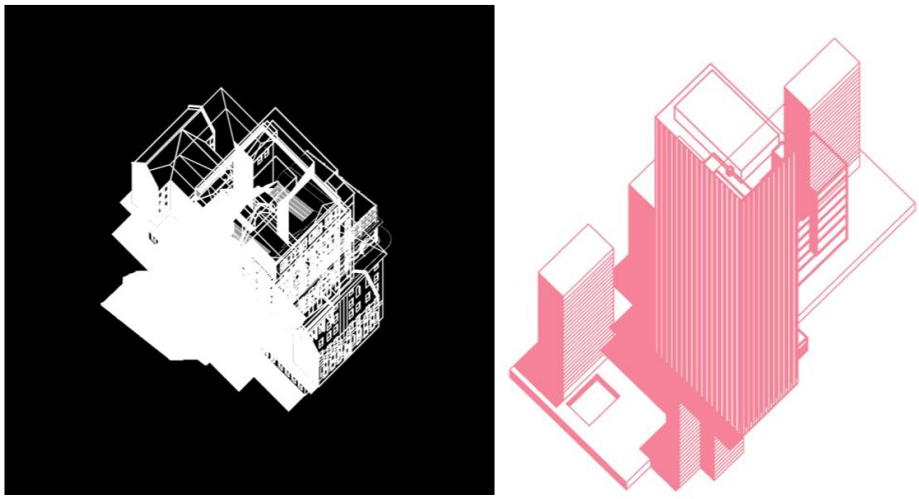


Figure 2. 1920 Typology (left), 1970 typology (right) by Lebogang Baleni.

People

The significance of the *flâneur* as an appropriate title for the observer of the urban environment was borrowed from the award-winning magazine called *Flaneur*[5]. The magazine has explored global microcosms, including urban settings in Berlin, Leipzig, Montreal, Rome, Athens, Moscow, Taipei and São Paolo. Described by the editors: "*Flaneur* presents one street per issue. The magazine embraces the street's complexity, its layers and its fragmented nature... The magazine is aware of its subjectivity. It wants to say: "This could be (the street called) *Treze de Maio*".[6] A *cyberflâneur* becomes the updated version – someone strolling, but simultaneously scrolling – connected with the virtual world of the internet via their smartphone. The viewpoint of the *cyberflâneur* becomes the lens through which time and architecture's relationship is revealed.

The premise of this design theory assignment was that students were assigned the role of the *cyberflâneur*. The exercises were carried out with two groups of students in 2019 and 2020; The student profiles revealed that 82% were born between 1994-1997, thus millennials, now between 23-25 years of age. Only one third was female. Only 16% had a rural upbringing, the rest urban, or suburban. Nine cultural groups were identified classified according to language: Afrikaans, English, IsiZulu, Northern Sotho, Southern Sotho, Sepedi, Tswana, Yoruba, Xhosa.

Data

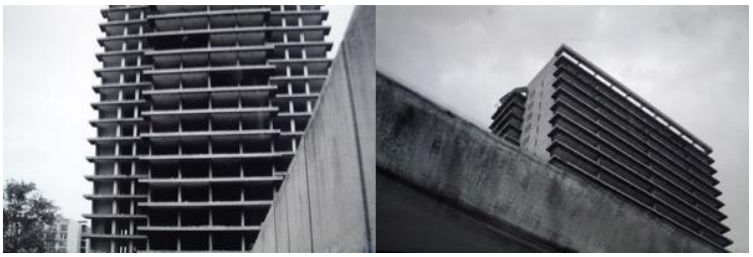
34 buildings, a third 1920 and two thirds 1970, were documented. Around 60 students generated a maximum of 9 A3 images and a 4-minute film each. The manipulated images were interpreted and archived according to visual features to trace similarities. (Table 1) Teaching in the exit-level Bachelor of Architecture design studio, the norm is using the city centre as the laboratory and the site for design projects due to its proximity and relevance. Adaptive reuse projects are the most appropriate interventions in this context. Photographing, filming and documenting the context precede each architectural scheme, a documentation process which becomes a project in its own right.

2019 - 50 = 1969	Woltemade Building | Bongane Zulu						
69.15C							
	1	2	3	4	5	6	7
Colour palette	strong primary colours with black						
Concept or special feature	Strong graphics + recolour						
Format frame	portrait						
Mirror					diagonal 3-d		
Radial mirror	radial frame						
Highlighter pen							
Ghost image / fade							
Collage		different scales /		different scales /			
Animate							
Repetition			elevation				diagonal warped
Recolour STRONG						primary colours +	
Google satelite image							
SIGN like Mc Donalds							

Table 1. Archiving of Bongane Zulu's photographic submission

Jesús Vassallo's project on pairing architects and photographers in *Seamless: Digital Collage and Dirty Realism in Contemporary Architecture* is an ode to blurring boundaries between these two disciplines. From the introduction by Herreros: "Indeed, it would be appropriate here to speak not of architecture but rather of the "project of architecture" or processes of architectural design; and rather than of photography of 'ways of looking' at our immediate surroundings, the most everyday elements, to transform them into raw material for the contemporary project." [7] The action of digital collaging[8] that the apps on the smartphones facilitate, is another theme of Vassallo's project, and an outcome of the manipulated images.

Melanie van der Hoorn is more interested in the moving image and explored how the medium of film has ever since the 1920s improved the representation and communication of architecture and urban design in her book *Spots in Shots. Narrating the Built Environment in Short Films.* The requirement for the short film by the *cyberflâneur* was that the space of the street and the building becomes the main "actor", a photograph in time. The short films were classified and archived according to concept, colour, editing, framing, and sound to trace similarities. (Table 2)



nr	**69.14 A**
Building name	**Schubart Park**
Documented by	**Kyle Peinke**
Movie description	**Slow pan views, beautifully photographed, far / close, interior incl. shops, parking**
Sound	Classical music
Colour	Black/white exterior footage, enter building minimum use of colour
Frame	Horizontal computer screen
Camera work | editing	Use black frame to transition

Table 2. Archiving of Kyle Peinke's short film submission

ZEITGEIST 2021: SMARTPHONE & INSTAGRAM

Bernard Hulsman, in an article called *Similarity*, traced the concept of *zeitgeist* in architecture originating in German Romanticism and was propagated by such philosophers as Friedrich Hegel. Hulsman suspected that *zeitgeist* should be listed as a possible origin for the search for originality; the widespread view that every age had, and even demanded, an architectural style of its own, and thus making it the architects' moral duty to be 'contemporary'.[9] Thus, by clinging to 'older' ideas you are resisting progress. And advancements in technology is about progress and about being contemporary. Historically, Hulsman stated, 'sameness' was either promoted; For architects in Antiquity and into the Renaissance, 'classicism' was a kind of construction kit full of replicate-able scaled components such as the Doric, Ionic and Corinthian columns.[10] Or was contested like the tubular steel chairs of the Bauhaus. The historian Reyner Banham used the word *Zeitgeist* in the context of copying or plagiarizing of who conceived that particular tubular steel chair first. He wrote "…the proliferation of such integrated designs for steel tube chairs was so rapid and universal that it soon appeared almost an anonymous, automatic creation of the *Zeitgeist* like Choisy's flying buttress." [11] A recent nod to the culture of copying involved the classic Italian fashion houses Gucci and Balenciaga which broke every rule of luxury fashion, Alessandro Michele hacking his friend Demna Gvasalia resulting in a Gucciaga / Balencigucci extravaganza, (Autumn Winter 2021) referencing classic traits from the other house including putting double insignias/logos on some items. They share a synergy, but don't call it a "collaboration"; They call it a "hacking" or a "mutual contamination".[12]

Technological

To interpret the student's visual data, the work of Gillian Rose[13], who studied visual culture, was referenced. She talked about technological, social and compositional modalities. It is argued that "the spirit of the time" is dictated by technology. New technologies change our perception of things, and of time. Television[14] was the first technology that changed the film-viewer's relationship with film, and by extension space-time, only seen from a cinema seat before. McQuire said that television immersed us in the so-called eternal present and quoted Deese Sconfield, first president of CNN, talking about live broadcast in an interview: "You want to lock everyone in the world in the belief that the next minute, the world's greatest catastrophe, the world's greatest joy, may occur, and if they leave CNN

they will have lost that one great moment in their lives that people will talk about forever…".[15] Soon the VCR (video cassette recorder) demolished the aura of the television's mode of absolute presence. The VCR introduced the potential to "time-shift" (to view what you want when you want), and to fast forward or rewind to any section you feel like. This has affected our concept of history and access to the past. The next technology – the TV remote control[16], made the manipulation possible from the couch. You then had a choice to instantaneously change television channels, freeze, rewind or fast-forward, switch between live and taped programs, and mute or increase volume, never before from your seat. Architect Norman Foster[17] admitted that the science fiction of his youth is the reality of today, he is still certain that if he told his 16-year-old self that he would be able to – communicate, type, find any book or movie, watch the news, photograph, process and store the photo – on a device that you can hold in the palm of your hand, he would have thought it's a crazy idea.

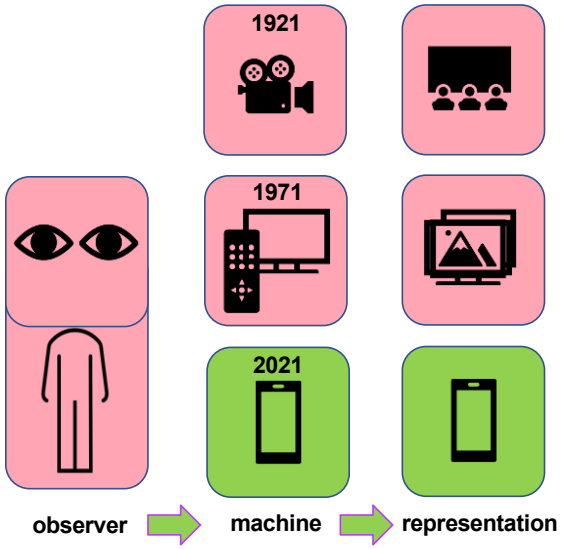


Figure 3. Visual data and technology by author.

Social

Social media, where you share the data mostly generated via your smartphone, is not new to the Millennials, and it reveals the popular social trends through the services these applications offer. Instagram is right now the most popular way to connect socially, replacing Facebook. Communicating through curated visual information is the norm today. Instagram is a visual gallery, the text is secondary, if not omittable completely.

From the statistics gathered from the participants, technology has become a large part of the *cyberflâneur's* daily ritual (4.5h average). The device of choice is the smartphone, otherwise a personal computer or laptop. The subject matter of the colourful photographs produced by the students are mostly grey, muted architecture of which 85% of the buildings are still in use but in serious need of renovation. The brutalist towers of *Schubart Park* (completed 1976) is on the curated list, in a ruin-state, stripped so that only the concrete skeleton is left. Yet seen through the students' eyes, washed in bright (or pastel) colours. The high resolution the smart devices have to offer becomes a reflection of the augmented way we view the world today. Photographer Wolfgang Tillman noted that the attention to detail in a digital picture, that he calls an inhuman sharpness, does not correspond any more with our everyday seeing experience.[18]

The way reality is altered by computers extends past the image galleries. The dual state of real versus virtual is particularly difficult to fathom if you are older than a certain age; A case in point is gaming. Even though an affinity for playing is not as simple as being a certain age, but exposure to the medium is a contributing factor. As 2020 will go down in the history books as a Zoom experience, where space was substituted, according to Blum, "its flat boxes became the venueless venue for everything – church, classroom, and banquet hall. The mise-en-scene of the flat background was for a moment our only public architecture."[19] During this time Blum's 7- and 10-year old had another virtual world into which to immerse themselves, he calls it "the candy-coloured islands" of *Animal Crossing: New Horizons*, an elaborate new video game released by Nintendo in March 2020.[20] Although this world is populated by cute talking animals and maybe targeted for a certain age group, Blum sees the premise as similar to *Sim City* and *Mine Craft* which involve inhabiting and creating a virtual world with unbelievable attention to detail. The game players' main activity is design – you start by buying and arranging furniture, eventually you can build bridges and transform the island creating pathways and hills. The Swiss architects Andri Gerber and Ulrich Götz gathered a series of interviews and essays in *Architectonics of Game Spaces: The Spatial Logic of the Virtual and its Meaning for the Real*, where they argue how important these simulated environments are for architectural design. They argue that especially because of architecture's solid nature, the fluidity of the virtual spaces of gaming can inform architecture. The heading of an essay by Gerber *Architectonics of Game Space, or why you should Play and Design Video Games to become a better Architect* sets out his position very clearly.[21]

Compositional

The representations, or photo collages, produced by the smartphones are layered. The base layer is the aged building as an original photograph. The term "original" makes reference to the initial shot without any post-manipulation; Yet, it becomes hard to pinpoint the "original" because of all the settings available pre-shooting. The images were deconstructed using the available apps, becoming collages of parts, often in perfect radial symmetry. Even though the brief asked the students to use applications they use currently on their devices to render the photographs of the buildings more subjectively, the strong presence of these applications was not anticipated. This was not an exception, but a rule. When comparing the photographs, the individual portfolios contain variety in almost all the shots, but when viewed in the context of the other participants' work, there are few shots that do not fall into one of the types used by the others. The photo editor on the smartphone allows everyone to rotate, crop, filter, splash, blur and adjust.

Taking the crop function as an example, the square frame is the obvious choice, made popular by the layout of the Instagram gallery, the grid of three horizontal images repeated infinitely vertically. Where the square proportion is similar in both directions, an A4 can be displayed in landscape or portrait format, the latter the obvious choice since smartphones are designed to be held vertically in the hand. The wide screen of the cinema was replaced by the shorter landscape format of the TV and now the frame is vertical. The Instagram gallery scrolls vertically, you view imagery top to bottom, a departure from the way Western books are paged from left to right. The pattern produced by the rows is an elongated checkerboard. This allows you to make associations from top to bottom, or left to right, or even diagonally (if you refer to a traditional storyboard or film strip, it is only left to right). It could be argued that the checkerboard layout highlights similarities and allows for a wider range of associations made between the parts.

More concept driven work was produced through the medium of film that allowed for less generic outcomes. Similarities were found in dynamic editing and framing the footage in a filmic horizontal

direction. The editing process was done on their laptop or pc rather than the smartphone, and apart from the fact that the medium of film, like Netflix and streaming from home, has transformed and changed what and how we receive content, but the format is still landscape. Everyone's editing skills were very competent. It shows the mastering of their electronic device and may point to their familiarity with piecing together the fragmented nature of the experience of contemporary life. Sourced footage inserted into their sequences suggests this generation's faith in "googling" information, it democratizes and allows for a subjective opinion. Google Earth allows you to view the world as never seen before. A satellite image can zoom out to view the continent and then zoom in to the birds' eye view of a particular building roof. Even though information is served in bite-size pieces, we have an idea of the bigger picture, the zoomed-out view.

CONCLUSION

It could be argued that the reason the architecture from 1920 or 1970 looks the same is obvious because it was done either in a Classical revival or in a Modernist style. And in the same way the visual material produced by the students, i.e. similar cell phones on sale in the local and international market will produce similar results. The collective spirit is generated with the help of computers, or smartphones. Designers and urban residents, or *cyberflâneurs,* now have a personal toolkit in the palm of their hands. Their smartphone is their recording, analytical and sharing tool. Some say that a particular quality in the arts, or architecture, can often only be recognized and named in retrospect, but it can also be argued that the self-obsessed smartphone generation might recognize their current shared obsession and use it as an advantage when approaching design, freeing oneself of the culture of originality. The contribution lies just as much in the understanding that time's significance extends physical borders and ties us to a synchrony that precedes design. It might appear that this argument disregards local culture in favour of a global one, but it is about understanding that to be in sync is to be contemporary.

NOTES

[1] *Nicholas Bourriaud, "Art, Cable and the Net. The Post-TV Situation." In C. Costa (Ed.), TV 70: Francesco Vezzoli guarda la Rai. (Milan: Fondazione Prada, 2017), 423.*
[2] Jean-Pierre De la Porte & Andrea Zamboni. *Future African Cities.* (Supplement to Domus 1015 July-August 2017), 34-57.
[3] Emanuel Christ and Christoph Gantenbein's *Review No111. Typology – Paris, Delhi, São Paolo, Athens* is a collection of typical urban buildings, and includes examples from the four metropolises. Christ and Gantenbein make it clear that the current quality of all four cities are rooted in built artefacts that developed mainly in the 20th century, and each has a direct historical connection with classical Modernism. (3,4) The urban type their book presents of the 100-year-old modern city is the compact multi-storey building – each one addresses densification in some way. Technologically speaking, the buildings are seen as modern, since most were manufactured rationally using standard concrete slab and column construction, known as the Dom-ino model. (4)
[4] The *Bank of Lisbon*, later the *Department of Housing*, built in 1970, a 31-storey building in the center of Johannesburg was irreparably damaged by a fire in September 2018, it was deemed unsafe after engineers found the slabs damaged and posed a thread of collapse. The building was imploded on Sunday, 24 November 2019. (Chabalala, 2019)
[5] The content of the magazine is produced with and for *Flaneur* by artists of all disciplines while the team spends two months on location. It is made using a collaborative, impulsive and unconventional approach. "The magazine attempts to use a single microcosm to tell universal stories." (https://www.bruil.info/product/flaneur-8-taipei/, Accessed 2021/02/22).
[6] Grashina Gabelman & Fabian Saul, Flaneur 07. *São Paolo. Fragments of a street. Treze de Maio*. Inside cover.
[7] Jesús Vassallo. *Seamless: Digital Collage and Dirty realism in Contemporary Architecture.* (Architecture at Rice & Zurich: Park Books. 2016), 9.
[8] See in particular *Identity Theft. Filip Dujardin vs. De Vylder Vinck Taillieu*, 45-68. "…the reference to bricolage is almost unavoidable, triggered by his (Dujardin) intentional conflation of architectural subject matter and digital collage technique." (51) In: Vassallo. *Seamless: Digital Collage and Dirty realism in Contemporary Architecture.*
[9] Bernard Hulsman, *Similarity*, 31.
[10] Bernard Hulsman, *Similarity*, 30.
[11] Reyner Banham. *Theory and Design in the First Machine Age.* (Oxford: Architectural Press, 1997), 198. Banham saw del Marle's remarks in *L'Effort Moderne* in 1927 as "a patent disingenuousness in an attempt to excuse (Marle's) own obvious cribbing of the Mies design." (199) Del Marle (in Banham, 1996) seemed to blame *Zeitgeist,* he interpreted it as a collective, or a family: "For practically a year we labored, my faithful craftsman and I, upon its possibilities. Parallel to us, Mies van der Rohe, Marcel Breuer, Mark Stam. Steel so modern a material and the Rationalism that commands its use, together gave all our realizations a family face. Should the credit go to Mies van der Rohe or to Breuer? Plagiarism? NEVER. Rationalism engenders a collective art." (199)
[12] Ahmed Osman, *Gucci and Balenciaga just broke every rule of luxury fashion. ID-fashion April 2021, 9:00pm*. In: https://i-d.vice.com/en_uk/article/5dbzmd/gucci-balenciaga-collaboration-aw21-review-runway-photos, Accessed 22/07/2021.
[13] Gillian Rose, *Visual Methodologies. An Introduction to the Interpretation of Visual Material.* (London: Sage Publications, 2002), 30.
[14] According to Friedberg (2000) a TV set per American household grew from fewer than 250 000 sets in 1952 to 80% of the American household by 1960. In 1985 only 20% of households owned a VCR; and by 1997 88%. (443) In South Africa TVs started only being part of privileged households at the end of the 1970's. Cable television developed in the USA in the 1970's. Broadcast television required a clear line of sight between transmitter and the receiving set. Cable television developed in areas where these signals were not clearly received. This allowed for more channels to be on simultaneously, and allowed for channel surfing.
[15] Scott McQuire, *Visions of Modernity, Representation, Memory, Time and Space in the Age of the Camera*, (London: Sage Publications, 1998), 254.
[16] Friedberg (2000) informed us that the TV remote control penetrated households as rapidly as the VCR in the USA. In 1976 9.5% of TV sets were sold with remote controls, by 1990 90% of them were. (447)
[17] Norman Foster, *Urbanism. What was next. Cities are the future,* 1061. In: Domus 1040, November 2019.
[18] Wolfgang Tillmans, *Neue Welt,* (Köln: Taschen, 2012), 7.
[19] Adrian Blum, *Virtual Reality Check*, 36.
[20] In the three months since release and the article by Blum, he noted that 10 million copies of the game have been sold. (36)
[21] Andri Gerber's article imagined key figures from the last century, including architectural historian Reyner Banham (1922-1988) playing video games. (135) About 50 years ago Banham published *Los Angeles: The Architecture of the Four Ecologies* in which he famously confessed he had to learn to drive to read Los Angeles in the original, in a similar way as earlier generations of English intellectuals who taught themselves Italian in order to read Dante in the original. After publication Banham shot a BBC documentary on Los Angeles, entitled *Reyner Banham Loves Los Angeles.* Gerber commented: "Once again, a change in medium — from archive to

car, and now from book to TV—was necessary to cope with the complexity of this post-urban phenomena par excellence. Los Angeles, the city of the future, could no longer be approached by the traditional means of walking around, or studying sources and plans in dusty archives; it called for a shift in perspective." (135,136) Gerber and his students were part of the development and testing of a new psychometric test for assessing the spatial abilities of architects with more than 600 under-graduate and master students at *ETH Zurich* between 2016-2019 to see the correlation between three-dimensional skills utilized in the architecture studio and frequency of playing computer games. Just over halve played, with more than 40% of the students answered that they never play video games. Performance was positively correlated with frequency of game playing. Though these correlations were typically small (around .20), the pattern was consistent. (149) The questionnaire submitted by the Tshwane University of Technology students in 2019 revealed only 13% of the students did not have a favorite computer game.

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INVISIBLE GEOGRAPHIES: THE POETICS OF DIGITAL INFRASTRUCTURE

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INTRODUCTION

What can a performance art practice reveal about the role invisible digital infrastructure plays in the production of space?

Invisibility, rather than being a natural quality of digital infrastructure, is a fundamental driver in the philosophy, design and development of ubiquitous and mobile computing. Invisibility enables the use of digital technologies but also has the potential to mask surveillance and misuse of personal data. This carries ethical and political consequences as ubiquitous computing becomes a reality and more environments and objects are embedded with computational capacities. Performance practices that explore the aesthetic qualities of digital infrastructure can play a valuable role in thinking about this problematic.

My research used performance techniques that focus the participants' attention on the materiality and poetics of the usually invisible infrastructure of ubiquitous and mobile computing.

INVISIBLE GEOGRAPHIES

Figure 1. Invisible Geographies participants listening to wi-fi frequencies

Invisible Geographies is a performance event that makes use of radio receivers to make the transmission of communications infrastructure such as wi-fi, Bluetooth and mobile phones, audible, while exploring Finsbury Park, North London. Broad-spectrum RF antennae are sensitive to a wide

array of electromagnetic fields produced by devices such as mobile phones, laptops, but also mains electricity and overhead pylons, exposing not only digital radio frequencies but also the supporting electrical infrastructure. Use of the antennae within the event allows the participants to become aware of their presence as they walk the environment. My analysis focuses on the findings of an Invisible Geographies event which took place on April 12 2019, as a performance and presentation at 'Approaching Estate: methodologies for practices of site and place'1, held at the Furtherfield Commons gallery space in Finsbury Park.

Standing on an area of scrubland, just off the Capital Ring path as it enters Finsbury Park from Stroud Green Road, three participants had stopped near a recently planted tree down a small slope from the path. Two of the participants were holding their antennae and discussing with the third an interesting discovery. A repetitive sequence of sounds was being received at this location. Its alien sound had a coherent structure of rising and falling frequencies. The participants stood, raising and lowering their antennae and changing their direction. One suggested that the transmission was stronger at head height and became weaker above this level or close to the ground. A clearer signal could be received by holding the antenna in a particular direction. The participants looked around, speculating on the source of the transmission. On the brow of a small hill three men sat together with their backs to the participants, rucksacks leaning up behind them. To the left a small building behind a tall green metal fence, possibly a community centre, had its doors open and local youth were entering and leaving. The participants speculated. Was the transmission they were listening to wi-fi data from the community centre or mobile data from the three men? The participants could not locate the source of the transmission, but what was clear was that they had tapped into a stream of data. The data was surprisingly spatial in that the participants experimented in tracing its boundaries. The signal would weaken and recede into the static of background white noise if the antenna was moved too far to the left or right, or equally too high or too low. The combination of movement and audio feedback allowed the participants to experience the intangible phenomena of wireless data transmission. The participants remained in this location for nearly ten minutes, testing out parameters, walking the data transmission. In their conversation, the participants discussed the infrastructure of digital communications, fascinated by the idea they had passed through a field of data. Had they walked through someone's email? A web page of images being downloaded? A stream of music received by someone's Spotify app? A telephone conversation, or the highly personal communication between lovers? Whilst the experience could not be understood by the participants in technical terms the experience had given them an embodied understanding of the infrastructure of ubiquitous and mobile computing.

Digital technologies are perceived to be ephemeral. Their existence in physical space is rendered psychologically invisible. What held the three members of the Invisible Geography event captivated on a seemingly unnoteworthy piece of scrub grass was an experience of digital technology that they hadn't experienced before. They had gained access to a steam of data communications that was passing through their own bodies at this location. Its spatial properties surprised both them and me. It was so clearly local and spatially defined. The response of the participants was to discuss the experience, to try and make sense of it. In this respect Invisible Geographies was successful in rendering the ephemeral nature of digital communications knowable. Not only had they become aware of the data signal cutting across the park at this location, they had also gained access to an embodied understanding of the signal's materiality. Its particular transmission rate and its sonic frequencies entered their knowledge. They had used their bodily movements to trace its spatial qualities, its location in the park, its height and width. This helped them to imagine the park criss-crossed with a multiplicity of data transmissions. Providing the participants with the ability to

experience the infrastructure from a new perspective, they discovered for the first time, the sound, rhythms and spatial quality of a stream of data, an understanding that they had not previously experienced. It also prompted a more profound cultural and political question. How and why is digital technology rendered invisible, and what ethical consequences does this carry? In an attempt to answer this question and gain a deeper understanding of the specific quality of the invisibility of digital infrastructure, I will dig vertically into the conceptual and philosophical roots of ubiquitous and mobile computing. Understanding the nature of infrastructural work involves unfolding the political, ethical, and social choices that have been made throughout its development[2]. Perhaps the most obvious place to start is with the conceptual ideas of Mark Weiser, who is credited with coining the phrase 'ubiquitous computing' during his tenure as Chief Technologist of the Xerox Palo Alto Research Centre (PARC).

The desire for infrastructures to become invisible has been a central driving force in the historic development of ubiquitous and mobile computing. Mark Weiser's foundational talk on ubicomp, at the 7th annual ACM symposium on User Interface Software and Technology in 1994, was entitled 'Creating the invisible interface', and linked the concept of the invisible directly to his vision of an emergent ubiquitous computing. Weiser stated:

For thirty years, most interface design, and most computer design, has been headed down the path of the "dramatic" machine. Its highest ideal is to make a computer so exciting, so wonderful so interesting, that we never want to be without it. A less- travelled path I call the "invisible"; its highest ideal is to make a computer so imbedded, so fitting, so natural, that we use it without even thinking about it. (I have also called this notion "Ubiquitous Computing") [3].

In the years since Weiser set out his vision for the development of ubiquitous computing, his concept of 'the invisible' has remained something that is both desirable within the wider HCI community and central to the mobile and ubicomp project. For example, Norman argued that the invisible computer is the natural goal of PC development[4]. Fishkin et al. placed 'invisible user interfaces' as the central goal of their work[5]. Two of the foundational texts of HCI[6], highlighted the importance of the invisible, linking it to their reading of Heidegger's phenomenology[7].

In an illuminating overview of the notion of the invisible as it is used within the ubiquitous computing community, Heer and Khooshabeh describes the capacity for infrastructure, whether physical, technological, or organisational, to become tacit in thought and action for human users[8]. The implementation of ubiquitous and mobile computing is predicated on a vast infrastructure of electromagnetic waves transmitted from mobile phone towers; from wi-fi routers and Bluetooth devices connected to a tangle of twisted pairs of copper wires and fibre-optic cables, interconnected in the joining rooms of data centres, with the ability to connect our devices to what Brian Holmes poetically describes as an "intangible planetary skin" [9]. The aim of infrastructural invisibility is to hide the infrastructural complexity required by our digital interactions, allowing users to concentrate on the task in hand. For example, if I send an email from my mobile phone, the device has to negotiate a series of complex infrastructural procedures. While writing the email, I do not have to think in terms of electrons, logic gates, or machine instructions. These machine-level operations are rendered invisible by the interface that acts as a mediator between the user and the technical infrastructure. When the email is sent, the mobile phone has to interface with a wider communications infrastructure. Procedures will make the decision about whether to use wi-fi or a mobile data network. The human-readable email will be broken down into a series of packets. Radio frequency standards will be followed to broadcast the packets, which will then be routed through a series of servers, reassembled at the desired destination and converted back into human-readable text for the intended recipient. From the sender and recipient's perspective they have simply sent and received an email.

They have had no knowledge of the complex infrastructural procedures that have enabled their interaction. This infrastructure has been rendered invisible. HCI researcher Sturla Bakke identified a trend in HCI such that the cultivation of an information infrastructure would benefit from hiding the infrastructural complexity beneath an easily comprehensible user-interface both to make an interface easy to learn for new users and to offer quicker ways for experienced users to complete their tasks[10]. In science and technology studies (STS) this is referred to as "blackboxing" [11]. Blackboxing is "the way scientific and technical work is made invisible by its own success. When a machine runs efficiently, when a matter of fact is settled, one need focus only on its inputs and outputs and not on its internal complexity. Thus, paradoxically, the more science and technology succeed, the more opaque and obscure they become" [12].

Many researchers interested in developing ubiquitous computing are in the process of taking infrastructural invisibility even further, reducing the need for any user interface by embedding computing directly into the environment. Examples include the construction of the Internet of Things (IoT) or the development of smart cities. This vision of 'everyware'[13] computing aims to realise Weiser's desire for a ubiquitous computing which recedes into the background, ultimately becoming an ambient part of the environment[14]. Such a concept of invisible everyware computing has profound implications for the understanding of urban space and how it is being digitally expanded. As Weiser remarks, "Such a disappearance is a fundamental consequence not of technology, but of human psychology. Whenever people learn something sufficiently well, they cease to be aware of it. When you look at a street sign, for example, you absorb its information without consciously performing the act of reading" [15]. Mobile phone masts are now ubiquitous growths atop most tall buildings; however, they are no longer part of public consciousness. They have become just as invisible as the data transmission experienced by the participants in Finsbury Park. As ubiquitous and mobile computing increase, the invisibility of these technologies raises important ethical and political questions. For example, if the aim of ubiquitous computing devices is to "weave themselves into the fabric of everyday life" [16] how does a society consent to such vast harvesting of data from everyday life if the technology remains invisible?

One of the goals of Invisible Geographies is to disrupt the everyday experience of the city, an act of estrangement that intends to move the participants beyond the everyday understanding of the city, making the familiar unfamiliar and in doing so exposing the practices involved in constructing and reconstructing their understanding of space. I would argue that the use of RF antennae was successful in exposing elements of ubiquitous and mobile computing's invisible infrastructure. By exposing aspects of the material infrastructure of digital technology, these practices enabled participants to start to construct a new understanding of these technologies, bringing the previously invisible infrastructures into discourse. The Invisible Geographies event promoted conversations about the ethics and politics of digital invisibility amongst the participants. I have expanded upon these through engagement with theories of the invisible within HCI, ubicomp and mobile research. I now want to turn to some of the less obvious responses to the Invisible Geographies event. These I would describe as responses that constructed a unique spatial imaginary of sites from the aesthetic qualities of the audio produced by the RF antennae and the physical experience of being situated within a particular location. Numerous instances were observed. I will focus on one.

Figure 2. Invisible Geographies participants

Whilst walking in Finsbury Park listening to the noise created by electromagnetism, one participant stopped. With a lack of self-consciousness, he could be observed making almost trance-like small repetitive movements. He was holding the ping-pong bat-shaped antenna in his right hand and the cube amplifier it was attached to in his left. He would raise the antenna and slowly swing the amplifier from his side to his front then back again, altering the direction of the antenna by about 45 degrees, then repeat the movement. He would then take a few steps forward and repeat the actions. There was an almost spiritual quality to the precision and concentration involved in these repetitive movements. I approached and asked him what he had been listening to. He described to me how he had discovered distinct bands of noise that ran parallel to a steep banking covered with trees. These bands were defined by clear directional changes in the texture of the sound. By turning the antenna 45 degrees, he would tune the sound in or out exposing a clear direction to the signal. At first he had suspected that he was picking up feedback from the amplifier but had disproved this thesis by altering the position of the amplifier in relation to the antenna. Having disproved this suspicion, he was convinced that he could define different textured fields running roughly parallel to the bank. The bank and trees that ran along it masked a train line with high-voltage overhead electricity cables suspended above the tracks. While the source of the bands of textured noise was unclear, what was more interesting was the way he was constructing a detailed and embodied understanding of this space, one that he was starting to explain in terms of an electromagnetic field with its own spatial properties that he was carefully mapping through his movements. He was constructing his own mental map of the park, overlaid with invisible channels and groves. He explained the boundary between two bands: “If you come here, listen, but if you move, you can hear the difference”. He was using specific spatial markings to explain the positions of the borders between the electromagnetic field he had mapped.

In this example, the aesthetic qualities of sounds produced by listening to digital infrastructures were interpreted in relation to the physical location in which they were experienced. Larkin suggests that aesthesis refers not to the mental appreciation of works of art, but to a bodily reaction to lived reality: "It is a form of cognition, achieved through taste, touch, hearing, seeing, smell," [...]17 Aesthetics in this sense is not a representation but an embodied experience governed by the ways infrastructures produce the ambient conditions of everyday life: our sense of temperature, speed, fluorescence, and the ideas we have associated with these conditions. Participants experience of Invisible Geographies drew from the aesthetic qualities of the infrastructure, merging these qualities with the aesthetics of the environment itself. Infrastructure was revealed to have local qualities and aesthetics far beyond its technical function as part of a larger integrated system. For example, these transmissions have consistent spatial qualities, the boundaries of which can be traced. They have specific audio qualities. The pitch of a 4G mobile phone mast is very different from that of a wi-fi router. All these aesthetic qualities are situated within the environment. For those experiencing the event this enabled a fully embodied and situated experience of digital infrastructure's transmissions to emerge.

CONCLUSION

Larkin argues for infrastructures to be studied in terms of their politics and poetics. He argues that what distinguishes the poetic is when a speech act is organised according to the material qualities of the signifier itself rather than to its referential meaning18. Therefore, in the case of infrastructures, the poetic mode means that form is loosened from technical function. The infrastructure's poetic imaginary is decoupled from its technical function. The poetics of ubiquitous and mobile computing tend to mirror the metaphors of the invisible or the ephemeral: for example, cloud computing. By making invisible infrastructures audible, Invisible Geographies promotes new poetics of space and a greater understanding of the unique aesthetic qualities of the infrastructure that enables ubiquitous and mobile computing. Aesthetics understood in the expanded context of an embodied experience affected by the material qualities of digital infrastructure helped to promote new poetics and imaginaries of digital infrastructure. The Invisible Geographies performance event did not inspire a singular imaginary; it produced a multiplicity of varied imaginaries. The participants actively formed alternative realities around sites and their digital infrastructures. This finding suggested the potential role of performance practice as a form of radical pedagogy, making invisible digital infrastructures knowable and bringing them into wider discourse through the poetic imagination they inspire. I would argue that this is a necessary step in bringing the invisibility of underlying infrastructures into the public imagination. This is a necessary process if we are to develop a politics and ethics capable of responding to the challenges posed by the introduction of ubiquitous and mobile computing to urban space.

ACKNOWLEDGEMENTS

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NOTES

1 The event was organised by the Sensingsite research group based at Central St. Martins. The participants in this event were predominantly artists, researchers and academics with a specific interest in site-based fine art and performance practices. For more information see: https://sensingsite.blogspot.com/p/approaching-estate.html
2 See Bowker et al. “Toward Information Infrastructure Studies: Ways of Knowing in a Networked Environment.” *International Handbook of Internet Research*, 97–117. Springer, Dordrecht, 2009.
3 Mark Weiser, “Creating the Invisible Interface.” *Proceedings of the 7th Annual ACM Symposium on User Interface Software and Technology*, p. 1. 1994.
4 Donald A. Norman, *The Invisible Computer: Why Good Products Can Fail, the Personal Computer Is so Complex, and Information Appliances Are the Solution*. Cambridge, MA: MIT Press, 1999.
5 Fishkin et al. “Embodied User Interfaces: Towards Invisible User Interfaces.” *Engineering for Human-Computer Interaction*, 1–18. Springer, Boston, MA, 1998.
6 Lucy A. Suchman, *Plans and situated actions: The problem of human-machine communication*. Cambridge university press, 1987. And, Paul Dourish, “Seeking a Foundation for Context-Aware Computing.” *Human–Computer Interaction* 16 (2-4) (12 Nov 2009): 229–41. Are foundational texts in HCI (Human–Computer Interaction).
7 An HCI disciplinary reading of Heidegger's phenomenology, and in particular his concepts of ‘ready-to-hand’ and ‘present-at-hand’ is at the core of a wider digital infrastructural invisibility and the creation of ‘blackbox’ entities such as the cloud. In Heidegger’s terminology, equipment is ‘present-at-hand’ when the user is conscious of it: when the user’s attention is focused on the equipment in-itself. When equipment is used to carry out a task it has a tendency to disappear from consciousness: it is, in Heidegger’s terms, ‘ready-to-hand’. The move from ‘present-at hand’ to ‘ready-to-hand’ is the move from visibility to invisibility.
8 See Jeffrey Heer and Peter Khooshabeh, "Seeing the invisible." In *Workshop on Invisible and Transparent Interfaces at AVI*. 2004.
9 Holmes writes, “A desiring mind seeks infinity, and finds it today in a proliferation of signals: electromagnetic waves beaming down from the skies, fiber-optic cables emerging from the seas, copper wires woven across the continents. The earthly envelope of land, air and ocean – the realm of organic life, or biosphere – is doubled by a second skin of electronically mediated thought: the noosphere. It’s a vast, pulsating machine: a coded universe grown complex beyond our grasp, yet connected at every pulse to the microscopic mesh of nerve cells in our flesh. Such is the contemporary circuit of communication. Its existence raises two basic questions. What will be the destiny of this intangible planetary skin? And how does it unfold in our own bodies?”. See Brian Holmes, “Guattari’s Schizoanalytic Cartographies.” *Continental Drift: the Other Side of Neoliberal Globalization* (blog). 2009.
10 See Sturla Bakke, “How Principles of Human-Computer Interactions Could Contribute in Black-Boxing Complexities in Information Infrastructures.” Scandinavian-Iris.org. October 2, 2021.
11 See Bruno Latour, *Science in Action: How to Follow Scientists and Engineers through Society.* Cambridge, MA: Harvard Univ. Press, 1987. And Bruno Latour, *Pandora's hope: essays on the reality of science studies*. Harvard university press, 1999.
12 Latour, *Pandora's hope,* 304.
13 Everyware Computing refers to the integration of computers embedded in everyday objects with an ever-present network. It moves computing away from the desktop and mobile phone and into every aspect of our lives. The term comes from Adam Greenfield, Everyware: *The Dawning Age of Ubiquitous Computing*. Berkeley, CA: New Riders Press, 2010.
14 See Mark Weiser, “The Computer for the 21 St Century.” Scientific American 265, no. 3 (1991)
15 Mark Weiser, 1993. “Hot Topics-Ubiquitous Computing.” *Computer* 26, no.10 (Oct. 1993)
16 Weiser, *The Computer for the 21st Century*.
17 For full quote see Brian Larkin, “The Politics and Poetics of Infrastructure.” *Annual Review of Anthropology* 42, 1. (October 2013): 327–43.
18 Larkin. *The politics and poetics of infrastructure.*

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SITE-RESPONSIVE. CRITICAL OF THE INTERACTIVE ENVIRONMENTS IN EXHIBITION DESIGN

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INTRODUCTION

With reference to the conference topics, this paper analyzes the emotive, perceptive and social effects of technology in the space dimension, referring both to design practices and user experiences. The aim is to suggest new design scenarios able to contextualize the exhibition design in the contemporary scenario.

For this purpose, examples of "interactive architecture"[1] are analyzed in order to extrapolate exhibition practices and strategies that include the communicative and educational component in experiences where users use their bodies in space. This implies: acknowledging the emotional, communicative and adaptive possibilities of interactive environments; assuming that the design of the exhibition space is oriented to the integration of advanced technologies – tangible and intangible – so that it is necessary to understand the importance of data and their multiple nature, according to a heterogeneous users that interact with a performative environment, which can make their experience unique.

This vital ability requires a level of phenomenological and design complexity that obliges designers to reflect on the meaning of our social nature and the mutable relationship with the world mediated by technology.

DESIGN OF INTERACTIVE SPACES

In complex interactive space design, digital technologies are adapted to an architectural vision and therefore various disciplines converge, such as Architecture, Interaction Design (ID), Human-Computer Interaction (HCI), User Experience (UX).

Using the concepts of space to look at user experience allows us not to split up the experience in terms of humans, computers and their interactions but to look at it as a totality and to think of people as being in social and technological environments. In this way, as David Benyon recalls, "*we look at user experience as a whole and interaction design as the design for those experiences*"[2].

Accordingly, designing interactive spaces requires an involvement with neuroscience, cognitive psychology and behavior, gestalt psychology and sociology. Knowing the processes that are the basis of the functioning of mirror neurons – which allow us to empathize with other people and the

environment – is essential in the design of artefacts that are created to interface people, spaces and information.

The architectural environment has become inextricably linked to technological trends. Interactive architecture projects, where datasets are motors of buildings and environments, are based on a series of data that are perceived and then translated to the inhabitants, with different purposes, by providing new forms of sensorial, motor and spatial interaction[3]. These structures show real-time behaviour according to local and global changes caused by users. Each element of the system is a potential transmitter and receiver of data – in input – which is processed to give back – in output – an ever-shifting configuration of itself.

In the beginning of the 1970s, the sociologist Ivan Illich in *Tools for Conviviality*[4] highlights the ability of objects to generate favorable conditions for the acquisition of information and social interaction or to obstruct it, but questions the possibilities that the industrial production system could fully satisfy cultural needs.

In the 1980s, Lucius Burckhardt[5] observed that all kinds of artifacts, even industrial ones, cannot be considered neutral, because they manifest the intentions of the designers, the companies that produce them, and the users who condition their relationships and behaviour. The design of artifacts and their related services consciously considers the overall invisible system composed of material and immaterial relations.

In the same years, the integration of electronics and information technology starts to give objects a smart dimension, opening up the prospect of interaction design in which artifacts – that previously were inert and "opaque" – acquire the capacity to perceive and react with people and to mediate interactions between people and environment.

This is a perspective, that following digital development, has evolved over the last decade into the "Internet of Things" (IoT), whereby objects provided with sensors and actuators capture messages, data and information from people and transfer them to other people via network. The result is a complex relational infrastructure with rich potential. Extending Ivan Illich's vision, this is a way to generate a parallel, digital and global culture.

IoT is now affordable to be integrated and connected to spatial design to help create hybrid and connected environments.

The design of these spaces has changed a great deal over the past decade and has found applications at several intervention scales by proposing different adaptations: some analogue, some digital; some audio-visual, some kinetic. It involves a variety of changing conditions, which include environmental changes, such as temperature, daylight, wind and sea, human behaviour (physiological including)[6].

CASE HISTORY

The case histories discussed in this essay have been selected for their exhibition character, not necessarily voluntary. Their common elements are engagement and performativity – essential aspects of contemporary exhibition design. At present, exhibition practices tend to significantly increase the process of user engagement, most often using interactive devices and systems.

This is an experience perspective that places the body at the centre of the use project and considers it, in relation to other bodies and to the space/time relationship: actor, communication and performance tool, education and learning tool, social relations vehicle, contexts appropriation tool[7].

The corporeal dimension consequently introduces the performative one[8]. The significance of this implication is underlined by David Dernie: "*performativity is one of the most significant developments in contemporary exhibition design as it goes beyond exhibition semiotics to develop the notion of experience design. Because of the fundamental function of the body in communication and learning in*

the performing space, new methods of interaction are introduced: the body and its movements within the exhibition represent a vital interface between the content of the exhibitions and the personal associations established by the visitor. The visit becomes an encounter with the body in motion, a space of events"[9].

Performative methods and tools are not limited to a specific technology. Performative design, in fact, is characterized by a spectrum of interactive possibilities and methods of engaging visitors, who are invited to establish new ways of interacting with the exhibited artifacts, with the spatial layout or with other visitors.

Observation of the following examples suggests three design scenarios that introduce different exhibit design thematics. These are identified by looking at spatial interaction and are: Interact to adapt; Interact to explore; Interact to visualize.

Interact to Adapt: Cupra's Booth

The first example is the Cupra's booth - a Spanish automotive company - by Leva and TODO studios at the eighty-eighth Geneva International Motor Show (2018).

The 139 "petals" that make up the kinetic wall are based on Kinect sensing and can move simultaneously to open dynamic "windows" in order to show users what is on display behind the wall (Figure 1).

The movement of the petals is output to the stimulus received as input from the Kinect system. This result is the outcome of the interaction between the user, who acts on the sensors, and the wall, which changes its configuration according to the input received.

The company's goal was not only to use an interactive installation to communicate the technological identity of its brand, but also to attract as many visitors to the event as possible[10].

This installation, related to the fair scenario, brings out two fundamental exhibition design issues that are common in many exhibition contexts: engagement and spatial adaptation.

Trade fairs are in most part alienating events in which it is difficult to find one's way around, also because of the planimetric division of the booths – linked to the sale of space – which does not make it easy to recognise the individual booths and the transitional space. This is not always overcome by signs or graphics therefore it is often difficult to recognise the stands from one another. This, combined with the difficulty of managing lighting and acoustic comfort, makes users easily get lost and tired. Another aspect to consider when designing a fair stand is the difficulty dictated by the confines of your booth, which are very often violated by adjacent companies that display their logos more visibly.

In this sense the Cupra's booth successfully engages visitors through the playful and participative dimension, creating a moment of entertainment beyond the confines of its stand (Figure 2).

Engagement is a common practice especially in the public sphere. Art installations such as sculptures, fountains and facades adopt interaction as a vital component, inherent in the artworks, to capture passers-by's attention.

The use of spatial interaction can also be understood with respect to the needs of presentation and display of expositions and artifacts in other contexts in order to re-materialize the "frame" that has become an interface. Moreover, as Michael Fox points out, this kind of spatial optimization based on the combination of interaction and spatial adaptation is "*means for adjusting three-dimensional configurations according to the changing situations of both users and programmatic considerations*"[11]. This feature can be useful both to the temporal and ephemeral character of exhibitions – thus of their change – and to the interaction of visitors with them.

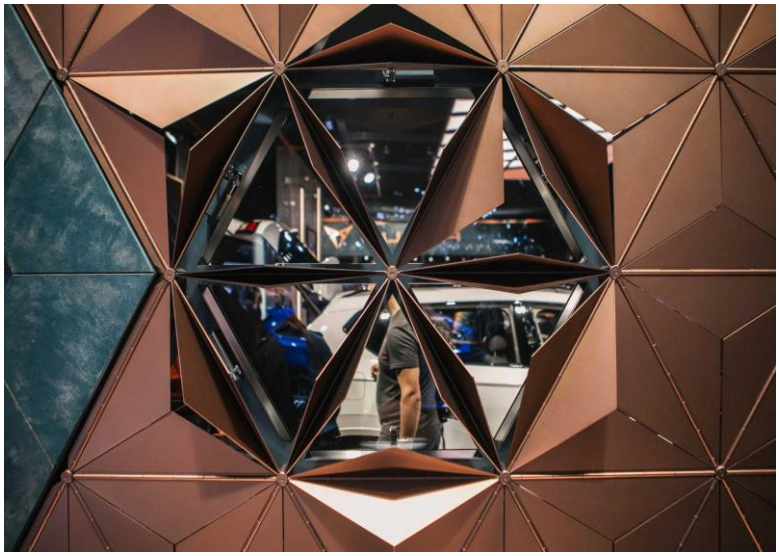

Figure 1. Stand Cupra, 2018. Kinetic variations generate "windows" and "frames". https://www.leva.io/projects/kinetic-wall.

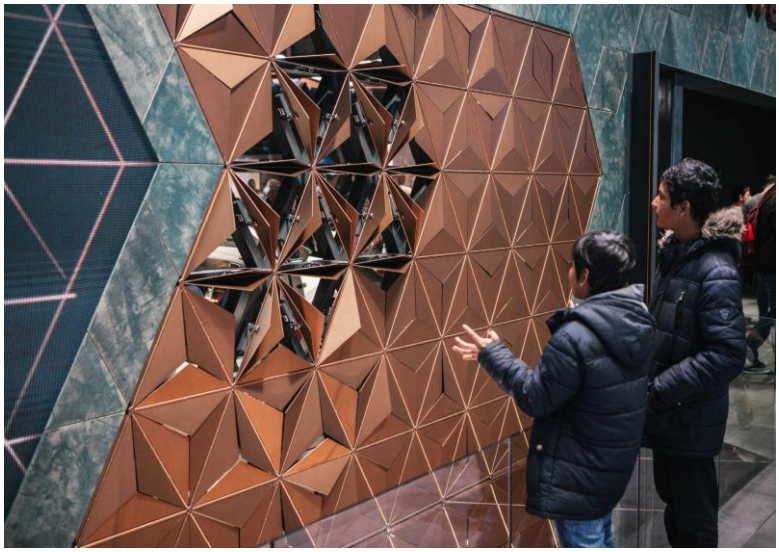

Figure 2. Cupra's Booth, 2018. Visitors interact with the kinetic wall from the fair hall aisle. https://www.leva.io/projects/kinetic-wall.

Interact to Explore: *Edge of Chaos*

Edge of Chaos is an interactive art installation, curated by Vasilija Abramovic & Ruairi Glynn[12], originally designed to understand the phenomenon of avalanches and the crystallization of liquids and inspired by the science of complexity.

Narratively, the authors describe the space as composed of three features: "*at its center, a kinetic tree that represents "Life" (the peak of the Edge of Chaos). It is surrounded by an inert "Cloud" representing the vast unorganized matter of an entropic universe (Chaos), and between them an interactive surface that represents the "Edge of Chaos*""[13].

The structure around the installation consists of five hundred items, four hundred of which are static and one hundred active, animated by servomotors and RGB LEDs representing the basic unit blocks of our chaotic universe. The surface - controlled by a custom Cellular Automata (CA) system - is powered by ultrasonic proximity sensors and is activated by local user interactions that trigger chain

reactions through the surface. Depending on the level of interaction and the existing state of the surface, it produces more ordered patterns or more chaotic sequences of kinetic transformations and chromatic variations (Figures 4 and 5). Increased movement triggers the tree of life performing a "choreography" complemented by light and sound. The sound, integrated in the tree, follows the chaos and order phases during the performance and improves the supernatural atmosphere.

Edge of Chaos makes the science of complexity tangible by showing its behaviors using sound, light and robotic motions, encouraging playful exploration and bringing out questions about the order of the universe[14].

This example allows us to reflect on the questions of emotional engagement and multi-sensorial exploration of phenomena.

These are themes profoundly linked to the performative exhibitions, in particular to the science centres. Still today, as Luca Peressut writes in *Museologia Scientifica Memorie*: "*the exhibition features of today's science centres are still focused on the experience-interpretation relationship that is activated during the demonstration or interactive action, by which an emotional and empathic impact is created on the visitors' multi-sensory perception*"[15].

Science museums are often places that allow visitors direct experience and physical engagement with phenomena to enable exploration and discovery in a collaborative dimension; examples are numerous of exhibitions in the physical, biological and social sciences asking visitors to interact with "hands-on" exhibits and digital interactions to learn scientific principles.

However, the use of the exhibit is often an end in itself and the flow of information is one-way and ineffective as a result of the very short time it is used. Moreover, they are usually intended for a school age group and therefore exclude a large target group.

In this sense, the *Edge of Chaos* experience seems to be functional in responding to these needs: the immersive and multi-sensorial quality of this interaction allows for a two-way communication between people and the environment and allows children and adults to learn by being conscious of the experience.

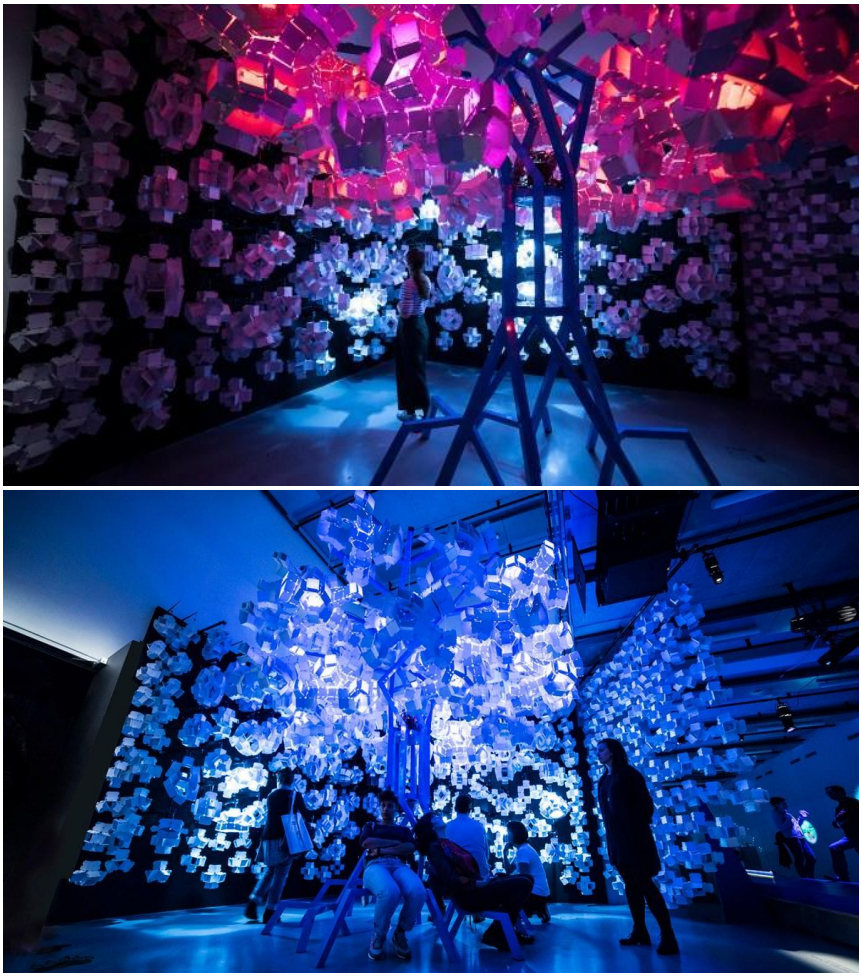

Figure 3 and Figure 4. "Edge of Chaos", 2018. Interaction with visitors triggers kinetic and lighting changes that generate an immersive experience. http://www.interactivearchitecture.org/lab-projects/edge-of-chaos.

Interact to Visualise Data: *Living Light*

Living Light by architects David Benjamin and Soo-in Yang[16] is a pavilion - permanently installed in Seoul (South Korea) in 2009 - that displays a dynamic "skin" that lights up in response to both air quality data and public interest in the environment. The Korean Ministry of Environment operates air monitoring stations which send air quality information to the pavilion in real time (Figure 5).

The pavilion is a reactive "gazebo" with a roof consisting of twenty-seven panels, each representing a district of the city. Each panel lights up if the air in the district is better than last year. Every hour the map darkens and the neighbourhoods light up according to the current improved air quality. Finally, citizens can request air quality reports via SMS and by using the postcode, the panels flash each time they are sent to pinpoint the request location on the map.

Conceptually, this pavilion served as a prototype for a building façade displaying information about the city's environment. Many buildings in Seoul are already illuminated at night by large billboards and the *Living Light* project suggests a façade that makes citizens more aware of pollution, the consequences of consumerism and environmental issues[17].

This example allows us to reflect on three issues related to contemporary exhibition design: engaging to raise awareness, narrating data and using devices for interaction.

Living Light, like the above example, highlights the possibilities of interactive spaces to translate and make very large or very small phenomena, information and concepts more accessible from real-time data collection, or data archives, engaging the public in an interactive and participative use.
In exhibition situations where data and information are displayed – and therefore the narrative subject is the visible representation of the non-visible obtained by conceptual transference actions – a problem often emerges regarding the relationship between scientific precision and making the data understandable to the public. In this sense, more accurate representations are targeted at a specific audience to show data related to an explicit topic while representations that simplify content are targeted at a wider audience and the data visualization can be more open and attract attention to a problem.
The aim of an exhibition is to help users understand the data behind phenomena so as to encourage not only investigation of the specific subject matter but, above all, critical interpretation and productive questioning by illustrating methods and results of research processes.
The use of a support device – as shown in the example by the sending of the text message – suggests another way of interacting with the environment. On the one hand, the user contributes to the data collection and on the other hand, the installation provides access to contributions that would otherwise be unknown[18].

Figure 5. "Living Light", 2009. http://www.thelivingnewyork.com/index.html.

CONCLUSION

The case studies and design experimentation described demonstrate how interactive architecture can communicate information, about objects, phenomena and behaviours, by interacting with groups of users, although not with an exhibition purpose – even if placed in exhibition spaces, as in the first two cases, they are still independent elements. Many of them incorporate an educational component in which kinaesthetic learning is combined with entertainment experiences; they allow for data visualization and subsequent learning; they engage users; they stimulate reflection; they display objects as showcases.
In the contemporary museum scenario, the technologies most commonly used for this purpose are usually multimedia video installations sometimes augmented by digital interactions. Furthermore, the use of technology can offer the user customized experiences. Using Rfid, Nfc, QR-code reading and

3D models, guides are digitized to give visitors a new way of orientation. In addition, technologies such as Augmented Reality (AR), Virtual Reality (VR) and Mixed Reality (VR) offer additional content and immersive, interactive visitor experiences.

These design experiences are configured through de-materialization that is to say an instrumental reduction of the display in preference to the electronic medium which becomes the narrative system. Digital technologies take exhibition systems towards an intangible virtual dimension in which space is a metaphor for UX.

Instead, this contribution suggests a use of digital technology linked to materiality to identify the possibility of designing "*Places for experience*"[19] in which digital technologies do not reduce space materiality but adapt to an architectural vision. As previously introduced, thinking in spatial terms allows us to look at the user experience from a different perspective. Already Paul Dourish[20] at the end of the last century identified in "*Tangible Computing*" an area of research aimed at bringing the interactive interface off the screen, in the real world.

This is an approach that supports the association of motion and sensorial engagement with understanding and perception and so it is profoundly related to the concept of "*embodiment*" and that is, that the creation and sharing of meaning is happening through interaction with an artifact.

"*Embodiment*" is the set of physical, social and cultural phenomena that happen around us at a specific time and in which we interact with each other, with technology and with other species[21] and then, as Harry F. Mallgrave writes, "*we are organisms within environments that continuously evolve and self-organize and relationships between mind, body and matter configures our cognitive understanding of the world*"[22].

In this regard, it is useful to explore new design scenarios starting from the identified exhibition concepts – that are only briefly mentioned in this paper.

Interactive architecture at the exhibition scale makes it possible to re-read the relationships between object/concept, place and user that converge and join in the contemporary combination of exhibition-communication – which is becoming unitary in the medium and in the message – so that it does not become subject to that instrumental reduction which is driving the exhibition space to become a "*black-box*"[23].

NOTES

[1] Michael Fox, ed., *Interactive Architecture: Adaptive World* (San Francisco: Chronicle Books, 2016).
[2] David Benyon, *Spaces of Interaction, Places for Experience. Synthesis Lectures on Human-Centered Information* (Penn State University: John M. Carroll, 2014), 1.
[3] Michael Fox, ed., introduction to *Interactive Architecture: Adaptive World* by Michael Fox (San Francisco: Chronicle Books, 2016), 11-15.
[4] Ivan Illich and Anne Lang, *Tools for Conviviality* (New York: Harper and Row, 1973).
[5] Lucius Burckhardt, "Design ist unsichtbar," in *Design ist unsichtbar*, ed. Helmuth Gsöllpointner et al. (Wien: Löcker, 1981), 211-217.
[6] Nils Jäger, Holger Schnadelbach and Hale Holger, "Embodied Interactions with Adaptive Architecture," in *Architecture and Interaction*, ed. Nicholas S. Dalton (Cham: Springer, 2016), 186.
[7] Raffaella Trocchianesi, "Nuove prossemiche museali e culturali. Corpi, gesti, relazioni, comportamenti/New Museum and Cultural Heritage Proxemics. Bodies, Gestures, Relationships, Behaviour," in *Design & Cultural Heritage. Immateriale Virtuale Interattivo/Intangible Virtual Interactive*, ed. Fulvio Irace (Milano: Jumpstart request for Mondadori Libri Electa Trade, 2014), 115.
[8] The performative approach is applied in several exhibition scopes: projects for educational tools where importance is attributed to the relationship between learning and playing – many applications can be observed in scientific museology; spaces developed by interactive software that encourage reflection on contents – more used in high narrative contexts.
[9] David Dernie, *Exhibition Design* (London: Laurence King Publishing, 2006), 46.
[10] Sandra G.L. Persiani, "Design of Autoreaction, Case Studies," in *Design of Autoreaction*, ed. Sandra G.L. Persiani (Cham: Springer, 2020), 157-192; "Kinetic Wall," Leva, accessed August 19, 2021, https://www.leva.io/projects/kinetic-wall.
[11] Michael Fox, "Mediate," in *Interactive Architecture: Adaptive World*, ed. Michael Fox (San Francisco: Chronicle Books, 2016), 91.
[12] The art installation is designed in partnership by artists Vasilija Abramovic & Ruairi Glynn (Interactive Architecture Lab, Bartlett UCL) and scientist Bas Overvelde (AMOLF/Studio Overvelde) and was exhibited throughout 2018 at La Gaîté Lyrique gallery in Paris, KIKK Festival in Namur, and Cinekid Festival in Amsterdam.
[13] Ruari Glynn, Vasilija Abramovic and Johannes T.B. Overvelde, "Edge of chaos: Towards Intelligent Architecture Through Distributed Control Systems Based on Cellular Automata," in *Recalibration on Imprecision and Infidelity-Proceedings of the 38th Annual Conference of the Association for Computer Aided Design in Architecture*, eds. Phillip Anzalone, Marcella del Signore and Andrew J. Wit (Mexico City: ACADIA, 2018), 228.
[14] "Edge of Chaos," Interactive Architecture Lab, accessed August 19, 2021, http://www.interactivearchitecture.org/lab-projects/edge-of-chaos.
[15] Luca B. Peressut, "Musei scientifici e science center: la comunicazione fra architettura e allestimento," Museologia Scientifica Memorie 8 (2011): 124. Translated by authors.
[16] Aka The Living; "The Living New York," The Living, accessed August 19, 2021, http://www.thelivingnewyork.com/index.html.
[17] Marcella del Signore and Gernot Riether, *Urban Machines: Public Space in a Digital Culture* (Barcelona: ListLab, 2018), 134-141; "Living Light," Interactive Architecture Lab, accessed August 19, 2021, http://www.interactivearchitecture.org/living-light-2.html; "The Living New York," The Living, accessed August 19, 2021, http://www.thelivingnewyork.com/index.html.
[18] Currently in museums, extra devices are often used to support the fruition of augmented and virtual contents accessible by Rfid, Nfc, the reading of markers such as QR-codes or by scanning pre-mapped objects. This approach frees the communicative system from the exhibit, allowing the information to be reached and systematized on multiple levels in order to reach many different audiences by means of direct and personal questioning and consulting the objects/concepts.
[19] David Benyon, "Places for Experience," in *Spaces of Interaction, Places for Experience. Synthesis Lectures on Human-Centered Information,* David Benyon (Penn State University: John M. Carroll, 2014), 97-101.
[20] Paul Dourish, *Embodied Interaction: Exploring the Foundations of a New Approach to HCI* (Unpublished paper, 1999), 8, accessed August 19, 2021, http://www. ics. uci. edu/~ jpd/publications/misc/embodied.pdf.
[21] Paul Dourish, *Where the Action is: the Foundations of Embodied Interaction* (Cambridge: MIT press, 2004), 16.
[22] Harry F. Mallgrave, *Empatia degli spazi: architettura e neuroscienze* (Milano: Raffaello Cortina Editore, 2015), 12. Translated by authors.
[23] Marco Borsotti, *Tutto si può narrare. Riflessioni critiche sul progetto di allestimento* (Milano: Mimesis, 2017), 15.

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A VIRTUAL PANOPTICON IN TURKEY DURING THE COVID-19 PANDEMIC: THE CASE OF THE LOCATION-BASED MOBILE APPLICATION ‘HAYAT EVE SIĞAR’

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INTRODUCTION

Based on Jeremy Bentham's panopticon design (1785) as the architectural manifestation of surveillance, Foucault theorizes how modern societies are built upon the relationship between power and knowledge operated by surveillance, self-regulation, and participation. With the development of information and communication technologies, these power and surveillance mechanisms expand beyond the spatial boundaries. During the Covid-19 pandemic, the measures against the disease such as tracing, quarantine, and especially virtual surveillance to provide order and discipline for the public health with the citizens' compliance create panopticon-like organizations. With the locative media and surveillance, exemplified by the mobile application called 'Hayat Eve Sığar' (literally translated as 'life fits into home'), which is a part of the official precautionary measures against the Covid-19 disease in Turkey to trace and isolate the diseased, surveillance mechanisms become a binary system incorporating physical and virtual spaces. The 'Hayat Eve Sığar' application tracks the health statuses of the individuals and residences like the panopticon cells and shares the necessary information to protect the public. It transforms the perception and interpretation of space through the mediation of information and communication. In this regard, this study aims to investigate the intersections and ambiguity between information and surveillance, security and control, physical and virtual, urban places and electronic spaces, the public, and private spheres.

PANOPTICON AND VIRTUAL SPACE

Hayat Eve Sığar, translated as 'life fits into home', is a part of the official surveillance measures to control and fight against Covid-19 in Turkey. The application juxtaposes physical space with the collected public data of healthy and diseased while promoting the merits of 'staying at home' to encourage the individuals to be conscious and isolated for the security and health of the society. The mobile application system, which tracks and maps the information about the health status of individuals and houses through state surveillance, operates akin to the disciplinary power mechanisms based upon the connection between power and knowledge, theorized by Michel Foucault. In "Discipline and Punish", Foucault suggests a paradigm shift from repressive to disciplinary exercises of institutionalized power during the 18th and the 19th centuries.1 With modernity, the disciplinary

power that has permeated to the entirety of the social body took the place of the former centralized and top-down forms of power applied by the sovereign. Thus, in contrast to the repressive power that requires prohibition and violence, disciplinary power is found on continuous surveillance.[2]
The constant surveillance mechanism necessitates knowledges and state institutions such as schools, prisons, asylums, and hospitals that are conducted by the relation of power and knowledge.[3] Indeed, Foucault employs Jeremy Bentham's prison concept 'panopticon' dated in late 18th century as an analogy for the functioning of surveillance and disciplinary power. Bentham's panopticon design is a circular building consisting of a watching tower at the core and prison cells at the periphery (Figure 1). The central tower has windows facing the enclosed prison cells. Prison cells, on the other hand, have two windows for each - one located towards the tower and the other towards the outside of the building. Together with the backlight provided from the outer windows of the cells, the facing windows establish a surveillance system in which the visibility of every segregated prisoner is accommodated for the inspection of a dominant gaze from the central tower. The same backlight effect, which reveals the prisoners' acts, disguises the overseer at the tower from the prisoner's gaze. The architecture, in this regard, becomes a self-regulating surveillance device in which the disciplinary power is executed like a machine no matter who observes whom.[4] Whether or not it is applied regularly, the continuous observation from a dominant gaze is interiorized by the isolated individuals to whom it is directed. The interiorization reaches such a point that each individual becomes a part of the surveillance mechanism, observing themself and others.[5]

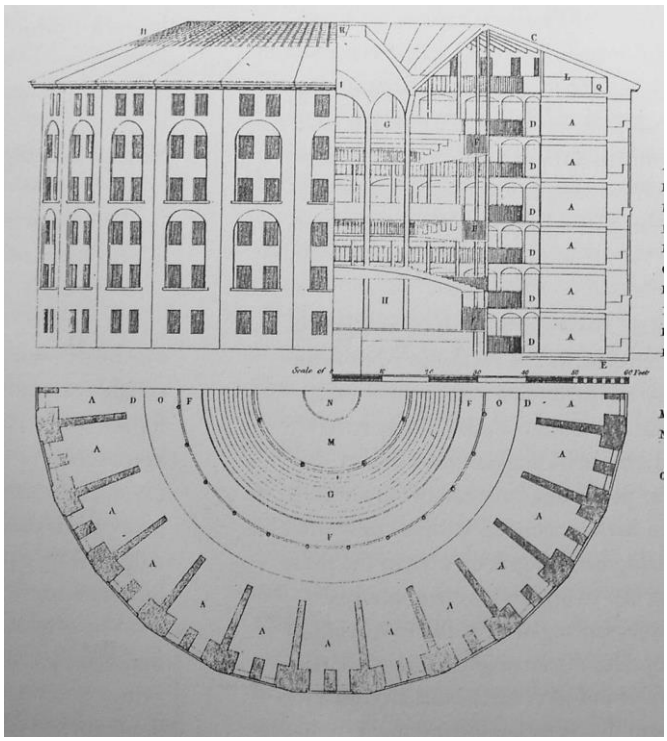

Figure 1. Drawings of Jeremy Bentham's Panopticon (Source: Foucault, Discipline and Punish, 171)

In the intersection of health, urban space, and political order, the knowledge-based disciplinary power mechanisms, depicted by Bentham's prison architecture, were integrated into the urban scale through epidemics and public health initiatives, particularly in Europe.[6] Foucault demonstrates the twofold mechanism of urban surveillance through the cases of plague and leper. Plague requires strict surveillance, division, and city-wide quarantine. And, leprosy, which causes the sick to be excluded

from society and urban space for the prevention of the disease, corresponds to the exclusion of homelessness, crime, and mental illnesses from modern societies.[7] In any case, in Foucault's words, "it is the medicine which has played the basic role as the common denominator".[8] Medicine separates the normal from the abnormal, healthy from the sick.[9] Thus, public health and hygiene become the apparatus of political control of the urban environment.[10]

Today, the disciplinary principles of exile and division, panopticon surveillance and control are integrated into every corner of urban life with intensive care units in hospitals, in disciplining children in school, in monitoring employees during work, in public space via city surveillance cameras, and finally in private sphere with the home quarantine, household media and technology, and phone applications. Beyond its spatial aspect, surveillance has become ubiquitous with the advancement of information and communication technologies. The urban surveillance took on the binary attributes of what Manuel Castell calls 'the informational cities', where space and communication networks overlap.[11] In this respect, the scholars pointed out the close relationship between information and communication technologies and surveillance. For example, Gilles Deleuze theorizes that "physical discipline has been replaced by more gaseous systems of control, where the credit card has supplanted the gaze of the foreman."[12] In other words, the physical form of panopticon surveillance is replaced by the composition of physical and electronic surveillance in informational cities. In fact, according to David Lyon, 'informational cities' are also the 'surveillance cities'. Lyon's argument highlights the extreme level of urban surveillance.[13] In this sense, the Covid-19 pandemic has been instrumental in the manifestation of the extent of disciplinary control and urban surveillance.

AN ANALYSIS OF ‘HAYAT EVE SIĞAR’

Most countries employed social distancing, travel ban, lockdown, and limited access to essential businesses as the methods to control the global pandemic. In addition, electronic surveillance of distance, crowd, physical contact, symptoms, susceptible and quarantined groups have been used through pilot and data-driven applications.[14] Mobile phone apps, electronic bracelets, drones, and wrist bands have been adopted as the intermediary devices for electronic surveillance (Table 1).[15]

Country	Mobile Apps	Other
UK	Covid Symptom Study NHS COVID-19	ankle bracelets
USA	Covid Symptom Study COVIDWISE App CovidAlert NY	
Australia and New Zealand	BeatCOVID19 COVID Safe FluTracking	ankle bracelets, drones
Singapore	TraceTogether	
Israel	HaMagen	
Hong Kong	LeaveHomeSafe	wrist bands linked to phone
China	WeChat AliPay Health Code	drones
Italy	Immuni	drones
Spain	Radar Covid	
Taiwan	Taiwan Social Distancing App	mobile phones as electronic bracelets
Turkey	Hayat Eve Sığar (Life Fits into Home)	

Table 1. Different countries' electronic surveillance systems against Covid-19 pandemic16

In Turkey, the locative mobile app17 Hayat Eve Sığar (HES) was introduced by the Health Ministry to protect public health, perform proactive healthcare, diagnosis, treatment, and manage healthcare services during the COVID-19 pandemic. The mobile application collects public data from a single centre so that it operates similarly to the panopticon idea. The private data is controlled and processed only by the Health Ministry as the central authority. The app processes five types of data: identity information, communication data, health data, occupation data, and location data. The application interface contains vaccination information, a questionnaire about COVID-19, calculation of infection risk, an entry form to the country, daily statistical data, and websites of the ministry. Regarding surveillance, the most remarkable parts of the app are the HES code, a risk density map, and the denouncement part.

HES application monitors citizens' movement through HES Code. HES Code is a personal QR code generated by the app for each citizen (Figure 2). Individuals use the HES code to enter particular closed spaces such as shopping centres, international or interprovincial transportation areas, state institutions and organizations, accommodation spaces, cafes, theatres, libraries, sports centres, and wedding ceremonies. QR codes enable business owners to check their customers' health status by checking the QR codes generated in the app, whereas the customers can also benefit from the same information. Just as hospitals have evolved around the concept of spatial observation, the public space transforms into a virtually observed area through the HES code system. Exercising surveillance on the virtual realm results in the spatial limits of the disciplinary power to be exceeded. The introduction of virtual media in surveillance of public health changes the whole public space into a panopticon, where the gaze of the state is upon everywhere and takes its justification by the new contagion. Virtual surveillance reveals the state's ability to conduct surveillance upon the subjects anytime and anywhere after the pandemic.

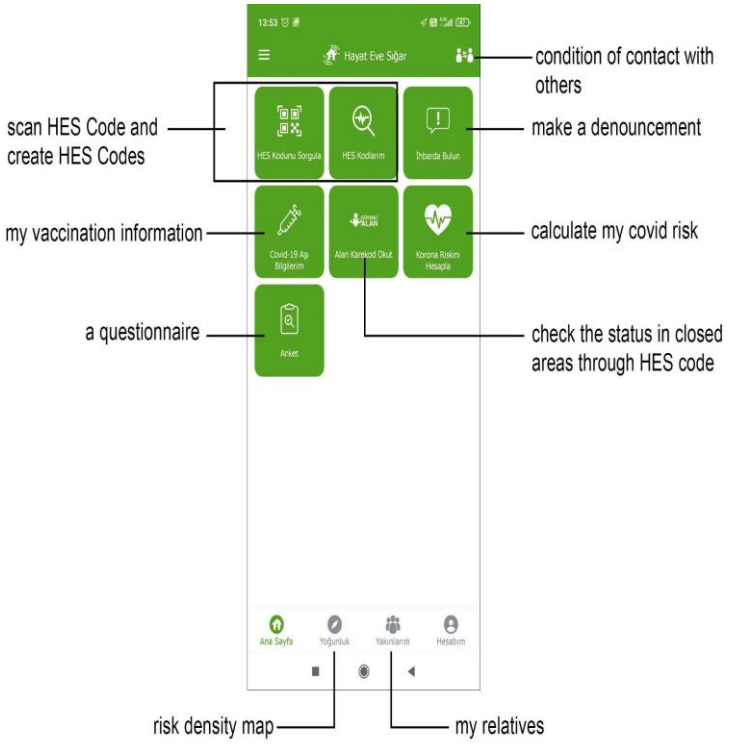

Figure 2. Interface of Hayat Eve Sığar application (Source: HES, edited by authors)

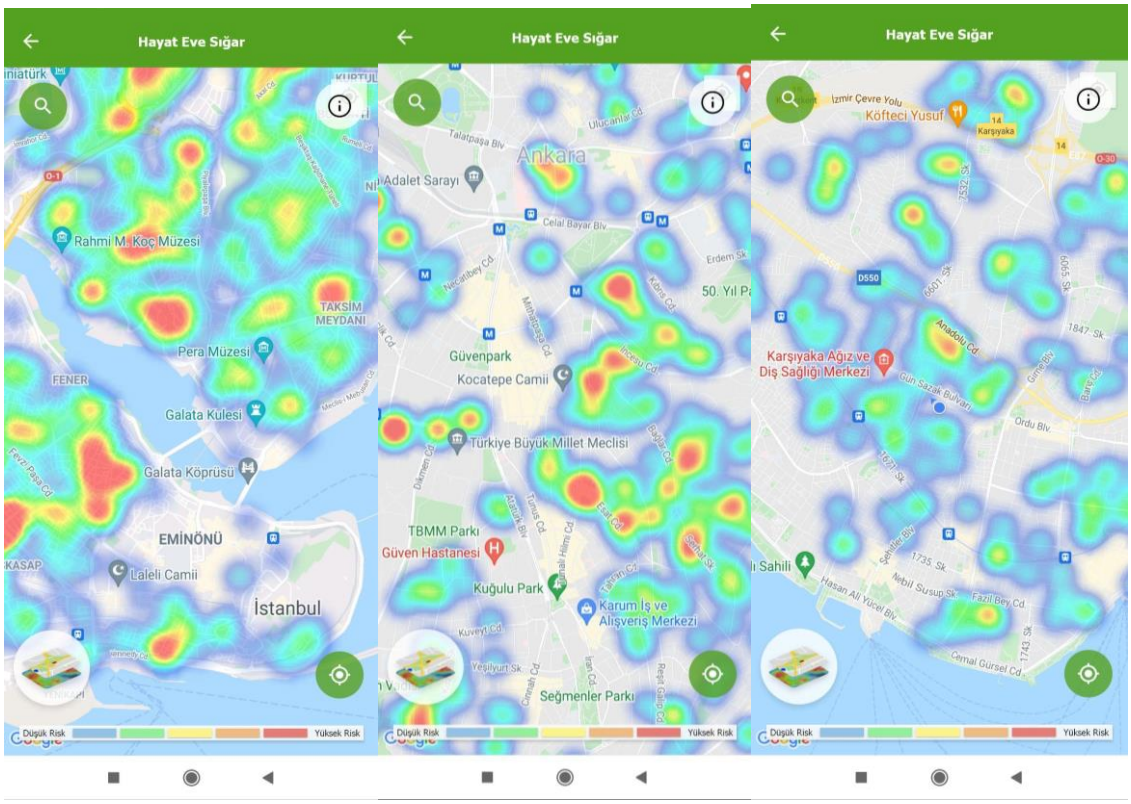

Figure 3. Risk density maps of İstanbul, Ankara and İzmir, three metropolises of Turkey, taken in June, 2021. (Source: HES, edited by authors)

Another service provided by the application is the risk density map. The application merges the location data of the user and the health data of people diagnosed with Covid-19. Then, it displays risk density in an anonymized map. In the map, blue, green, yellow, orange, and red colours respectively indicate a range from low to high-risk areas by processing the number of Covid-19 positive citizens (Figure 3). Under the circumstance of any isolation, the patient's location is automatically detected by the application. If the patient leaves its isolation zone during their quarantine period, a notification is sent to the patient as well as relevant authorities like police forces and the Ministry of the Interior. Moreover, the application calculates users' risk of infection according to the contact with infected people, risky individuals, and the number of people that exceed social distance through the map. Its temporary yet inconvenient and undesirable nature causes the branding and classification of the diseased individuals as the 'other' in society.[18] On the other hand, the fear of this unknown and highly contagious disease causes people to restrict themselves with state advice. As a result, the risk density map indicating the crowd encourages people to avoid any congregation or any political counteract in public space.

HES presents an option for users to denounce those who do not obey quarantine rules in addition to electronic surveillance and data mapping. In the denouncement section of the application, users can report other citizens' public health violations anonymously. In the report, the name, address of the informer, space where violation happens, the violation type, detail of violation textually, and proof of violation in pictures are the asked features. Choices of violation spaces are presented as airport, workspace, a person, a person subject to isolation, social activities, and public transportation. The violation types have opted as non-use of a mask, violation of social distance, and violation of hygiene rules. The application ensures that the denunciator's personal information will not be shared with a third party. Through such an Orwellian situation, a sense of being surveilled constantly prompts citizens to shape their behaviour according to rules. It makes individuals monitor themselves and others. In consequence, it enables individuals to join as a part of the surveillance system. In other words, the system encourages self-surveillance and discipline of society. In this case, not only self-surveillance but also individuals' control of each other is encouraged. Each individual is transformed into "a well-governed citizen".[19]

CONCLUSION

Whether the increased level of surveillance during the Covid-19 pandemic serves public health or political interests is a question mark.[20] Contemporary clinic medicine is structured on isolation, observation, and surveillance of the body.[21] This structure facilitates the integration of power relations established between a few numbers of surveillants and many observed into public health issues. Hayat Eve Sığar epitomizes disciplinary power and knowledge structure actualized through health and medicine with its observational, self-regulative, and participatory features. HES Code, risk density map, and denouncement of the other citizens contribute to urban surveillance rather than the pursuit of public health. Although the mobile app's functionality is questionable, each individual is regarded as potentially sick in the risk of isolation and exile. Within this surveillance system, the information network overlapping onto the physical urban layout eliminates the boundaries between information and surveillance, security and control, physical and virtual, urban places and electronic spaces, the public, and private spheres. Surveillance transcends beyond the limits of the public space, into the home, and even beyond the spatial realm, everywhere.

NOTES

1 Michel Foucault, *Discipline and Punish: The Birth of the Prison* (New York: Vintage Books, 1995), 195-228.
2 Michel Foucault, *Power/Knowledge: Selected Interviews and Other Writings 1972-77* (New York: Pantheon Books, 1980), 38-39.
3 Paul Hirst, "Foucault and Architecture", *AA Files*, no. 26 (Autumn 1993): 52-60.
4 Foucault, *Discipline and Punish*, 200-210.
5 Foucault, *Power/Knowledge*, 154.
6 Stuart Elden, "Plague, Panopticon, Police", *Surveillance & Society*, 1, no: 3 (2003): 242-245, https://doi.org/10.24908/ss.v1i3.3339.
7 Foucault, *Discipline and Punish*, 199.
8 Foucault, *Power/Knowledge*, 62.
9 Foucault, 61-62.
10 Elden, "Plague, Panopticon, Police", 242-245.
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FRAGMENTS IN CONNECTION AND ALGORITHMIC RULE: ENCODING THE URBAN IMAGE IN MOTION

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INTRODUCTION

The urban environment is closely related to the digital production of images and the world market system, not only through the use and exchange values of public goods according to the relations of production and the productive forces, but also through the symbolic values that represent cultural signification. Both social and cultural history identify how to observe the transformations that have implied changes in the arts, culture, and all aspects of human achievement in its sociocultural representations in the configuration of the urban image. One of the most representative works of the 20th century concerning this fragmented sense of the urban image is Walter Benjamin's *Arcades Project* (*Le Livre de Passages*, the French edition), describing the years from 1927 until the end of his life (1940) and remains an incomplete work. This book describes the main characteristics of an image of a 19th century capital — Paris — with its universal exhibitions, fashion, advertising, stores, passages, iron and glass constructions, the streets, and more. The image fragments in a textual and visual narrative enable perceptions of an urban image in movement. One of the relevant aspects from these observations outlines the concept of "aura" developed by Benjamin in 1935. This concept is related to the reproduction process and effects of urban images—taking the image as art throughout its history, showing the presence of the image through reproduction, maintaining its characteristics of origin, that is, the time and place. In contemporaneity, the sense of this transference of values in front of the image is also seen as "a decline of aura" regarding the rhythm of the urban image and its distance from the origin, that is, traditional values. However, this decline is also interpreted as a revolution of all the art and image functions, especially at the progressive end of tradition, which favours the immediate experiences of everyday life, and which is mediated by digital technologies. Initially, in his last version of *The Work of Art in the Age of Mechanical Reproduction* (1939), Benjamin addressed the technical reproductions, which in his time were the press, photography, radio, and cinema, that would lead to the impairment of the authentic experiences, thus, clarifying that he did not believe that the decline of aura would enable the democratisation of art and culture. He questioned whether the stars would favour the media as we know it today or whether they would be the ones favoured. In addition to this classic reference as an introduction to this paper, it is necessary to understand that the urban environment is about the appearances directly related to the images. To think about the image, one must actually contend with two images. The first, objectively understood, is a graphic, photographic, plastic, and dynamic representation. The second image is subjective; an idea that one has of something conceptually. Images exceed physical and knowledge boundaries

through imagination, create and provide free access to creativity, and, thus, have a place beyond the immediate social environment. In this sense, the status of the contemporary image is analysed in its technical and polysemic character, that is, the diversity of its sociocultural meaning, considering the fragmented and constituent aspects of the visual system from analogue to digital given that "after the rise of the Internet and today's algorithmic rule, we are again on the verge of a significant paradigm shift" (Kaponen 2018).

FRAGMENTS OF THE URBAN IMAGE: A DIGITAL OPTION

With the development of digital technology and network communication through the World Wide Web, there has been a transformation from analogue formats of films, photographs, and printed images to digital formats and, primarily, of new productions created in digital formats. In this way, the characteristics of each form, film, photography, and television and their unique values as media, are maintained but only updated with the new digital technology and inserted onto the Internet (McLuhan 1964). The well-known technological convergence occurring by means of the World Wide Web is currently the most significant result of the digital technological evolution. It is a system that provides the user with simultaneous access to various means of communication, all connected on the same device. There is the possibility of keeping in touch with all the other users of this technology directly or indirectly, actively or passively participating, receiving or emitting information, depending only on what one chooses among the many interaction possibilities that exist. With the decreasing costs of digital devices and, consequently, their popularisation, it is possible for any individual to film, photograph, and produce sounds and images demonstrating their content and authorship. Of course, one must also consider that globally, many still do not have access to digital technologies due to social inequalities. However, considering that those who define the meaning of the market possess the technology, an infinitude of independent productions with the most varied repertoires emerges supported by the facility of their insertion onto the Internet. The predominant language of this digital landscape is hypertext, which is very familiar to most Internet users. This term originated with Ted Nelson in the early 1960s. However, it took several more years for hypertext to be developed by Douglas Engelbart just before the World Wide Web emerged (Bardini 2000). The concept of hypertext was central to the creation of the World Wide Web. Virtually all companies, organisations, and institutions use the Web for a diverse range of activities, that is, to manage projects, offer distance learning, virtual tours of museums, order materials, and distribute company information via the Web system. The Web provides servers through the open system that is the Internet and private and secure servers called the intranet. In this sense, graphical Web browsers offer pictures, sound, and video capabilities to be embedded in the text and applications that are embedded in the multimedia system. Multimedia is dependent on information and communication technologies for direct (non-linear) access, interactivity, and integration with programmes and applications. Its spatiotemporal nature is classified into three media forms, and their respective characteristics are, firstly, the discrete or static media such as texts, static images, and graphics. Then there are the continuous or dynamic media because their content changes over time, such as audio video, and animation. Finally, immersive media present interactive information elements in 3D environments that allow substantial interactivity with the user. As for the degree of linear interaction, the user has no control over the multimedia reproduction process, which differs from non-linear interaction in which the user can interact through navigation. Information is accessed in a non-linear and autonomous way by the user through various means of representation and expressions of content. The user can interact freely with multimedia. The basic classes of multimedia applications and services are conversation, messaging, retrieval by accessing multimedia information servers, and broadcasting.

DIGITAL IMAGE AND VIDEO PROCESSING

It is thus understood that the production of images through the digital option offers an interactive dynamic of fragments of the urban image. This production is about the diversity of images transmitted in their forms, formats, and meanings to the visual culture. However, these several meanings are also related to the variety of the visual forms of perception with consideration given to how the visual experience is presented. In this regard, among the world of material things, the natural, traditional media and the virtual, there is technological transference from the material, natural world, and analogue, which represents the traditional media, to the digital. Specifically, with regard to images, the technical aspects of how digital images are configured are relevant. There are two types of configurations: vector images and images formed by pixels. The great advantage of vector images (Fig. 1) is that their data do not need to record the position of the pixels in the computer's memory, which enables reduced storage, in addition to being able to enlarge the image without losing resolution (Fig. 2), unlike the images formed by pixels (Fig. 3). Vector images use basic geometric shapes, such as lines, curves, points, and polygons, as the foundations for their construction. They are images formed by mathematical calculations performed directly by the computer (Gonzales and Woods 2018).1

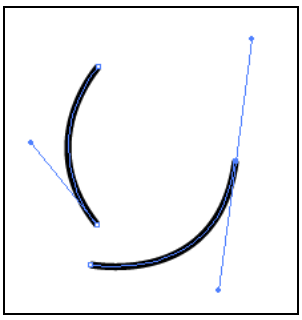

Figure 1. Vector curve.

Figure 2. Vector image.

Images formed by pixels are computer images represented by bitmaps. The bitmap is a two-dimensional spatial matrix composed of image elements called pixels (Fig. 4). The name given to the process of transforming a vector image into a bitmap image is known as a raster, which corresponds to forming a sequence of pixels through a pattern of parallel lines that form the image projected onto

the screen. As for the colours, in the digital system, they are formed by a pattern based on the chromatic effects of light projection by adding the primary colours, red, green and blue, which, in their totality, are pure white light. Through an assortment of compositions, they offer a spectrum of colour tones. This model is known as RGB and is the standard used in digital systems (Fig. 5). However, this standard was already a feature of electronic systems and developed from significant theories based on the human perception of colours (Gonzales and Woods 2018).2

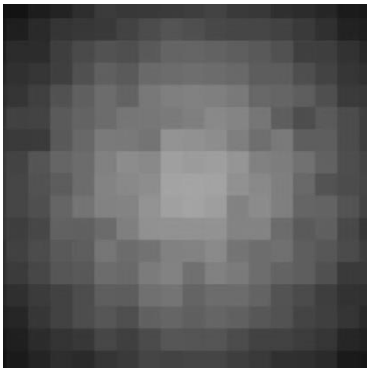

Figure 3. Bitmap image shown in 8-bit grayscale.

Figure 4. Bitmap image formed by pixels.

Figure 5. Bitmap image. The colours in the digital system: RGB (Red, Green and Blue).

In general, the digitalisation of information refers to the transformation from analogue to digital technology, when data from traditional media is converted to digital media. This process of converting the analogue signal to digital is based on quantifying the signal amplitude value at various time instants. In the context of the digital encoding and decoding of digital images, information ignored by the human visual system or that is irrelevant to the intended use of the image is omitted. Therefore, this interdisciplinary analysis on the image is worth highlighting in the study of perception as a hypothesis with regard to the values and effects of contemporary visual culture related to the connected fragments and the algorithmic rule between the physical and virtual world in the imagined and concrete realisations of the urban moving image.

ENCODING STATIC AND MOVING IMAGES AND DATA COMPRESSION PROCESSES

In the context of our approach to computer-transferred or constructed images, the meaning of the digitisation of information refers to the transformation from analogue to digital technology when data from traditional media is converted into digital media. This data may undergo encoding and data compression processes, which involve reducing the amount of data needed to represent a given amount of information. The images formed by pixels are many,3 and some have a well-known file format called JPEG (Joint Photographic Experts Group),4 which in digital practice represents an encoding that aids the compression of images without loss of visual quality. The JPEG encoding procedure is achieved using the variable-length code to eliminate redundant information from the image, and the decompression process is the exact inverse of the compression process in terms of the sequence of steps (Gonzales and Woods 2018).5 As such, the JPEG encoding procedure is designed to take advantage of the long sequences of zeros that usually result from reordering. However, the term ‘data compression’ refers to the process of reducing the amount of data required to represent a given amount of information. In this definition, data is different from information. Data refers to how the information is transmitted. Removing irrelevant visual information involves the loss of accurate or quantitative information from the image. However, a typical normalization matrix is used in JPEG standardization to weight the transformed image according to its percentage or *psychovisual* importance (Fig. 6).

16	11	10	16	24	40	51	61
12	12	14	19	26	58	60	55
14	13	16	24	40	57	69	56
14	17	22	29	51	87	80	62
18	22	37	56	68	109	103	77
24	35	55	64	81	104	113	92
49	64	78	87	103	121	120	101
72	92	95	98	112	100	103	99

Figure 6. Quantization matrix in JPEG standardization.

Because of the loss of information, a method is needed to quantify the nature of the loss. Two criteria can be used for this assessment: objective and subjective fidelity criteria. For this purpose, mathematical calculations are used in the digital system, and a variation between objective and subjective fidelity criteria is obtained visually in the image quality comparison. On the one hand, we evaluate the loss of information by employing mathematical calculations appropriate for the computer to obtain the accurate measurements for encoding and decoding processes (Fig. 7). However, on the other hand, this quality is evaluated by human vision, that is, by subjective evaluations. As we can

see, it is not possible to perceive the differences by human vision comparing the JPEG images with DPI 300 pixels/inch in three different resolutions (Figs. 8-10).

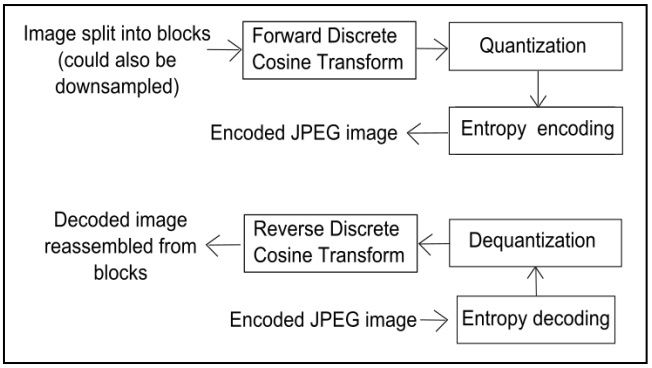

Figure 7. Baseline sequential JPEG encoding and decoding processes.

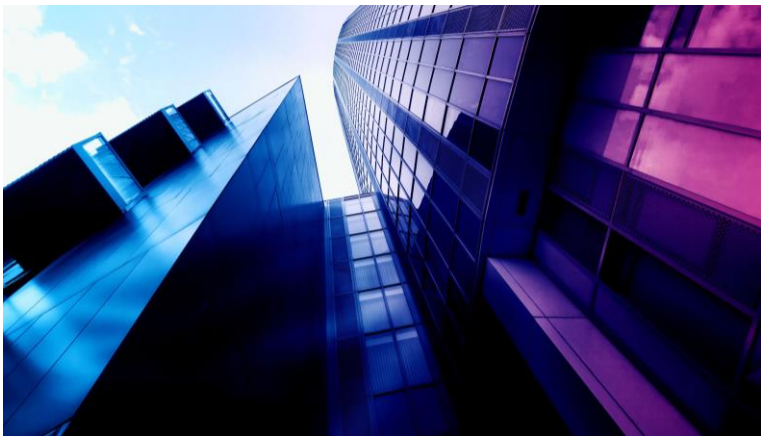

Figure 8. Image quality comparison.
JPEG image, size: 5184×3888 pixels, DPI 300 pixels/inch.

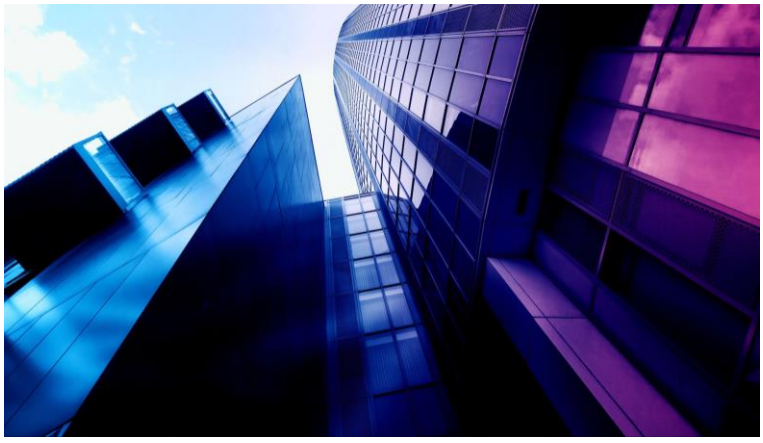

Figure 9. Image quality comparison.
JPEG image, size: 1920×1440 pixels, DPI 300 pixels/inch.

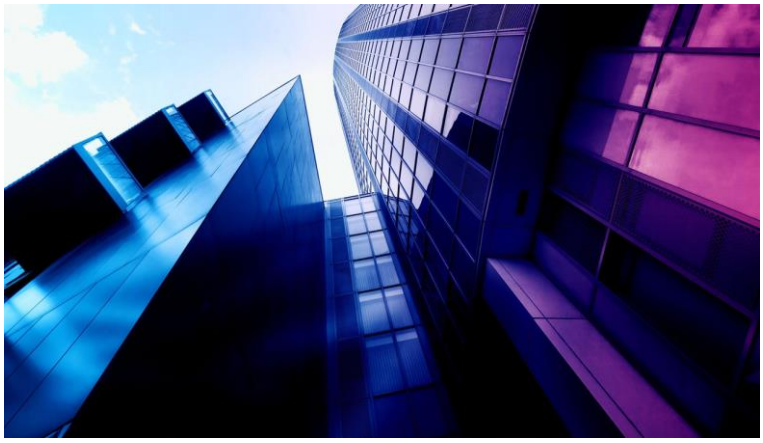

Figure 10. Image quality comparison.
JPEG image, size: 800 × 526 pixels, DPI 300 pixels/inch.

As for moving images, video compression systems avoid data expansion in two ways. First, by monitoring the motion of objects and compensating for this motion during the prediction and differentiation process. Second, by switching to an alternative coding method when the correlation between frames, through similarity, is insufficient to benefit from predictive coding. Successive frames in a video sequence are often very similar. Coding their differences can reduce temporal redundancy and provide significant compression. However, the similarity between nearby frames is reduced, and compression is negatively affected when the frames sequence contains fast-moving objects, zooming and camera spins, sudden changes, or gradual increases and decreases in scene light intensity (fade-in and fade-out, respectively).

In most images, pixels are correlated in space and time when the image is part of a video sequence. Since most pixel intensities can be reasonably predicted from the intensities of the adjacent pixels, the information conveyed by a single pixel is small. Much of its visual contribution is redundant in the sense that it can be inferred from its neighbours. A two-dimensional intensity arrangement must be transformed into a more efficient but usually non-visual representation to reduce the redundancy associated with correlated pixels in space and time. In image coding, algorithms seek to eliminate statistical, spatial, and *psychovisual* redundancies. Therefore, animated images represent a significant advance in the human-computer relationship, as does the digitisation of sound. *Psychovisual* redundancy exploits the properties of the human visual system based on greater sensitivity to distortions in soft and dark areas and greater sensitivity to changes in luminance than chrominance (Gonzales and Woods 2018).6

One of the most popular techniques for removing coding redundancy was developed by David Albert Huffman (1952). Huffman's encoding results in the smallest possible number of code symbols per source symbol by individually encoding the symbols of an information source7. The sequence of code symbols can be decoded in a single form. To 'isolate' the information to which the human eye has less sensitivity, one must transform the image from the spatial domain to the *psychovisual* redundancy domain. In this sense, we must understand the image in its forms of perception in distinct realities; one that concerns the perception of images in the physical world, another in analogue technologies, and another in digital. The idea is that the configuration of images presents a distinction through information and communication technology by a specific codification – Huffman codification – among the dynamics of other codifications in the digital processing of images. The images pass through compression algorithms, called codecs, a device capable of performing both encoding and decoding to reduce the amount of data needed to represent an image. These codecs are techniques for

compressing and transmitting digital video. For example, the MPEG (Motion Picture Experts Group) family of codecs extends JPEG to animated picture sequences, according to the coherence between frames. It is an essential digital compression standard.

In general, it is the point of the global society to illustrate the dynamics of how individuals in some way alienated, conditioned or not, are also profiting from a continued investment in digital technology. Their pleasures and behaviours are converted into actions that maintain the system in its functioning and continuity. Accordingly, we follow the World Wide Web since its emergence and the whole digital system in its codifications and algorithmic rules towards the future. Benjamin understood in his observations and reviews that reproduction techniques would be meaningless if they were not capable of increasing our reflections or being integrated into our experiences. If these techniques replaced lived experience, we would lose our senses. According to McLuhan, it is essential for our orientation under the effects of media and new technologies that we do not change our goals as a result of the aforementioned newness. Otherwise, we will only be conditioned to a constant and, perhaps, illusory updating by the latest technologies and resources.

FINAL CONSIDERATIONS

Transformation is considered to be the main characteristic of urban visual culture as a representation of a world-conception with its characteristics and needs that vary according to culture, society, and economy. Creativity is presented in its realisation processes as the meaning of the urban image in its current transformation process and the reality of society is represented by the configurations of images. Thus, through visual culture, the action of the present develops around the economy, techniques, science, ideologies, political will, and other elements. These actions transform evolution, and, within such a perspective, one can reflect on the conditions that allow innovation and creation in the face of the polysemy of images in this new sense, which is based on the media spreading the ideas and images of mass society. The copious production of images is possible in a context that is itself favoured by the sociocultural dynamics. In other words, this level of production is possible because contemporary metropolises and societies report and represent their histories, experiences, expectations, in short, their daily lives, through images that propose a projection as social identity. This projection transmits, for most people, the collective imaginary. In addition, the diversity of audio-visuals, film production, advertising, and visual arts represent how images can construct the social imaginary. In this context, visual fragments configure the images displayed in the public space globally by undergoing several configuration techniques, codifications, and optimisations when conveying virtual time and space in relation to the physical urban environment. One must consider society in all its dimensions. The digital world is just an extension, as a constituent of the social imaginary.

NOTES

1 Rafael C. Gonzalez and Richard E. Woods, “Digital Image Fundamentals,” in *Digital Image Processing* (New York: Pearson, 2018): 47-83. Further citations of this work are given in the text.
2 Gonzalez and Woods, “Color Image Processing,” 2018, 399-455.
3 Possible formats for pixel images are GIF, commercial distribution of compressed images; BMP, Windows standard; TGA, used by animation and video processing programs; TIFF, high-resolution images; PCD, for images recorded on Photo-CD; PNG, alternatives to GIF. JPEG: for photographic images.
4 “The Joint Photographic Experts Group (JPEG) committee has a long tradition in the creation of still image coding standards. JPEG is a joint working group of the International Standardization Organization (ISO) and the International Electrotechnical Commission (IEC). More specifically, the JPEG committee is Working Group 1 (WG1), Coding of Still Pictures, of JTC 1’s subcommittee 29 (SC29), Coding of Audio, Picture, Multimedia and Hypermedia Information,” About JPEG, accessed May 17, 2021, https://jpeg.org/about.html
5 Gonzalez and Woods, “Image Compression and Watermarking,” 2018, 539-553.
6 Ibid, 576-594.
7 Ken Huffman, “Like many codes, including the one named after Samuel Morse, Huffman’s creation tried to find a way to assign the shortest codes to those characters used most, the longest codes being reserved for those used rarely if at all. This process was carried out by forming a so-called coding tree, in which the probability that a number, letter or another character will occur is designated as a leaf on a tree,” in “Profile: David A. Huffman: Encoding the ‘Neatness’ of Ones and Zeroes,” *Scientific American* (September 1991): 54–58.

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MAPPING VERNACULAR MEMORY: THE LOGIC OF ASSEMBLAGE IN URBAN EVERYDAY LIFE

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INTRODUCTION

My thinking about the logic of assemblage and urban life has been shaped in two directions. First, it has been shaped by my ongoing scholarly interest in theorizing collective memory as a complex, communicatively-constituted social and cultural process.[1] Like many who study collective memory, my previous work concerned memory in what might be best described as its "official" modalities: monuments, museums, public art. These official forms of collective memory often reify and authorize certain events, narratives, identities, and forms of memorialization at the expense of others. But my interest was less in what elite arts, journalistic, and political institutions say and do. I was more concerned with how ordinary people appropriate or *live* official memory as they perform the acts through which public space is territorialized.[2]

The second influence has come from my long-term fieldwork project in the Kensington section of Philadelphia. As I lived and moved through this part of the city, I began noticing the residue of memorial acts—shrines, murals, graffiti—which did not fit comfortably within the conceptual landscape of collective memory as I had come to understand it. After watching many memorials, unacknowledged in any official way, appear and disappear from the city's streets, I began to understand these not as isolated, idiosyncratic, mimetic forms (memorials that simply mimic other, official forms of memorializing) but as connected, collective, poetic acts through which personal emotions were being collectively, publicly expressed and displayed.

In this paper, I draw on the ethnographic context for my understanding of memory as urban assemblage in order to explore the connections between three key terms: memory, assemblage, and mapping. The first of these—memory—is widely understood to reference individual, psychological or episodic memories—memory as something that "I" do as a consequence of being a conscious, living and experiencing human being. However, following a body of memory studies scholarship, I argue that memory operates in an audience-directed, collective way—as something a "We" does, together, for an audience of both "us" and others, especially in the context of cities.[3] In this sense, memory is the being of a group's past in the present. Memory in this collective sense exists insofar as it is actualized in what Mieke Bal terms "acts of memory."[4] I will argue for the value of a view of *memory as a process of assemblage*.

This brings me to the second term—the concept that brings this conference together: assemblage. I approach the concept of assemblage through the philosophy of Gilles Deleuze. I understand what

might be described, following Paulo de Assis, a logic of assemblage as more than simply another (infamous) Deleuzean neologism.[5] Rather, it is both central to Deleuze's thought and to his approach to working. As he might himself have put it, "Deleuze" here is a proper name or conceptual persona.[6] And as he repeatedly pointed out, this logic was a singular effect of his own practice of assemblage. It was, after all, through his intensive collaborations with Félix Guattari, as well as Claire Parnet, and Giorgio Agamben, that much of the direct elaboration of the logic of assemblage occurred.[7] And it is arguably only from the point of view of this logic that one can make sense of the dizzying number of productive encounters/relations between Deleuze and his many intermediaries, including an impressive list of films and film makers in the two volumes on cinema; the paintings of Francis Bacon; the literary works of Marcel Proust, Franz Kafka, and Lewis Carol.[8] Even his relations with philosophical interlocutors like Foucault, Hume, Neitzsche, and Spinoza were undertaken not as readings of texts to be interpreted but as "mediators" for assembling thought.[9]

Finally, I want to connect this logic of assemblage to the last of my key words: mapping. I mean it in both a figurative and a literal sense. Figuratively, mapping is a critical part of the logic of assemblage. In *A Thousand Plateaus*, mapping—open, creative, connectable, experimental processes through which we constitute both desire and the social—is importantly linked to assemblage.[10] This connection of cartography and assemblage reflects not willful idiosyncrasy on Deleuze and Guattari's part. On the contrary, it is in harmony with much writing on urban geography and cartography, and it is deeply connected to themes of territoriality and mobility, which are crucial terms in the study of urban life and built environments.[11] As Deleuze often did, I seek to connect the figurative register in which mapping occurs in their work to cartography, the art and science of making of maps. In this dual sense, map-making is a practice for engaging what Amin and Thrift describe as the "specific phenomenalities" of belonging through which those who live in cities produce space and place.[12] I also approach mapping from the literal and practical position of one who creates maps not to "trace" the real, but as a multimodal, multisensorial tool in the conduct of ethnographically-inspired fieldwork.[13] In this connection, the conceptual and practical are wedded in my effort to practice map-making as a mode of inquiry, as a way to preserve the traces of ethnographic sensemaking, as an effort to intervene in the political imagination, and as a way to communicate with multiple audiences—some of whom are the subjects I study.

And that is where I begin: in Kensington.

KENSINGTON REMEMBERS

I was on my way to catch the el—that is what locals call the screeching, silver train that snakes along the elevated tracks through the heart of Kensington. But just as I crossed the street in front of a corner store, I spotted a small memorial, obscured by weeds in front of an empty, fenced lot. A repurposed piece of furniture serving as a shrine was placed on a base cobbled from scraps of used lumber. Empty liquor bottles were arranged inside the cabinet and around the lip of the platform on which it rested. A menagerie of stuffed animals, matted by rain and bleached by the sun, covered the top. The words "RIP Bug" had been scrawled across the chest of a once bright-blue koala. Invisible in the grass beside the shrine, a small rectangular concrete pad had been poured in the dirt. Inside was a plastered heart containing the words "IN MEMORY OF BOUGH." The dates 9/26/92 – 9/2/14. A baby's footprint. A color photograph of a young black man wearing a King's hat and a Phillies jersey. The heart was bejeweled by religious jewelry, a heart-shaped locket, and decorative glass pebbles. The remnants of votive candles sat in prayerful stillness around it.

Figure 1. In Memory of Bough

I went my way but returned frequently. I was drawn back by wonder about the intensely personal work of memory that his friends and family enacted here on a public sidewalk. Who was "Bough"? How did he die? Why did his family and friends memorialize him in this public way? I started finding other similar public expressions of private emotions and they took a surprising variety of forms: a mural on the side of a corner row house remembering Mickey; graffiti dedicated to the memory of Philadelphia-legend "Disco Duck," one of the original practitioners of modern, urban graffiti writing; a park bench in front of another row home dedicated to Louise; a ghost bike to Antonio Sandoval, a restaurant worker killed in a hit and run accident. While I had been writing about collective memory since the early 2000s, the scholarship I was familiar with focused almost exclusively on what I call the three M's: museums, monuments and memorials. This scholarship hues closely to the official accounts authorized by political and cultural elites and circulated in the mass media. What little scholarly focus did exist on memorials like the ones I was finding tended to subsume them into a narrative dominated by those official, elite, monumental forms of public memory—and the theories that inevitably lean in their direction.

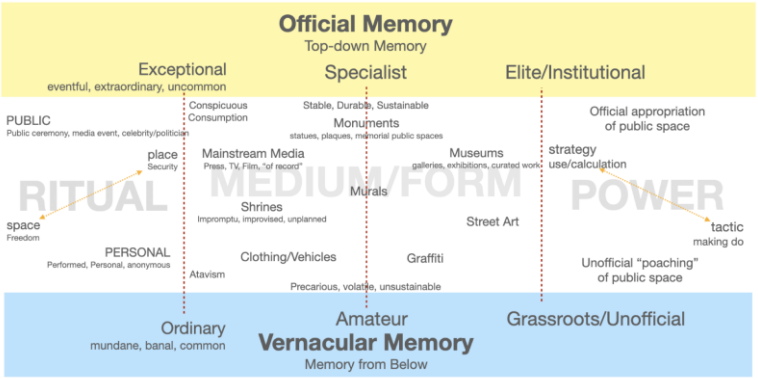

Figure 2. Conceptual map of official versus vernacular memory

I was encountering a cultural phenomenon that also did not figure into the work of the many famed cultural and arts institutions in Philadelphia like Mural Arts Philadelphia, which was originally a city-run anti-graffiti scheme, or Monument Lab, a public memory project at the University of Pennsylvania.[14] It certainly did not cohere with the dominant media representations of Kensington as ground zero for the gun-violence epidemic, the opioid crisis, and the homeless crisis in the United States.[15] With the onset of the global pandemic and the subsequent quarantine measures, Villanova's IRB suspended all approved research activities. And so, I began thinking about ways to work with what I had collected and documented to date. Thanks to generous support from Villanova's Digital Scholarship Librarian, Erica Hayes, and a small research grant from the Office of the Vice Provost for Research, I was able to create a digital archive for the ongoing fieldwork. *Kensington Remembers* was launched in Fall 2020, and it includes an interactive map, a gallery of photographs, and a blog through which I seek to tell the stories of vernacular memory in Kensington and preserve the traces of fieldwork for multiple audiences, including those who live there.[16]

MEMORY AS COLLECTIVE ACTION

"Collective memory" brings with it a constellation of associations not all of which are helpful. It runs counter to our assumptions about memory in a purely personal or autobiographical sense. In this sense, memory is understood to function in either an episodic sense (memory of events actually experienced) or in a rote sense (ability to recall learned information). While these differ importantly and are complexly related, both uses of the term assume memory is one's true recollection of past experience as constructed on the basis of traces.[17]

Collective memory differs in important ways from personal memory. First, "remembering" is understood as a collective and communicatively-constituted process: social groups are formed on the basis of an assumed, though often contested, shared past. This is what Barbie Zelizer means when she says that memory is "instantiated" beyond the individual, by and for the collective.[18] It is at the level of the group that determinations are made regarding both what of that past is salient and what is not; what those events mean; and how those past events are made physically present. These practices—of selection, framing, materializing, deliberating, debating, and most important forgetting—all imply communication not as the transmission of meaning "found" in the past, but as the ongoing making of the past as such, as meaningful, in the present. Zelizer continues, noting that remembering is implicated in a range of other activities including identity formation, powe and authority, cultural forms, and social interaction. And as Mieke Bal explains, in order for the shared past to exist, it must be made present in what he termed *acts of memory*.[19] This enacted, "imagined" past, as Appadurai explains, is rather like Benedict Anderson's "imagined community," in that it forms the very basis of group belonging, exclusion, identity and identification.[20]

Memory is thus important for understanding not only consanguinity and connection, but also conflict, contestation, and schism. This is aptly illustrated in contemporary contests over monuments celebrating the lives and legacies of figures connected with White supremacy in the United States. Many of these monuments date not from the war but from the early 1900s, when they were raised as symbols of White power: the power to decide the past, the power to memorialize, the power to control not only the meaning of race, but also education, imagination, and public space. The contestation of such monuments in highly visible ways as well as the raising up of new memorials and monuments to excluded and forgotten figures as part of the Black Lives Matter movement is an important moment in the lifecycle of collective memory as new groups form to intervene on who and what is remembered, how and why.

As these examples suggest, cities are crucial to collective memory. Cities have historically been important locations for memorials which are not otherwise tied to specific locations where the events being monumentalized occurred. The Mall in Washington D.C., where the many of wars in which the United States has participated are memorialized; the Holocaust memorial in Berlin, which memorializes the millions of victims of the Nazis' "final solution"; the *Arc de Triomphe* in Paris, which memorializes those who fought and died in the French Revolution, the Napoleonic wars, and the Great War. In such instances, cities serve not as "*milliuex de memoire*" or "environments" of memory but as what Pierre Nora calls "places" where "memory crystalizes and secretes itself." Cities have often been the locations of important events for larger collectives, such as the nation. Such sites—real or imagined—attract tourists who visit cities like New York City in part as pilgrimages to the Holy sites of collective memory. My own home in Philadelphia, for example, is a city rich with such sites of memory: the Liberty Bell, Independence Hall, as well as the many haunts and homes of historical personas who figure prominently in the history and collective memory of the United States.
To render this argument somewhat more concrete, I want to consider a new memorial I encountered just days before the conference at which this paper was presented. It appeared just a few blocks from the spot where the "Bough" memorial was located.

Figure 3. Photographs of "In Memory of Mikey"

While I have not had time to determine who Mikey was, how Mikey died, who Mikey's friends were, or why they engaged in this activity, I want to draw a few conclusions based on the visual evidence here. First, this is not the work of a single individual—it was a group effort, as evidenced by the different handwriting styles on the candles. Second, this activity was intentional and audience directed: items were purchased and made, their arrangement was planned, there is implied "frontality," they interpolate passersby. Third, it is complex: it involved people performing several different, ritualized acts: this is evident in the ritual messages (expressions of love, loss, and grieving), as well as in the selection and arrangement of elements. Finally, it was a symbolic gesture, as implied for example in the heart made with votive candles. These particular elements are brought together in this particular manner, in this particular public space to create a site of shared memory. As an act of memory, this is evidently collective, affective labor.

MEMORY AS ASSEMBLAGE

While it is tempting to see this memorial as a "thing," the logic of assemblage disposes me to consider it otherwise. "It" is, if anything, a process, a becoming, and a set of relations. These are irreducible to "its" being fixed in any object (a shrine), statement ("RIP") or representations (these photographs). According to Paulo de Assis, the "logic of assemblage" focuses upon process over product, privileges flow and movement, and asserts the primacy of indeterminacy and transformation over fixity and stability, which are simply "moments" within a process (see Fig. 4). Assemblage is oriented toward the future, the creating and becoming of (in this example) remembering, rather than on the being of the past in itself (history).

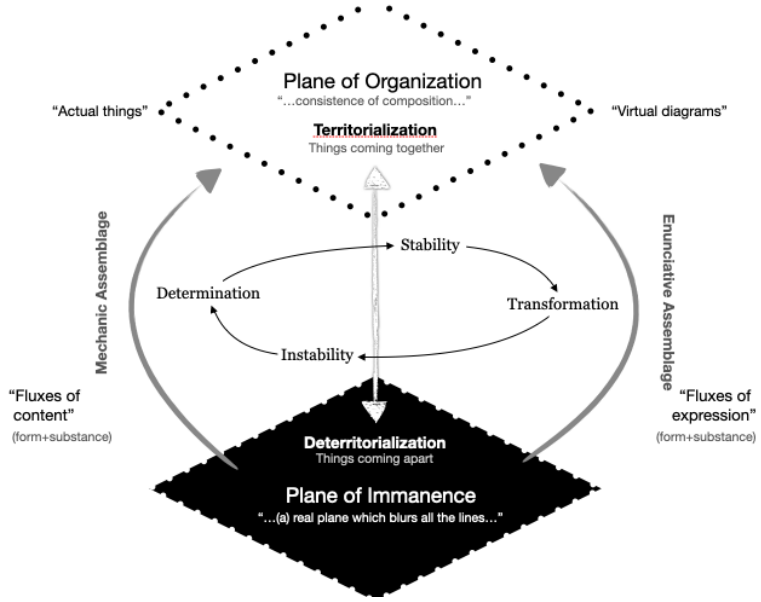

Figure 4. Conceptual map of the logic of assemblage.

This logic of assemblage posits a process that begins in a plane of immanence, substance without form or determination, without a priori designation, identity or essence. At this level of the matter, matter remains in flux until it moves in the direction of ordering or organizing. On one side, this ordering is "machinic," a composition of fluxes of content. Assemblage at this level is the process by which form is given to substance. The machinic side is complimented on the expressive side by the organization of forms of expression. Between these two double articulations forms and contents, "an assemblage" emerges not as an object, but as a set of mobile, provisional relations established between heterogeneous elements whose identity and meaning are irreducible to the individual terms. This unlikely situation is as likely to devolve and disintegrate as it is to persist. The relations among these specific, heterogeneous elements are maintained or territorialized through recurrence and communication. Like a murmuration of starlings, these mobile relations are mappable along two axes: along the longitudinal axis individual elements are constituted as "a body" through relations of movement and rest, speed and slowness; and on the latitudinal axis, they are mapped in terms of their capacity to affect and be affected—in relation to still other "bodies."[21]

To return to the memorial to Mikey, we might ask, not "what do candles arranged like a heart mean?" But instead: What makes candles semiotic? It certainly is not something inherent to "candle-ness." Neither is it reducible to the act of writing "memorial" words on it. It is rather the fact that elements are caught up in a process that includes both the machinic arrangement of material elements which

constitute the "thing," The Shrine, (the arrangement of votive candles into a symbolic shape for example). On the other side, there is a process of enunciative assemblage which causes machinic relations to function in a semiotic manner. To assemble is to borrow elements and fragments from available milieus, bring them together (territorialize them), as Deleuze and Guattari say, to appropriate and set in motion the properties or rhythms through which they become meaningful. Such memorials, in other words, are passional as well as actional. They are not "spontaneous" or natural (cultural) determinations. They are assembling and assembled desire. Memorials, I am arguing, are better viewed as processes, relations of recurrence and communication performatively established between elements which are made territorial. Elements from elsewhere and otherwise function together here and now' they have these particular affective capacities under these particular conditions in this particular arrangement. The symbol of a heart written with votive candles. Prayer candles turned into significant surfaces. A fuzzy toy bear, ribbons, and flowers arranged to fix a territory on this bit of cracked and stained sidewalk in front of this defunct store, which was once a busy neighborhood place. That place is now reconfigured as a site or milieu of memory.

CONCLUSION

MAPPING URBAN MEMORY ASSEMBLAGES

And here we arrive at my final term: mapping. Ethnographically speaking, mapping the city is a multisensory, multimodal way of knowing. As Kim Dovey and Mirjhana Ristic explain, maps are "a lens through which we see the city…tools we use to navigate, control, understand, imagine and transform the territory of the city."[22] Accordingly, maps deeply implicate our bodies—not just our minds, our sight, or our imaginations—because it is by way of (in/as) bodies, as a "doing," that we negotiate the places and spaces maps imagine. As we move through cities we constitute or territorialize places and spaces at the scale of our acting, sensing, living, moving bodies. These bodies, too, are not *a priori*, pre-constituted things or essences, according to Deleuze and Guattari, but assemblages constituted of heterogenous elements along the axes of movement/duration and affective capacities.[23]

They note that a map is "open and connectable…detachable, reversible, susceptible to constant modification." It can be "reworked by an individual, group, or social formation. It can be drawn on a wall, conceived of as a work of art, constructed as a practical action or as a meditation."[24]

"Becomings," Deleuze and Parnet write, "belong to geography." According to the logic of assemblage, it is the destiny of assemblages to start out or wind up in maps as "orientations, directions, entries and exits."[25] Thus understood, memorials are assemblages, because memory, too, is assembled. And territorializing.[26] Mapping them—collective memory, memorials—is also more than a matter of "tracing" real things. It is also a work of assemblage. And it is through this work that acts of memory are undertaken, sites of memory are connected and related. Cartography causes them to resonate together and amplifies their effects. Thus mapped, located and related, sites of memory produce a collective territorializing affect that constitutes a way of living place and placing life—what Raymond Williams meant by his term, a "structure of feeling."(128-135)

As Amin and Thrift emphasize, the city is a place of mobility, a place of flow and everyday practices, and the value, they suggest, in understanding urban life in this way is that it compels us avoid thinking of the city as container or system. Instead, they suggest we look at the recurrent phenomenological patterns through which urban life, and the city, is lived.[27] This kind of city, the viscous city, is like old windows in old buildings, leaky and inefficient, the pits and runs and distortions indicating that the glass is slowly dripping from the frame. This metaphor reminds me of Walter Benjamin's use of the term porosity to describe the city.[28] He uses it to explain "the indeterminant character of urban life."

The absence of spatial boundaries and divisions, one thing blurring into another, the activities of individuals and groups as they arrange living—urban assemblage. In other words, assemblage is responsible for the continuous deterritorialization of cities—the constant friction between “old” and “new” as it is marked in the discourse of gentrification. The city is constantly being decoded and recoded in novel, if provisional ways. But if assemblage describes the condition of the undoing of the urban, It must also account for the reterritorialization of the city in new forms, its continuous reinvention and variation.

ACKNOWLEDGEMENTS

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NOTES

[1] For two foundational arguments regarding the connection between communication and collective memory, see Carol Blair, “Contemporary U.S. Memorial Sites as Exemplars of Rhetoric’s Materiality,” in *Rhetorical Bodies*, ed. Jack Selzer and Sharon Crowley (Madison, WI: University of Wisconsin Press, 1999), 16-57; and Barbie Zelizer, “Reading the Past Against the Grain: The Shape of Memory Studies,” *Critical Studies in Mass Communication* 12, no. 2 (1995): 214-239.
[2] See Gordon Coonfield, “New Images, Lived Images, and the Post-9/11 Landscape: Performance as Refrain,” in “Paradigms of Performance Studies,” ed. Craig Gingrich Philbrook, special issue, *Liminalities: A Journal of Performance Studies* 5, no. 1 (April 2009), http://liminalities.net/5-1/refrain.pdf; Gordon Coonfield, “News Images as Lived Images: Witness, Performance, and the U.S. Flag After 9/11,” in *Culture, Trauma, Conflict: Cultural Studies Perspectives on War* , 2nd ed., ed. Nico Carpentier (Cambridge: Cambridge Scholars Press, 2013); and Gordon Coonfield and John Huxford, “News Images as Lived Images: Media Ritual, Cultural Performance, and Public Trauma,” *Critical Studies in Media Communication* 26, no. 5 (2009): 457-479, https://doi.org/10.1080/15295030903325354.
[3] On the important relationship between cities and memory, see Kim Dovey, "Memory, Democracy and Urban Space: Bangkok's 'Path to Democracy'," *Journal of Urban Design* 6, no. 3 (2001): 265-282.
[4] Mieke Bal, Jonathan Crewe, and Leo Spitzer, *Acts of Memory: Cultural Recall in the Present* (Hanover, NH: Dartmouth College: University Press of New England, 1999).
[5] Paulo de Assis, *Logic of Experimentation: Reshaping Music Performance in and Through Artistic Research* (Leuven, BE: Leuven University Press, 2018).
[6] He discusses this concept of the proper name in his first co-authored book with Félix Guattari, *Kafka*: *Toward a Minor Literature,* trans. Dana Polan (Minneapolis: University of Minnesota Press, 1986). But Deleuze himself makes the connection to conceptual personae most ardently in Gilles Deleuze and Leopold Sacher-Masoch, *Masochism: Coldness and Cruelty and Venus in Furs* (Cambridge, MA: Zone Books, 1989).
[7] Deleuze co-authored four books with Félix Guattari, but assemblage is most clearly explicated in *A Thousand Plateaus: Capitalism and Schizophrenia*, trans. Brian Massumi (Minneapolis: University of Minnesota Press, 1987). It is also elaborated in Gilles Deleuze and Claire Parnet, *Dialogues,* trans. Hugh Tomlinson and Barbara Habberjam (New York: Columbia University Press, 1987). As the title of the essay co-authored with Giorgio Agamben suggests (What is an apparatus?), *assemblage* is developed in relation (and opposition) to Michel Foucault’s “apparatus.” See Giorgio Agamben, *What Is an Apparatus? And Other Essays* (Stanford: Stanford University Press, 2009). For more on this connection, see Stephen Legg, “Assemblage/apparatus: Using Deleuze and Foucault,” *Area* 43, no. 2 (2011): 128-133.
[8] See Deleuze and Guattari, *Kafka*; Gilles Deleuze, *Proust and Signs: The Complete Text,* trans. Richard Howard (Minneapolis: University of Minnesota Press, 1986); and Gilles Deleuze, *The Logic of Sense*, trans. Constantin V. Boundas (New York: Columbia University Press, 1990).
[9] It is no coincidence that the essay I am referencing, “Mediators,” appears first in the section on philosophy in *Negotiations, 1972-1990* (1995). It is also no coincidence that, as noted at the end of the essay, it is a “conversation” between Deleuze, Claire Parnet, and Antoine Dulaure. Gilles Deleuze, *Negotiations, 1972-1990*, trans. Martin Joughin (New York: Columbia University Press, 1995).
[10] See especially Deleuze and Guattari, “Introduction: Rhizome,” in *A Thousand Plateaus,* 12-18.
[11] See Deleuze and Guattari, “Treatise on Nomadology—The War Machine,” in *A Thousand Plateaus,* 351-419; and Deleuze and Guattari, “Apparatus of Capture,” in *A Thousand Plateaus,* 420-473. The connections between assemblage, mobility, territory and the city are clearly evident in his Paris lectures archived online at https://deleuze.cla.purdue.edu/seminars.
[12] Ash Amin and Nigel Thrift, *Cities*: *Reimagining the Urban* (Cambridge: Polity, 2002), 49.
[13] For an overview, see Samuel Gerald Collins, Matthew Durington, and Harjant Gill, “Multimodality: An Invitation,” *American Anthropologist* 119, no. 1 (January 2017): 142-146.
[14] For more on Mural Arts Philadelphia, see their website: https://www.muralarts.org. For information on The Monument Lab, see either the book by Paul Farber and Ken Lum, *Monument Lab: Creative Speculations for Philadelphia* (Philadelphia, PA: Temple University Press, 2020), or their website: https://monumentlab.com.
[15] See for example a 2018 *New York Times Magazine* photo-essay that described Kensington as the “Walmart of Heroin:” Jennifer Percy, “Trapped by the ‘Walmart of Heroin,’” *New York Times Magazine,* October 10, 2018, https://www.nytimes.com/2018/10/10/magazine/kensington-heroin-opioid-philadelphia.html. There are also social media accounts like @KensingtonBeach that sensationalize some of the everyday violence associated with opioid addiction in Kensington. There have also been numerous homeless encampments which are visible in both the above sources.
[16] See https://kensingtonremembers.org.
[17] See Christopher McCarroll, *Remembering from the Outside: Personal Memory and the Perspectival Mind* (Oxford: Oxford University Press, 2018) for a recent summary of the case for personal memory.
[18] See Zelizer, “Reading the Past Against the Grain.”
[19] Bal, Crewe, and Spitzer, *Acts of Memory*.

[20] Arjun Appadurai, *Modernity at Large: Cultural Dimensions of Globalization* (Minneapolis: University of Minnesota Press, 1996), 53-64.
[21] I am summarizing the argument in Deleuze and Guattari, *A Thousand Plateaus*, 260-272 and 291-298. See also Félix Guattari's essay (written in collaboration with Deleuze), "Balance-Sheet Program for Abstract Machines," in *Chaosophy: Texts and Interviews 1972-1977,* trans. Sylvére Lotringer (New York, NY: Semiotext(e), 1995), 119-150. On the definition of a body, see Gilles Deleuze, *Spinoza: Practical Philosophy,* trans. Robert Hurley (San Francisco: City Lights Books, 1988).
[22] Kim Dovey and Mirjana Ristic, "Mapping Urban Assemblages: The Production of Spatial Knowledge," *Journal of Urbanism* 10, no. 1 (2017): 15.
[23] See Derek P. McCormack, *Refrains for Moving Bodies: Experience and Experiment in Affective Spaces* (Durham, NC: Duke University Press, 2013) for a thoroughgoing argument regarding the relation between bodies, movement, and the creation of "affective spaces."
[24] Deleuze and Guattari, *A Thousand Plateaus*, 12.
[25] Deleuze and Parnet, *Dialogues*, 2.
[26] Deleuze and Guattari make this point about memory in *A Thousand Plateaus*, 294.
[27] Amin and Thrift, *Cities*, 26-30.
[28] See Graeme Gilloch, *Myth and Metropolis: Walter Benjamin and the City* (Malden, MA: Polity, 1996), 25.

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MAPPING THE TEMPORALITY OF EVENTS

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INTRODUCTION

Understanding the space that we live in has been an interesting challenge for people for a long time. While defining place was a great challenge, the concepts like 'sense of place', 'place identity' and 'placelessness' evolved lately as the digital world was pervading into people's lives. The ease in the communication among people who live across the world with the developments in digital technology causes globalization and standardization, and as a result the appearance of new types of places and new meanings. Besides the physical features of the urban environment social and economic aspects of the city is currently a matter of debate together with the idea of the city as a complex organism. Corner also points out that, the city is more than a physical setting with its ever-changing politics, psychology and sociality of its inhabitants that use the urban space.[1] The city is composed of different layers with a dynamic character which is constantly changing and in the process of time the meaning of the places in the city is also regenerated.[2] Although the complex character of these notions is difficult to grasp, it becomes easier to grasp via the expressive and descriptive nature of mapping as an act.[3] Advances in digital technology and also has contributions to contemplate the urban space of the growing interest in digital mapping. Technology allows us to create visuals and a serious amount of voluntarily shared web-based data. There is a rising interest in the field of digital mapping by scholars and many projects and researches have been conducted. Jenkins says that "The emergence of massive amounts of geo-tagged content is bringing forward a renewed focus on spatial humanities, or the study of human activities in, and in relation to, space and place."[4] According to some scholars repeated events occurring in a specific time of the year like local festivals and cultural events can be indiscernible for the people who do not live there but they substantially unveil the identity of that specific place.[5] Revealing the hidden activities and events in the city can give an idea about the characteristics of the cities. In this study, first, the relation between urban identity, events and their temporal dimension will be explained and secondly, the potentials and limitations of mapping events and identity of the urban environment through web data will be discussed with relevant examples and consequently, time as a component of mapping urban space and activities will be debated.

Identity of Urban Space, Time and Events

Why is understanding the character of the city that we live in so important? Architectural critic Ian Nairn claims that identifying and recognizing the environment and the relation to it is a need for the human being, therefore sense of place is a necessity instead of a 'fine art extra'.[6] In other words, people need to be aware of what is going on in their surroundings to have a sense of place. Relph also

asserts that grasping place phenomenon is necessary firstly for people to express their attachment to the world that they live in and secondly knowing place thoroughly allows people to create and recreate places in accordance with the changing situations.[7] At that point, it can be asserted that it is not possible to understand a place without time as its component. Spatial and temporal concepts are inevitably connected and can be used to represent each other.[8] Moreover, Lynch argues that both natural and human events are related to time and give an idea about spatio-temporality.[9] He gives examples of 'dry season' and 'market day' to indicate the connection between time space and event. Bodenhamer supports this idea also by saying that "Our sense of place depends upon the simultaneous connection of both time and space. One attribute alone, either time or space, is not sufficient to define it" and by introducing time as the 'fourth dimension of space'.[10]

According to Relph, another meaning of having a sense of place is recognizing that each place has a different identity.[11] He also points out that place identity can be explained by its "persistent sameness and unity which allows that to be differentiated from others".[12] Similar to that, Lynch describes place identity through its recognisability and its distinctiveness from other places.[13]Additionally, he mentions the link between the sense of place and human activity.[14] 'Persistent identity' of place that Relph mentions is composed of three elements which are activities and events, physical setting and meanings created by experiences.[15] Moreover, by declaring that social events can contribute to the identity of the place, Southworth and Ruggeri promote the idea of the connection between events and identity of place in the urban environment.[16] The place character is constituted by human activities and experiences.[17] Hence, it can be inferred that the identity and character of a city is highly relevant to the events and activities which take place in urban space and can not be considered independent from the temporal dimension.

Mapping Urban Events with Web Data

The dependence of urban practice upon spatio-temporal attributes makes it difficult to analyze via conventional ways and sources of information. Current technological advancements especially in the field of information and communication bring about the recognition of a large amount of geographical data.[18] With the proliferation of the use of the internet people are voluntarily sharing location-based visual and textual data.[19] The information about human activities and events can be found through social network sites like Twitter, Facebook, Snapchat and many other websites easily and new information is added by the users constantly.[20] By means of application programming interface (API), this data can be organized and used to create visualization of the events of the city. This kind of data can help to reveal the activity pattern of a place and it also becomes possible to predict the near future situation of the places. The big data provided by the internet users have great potential and allows grasping the human activity patterns along with many other urban components nearly with no cost.[21] The occurrence and growth of such geo-tagged data brings about new interest among researchers in using such data to study human activities in urban areas to reveal the spatial patterns.[22] This unprocessed data includes the more stable physical setting together with unstable socioeconomic data such as human activity and mobility. With the content generated by the users about places in urban environment and computer technology, it is possible to demonstrate and differentiate the character of places upon activities of people.[23] Therefore, it has great potential to uncover the urban character on a large scale if it is organized and presented properly.

The advancements in technology also allows people to visualize big data to make it more meaningful. Beginning with Geographic information systems (GIS) as a new technology to discover the physical setting and transferring it into the digital world, geospatial crowd source data allows people to observe urban patterns more easily. [24] [25] The methods used for this operation varies in terms of the data used by

researchers. Social sensing data, remote sensing data, textual data from the comments of users, visual data like videos and photographs, location data and many other types of data become meaningful with methods such as data mining, topic modeling, word cloud visualization, kernel density estimation and the like.

At this point, the role of maps as an already existing unorganized data source to create a more meaningful understanding of the urban environment becomes crucial.[26] Mapping can be interpreted as a new tool in reading urban space clearly and completely with its various features.[27] As Graafland also mentions, "It (map) functions as an instrument for the visualization to different needs, for the understanding of spatial phenomena, for the storage of information, as a research tool by which we can comprehend relationships and distribution patterns, and so forth".[28] Harris also claims that maps can be used to understand the deep meaning of place and to comprehend the difference between place and space.[29] Moreover, maps have a strong visual quality and great potential to contain a big amount of information to capture at a single glance.[30] Abrams and Hall explains the relation between mapping as a method and our current situation with the new data sources and technologies as follows: "Mapping has emerged in the information age as a means to make the complex accessible, the hidden visible, the unmappable mappable. As we struggle to steer through the torrent of data unleashed by the Internet, and to situate ourselves in a world in which commerce and community have been redefined in terms of networks, mapping has become a way of making sense of things".[31] Lachiver also asserts that mapping is a way to gather, present, perceive and conceive information in order to know our world and our place.[32] Furthermore, Abrams and Hall claim that mapping as an act has significance instead of map as a final document and mapping is a nonending action.[33] Similarly, Presner, Shepard and Kawano advocate the idea of mapping is a continuing action by saying that "Mapping is not a one-time thing, and maps are not stable objects that reference, reflect, or correspond to an external reality. Mapping is a verb and bespeaks an on-going process of picturing, narrating, symbolizing, contesting, re-picturing, re-narrating, re-symbolizing, erasing, and re-inscribing a set of relations… Maps are representations of a world, which reference other such representations".[34] In other words, in an environment with constantly changing character in terms of meaning and using a data source which is also ever-changing, mapping as an action can be the proper way to demonstrate such data to have a more comprehensible idea about the environment. To add, some researchers claim that user-generated mobile data can contribute to mobility practices and thus help to understand and describe the shift in the behavioural patterns and human activities in contemporary urban space.[35] [36]

As an example of a recent research conducted to study urban identity through photograph data, Liu and his colleagues created visuals by using Panoramio (no longer available) and Flickr data to compare cities in terms of their visual similarity and differences and their uniqueness is revealed by this way as it can be seen from the Figure.1.[37] The aim of the research was to prove the potential of large scale geo-tagged data in understanding place identity. Although the visuals reflect the city identity through landmarks, colours and other architectural objects, the identity is limited to tourist activities and physical objects in these images.

Figure 1. Samples of city-informative scenes. Panoramio dataset.

The other study by Jang and Kim aims to visualize the collective identity of place by using textual and location data extracted from Instagram to create a 'crowd-sourced cognitive map'.[38] They used Instagram check-in data and categorized the textual data on Instagram under the keywords 'activity' and 'meaning' to demonstrate spatial relations in Bundang. The map created by them visualizes the check-in location as blue dots and circles that each represent an activity or meaning and the diameter expresses the frequency of the activity or meaning as it can be observed from Figure 2.

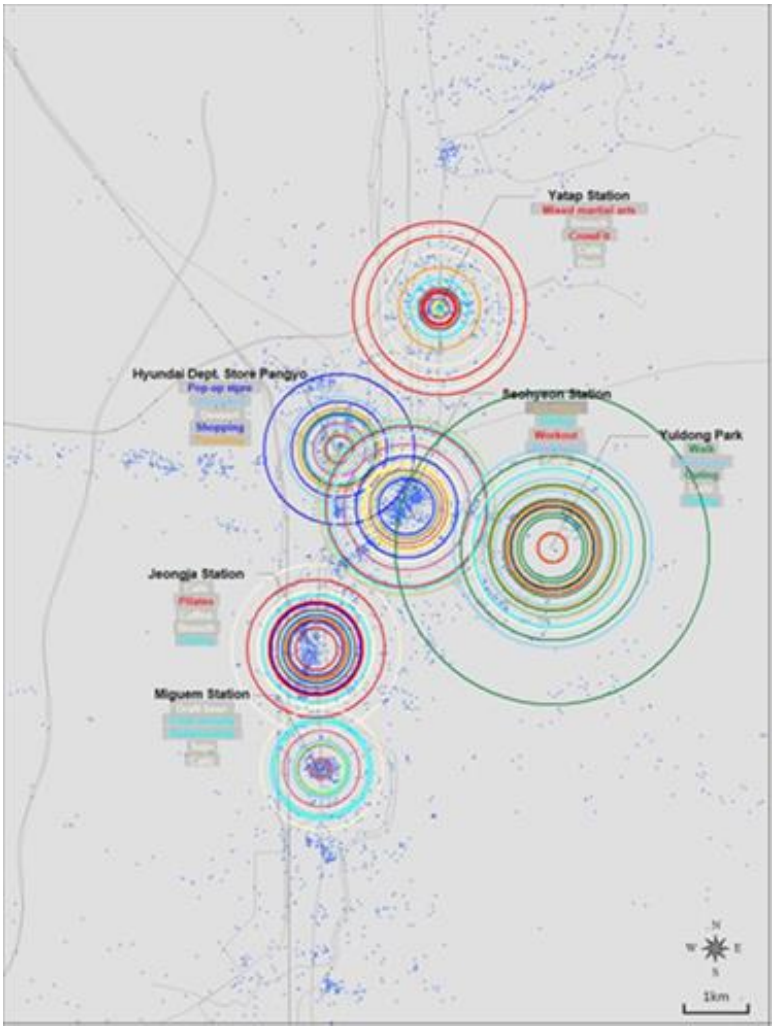

Figure 2. Map of Bundang

In Figure 3 all the categories they create are visible in the New York map. As another example of mapping by using web data, Liu and his colleagues make use of Flickr's geo-tagged photos together with the hashtag data, and they produce a word cloud and a map expressing the density of photograph locations in Paris. Their main purpose was to provide a sense of city generated by people's perceptions through what they call 'social sensing data' as it is observed in Figure 4a Figure 4b and Figure 4c.[39] The words like street art, architecture Eiffel Tower and Louvre museum indicate the activities along with the city however, they give a general idea about the activities and character of the city instead of locational information. Density maps illustrate the tourist attractions with their specific coordinates but also since they focus on specific landmarks of the city, they give a partial idea about the identity of the city through activity.

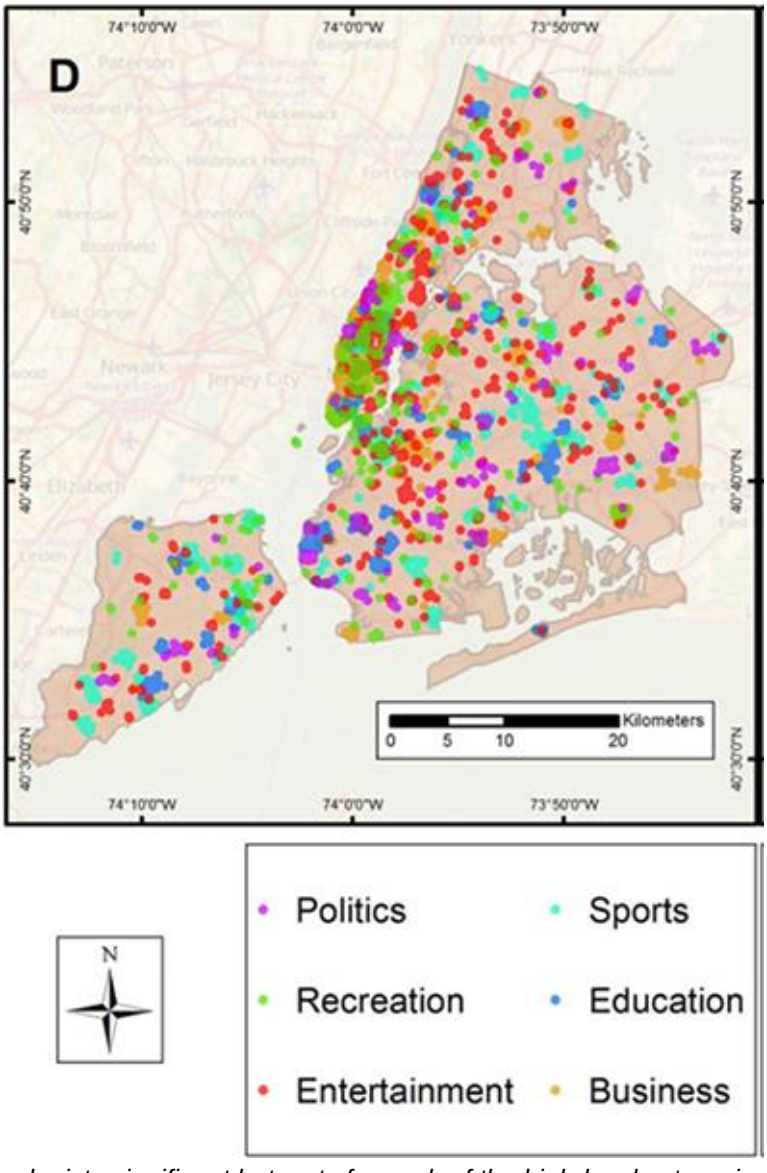

Figure 3. Map depicts significant hotspots for each of the high-level categories in New York

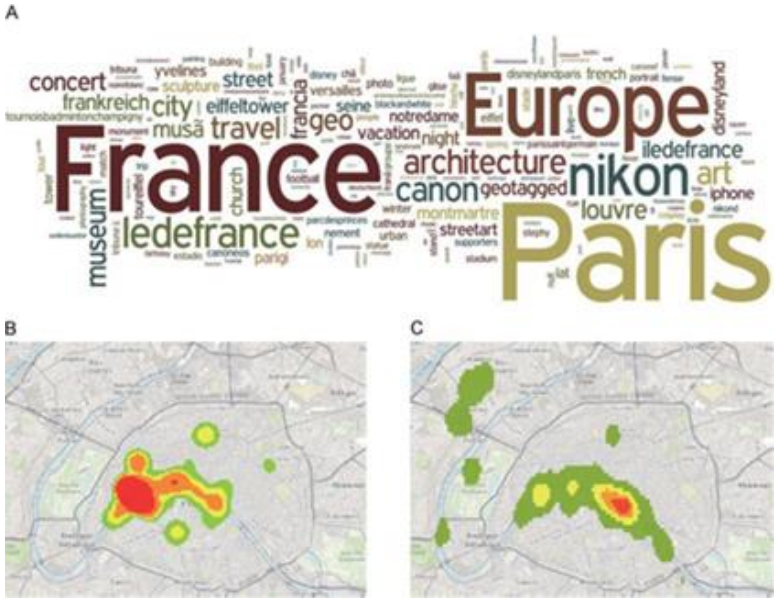

Figure 4a. Word cloud with 200 most frequent Flickr tags, Figure 4b. Density of geo-tagged photos of Eiffel Tower, Figure 4c: Density of geo-tagged photos of Seine River

Temporality of Events in Mapping

In Time as a component of place is another crucial point to understand the notion of place. The first example of mapping that considers time is by Hochman and Manovich.[40] It is also generated by using Instagram check-in data and photographs. The authors created a composition of photos taken in a specific place in a specific date arranged in a different manner, they also a dot and line network map to show the photos which are taken at the same time with connecting them with a line that can be seen in Figure 9. Their aim was to reveal the spatial pattern which is generated by Instagram user-generated data in a specific time and place and their relation. Figures 5a, 5b and 5c demonstrate photos taken in Tel Aviv in April put in order from left to right and top to bottom according to the time that it is uploaded.[41]

Figure 5. Most active Instagram users' activities in Tel Aviv. Dots demonstrate the locations of the users and the green to red color gradient shows the time that each photo is uploaded. Lines are drawn between the dots identify that the photos are taken at the same time.

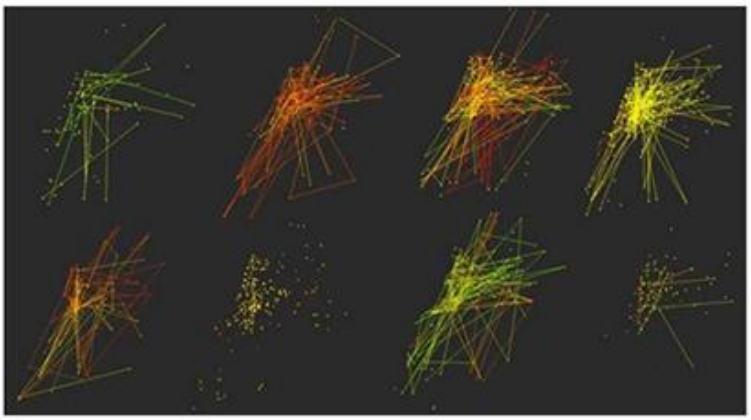

Figure 6. Most active Instagram users' activities in Tel Aviv. Dots demonstrate the locations of the users and the green to red color gradient shows the time that each photo is uploaded. Lines are drawn between the dots identify that the photos are taken at the same time.

Another sample project was conducted by Liu and his colleagues.[42] They used three sources of data to illustrate human mobility and activities through the urban area in Shanghai. Check-in data as the red color, taxi pick-up data as the green color and taxi-drop-off data as the blue color illustrated in Figure 7a between 8 am and 9 am and in Figure 7b between 8 pm and 9 pm. Similarly, in this research, the

authors focus on illustrating time as a dimension of urban. Nevertheless, it would be more meaningful if we could observe the change in the colors also between the hours 8 am and 8 pm.

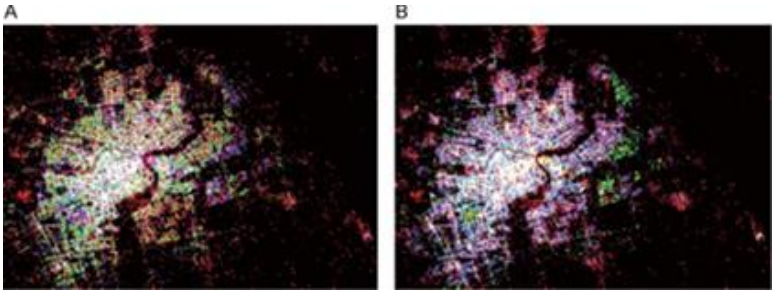

Figure 7a. Mobility map of Shanghai between 8 am and 9 am, Figure 7b. Mobility map of Shanghai between 8 pm and 9 pm

An interesting project by MIT SENSEable Lab is 'hub cab' that allows users to see taxi pick-up and drop off activities to enable them to share the taxi (Figure 8).[43] The interactive map they created with real time data can be perceived in the website. Alongside the benefit of the ability to join someone else's ride and sharing the price, the travel data of the city with a time period option that people are able to change can give an idea about the 'collective mobility'. The users can arrange and filter the data given in the website and modify the map in a manner that they can benefit from.

Figure 8. Screenshot of HubCab, highlighting all taxi dropoff points in New York City of passengers who were picked up at Times Square daily between 12 PM and 3 PM.

Expression of the activity pattern of the people is only possible by integrating time as an active component in maps. With this method, the representation of the urban character will be more complementary and accurate. In most of these researches, time is considered as a component to understand the urban environment and its visualization and representation. However, when the main argument is how to integrate time into maps, the continuity of maps as an ongoing process and interactivity of maps as allowing users to get involved in the process should be in consideration. At this point, utilizing computational technology to create an ever-changing map adapted to the constantly changing character of the urban environment becomes a crucial interpretation.

Finally, the aim in the map, which is created as a project for one of the master courses at METU which is Arch 735 Creative Mapping Techniques in Architecture, is to reveal the daily life and

experience of children who work on streets as paper collectors and who work in farmer's market in Ankara and the conflicts and negotiations between these two different groups of children (Figure 9).[44] Besides revealing the interactions and material exchange between these groups, it is important to express what kind of activities these children do during a typical. The space time cube method which is introduced by Hägerstrand is tried to be integrated to the map and time sequence is emphasized by creating a gif.[45] Here, the data stems from the observations of the mapmaker but method and content includes both activities, time and meaning as components of sense of place.

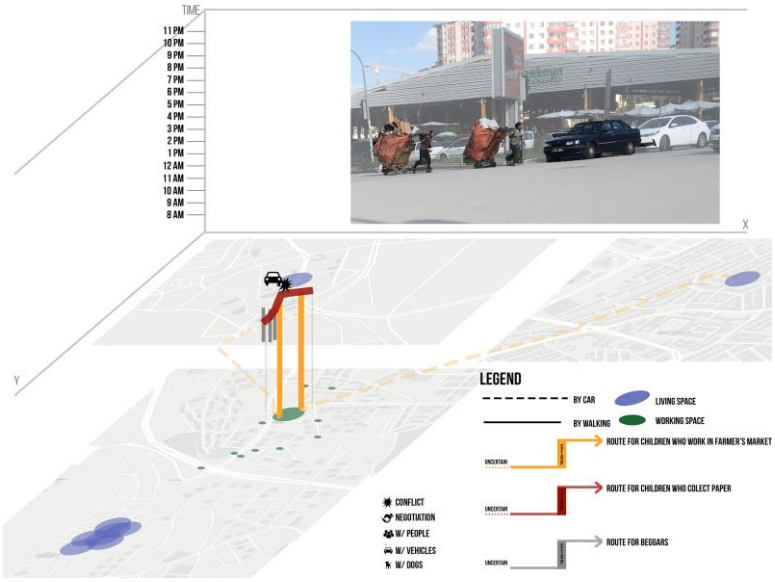

Figure 9. The map of Narrative of Working Children's Sunday

CONCLUSION

Comprehending the environment in which we live has long been an important challenge for people and the complexity of the city with its both physical and social aspects is still a matter of debate. Ideas such as ' sense of space' and ' place identity 'have recently developed as the digital world penetrated the lives of people and globalization has occurred. The city is continuously evolving and the sense of the city's places is often regenerated in the course of time. Moreover, it can be derived that, without time the place could not be understood as a whole. The definitions of space and time are naturally related and can be used to represent one another. The proliferation of vast amounts of web data leads to a new interest in research on comprehending space through human activities. Furthermore, some scholars claim that the identity of the city can be read through events and activities. Various sample researches and projects are carried out about mapping to unveil the character of the urban environment through big data and activities of people considering many different approaches. While the result of the visuals that are produced by scholars are highly satisfactory regarding reading the city via human activities, they refer to a certain period of time. Therefore, it becomes difficult to understand the urban dynamic as a whole without time continuity. Continuity of maps as a process and interactivity of maps as the involvement of users to the process should be considered while the fundamental issue is how to incorporate time into maps. Therefore, it can be concluded that a city's identity and character are much related to the events and activities occurring there and cannot be treated as independent of the time as a component of urban space.

NOTES

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CULTURAL MOBILE TOURISM AND TOURIST KNOWLEDGE AT VIRAL SOCIETY: SOCIOLOGICAL RESEARCH GAMES AGAINST COVID-19, WITHIN A BIG KNOWLEDGE CONTEXT

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INTRODUCTION

Objectives

The present essay aims to understand some central articulations between *mobile tourism* and daily life within the urban fabric, under *Covid-19* pandemic, considering the following sociological debates on the contemporary city (see Figure 1).

Mobile touristic knowledge

Mobile tourism is circumscribed, among other characteristics, as tourism supported by locative digital devices, for example mobile phones and their apps, as sociologist John Urry [1] puts it. Departing from this perspective, we may note that, before mobile revolution, tourists often just collected *descriptive or normative information* on the travel and about the visited society. E.g. data on booking trips and hotels, leisure places, food and drinks. Nowadays, s(he) searches more and more knowledge about the visited societies, using a strategy named '*mobile touristic knowledge'*. Such concept means the production and consumption of experiences and memories *within a travel*, that articulate, on one hand, knowledge originated inside societies where the tourist belongs, with, on the other hand, knowledge and *savoirs* generated in the visited countries/cultures.

Viral Society

However, we are also immersed into a *Risk Society*, an idea developed by sociologist Ulrich Beck. [2] And since 2020, one of the most evident, ubiquitous and catastrophic risks is clearly Corona virus. Therefore, in my point of view, this and all other social processes must be understood within an unprecedent context, the emergence of a sort of '*Viral Society'*. Such new societal and sociological paradigm subverts and transforms every reality realm into novel configurations. E.g. *viral economies and technologies* are rising, based on capitalism's global expansion, but as well on this system weaknesses and economic crises, caused not only by computer viruses, but also and increasingly by biological viruses; *viral policies and politicians* appear, for example the possibility that certain states, institutions, organizations, associations, or other social agents, use various types of viruses as

weapons of threat, aggression or surveillance, local or global; *viral cultures and cults* proliferate, that is, ways of exercising science, new media and arts, or other knowledge and leisure, to reach a contamination of all societies and cultures, in order to establish hegemonies of scientific thought, dominance of technological skills and devices, and dictatorial artistic tastes. [3]

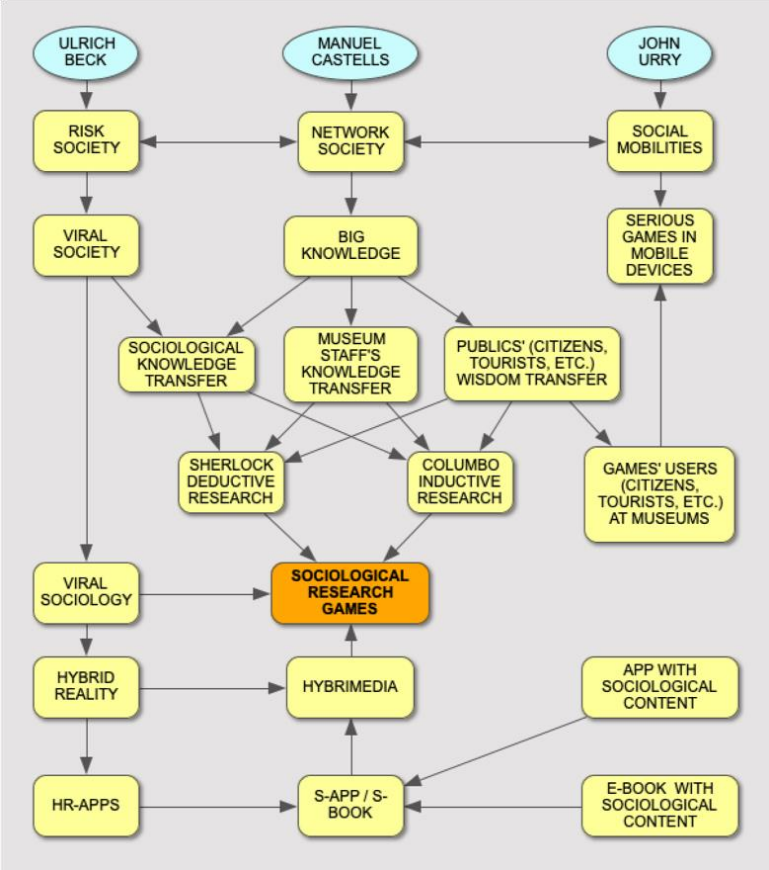

Figure 1. Debates on knowledge, research and games within viral society

Big Knowledge

Information society, for decades, has produced huge amounts of data, a process named *Big Data.* This phenomenon makes it difficult to analyze information in a scheduled way, in order to be applied to economy, cultural industries, education and research. The recent *Network Society*, a concept coined by Manel Castells [4], augments the impact of such conjuncture. One of the recommended alternatives to surmount this issue is the use of 'knowledge management systems', such as Knowledge Sites and Bases (e.g. *Freebase*). These systems utilize diverse software for the search, analysis and dissemination of knowledge (*Knowledge Graph* in Google, Facebook, etc.). In other words, nowadays Big Data is being transformed into *Big Knowledge,* a strategy that surpasses some insufficiencies of Big Data, but simultaneously provoke other risks. '

Method

The precedent theoretical statements may be applied to *tourism playful practices*, via digital media and methods.

Today, games appear as the most relevant growing segment of the digital industry and services. Specifically, *serious games* constitute an efficacious strategy to disseminate and share knowledge, and became a genre on its own. [5] They encourage teaching and training in multiple activities, within a

critical stance, and allow delivering needed competences. For example, health skills; marketing or political campaigns; and cultural heritage competences and solid qualifications for professionals and audiences at an art museum or gallery. Thus, digital games, and in particular serious games, may be utilized as one of the most operational *research methodological tools*, inside any type of knowledge, whether scientific, technical, artistic or otherwise.

E.g., *Research/Sociological Games* are visual methods, developed by the author using Unity and 3D software, to construct game apps for mobile devices, to be used in particular against Covid-19, by tourists or other citizens within urban locations/territories of visited or touristic countries. As we will see below, these games' scope is not just to consult informative data, but also comprehend different visited cultures and risks, by playing/applying multiple modes of interconnected knowledge.

HOW TO COPE WITH COVID-19 WITHIN ART INSTITUTIONS AND IN OTHER CULTURAL SITES

Inside the daily life of cities, everything is in motion. The latest urban planning strategies inaugurated new city paradigms, e.g. the 'smart city', the 'creative city' or the 'city 3.0'. Such continuous and sustained social process is expressed via two central manifestations, analyzed by sociologist John Urry (2007): *urban social mobilities* and the *cell phone*. In particular, this digital device constitutes one of the most paradigmatic instruments of such mobilities.

Recently, worldwide urban fabric changed even more inexorably, after the outbreak of the pandemic caused by Covid-19. This situation is also visible in art museums and other cultural sites, where visits have declined dramatically since March 2020. Moreover, the conjunction of the so-called *Big Knowledge* and *viral knowledge* is producing a sort of *viral Big Knowledge.* Such concept means an inflation of non-curated and thus useless knowledge, in what regards multiple social and cultural activities. For instance, some (but not all) museums or art galleries' art practices, where the diffusion of information and knowledge is now partly targeted to safety within audiences' visits, under the Covid-19 threat and respective risks.

Put in another way, although such initiative is naturally welcome and precious, it is urgent to reflect even more on the influence that the Corona virus has on the access, circulation and enjoyment inside museums, galleries and other cultural locations, and reformulate the inherent communication of information and knowledge. Some aspects of this further analysis and call to action are as follows:

It is emerging a clear and remarkable awareness, among some museum staff (planners, researchers, museum cicerones, etc.), about recent changes, motivated by the pandemic, in what regards not just health care and the diffusion of *descriptive information and knowledge* on this matter, but also on the dissemination of *interpretive and critical knowledge* about it. For instance, such communication should be related to not just historical knowledge or to other traditional descriptive or normative information, such as the use of masks, decontamination via disinfectants, or the minimum distances among visitors. In addition (but not instead of), a more effective reciprocal communication could include social, sociological and anthropological knowledge, and not just on art, but also e.g. about the diverse cultures of visitor profiles.

Within such perspective, the concern and correlative good practices might significantly increase, for example, the intercultural relationships among the different cultures that underlie the profiles of art visitors. These audiences, even before the outbreak of the virus, were already being reformulated in a regular basis. In effect, today, not just traditional art museum or galleries profiles visit cultural sites, e.g. families, schools, tourists, the individual or group visitors in learning or training throughout lifetime, among others. In addition to them, there is now a more intense conscience of social

marginalities as visitors to cultural and art sites, such as migrants, pensioners, the unemployed and the disabled.

Moreover, this and other anti-pandemic strategies could increase the effectiveness of the knowledge that visitors have about the *traveling risks* to cultural places, e.g. strolling in the museum. However, such compilation and dissemination of knowledge must be selected according to clear criteria, to avoid the inflation of useless knowledge that characterizes *Big Knowledge*. Some of the interpretive and critical knowledge contents pertaining to this sustainable cultural health service may include: not just rules for internal behaviors of visitors in what regards social distance, but also suggestions for a gradual social and intercultural proximity, according to the changing levels of decontamination and vaccination; not just information about the schedule for any possible future confinements and deconfinements, but also explain some economic causes or cultural motivations for these calls for action, etc. Such interpretations, recommendations and critical advices and tips could diminish the reluctance of citizens and tourist to vaccination, among other advantages.

Even if the museum or gallery naturally doesn't replace health counseling services, at least some advices or suggestions can be given within cultural spaces to raise awareness among visitors. For example, in the form of interpretive and critical talks by the curator or sociologist; or through works of art on the pandemic, carried out by artists; or via cultural, humanities and social sciences games.

SOCIOLOGICAL RESEARCH GAMES FOR SAFE TOURING

A Sociological Research game is an instrument using mobile devices' software, that may help citizens and cultural tourists to exchange more *information* on one another, and share *social, cultural and sociological knowledge* about their societies / cultures, mainly under the *Covid-19* threat. Such games may be implemented via *mobile devices / apps and e-books,* that can help their users and readers not just to convey information on destination sites, but as well include social, sociological and anthropological knowledge about the diverse cultures and profiles of visitors and visited social actors.

In addition, a sort of *Viral Sociology***,** which may be defined as a genre of *viral knowledge* on the viral societal fabric, in this case mediated via sociological Research Games, may study *hybrid reality-HR*. HR signifies a mode of the real that blends and hybridize social reality, Virtual Reality-VR, Augmented Reality-AR and Mixed Reality-MR (which, in turn, means VR + AR).

Furthermore, *Hybrid media* (also named *hybrimedia*) hybridizes at least two types of media: on one hand, *originated media*, that is, the initial media within a communication process, e.g. a newspaper interview and a poster; on the other hand, *original media*, meaning the resulted media of both, e.g. a creative post disseminated within a social network, including a fusion of the originated media (that is, the referred newspaper interview and the poster). And a *HR-app* is circumscribed as an app using HR-hybrid media. An example is a *s-app / s-book:* this signifies a sociological app (ie an app including sociological content), which is mixed, in what regards media, with a sociological e-book, (i.e. an e-book containing sociological content). [6]

FORMER RELATED PROJECTS

The above-mentioned considerations are based on previous projects intended to hybridize Social Sciences, New Media and Arts, such as the following.

Sociological Game *Major Valentão ['Major Bully'],* 2006

'*Sociological Games*' is a game paradigm that was created in 2006 by the author of this text, when he taught the '*Art and New Technologies'* chair at the Faculty of Fine Arts, University of Lisbon (Cf. Figure 2). [7] A subjacent challenge was to find out the answer to the following question, in what regards Sociological Games: 'To be or not to be *Sims*?'. [8]

Figure 2. Ex. Of a Sociological game:
Pedro Andrade, Major Valentão (Major Bully), 2006

Trichotomies Game, 2010

This is a game aimed at researchers, teachers, students, cultural tourists and citizens in general, with the scope of developing their artistic knowledge in a perspective of (re)search (observe Figure 3). (Re)search means *research via search*. For example, searching through the Google search engine or within a game with the view to gather information or knowledge that can be utilized within a particular research. The challenge was to use it inside an *interactive multitouch table* at an art exhibition. [9] As part of such exhibition, several *innovative sociological methodologies* were generated and tested: E.g, the *Multitouch Interactive Questionnaire* and *Trichotomies Game* itself. [10]

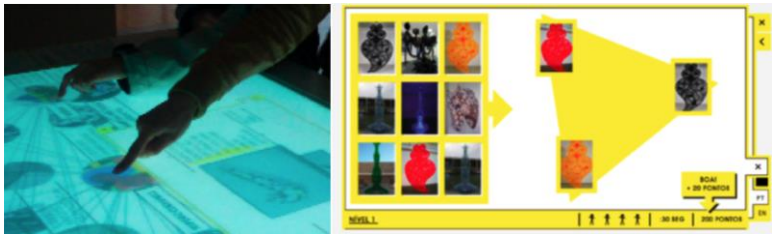

Figure 3. Multi-touch interactive table (on the left) and Trichotomies Game (on the right)

Research Game, 2014

A later stage has been reached through a serious game called *(Re)search Game* (consult Figure 4). It enables you not only to play with concepts inserted in a search/research, as with the Trichotomies Game. Furthermore, a (re)search game circumscribes all research in a more playful way, via the integration of its core procedures within an environment that transforms the game's user into a more active and social player. Put another way, a (re)search game permits to design a successful research (e.g. a case study) in its successive or simultaneous steps, by using playable research methods, techniques and actions. Once again, current Social Sciences and urban methodologies ignore several of such potentials. [11]

Figure 4. Research Game

Sociological Research Games, 2014-2021

Furthermore, a *game's meta-genre* that hybridizes sociological games, trichotomies games and research games, may be defined as a *Sociological Research Game* (explore Figure 5).

This means that, besides using more traditional sociological knowledge and methods, such as interviews, polls and direct observation, this game type suggests an emergent *hybrid knowledge* and a rising *hybrid methodology*, developed around novel, intense and augmented new media potentialities, to be applied e.g. on sociological subjects.

In other words, such hybrid knowledge is to be transferred from their producers (*authors*) to their publics (social *actors*). Therefore, what follows is an example of *knowledge transfer* among three sorts of knowledge: social sciences methods, museum staff literacy and publics' common sense.

SHERLOCK OR / AND COLUMBO STYLES OF RESEARCH?

The precedent knowledge sharing is to be mainly done through the following steps: the player collects information/knowledge clues to reach a specific goal; the player answers some tests and plays *mini games* to show her or his global interpretation and understanding on what happened; a final test to the player will evaluate what she or he discovered, based on the information and knowledge she or he collected and on precedent partial tests' results.

For such aims, players may act and play within the role of a '(re)search detective', either playing the Sherlock or the Columbo characters, while using two different but complementary strategies of inquiry ('deductive Sherlock' strategy and/or 'inductive Columbo' style of research). Each of these postures is defined through their particular type of knowledge used, and via the respective sequence or web path (watch Figure 5).

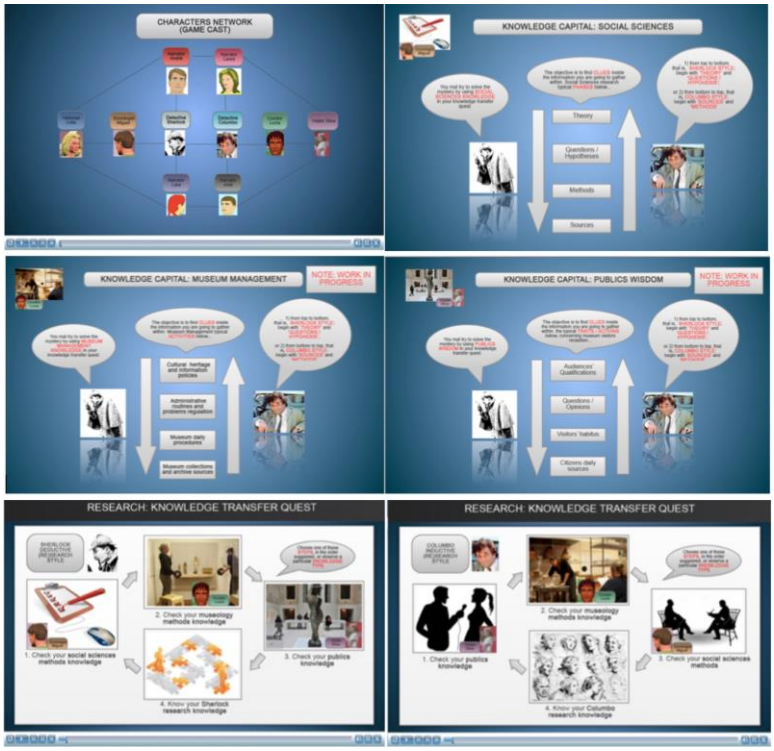

Figure 5. Sociological Research Game: storytelling and knowledge types (top/center); Sherlock and Columbo research methods (below)

RECOMMENDATIONS

HOW USEFUL SOCIOLOGICAL RESEARCH GAMES FOR TOURING MAY BE

Within such worrisome pandemic context, and as for sociological, cultural and urban studies, it is also urgent to use not just traditional methods and techniques such as textual ones, e.g. questionnaires and interviews. It is also relevant, among other procedures, in order to increase direct observation via photographs and videos, in particular those produced around cultural practices and discourses emanating from urban citizens, tourists and migrants using cell phones. These devices, largely activated by cultural and art institutions' visitors, introduce new social processes, media and methods underlying these actors' actions. For instance, they may construct personal *visitor art catalogs*, when photographing and filming art works.

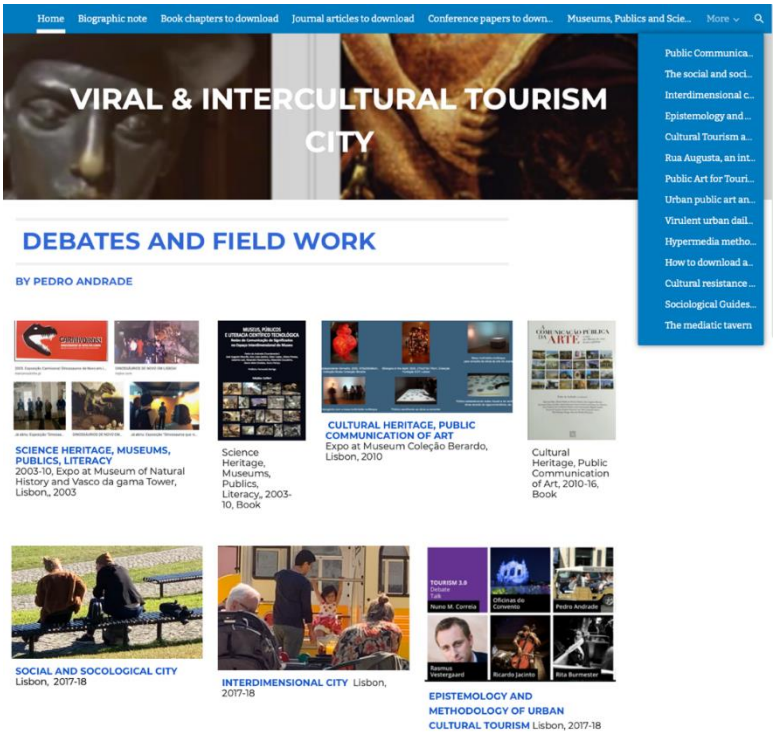

Figure 6. Homepage of site Viral & Intercultural Tourism City

Such visual and audio digital sources can be brought together and mobilized utilizing appropriate tools to increase communication between producers and users of culture and arts. One of these instruments, inspired on the projects above-mentioned, may be social and *Touring Sociological Games*, for discovering and interpret cultural sites. By using mobile devices' software, citizens, cultural tourists and even migrants, may share social/sociological knowledge about their cultures, and mainly considering the impact that Covid-19 threat wields on their societies.

More concretely, and partly revisiting previous considerations, some recommendations may be as follows: social/Sociological Research Games, via *mobile devices' apps and e-books*, can help their users and readers not just to exchange information on destination sites, e.g., data on booking trips and hotels, degusting local food and drinks or choosing cultural places. But also share *cultural curation* and *sociological knowledge* about their cultures and societies, in particular concerning *travelling knowledge*, e.g. the awareness on how to act safely at cultural/digital locations within the contemporary pandemic conjuncture.

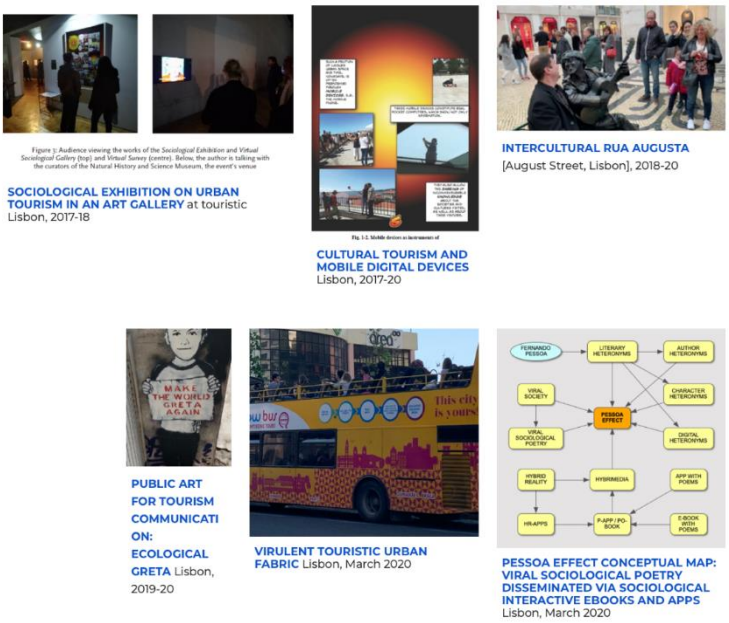

Figure 7. Discussions on the Network Society, Risk Society and Viral Society

SOME SOCIOLOGICAL RESEARCH GAMES CONTENTS

The contents activated through Sociological Research Games include a *curatorship of critical knowledge transfer* [12] *about social and urban processes*, contemporary structures, contexts, agents, practices and objects. In particular, this content is based on and privileges sociocultural and sociological aspects of everyday life invaded by the Corona virus. For instance, the present urban fabric is being analyzed in terms of a *viral cultural city*.

Such posture is inspired on precedent studies, undertaken by the author within his profession as a sociologist, professor and researcher on urban cultures and arts, cultural tourism and digital methodologies, previously at Universities of Coimbra and Lisbon, and presently at Communication and Society Research Centre, University of Minho, Braga (peek Figures 6,7,8,9). [13]

Figure 8. Social and Sociological Touring Guides for travelling safely under Covid-19 threat

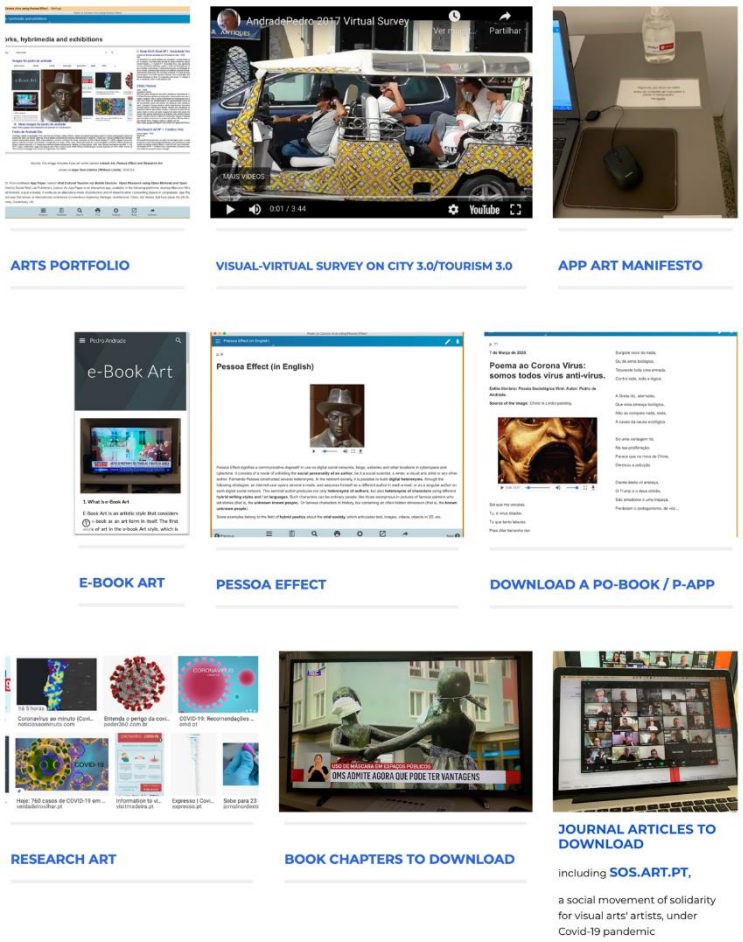

Figure 9. Debates on viral cultures and virulent arts

Within the site *Viral & Intercultural Tourism City,* at: _____, multiple issues are debated, for example around: cultural and scientific heritages; communication inside science and arts museums; publics and audiences studies; scientific, technological and artistic literacies; critical and viral big knowledge on cultures and arts; the social, sociological, interdimensional and intercultural city; epistemology and methodology of cultural urban tourism; exhibitions of sociological content within art galleries using augmented reality; cultural tourism using mobile devices; public art for tourist communication; the viral city articulated with viral tourism; new sociological and urban methodologies using new media, e-books, *sociological apps* (s-apps), *poetry apps* (po-apps) [14] and *art apps* (a-apps).

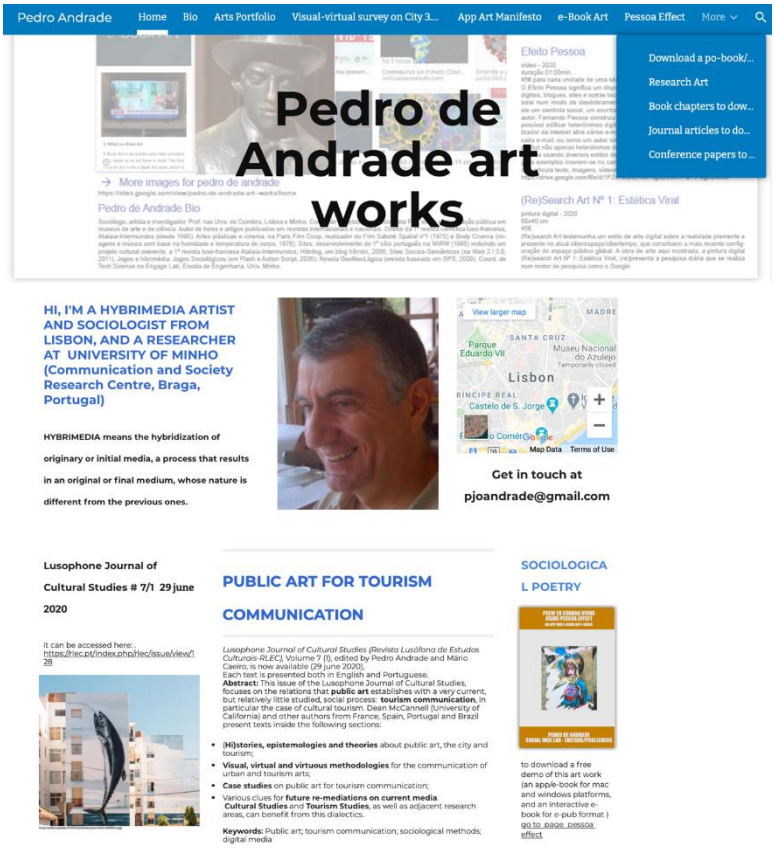

Figure 10. Home page of a sociological artist and art sociologist's site

Such content includes text, but also visual sources as photographs and videos obtained through direct observation of social actors mostly since March 2000. Some are images taken in the city of Lisbon and in the South of Portugal under the Covid-19 pandemic, mainly in April-July 2020. These last ones and others are here shown and commented via a framework of tourists' interactions within the localities visited and their inhabitants, in terms of *social and cultural meetings or clashes*. Presently, such first-hand photographs and textual testimonies are being analyzed as well in terms of *reciprocal and travelling knowledge*, permuted by citizens and tourists on Corona virus pandemic and about the respective impact on their own travelling and cultural actions and behaviors.

Curatorship of cultural and arts' knowledge

A step forward in what regards Sociological Research Games content, is taken with the *curation of cultural and arts' knowledge*. One of its manifestations is the social and urban biography of visual artists who hybridize the arts with new media. As an example, the author presented his own practice as a *sociological artist*, in connection with his activity as an *art sociologist* (see the home page of his web site on this subject in Figure 10). [14]

Moreover, within this website, a set of art works are exposed, both theoretical (conceptual, etc.) and practical, mostly on visual arts and poetry, as well as cultural events, disseminated in the urban fabric, across both the *pre-viral city* and the *post-viral polis*.

CONCLUSION

The possibilities of Sociological Research Games, in order to augment interactive communication and curatorship of social, cultural and art's knowledge for citizens, tourists and migrants, are endless.

These and other tools may hopefully help in the unequal and dramatic struggle that is taking place today, between, on one hand, the invasive pandemic caused by Covid-19 and, on the other hand, societies and cultures mediated by the respective stakeholders.

More concretely, multiple social agents could take benefit of Sociological Research games' virtualities. In addition of the issues discussed above, involving art institutions as museums, other suggestions of possible applications include:

(a) At a first moment, while the pandemic shows a profound impact, corporations such as art galleries, could use these games to promote exhibitions, on their websites, for cultural tourists. And travel agencies might employ such game genre to advertise or offer different types of virtual holidays and leisure events, e.g. within a sort of *'streaming virtual tourism'*, eventually paid or in open access.

(b) Gradually, as the pandemic recedes, economic and cultural stakeholders could include this style of games within their very agenda of physical trips, for instance by activating gamification inside touristic vehicles, such as buses, taxis, boats and ships.

Using the above-mentioned strategies and applications of Sociological Research Games, these tools may work as sound motivations for a better understanding of travel destinations, socially and sociologically related to the departing societies where tourists originate.

NOTES

[1] John Urry, *Mobilities* (Cambridge: Polity Press, 2007).
[2] Ulrich Beck, *World at Risk* (Cambridge: Polity Press, 2013).
[3] On the conceptualization of Viral Society, applied to 'viral consumption' and 'viral tourism', consult Andrade, 2021a,b,c.
[4] Manuel Castells, *The Rise of the Network Society* (Hoboken: Wiley Blackwell, 1996).
[5] For more details on the *serious games* debate, consult: Karl Kapp, *The Gamification of Learning and Instruction: Game-Based Methods and Strategies for Training and Education* (Wiley, 2012, p.10). Nick Luppa and Terry Borst, *Story and Simulations for Serious Games* (Focal MQI Press, 2012). Minua Ma and Andreas Oikonomou, *Serious Games and Edutainment Applications* (Springer, 2011). Kurt Squire, *Video Games and Learning: Teaching Participatory Culture in the Digital age (*Teach, 2011). Paul Virilio et al, *Serious Games: War, media, art* (Ostfildern, 2011).
[6] Some examples of s-apps / s-books are presented at Andrade, 2021a, 2020b,d.
[7] The teacher presented in a class, as a section of the *syllabus*, a Sociological Game that he programmed in Flash and Action Script, called *Major Valentão* ('Major Bully'). Among other locations, this work was also exposed in 2013 by the author, as a visiting professor within a seminar at the University of Savoie-Mont Blanc, France; and at *NewArtFest'18* (an event in partnership with *Lisbon Web Summit*), which happened at the National Society of Fine Arts, National Museum of Natural History and Science, Faculty of Fine Arts and Portuguese Architects Association, Lisbon, since 28 November to December 2, 2018. Sociological Games can be defined in this way: "(…) Sociological Games are digital devices allowing to participate in social processes, and to interpret or transform them, by means of playful strategies. These games are made within society, but they don't reduce themselves to functioning as 'social games', they also work as 'sociological games'. Indeed, they present, represent and simulate social realities in multiple ways, engaging the player as a social actor, but also as a sort of 'ordinary sociological author' (…)" (See Andrade, 2015a, p. 155).
[8] " (…) *Sims* simulation (…) even if it is a '*social game*', cannot be considered a '*sociological game*', because it does not suggest enough reflections or deep criticism on society through its use. On the contrary, recent sociological digital games can transform any dimension of society into playful gaming, by applying various hermeneutics. In 2006, the game *Major Valentão* ['*Major Bully'*] ironically criticized a public person, by playful means (e.g., by shooting a projectile on that symbolic social person), and via an attractive interface, whose recognizable social context [a football field] frames and ridicules the targeted social agent ['Major Bully', a dishonest football manager]. " For more details, see again Andrade, 2015a, p. 155.
[9] The Trichotomies Game was built since 2009 until 2010, based on an idea proposed by the author of this text, while he was coordinating a sociological project named *Public Communication of Art*, financed by the Foundation for Science and Technology, at Lisbon, Portugal. The project studied art museums and aesthetic practices, activated through new media by the museum audience. The game was inserted in a *hypermedia multitouch table*, which allowed the selection of artworks and concepts within visual networks. Such device was developed by a sub-team of this project's researchers, under the supervision of Prof. Nuno Correia, from the Faculty of Science and Technology, New University of Lisbon. This interactive table allowed "(…) the public of the museum to consult works using essentially touch, associated with visual devices and other media. Its prototype was presented to the public at the exhibition *Without Web* by artist Joana Vasconcelos, which took place at Museum Collection Berardo, Lisbon, from March 1st to May 18th, 2010." (see Andrade, 2011, p. 173).
[10] "The Multitouch Interactive Questionnaire (...) was developed in 2010, and probably consists of the first sociological questionnaire carried out in Portugal, activated through touch by a wide audience" (see Andrade, 2011, p.179). Trichotomies Game itself is a novel sociological method of its own, inasmuch as the data relating to its implementation were registered in the museum for sociological analysis. A trichotomy expresses the link constellation among three ideas, in the same way that a dichotomy signifies the relationship between two concepts. "In the Trichotomies Game presented in Joana Vasconcelos' exhibition, visitors were invited to choose three works of art made by the artist, in some way interconnected. For example, 3 works that show women's issues in both content and form, such as those showing the same visual configuration, the heart [or a *burka*] (...). The objective of this strategy is to allow visitors to the museum or exhibition, when observing works of art, to better understand and assimilate the necessary relationships that the art works contain in its production process by the artist." (see Andrade, 2011, p. 181).
[11] This tool is also mainly intended to be activated by a population / universe of teachers, researchers, students of higher education institutions, tourists and citizens in general, in order to investigate and enhance, among other competences, their *research literacy*. In effect, such game stimulates the embodiment of more demanding qualifications than those that can be provided by many educational games. In truth, within our 'knowledge society', it is fundamental not only to know how to cope with information, but also with specialized knowledge, both s*ubstantive knowledge* in a given area and the respective *methodological procedures and tips*. This posture frequently involves the actions and skills as follows: connecting search (within Google, etc.) with research, what leads to (re)search; reveal the deep meaning of the information, and not just subscribe, describe or narrate facts;

a sociological analysis articulated and hybridized with critic judgments on the social; disseminate substantive content and novel ideas to diverse audiences segments.

[12] Explore some discussions about *knowledge transfer* with the following authors: Calixto Anaya, *Knowledge Transfer: a Practical Approach* (Xlibris, 2012). Lori Bachman and Mark Sanborn, *MentorShift: Improve Leadership Development, Engagement and Knowledge Transfer (*MentorWorks Publishing, 2014). David Bennet and Alex Bennet, *Knowledge Mobilization in the Social Sciences and Humanities* (MQI Press, 2013). Barry Krusch, *The Role of Frame Analysis in Enhancing the Transfer of Knowledge* (ICI Press, 2010). Frank Leistner, *Taking Knowledge Flow Management to the Next Level with Social Media.* (Wiley, 2012). Carla O'Dell and Jackson Grayson, *If Only We Knew What We Know: Transfer of Internal Knowledge and Best Practices* (Free Press, 2011).

[13] Some detailed examples of this work in progress can be found in the following essays: Andrade, 2020a,b,c,d,e,f,g; 2018a,b,c; 2015b; 2014.

These and other works may be consulted at the following website: "Viral & Intercultural Tourism City", Social Web Lab, accessed August 1, 2021, https://www.sites.google.com/view/viral-tourism-city. For an overview of the author's research centre activities, see the website: "Communication and Society Research Centre", accessed August 1, 2021, http://www.cecs.uminho.pt/en/ .

[14] One of these works is *Viral Poetry*. This new poetry style and genre derives from the sensibility of writer Fernando Pessoa, who wrote as well a poetic tourism guide (2015). Other information related to this subject is visible at *Fernando Pessoa House's* site (2020). Viral poetry may be read at Andrade, 2020d.

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INTEGRATION OF AI ONTO EXISTING ARCHITECTURE FOR WOMEN'S SAFETY IN DEVELOPING COUNTRIES

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INTRODUCTION

Women are important to a developing country's workforce. Women are more likely than men to drop out of the labour force for a time even if their careers are at stake. This work pattern undermines productivity, increases women's vulnerability to income shocks, and impairs their ability to be independent and has a comfortable old age life.[1] Many developing countries have introduced social protection programs to protect women from social and economic risks. An important, overarching factor is for dropout is security issues. Road safety and city safety is a contributing factor to a woman's daily routine and lifestyle. However, cities of developing nations have continuously shown to be not safe for women. Women are most vulnerable when travelling alone into lonely roads and deserted places. Poorly lit roads, unkempt public transportation and hostile circulation are urban planning factors that plague the city and its women.

Current Issues plaguing the urbanscape

The effect of bad architecture is tremendous on the safety of women. To prevent this women and girls in the workplace, at school, in streets, parks, public squares, and on public transport must no longer be seen as victims, but rather as essential contributors in transforming cities to be inclusive and comfortable. For women to genuinely achieve gender equality their urban life must be free from fear of intimidation and violence.[2] Bad architecture has an effect on women and girls and how they feel and act in their communities.

For instance, many women choose not to go out alone or choose to avoid certain places where they feel unsafe.[3] Thus, fear of violence limits the possibilities that women and girls have to take full advantage of the opportunities that cities offer, preventing or reducing their access to employment and education opportunities, health services and leisure activities, as well as their participation in political processes. The built environment can significantly affect users' thought patterns and behaviour. Often without their knowledge, building occupants and visitors respond to environmental cues that encourage particular behaviours and discourage potentially harmful tendencies. Lighting is perhaps the most common example – well-lit, open areas tend to deter crime, while darker, enclosed spaces can encourage it.

The data points support this claim - with over 54% of women stating that poor lightning is an important social factor. The most unsafe areas are usually inhabited by men. This study also revealed

that these areas generally lacked architectural elements like pavements and if pavements were provided, they had been encroached upon by stalls and parking. “There were also several men’s toilets on the road which were poorly designed and did not provide privacy for users or pedestrians, leading to discomfort for women and girls walking past.” Issues raised included poor lighting (especially on regularly used routes) lack of pavements, lack of public toilets and heavy vehicle traffic.
Recommendations by women included improved lighting, making streets more vibrant during the evening, and providing safe and accessible public transport options.

In the city or area where you live, do you feel safe walking alone at night, or not?

Percentage "yes, feel safe" among women and men in each country

	Women	Men	Gap
New Zealand	50%	85%	-35
Algeria	32%	66%	-34
Malta	48%	82%	-34
Cyprus	57%	85%	-28
Italy	40%	68%	-28
Albania	54%	81%	-27
France	51%	78%	-27
Australia	51%	78%	-27
United States	62%	89%	-27
Finland	66%	92%	-26
Sweden	65%	91%	-26
Ireland	58%	83%	-25
Portugal	51%	76%	-25
Yemen	56%	80%	-24
Belgium	52%	76%	-24
Malaysia	34%	58%	-24
Japan	57%	81%	-24
Estonia	46%	69%	-23
Czech Republic	48%	71%	-23
Slovakia	48%	70%	-22
Netherlands	69%	91%	-22
Latvia	39%	60%	-21
Moldova	40%	61%	-21
Germany	67%	88%	-21
United Kingdom	62%	82%	-20
Taiwan	54%	74%	-20
Poland	50%	70%	-20

Social Factors	%
Public Transportation	22
Poor Lightning	54
Availibility of Alcohol	21
Poor Signage/Crowds	4

Streetscaping	%
Hidden Walkway	21
Single Landuse	54
Unkempt Landscape	34
Lack of Lightning	95
Grafitti	17
Litter	46
Poor Maintainence	78

Figure 1. ‘Tackling Gender Exclusion: Experiences from the Gender Inclusive Cities Programme’ [4]

‘*Safetipin*’[5] also did a safety audit of 15 metro stations around the city and ten important tourist monuments in the city of Delhi were also mapped on safety parameters.
This audit identified 7483 dark spots across the entire city and improvements were done including fixing the existing streetlights and installing additional street lights in the areas of poor lighting.

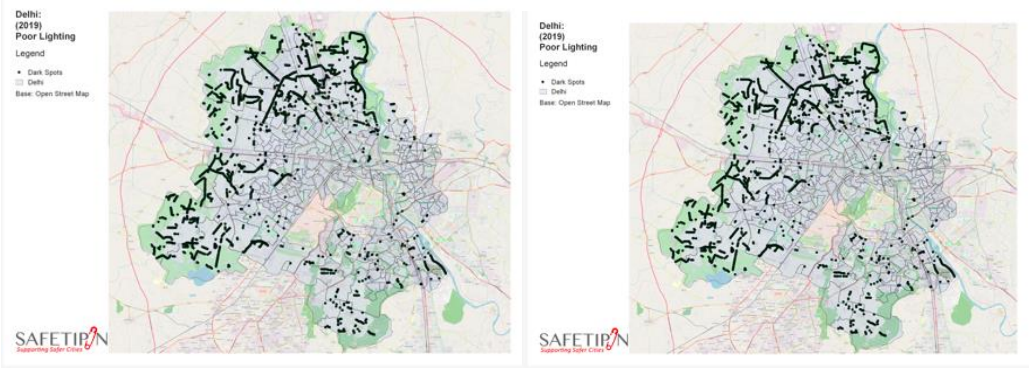

Figure 2. 'All dark spots study in Delhi done by Safetipin' [5]

Figure 3 indicates the different variables that lead to safety and allow for better safety in an urban context. The 6 overarching variables are Social Factors, Spatial Planning, Visibility, Access, Resilience and Security Facilities. [6] These variables are studied and can be broken down into other facets. If this top-down approach is tackled, the problem of safety can be solved much easier.

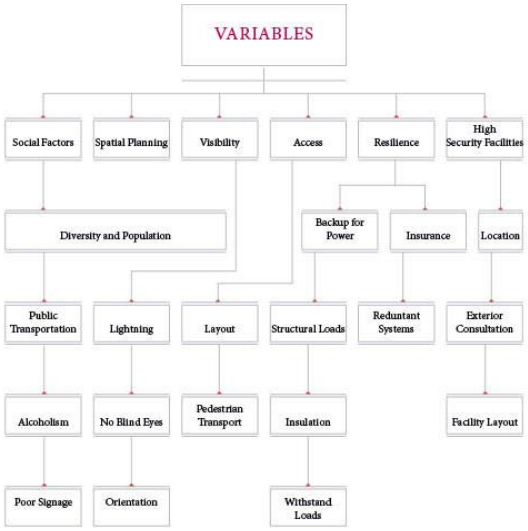

Figure 3. Top down approach to tackle safety in Urbanism [6]

Testaments collected from women from developing countries regarding their safety [7]
"It's not just in the morning or night, but you can be robbed at any time of the day."
"It is a shame because there are so many green spaces in the neighbourhood, but you can't spend time there."
"We haven't designed public spaces to account for the violence that women experience, and not just to protect women from the violence, but also to account for the way that it's always in our heads."
"It's not that just that the buses are unsafe, but that the people who do it [harass women], get away with it."
"In well-lit places where there is no activity, no eyes on the street, people are not going to feel safe anyway."
"Such people realise that a young woman being alone in a dark street and no people around has nobody to turn to for help."

AI APPLICATIONS IN SECURITY

AI is a rapidly advancing field of computer science. AI is the ability of a machine to perceive and respond to its environment independently and perform tasks that would typically require human intelligence and decision-making processes, but without direct human intervention.

One facet of human intelligence is the ability to learn from experience. Machine learning is an application of AI that mimics this ability and enables machines and their software to learn from experience. Particularly important from the criminal justice perspective is pattern recognition. Humans are efficient at recognizing patterns and, through experience; we learn to differentiate objects, people, complex human emotions, information, and conditions daily.

AI seeks to replicate this human capability in software algorithms and computer hardware. [8]

AI applications can be found in many aspects of our lives, from agriculture to industry, communications, education, finance, government, service, manufacturing, medicine, and transportation. Even public safety and criminal justice are benefiting. AI is being researched as a public safety resource in numerous ways. One particular AI application — facial recognition — can be found everywhere in both the public and the private sectors. It can also be used to increase public safety through researching, developing, and testing automatic traffic accident detection based on the video to help maintain safe and efficient commuter traffic over various locations and weather, lighting, and traffic conditions. AI is also quickly becoming an important technology in fraud detection. Internet companies like PayPal stay ahead of fraud attempts by using volumes of data to continuously train their fraud detection algorithms to predict and recognize anomalous patterns and to learn to recognize new patterns. There is an upward trend in funding in the field of AI and Safety. [9]

This is how it can be used: Video and image analysis is used in the criminal justice and law enforcement communities to obtain information regarding people, objects, and actions to support criminal investigations. This technology can also identify images in which an individual's face is captured at different angles or is partial to the side, and when the individual is looking away from the camera, obscured by masks or helmets, or blocked by lamp posts or lighting. Pattern analysis of data could be used to disrupt, degrade, and prosecute crimes and criminal enterprises. Algorithms could also help prevent victims and potential offenders from falling into criminal pursuits and assist criminal justice professionals in safeguarding the public in ways never before imagined.

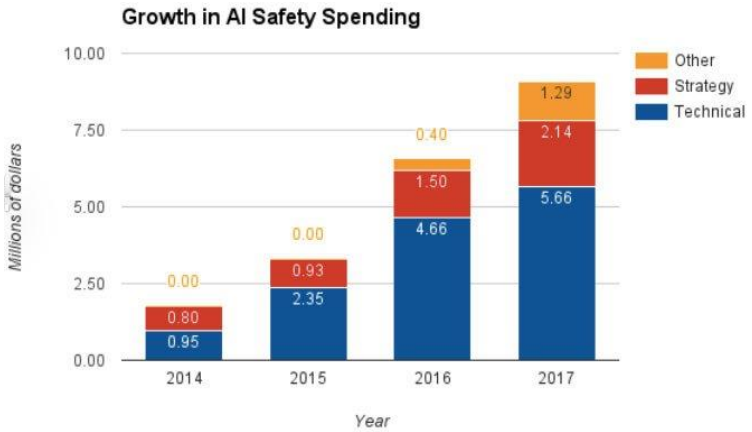

Figure 4. Growth in AI Safety Spending[10]

Working of the Project

The working of the project is as follows: For the predictive analysis for the area pinpoint 2-5 years of data will be required to train the algorithm for each new city. However, the algorithm each day updates with new events as they are received from the network. The three data points used for this prediction is crime type – visual/vocal/physical assault, crime location and crime data/time. These data points are determined because extensive research has shown that day-to-day crime patterns are the result of:

(1) Crime generators that are fixed features of the environment;

(2) Repeat and near-repeat victimization that leads previous victims and their neighbours to be at greater risk of follow-on crimes;

(3) The routine activity patterns of offenders that keep risk local;

(4) Substantial random noise. Each of these processes is well known empirically, but when put together their impact on how crime hotspots emerge, spread and disappear is incredibly complex.

It is very hard to predict where crime will occur in the next 10-12 hours given where it occurred yesterday. Having a platform that can collect data points were victims of assaults. These variables include the area of assault, the severity of the assault and the nature of the assault. This will help establish hotspots and allows for pattern formation. This can also be used to identify more blind spots in the city and be able to find more buildings/alleys to attach CCTV cameras. Another aspect of this which is real-time is the idea of "scene understanding," or the ability to develop text that describes the relationship between objects (people, places, and things) in a series of images to provide context. For example, the text may be "Group of men following a woman in a street." This process will achieve the goal to detect objects and activities that will help identify crimes in progress for live observation and intervention. This data will also support investigations after the scene and understanding over multiple scenes can indicate potentially which events are of priority that law enforcement should follow up.

Integration with Architecture

Safety and Prediction can go hand in hand in the following way -

It can predict infrastructure disruptions with distributed sensor/cameras systems and pattern information.

Adapt operations for minimal damage in the future.

This procedure is sensitive to the types of processes that allow for false profiling.

This can be prevented by understanding data collection and critical data representation issues. This should be integral to the design and being able to determine what an adequate dataset is, and being able to think critically about how to define it, and what the implications of various choices of categorization are. The best way to do this is a matter for further research.

The architecture infrastructure can be utilised to complement this tech infrastructure. However, these cities usually have some saving grace. With a framework that offers perfect adhesion. These governments are outdated and need revamping. These solutions however need the government to improve their tools. This will in turn improve public services such as crime-fighting and sexual assault crimes. This solution uses 'enterprise' LTE (LTE) technology, a private version of the 4G (LTE) networks available to consumers, to knit together this IoT with secure wireless broadband connectivity, in tandem with sundry fixed-line, fibre and microwave technologies. This allows for the working of this without any major addition of cost and infrastructure. This solution is efficient only if there is a seamless integration of tech infrastructure and architectural infrastructure. It can take advantage of public buildings, public plazas and transportation hubs. These areas can offer multiple

platforms, surfaces for installing, panic buttons or surveillance devices. Without actual wires or a fixed line, it will still allow for efficient movement.

Case Study in Mumbai [11]

Data regarding Mumbai and how it can be implemented within one area - Metro Line 3 - Colaba to Bandra to Seepz as per Mumbai Metro Rail Corporation Limited (MMRCL), 1,600,000 people pass through this line daily. This area has one large problem areas like:

BKC is one of the most important business districts of the country but it lacks connectivity. This area can be instantly improved by increasing the surveillance of selected areas. Certain undeveloped areas of Lower Parel has low vacancy establishments and this can be ameliorated by increasing activity and ensure more societal activity to ensure better visibility. There are several old buildings and industrial units in this belt. This allows for the fixing of technical infrastructures like cameras and lighting fixtures.

Figure 5. Lower Parel Metro Station

The Way Forward

Apart from the existing infrastructure that the city offers certain additions like CCTV and smart lights need to be invested in to gather data to be handled by the autonomous AI. There will be a network system for these devices. The CCTV systems, Smart lights and bus stops will be reporting back to common safety management systems. The officers in charge will be assigned according to the findings of the AI. This AI works in two ways – it can build a profile of an individual that reports on how likely a person is to commit a crime and it identifies hotspots of a predictive crime. When the risk is high, the police take pre-emptive measures; like hyper-surveillance.

A successful replicated project can be done by focusing on helping key stakeholders to understand their duties and responsibilities associated with women's safety and inclusion, and how to meet these responsibilities with appropriate action in their given field. Individual attitudes and behaviours about women are at the heart of this issue, though their policies, institutions and professions are also vital. For example, governments can develop legal provisions to help this infrastructure. They can also allocate resources and incentives to ensure that programmes are in place which facilitate women's participation in data collection and determine the appropriate and effective variables. The authorities must offer support to women who have experienced violence and/or exclusion. Further steps must be

to tie up with urban planners who can work with women to build infrastructure and services which respond to women's needs and which discourage violence and other criminal behaviour.
Implementation agencies and programmes need an understanding of what AI can do and what problems cannot be solved through AI. The mentioned systems and programmes need to be integrated well and stakeholders including law reinforcement, development partners, research organisations and governments need to come together not only to develop partnerships but also to identify and develop sustainable models around AI solutions.
After several field experiments, there has to be access to the availability of mobile and data networks. The stakeholders must show no hesitancy in using new technology. Tech illiteracy can be overcome by training law enforcement and officers in charge. To overcome the challenges, the project's work must make the solutions as intuitive as possible. This device needs support for local languages and contextually aware technology for functioning in the developing world. This context data needs to be gathered by extensive data collection such as dark spots, failing pavements and dark alleyways.
Cultural context like ages of women, paths are taken by women on their way to work must also be examined.
These AI applications can tackle the economic and social challenges that women safety that these developing countries face. Economically speaking, Al possesses unique mechanisms that allow it to have significant impacts on economic productivity. While developing countries may experience a decline in outsourcing jobs from developed countries, the potential negative impact of such decline can be minimized by appropriate policy to deploy Al solutions. The true potential of Al comes from the ability to complement as well as enhance traditional factors of production.

CONCLUSION

This project allows for women to take back the city. This can be multifaceted - motherhood, friendship, livelihood and the joys of independence - mapping the city from new vantage points, laying out an intersectional approach to our urban cities of developing countries. This project allows for our cities to shape a new urban future. It is time to dismantle what we take for granted about cities and to ask how we can build more just, sustainable, and women-friendly cities together.
The city shapers and policy shapers need to get better at designing with inclusivity of experience of women at front of mind. The need to learn to question the appropriateness of standards is required rather than simply aim for compliance. By combining data-driven evidence-based and experience design, predictive policing techniques and cross-disciplinary collaboration there is a possibility to work towards including more voices that were previously ignored in city-shaping conversations. By designing for the challenges faced by the marginalised members of our communities - women, quite often these solutions positively impact us all. In creating safer, more inclusive and more equitable cities, communities become more vibrant that can be enjoyed by all of us, no matter what time of day. Our cities are becoming increasingly diverse. The decision-makers who shape and build cities need to reflect this in our design methods. Quoting Anne F. Stenhammer, UN Women's Regional Representative for India, Bhutan, Maldives and Sri Lanka[12]. "Sexual harassment and violence in public spaces must not be tolerated. We need to join hands and work together to change existing attitudes and behaviours. This is everyone's responsibility – men, women, families as well as service providers."

ACKNOWLEDGEMENT

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EVERYONE IS AN ISLAND: SPATIAL NARRATIVE AS AN ART PRACTICE IN COMBATING UNHEALTHY SOCIALISING BEHAVIOURS INFLUENCED BY SOCIAL MEDIA IN MODERN SOCIETY

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INTRODUCTION

Everyone is an Island is an immersive, multi-sensory experience that challenges the way college students build relationships in social-media-influenced modern society that they feel immersed in either social interactions or loneliness. It encourages 18–25-year-old college students to explore the balance between solitude and companionship, aims to raise their self-awareness learning to understand and taking care of their feelings, and to offer an opportunity to experiment with their balance between solitude and companionship. Moreover, it encourages students to understand other's need for solitude and develop more understanding and meaningful relationships.

In today's hyper-connected world, 18 to 25-year-old college students, also known as digital natives, are unconsciously manipulated by social networking services. On the one hand, with easy access to information about all kinds of activities and events happening across one's social media network, one can be forced to inundate in social interactions. In this such over-socialising situation, one can feel disconnected from the surroundings and not able to engage with others. On the other hand, social media can be so distractive that one can struggle to engage with their own mind, thoughts and feelings and not able to enjoy the solitary time. Both situations jeopardise their mental health with anxiety, dissatisfaction, and depression.

Seeing architectural space as a form of art, *Everyone is an Island* applies spatial narrative theories into practice, creates a wonderland for the visitor to explore the emotions arising from unwanted socialising or unwanted solitude by materialising feelings of over-socialisation and over-isolation in a series of rooms with different atmospheres. It is a journey of getting lost, recollection, reflection and reclamation eliciting a self-reflective exploration of the balance of solitude and companionship that, as it discloses while unfolding, leads to reclaiming power from the social media.

The None-stop Culture and FOMO

As Jonathan Crary states in his book *24/7* (2013), war-relayed innovations have been adopted to a broader social content, turning sleepless soldiers into sleepless workers and consumers, forming a none-stop culture.[1] Among those innovations, the internet has the most significant influence on people's social behaviours, particularly college students. According to Steve Jones' report, since

2002, college students have been heavy users of the internet.[2] On the surface, the internet and social media are making connections easier. However, they also take time away from face-to-face relationships, which could reduce social capital, because "eye contact, body language, facial expressions, vocalisation, hugs, pats on the back, cries, embraces, kisses and giggles are the fundamentals of our evolutionary socio-emotional well-being".[3]

Moreover, the internet also makes people exposed more than ever before to others' lives. With easy access to real-time information about activities and events happening across the social network, FOMO happens. FOMO stands for Fear of Missing Out, "defined as a pervasive apprehension that others might be having rewarding experiences from which one is absent, FOMO is characterised by the desire to stay continually connected with what others are doing".[4] FOMO is now a non-negligible issue among teenagers and adult millennials,[5] generating negative feelings like anxiety and alienation, forcing people to give up their time and space to social activities. Current solutions to overcome FOMO now depend on one's subjective initiative, not to pay attention to social media, notice the happiness in real-life, learn to cut off, etc.(Bloom and Bloom 2015; Florentine 2015; Baker 2016; Guerra 2018; Sokol 2020). This method only works for people who are aware of their FOMO issue and have a strong will to overcome it, while FOMO can be paralysing that people can be caught up in their fears, unable to be aware of the need of mitigating it. At the same time, many brands and activities have used FOMO as a marketing strategy, making it harder to overcome.

The non-stop culture and FOMO are breaking the boundary between social space and solitary space, distracting one from solitary activities and decreasing solitude time quality. The project *Everyone is an Island* conceives of this situation as "Solitary Disconnection", which refers to the difficulty to engage with one's own mind, thoughts and feelings while spending time alone.

Loneliness V.S. Aloneliness

FOMO is closely related to loneliness. According to because FOMO indicates an unsatisfaction with the quality and quantity of one's social activities, which is consistent with the definition of loneliness as defined by Daniel Perlman and Letitia Anne Peplau: the unpleasant feeling that occurs when one's network of social relations is quantitatively or qualitatively deficient.[6] Liesl M. Heinrich and Eleonora Gullone demonstrate in their review to loneliness that the main reasons behind loneliness, including social needs, interactionist, and cognitive discrepancy.[7] The social needs approach proposed by Reichmann believes that loneliness is caused by the absence of a needed relationship.[8] This absence is a gap, in other words, disconnection, between an individual and the society to which one tries to connect. Therefore, in the project *Everyone is an Island*, the term "Social Disconnection" refers to when someone does not feel engaged with others, even if in a social context.

Although loneliness is strongly connected to solitude, it is crucial to note that solitude is not a negative experience like loneliness. Intrinsically motivated solitude is neutral or rather enjoyable (Long et al. 2003; Chua and Koestner 2008; Nguyen, Ryan, and Deci 2017). Therefore, when people with a high preference for solitude can not spend enough and high-quality time alone will suffer from "aloneliness", which is a concept proposed by Robert J. Coplan referring to negative feeling resulting from dissatisfaction with the amount (and/or quality) of solitary time.[9]

Both loneliness and aloneliness are negative feelings associated with mental issues such as depression and anxiety, which indicate that too much and too little alone time are harmful to people's mental health. Hence it is crucial to find the balance between social life and solitary life.

How to Live Together? – Idiorrhythmy

"Idiorrythmy" first appeared in the early middle ages "in connection with certain orders of monks whose members, though they might have dwelt in the same space, were free to live, work and wander each according to his specific rhythms".[10] In other words, it refers to a pattern of living together, which respects each individual's personal living rhythm.

Roland Barthes later borrows this concept to study relationships in the social community. In the book *How to Live Together*, Barthes used architectural space to carry social connections, discussing the relationship between individuals and society.[11] He attempted "to reconcile collective life with individual life, the independence of the subject with the sociability of the group" and shared his idea about a utopian society where individual rhythms, habits and preferences can exist together with social rules.[12] Taking Barthes' blueprint as an inspiration, *Everyone is an Island* aims to encourage visitors to focus on their own pace and need for companionship and solitude to find their balance of social life and solitary life.

SPATIAL NARRATIVE METHODOLOGY

The *Everyone is an Island* project conceives of architectural space as a medium of narrative that carries atmosphere and "provides emotional resonance", and moves the visitor by touching something deep in one's embodied memories, through a series of phenomenological and multi-sensory activities. The fundamental narrative structure of this project follows Freytag's Pyramid, a storytelling structure consist of five key stages: "Exposition" followed by "Inciting Incident", "Rising Action", "Climax", "Resolution", and "Denouement".[13] These narrative stages will be revealed through the architectural space following Le Corbusier's Architecture Promenade. Corbusier believes five processes take place while visitors are moving in an architectural space: Introduction (threshold), Disorientation (sensitising), Questioning (savoir habiter), Reorientation and Culmination (ecstatic union) (Samuel 2010).[14] This structure matches Freytag's Pyramid for narrative.

Narrative and the Spatial Design

The overarching narrative is inspired by the film *Inside Out*, which is set in a young girl's mind and personifies her five emotions. *Everyone is an Island* creates a wonderland representing a corner in visitors' minds, where they cannot physically access it in the real world. Here emotions of over-socialising and over-isolation are materialised in the physical space to stimulate visitor's embodied memories of negative experiences with FOMO or unwanted social events.

Figure 1. Inside Out

In the design of narrative space, there is an articulation of interpreted narrative world and embodied lifeworld, which brings about a "storyworld".[15] *Everyone is an Island* creates a storyworld where the

narrative world goes beyond the physical installation and encounters the lifeworld at a real socialising event.

Figure 2 shows the structure of the storyworld of *Everyone is an Island*. There are two layers of narrative, the "Socialising Event" and the "Island of the Self" embodied in the other. The first layer of narrative, "Socialising Event", is the "framing narrative" which "set the scene" for the embodied one, providing a context for the visitors to interpret their experience in that space.[16] Each layer of narrative has a "doorkeeper". The first is a security guard, who lets visitors enter the first layer of narrative "Socialising Event" and informs visitors how to find the next doorkeeper, the special staff. The special staff verifies visitors' passwords to the second layer of narrative, "Island of the Self", and informs them of the rules in it.

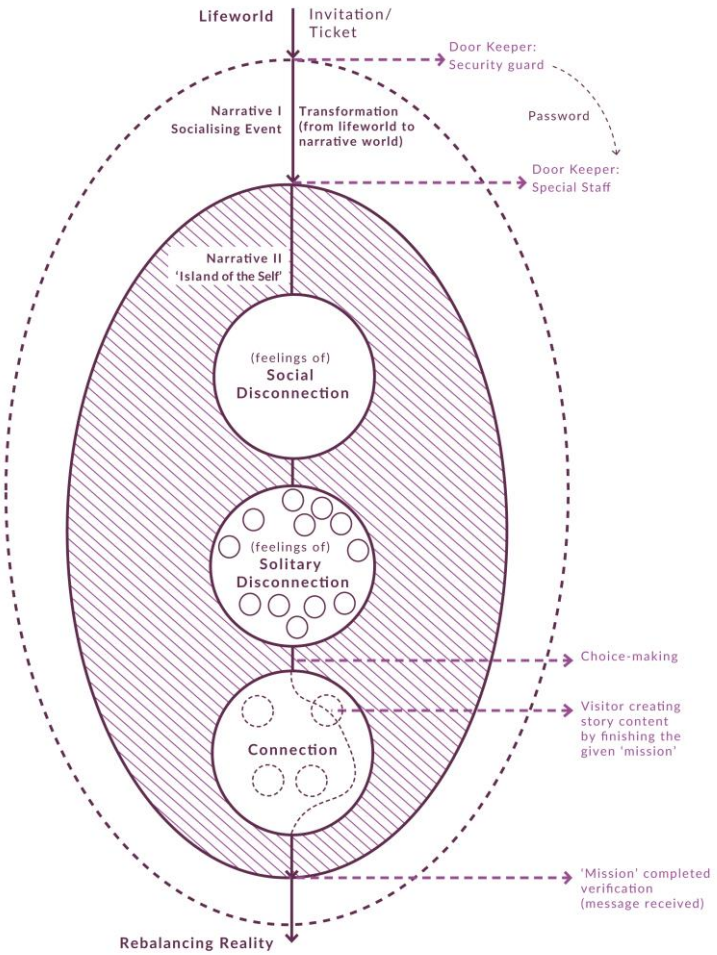

Figure 2. Narrative Structure

There are six key sections of the *Everyone is an Island* experience: Socialising Event, Transformation, Social Disconnection, Solitary Disconnection, Connection and Rebalancing Reality. Each section associates with a particular stage in Freytag's Pyramid and Le Corbusier's Architecture Promenade. "Socialising Event" is the Exposition in Freytag's Pyramid and the Introduction in the Architecture Promenade, where the visitor will receive an introduction to the rule of the storyworld from the security guard who is the "doorkeeper" of the framing narrative. "Transformation" section is the Inciting Incident in Freytag's Pyramid and the Disorientation in the Architecture Promenade, where the life world encounters the narrative world. By finding their way to the "Island of the Self", visitors

disorientate from the lifeworld. “Social Disconnection” and “Solitary Disconnection” are the Rising Action and Climax in Freytag’s Pyramid, while both are the Questioning process in Architecture Promenade. Here visitors have to interact with feelings of over-socialising and over-isolation, questioning how their unhealthy socialising behaviours affect their mental health. “Connection” is the Resolution and Reorientation which allows visitors to reflect on what they need to build a meaningful relationship with others and their balance of social life and solitary life. Last is the “Rebalancing Reality”, which is the Denouement and Culmination. This last section is where the experience ends for visitors to go back to the lifeworld, but with a new understanding of the importance of developing healthy social behaviours.

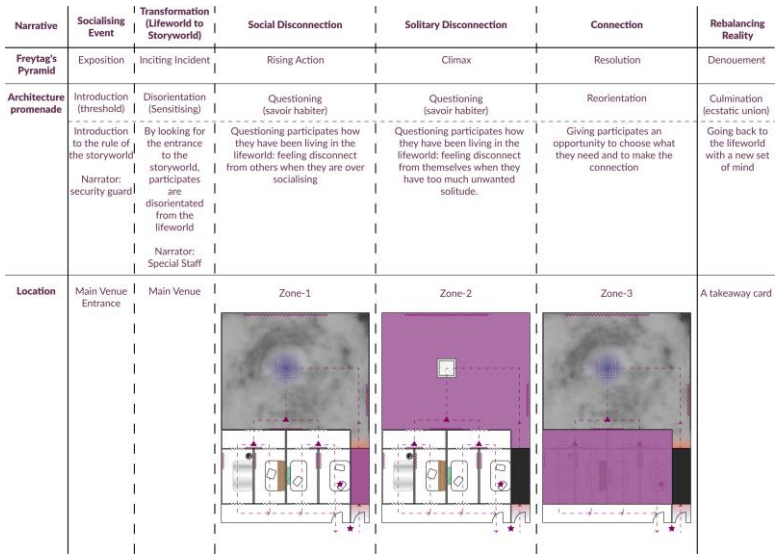

Figure 3. Spatial Narrative Matrix

Visitor Participation and Interaction

Everyone is an Island has a multi-authorship, which allows visitors to participate in the design and creation of the spatial narrative. Visitors can contribute to the narrative content by sharing their stories and feelings in workshops and interviews. They will also create new narrative content in the experience following instructions.

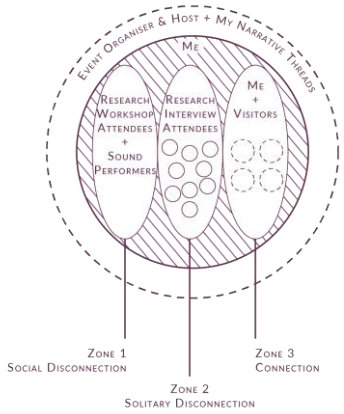

Figure 4. Multi-authorship

Target Audience

Tom Butler introduces reception theory in a lecture arguing that there is a 'blank' (a space) between the author and the story, which will be filled by the narratee's imagination.[17] According to reception theory, there are three ways the narratee can experience the event: dominant position, negotiated position, or oppositional position. Figure 5 shows the definition of the three groups of audiences in *Everyone is an Island* and how they relate to the content. This project targets 18 to 25-year-old university students living in today's fast-paced and hyper-connected world.

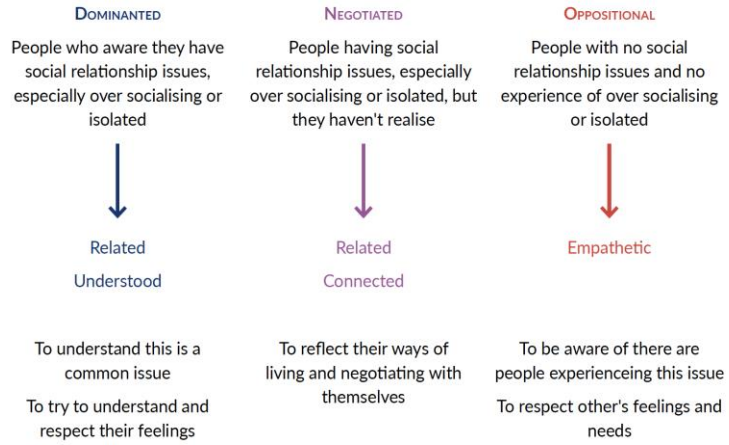

Figure 5. Audience Types

Participation and Interaction

During the workshop with target audiences about over-socialising, attendees answered the question "What question makes you feel overwhelmed while socialising?". Their answers formed the audio content in the "Social Disconnection" section.

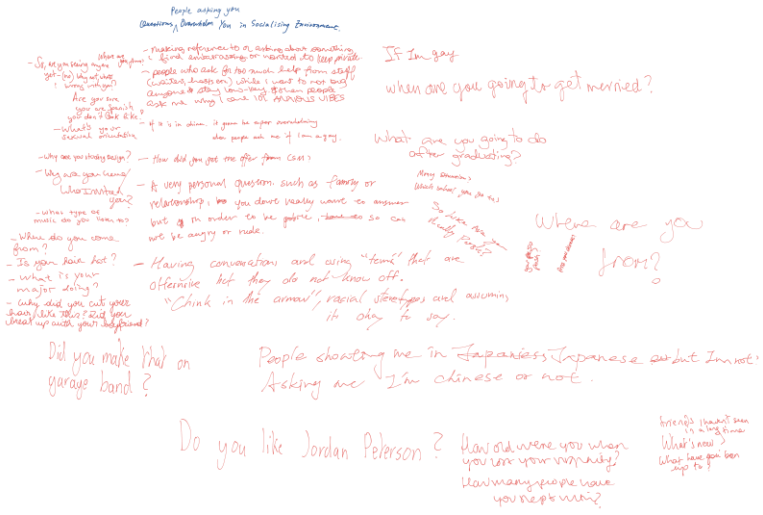

Figure 6. Workshop Outcome

From interviews and workshops about over-isolation, participants described how they feel when over-isolated and what disrupts them from self-connection. They answered the question "What makes you

feel you have to go out socialising?". Their descriptions and monologues form the text content in the "Solitary Disconnection" section.

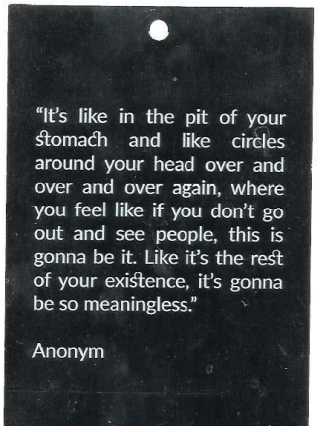

Figure 7. "Solitary Disconnection" Text Tag Example

Allan Parsons (2019) mentioned in a lecture at Central Saint Martins college that "a narratee and an audience are modes of action, of 'doing': reading, listening, watching, looking, spectating and attending".[18] *Everyone is an Island* enables visitors to talk, walk, listen, read, think and make choices in the storyworld. For example, there is a narrative frame in the "Connection" section, where visitors complete the story by following the instructions. The narrative frame asks visitors to make decisions and take action of their choices, as a process of "finding the way to be connected". Meanwhile, by walking through the narrative space and interacting with different spatial elements, visitor emotions will rise and fall accordingly, leaving a dramatic emotional experience.

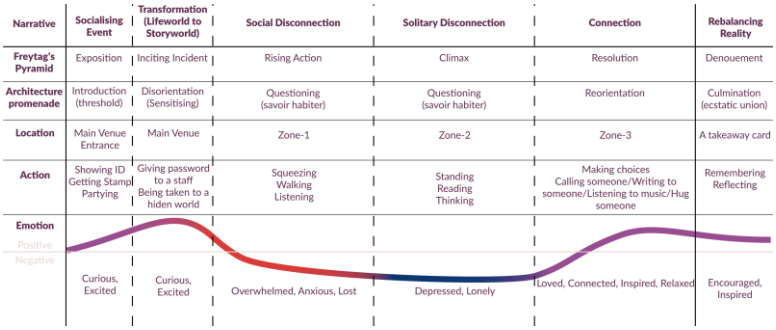

Figure 8. Visitor Interaction Matrix

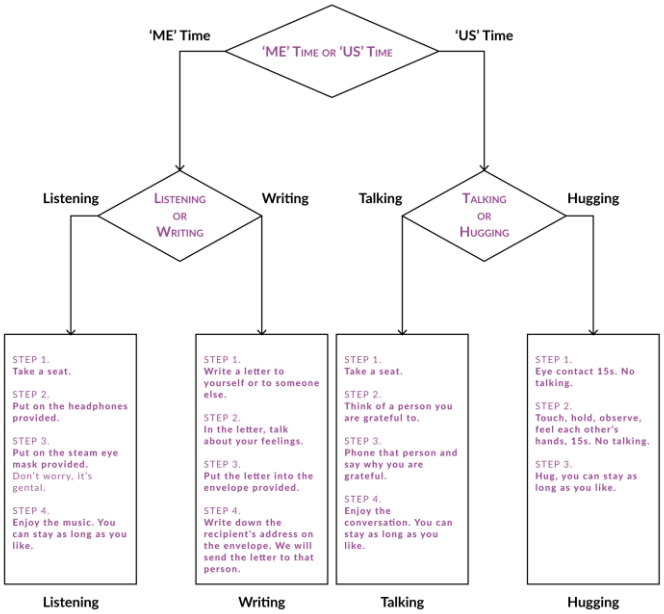

Figure 9. Narrative Frame in the "Connection" Section

PROJECT OUTCOME

The outcome of this project is an immersive experience prototype where they can experience feelings of over-socialising and over-isolation. It questions college students' ways of socialising in non-stop culture. In the end, it provides options for audiences to reconnect with themselves or others. The response to this event is positive, and it suggests that each zone can deliver the right emotion to the audience. Visitors' feedback shows they feel reflective and inspired, so they start to think about their socialising behaviour more. They also feel encouraged to understand their feelings of solitude and develop more meaningful relationships. Thus, it proves the possibility of using spatial narrative as an art practice in combating unhealthy socialising behaviours influenced by social media in modern society.

The project aims to raise university students' self-awareness: to encourage them to understand and take care of their feelings, offering an opportunity to experiment with their balance between solitude and companionship. Also, it aims to encourage students to understand other's need for solitude, develop more understanding and meaningful relationships and challenge the FOMO culture in college. According to visitors' feedback, the goal of this project is fulfilled. An unexpected outcome is that many participants suggest they feel comforted knowing they are not alone and that their struggle between socialising and solitude is ubiquitous.

There are five points in the evaluation of success. The project is considered successful if:

1. Visitors are willing to look inwards to their feelings through the experience and can experience overwhelmed and anxious feelings in the "Social Disconnection" section; depressed and isolated feelings in the "Solitary Disconnection" section; loved and inspired feelings in the "Connection" section.
2. It encourages improved awareness of the disconnection resulting from an imbalanced social and solitary life.
3. It encourages improved awareness of how daily actions can connect the participants with others and themselves. These everyday actions include listening to favourite music, writing down thoughts, calling to someone they love and physical interactions like holding hands and hugging.

4. It encourages visitors to understand their feelings.
5. It encourages visitors to leave honest feedback.

To evaluate the success, a feedback form is designed for visitors to the experience prototype, along with a post-experience interview. According to feedback, most visitors feel overwhelmed and lost in "Social Disconnection", isolated and thoughtful in "Solitary Disconnection". Many also feel inspired to think about the disconnections in their lives and feel encouraged to balance their social and solitary lives. Many feel more connected with themselves or others, especially those who chose to go to the Listening Room or Hugging Room in the "Connection" section. Thus, the project is successful.

CONCLUSION

Everyone is an Island applies the spatial narrative methodology to practice. It delivers an immersive experience for university students to reflect on their unhealthy social behaviour and ways of building meaningful relationships. It provides a live case on how spatial narrative can help to study sociological subjects.

The project outcome is installed in March 2020, right before the COVID-19 pandemic breaking out in the UK. Therefore, there is a lack of a further assessment of how this experience changes visitors' behaviour in real life. In addition, the pandemic increases loneliness and is developing a new dynamic form of social relationship, including ways people connect to others. Hence, it is crucial to learn how this new post-pandemic situation influences university students' social behaviours and mental health and explore how spatial narrative can alleviate these issues.

NOTE

[1] Jonathan Crary, *24/7: Late Capitalism and the Ends of Sleep* (London: Verso, 2013), 1-28.
[2] Steve Jones. "The Internet Goes to College: How Students Are Living in the Future with Today's Technology," Pew Internet & American Life Project, September 15, 2002, https://eric.ed.gov/?id=ED472669.
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[5] JWT Intelligence, "FOMO: The Fear Of Missing Out (March 2012 Update)," JWT Intelligence, 2013.
[6] Daniel Perlman and Letitia Anne Peplau, "Toward a Social Psychology of Loneliness," in *Personal Relationships: Personal Relationships in Disorder*, ed. Steve Duck and Robin Gilmour (London: Academic Press, 1981), 31-32.
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[12] "Can We Live Together, Roland Barthes?" Daily Beast, accessed September 19, 2020, https://www.thedailybeast.com/can-we-live-together-roland-barthes.
[13] Gustav Freytag, *Freytag's Technique of the Drama : An Exposition of Dramatic Composition and Art* ed. Elias J. MacEwan (Chicago: Scott, Foresman, 1894).
[14] Flora Samuel, *Le Corbusier and the Architectural Promenade* (Basel: Birkhäuser, 2010), 85.
[15] "Storyworld," Narrative Environment Course Compendium, accessed March 25, 2021, https://narrative-environments.github.io/CourseCompendium/Storyworld.html.
[16] "Framing Narrative," Narrative Environment Course Compendium, accessed March 25, 2021, https://narrative-environments.github.io/CourseCompendium/Framing-Narrative.html.
[17] Tom Butler, "Story and Telling," Narrative Environments (class lecture, Central Saint Martins, University of the Arts London, London, November 26, 2019).
[18] Allan Parsons, "From Audience to Participation Part 1: Modes of Participation," Narrative Environments Theory Seminar Series (class lecture, Central Saint Martins, University of the Arts London, London, November 5, 2019).

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INFRASTRUCTURAL SPACE: FORMS OF PERCEPTION AND STRATEGIES OF REPRESENTATION

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INTRODUCTION

The way in which the experience of the city is lived and socialised is closely connected to the narrative and visual strategies through which the urban phenomenon is represented. Perhaps it is not possible to establish a single causal link, that is, to attribute an absolute primacy of experience over narration, since the cultural context in which we experience the city is simultaneously the cause and the result of the representations of that same experience. However, it is possible to highlight how parallel to the process of formation of the large European metropolises a method of representation of the city mainly oriented to the visual aspect has taken place and that this same method significantly influenced the understanding and development of the urban phenomenon in the following decades.
This is the case of photography, cinema and comics, eminently visual languages that are widespread among the populace and that, between the end of the 19th and the beginning of the 20th century, saw a very rapid technical and structural maturation, becoming negotiating spaces[1] where residents of the metropolis could find respite from the "intensification of nervous life"[2].

Moving spaces and visual languages of the metropolis

The predominance of the dimension is well represented by the debate aroused by the construction of the first rail transport lines. We are interested in dwelling on this issue for two reasons. First of all, the construction of the railway network is certainly one of the first examples of massive infrastructure throughout the land for the transport of people and goods in modern times: a condition that inscribes this moment in a path that today is expressed in the infrastructure for the exchange of goods, data and capital represented by what Kevin Easterling called the "zone".[3] Secondly, we would like to point out that there has been an important debate not so much on the technological, logistical or commercial aspects of rail transport as on the perceptual aspects. Indeed, the railway was perceived both as a place of the impossibility of a real perception of the space crossed and as a new, concise way of perceiving the landscape. As stated by Léger, “Un paysage traversé ou rompu par une auto ou un rapide perd en valeur descriptive, mais gagne en valeur synthétique”.[4]
The originality with respect to the previous method of perception of space lies in the new relationship between the observer and the object observed: “le paysage ferroviaire est original: c'est un paysage vu et seulement vu, les autres sens étant empechés; c'est un paysage traversé selon une translation mécanique et non abordé selon un mouvement propre”.[5]

In terms of language, the first direct consequence of this new way of moving can be identified in the publication of the illustrated Hachette travel guides sold in the bookstores that popped up in railway stations throughout France where, in a particular form of dissociation, the text describes what is visible from the train window (thus identifying with the passenger's gaze) while the illustrations alternate images of the landscape and images of the railway, bridges and crossings (thus shifting the point of view outside the train).[6]

The violent "dance"[7] of the "paysage dans le cadre des portières"[8] took the form of a "panoramatic view"[9] and entered into the representation of the urban phenomenon through the mechanised dioramas of the Parisian passages and into the cinema. However, the mechanisation of movement was not the only visual theme that contributed to defining the narratives of spaces at the beginning of the 20th century. "Framed" views proliferated (train windows, but also windows, the frame of the cinema screen, edges of photographs, shop windows), a corollary of the panoramic view, as did the theme of vertical views (caused by the development of the first skyscrapers in the North American metropolises) and that of artificial lighting. These visual themes conditioned the representation of the metropolis but also the culture that informed its design, triggering a circular process of producing images and making them come to life: “chaque grande technique de transport modèle donc une approche originale de l'espace traversé, chaque grande technique porte en soi un ‘paysage’”.[10]

A further example, among the many that we could offer, is the series of architectural renderings made by Hugh Ferriss between 1916 and 1922 and collected in the volume *Metropolis of tomorrow*.[11] Commissioned by skyscraper architect Harvey Wiley Corbett to visualise the possible consequences of the new city planning law on land occupation in New York City in 1916, these dizzying perspective views illuminated suggestively from below (which in a specular way evoke the sublime hypogeal visions of Giovan Battista Piranesi in his Prisons of Invention[12]) became a powerful element in the characterisation of the image of the metropolis.

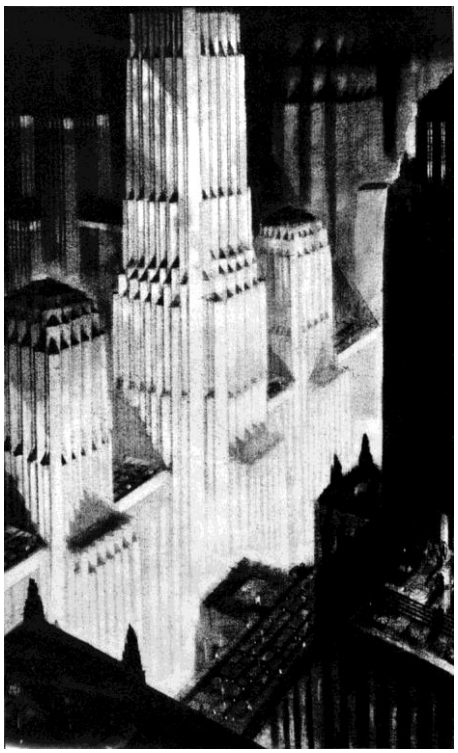

Figure 1. Hugh Ferris, Overhead Traffic Ways, in The Metropolis of Tomorrow

Together with the monumental architectures of Antonio Sant'Elia for *La Città Nuova* (1914)[13], Ferris's renderings would constitute a possible reference for the work of Eric Kettelhut on the sets of Metropolis by Fritz Lang (1927) and, decades later, for the design of Blade Runner by Ridley Scott (1982), two fundamental films in characterising the metropolitan imagination.

Figure 2. Erich Kettelhut, sketch for the set design of Fritz Lang's Metropolis, first version. View of a multi-level street with buildings and a church, 1925, pencil and pen on paper, Berlin, Stiftung Deutsche Kinemathek.

The visual contribution of the media in the narrative of the city dominated precisely by virtue of the supposed ability of these languages to confer an autonomous sense to phenomena whose complexity had quickly escaped the available cognitive models. As Desportes wrote, “fait primordial, le cinéma enregistre le mouvement. [...] Ensuite, le cinéma est apte, grace au montage, à rendre l'enchainement des visions qui s'imposent au citadin. Cet enchainement est rendu non pas comme une suite heurtée, syncopée, mais comme un tout unifé, porteur d'une signification sousiacente”.[14]

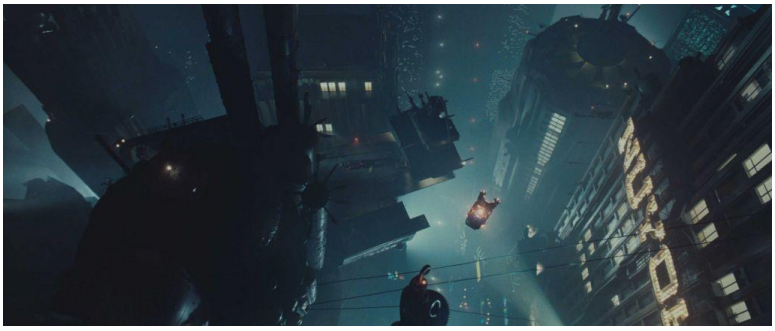

Figure 3. Frame from “Blade Runner”

Beyond the visible: surpassing the regime of sight

The predominance of narrative languages centred on sight has triggered an array of self-fulfilling projects-prophecies that, in some cases, have reduced the effectiveness of reflections on the urban phenomenon and more.

A very clear example of how the visual strategies of spatial narratives have influenced the cultural debate on environmental and city issues is the case of the Anthropocene project.[15] In fact, in

Burtynsky's work, beyond the meritorious work of disseminating the impact of human activity on the global ecosystem and beyond the reflections on the meaning of the definition of Anthropocene,[16] a visual imprint heavily influenced by the overhead view emerges. Sophie Hackett addresses this issue in the chapter "The View from Above",[17] where, indicating a path that goes from the ancient tracing of pilot books and passing through aerial mapping for military use, she reconstructs the relationship between the overhead view and the story of natural phenomena on a continental scale. Using this type of image to "document the scale of anthropogenic activity on the surface of the planet"[18] is legitimate, but it is at the same time important to take into account the fact that this view is not a pure, simple geometric piece of information but rather a way of looking and recounting that is full of implications. As Mirzoeff argues, in fact, "Visualizing was and is a hierarchical, indeed autocratic, means of imagining the social as permanent conflict".[19]

Figure 4. Edward Burtynsky,Tetrapod #1, Dongying, China, 2016

The aestheticisation of the catastrophe cushions the critical impact of images since, as Susan Sontag argues, “Taking photographs […] is a way of certifying experience, [but] also a way of refusing it – by limiting experience to a search for the photogenic, by converting experience into an image, a souvenir. [...] The very activity of taking pictures is soothing, and assuages general feelings of disorientation that are likely to be exacerbated by travel”.[20]

Thinking of the future as a photogenic object is the effect of the production of mass images implemented by fiction and cinema: it should not be surprising that, in an attempt to rationalise the complexity of its environment, humanity tends to resort to known and to some extent comforting visual codes.

How can we overcome these dynamics that in some way "confine" reflection within a visual short circuit of experience and representation? A first possible solution is a shift from the visual to the oral. For example, thanks to Benjamin's reflection on tactile perception and distracted perception[21] up to Ingold's reflection on the narrative ability of the hand (*telling by the hand*[22]), it is possible to bring the experience of the project into a tactile sphere by downscaling the hegemony of the visual aspect. In affirming the need to reaffirm an “oral” space (i.e. linked to sound and narration) in contrast with a merely visual space,[23] it seems useful to recall Pallasmaa's reflection on the so-called “eyes of the skin”, i.e. that set of experiential perceptions that act as alternatives to simple vision. According to Pallasmaa, the liberation from an architecture dominated by a “frontal ontology”,[24] from a reading of the world as “potential photograph”,[25] is possible only through a balance of the senses, an oral narrative dimension of experience: a narrative act that offers directions without prefiguring the destination. This paradigm shift is not intended as an elimination of the visual aspect but rather as a

questioning of the prefigurative tendency of visual materials: it is therefore a question of hybridising narratives with alternative models of representation.

If the above suggests that we include in our reasoning the subject of the body as the precise vector of experience in the haptic continuum,[26] going beyond a frontal idea of space, Ingold's reflection completes the reasoning by proposing the surpassing of the ilomorphic approach that provides for the exact transcription of a design in matter. Abandoning the idea of accuracy of design predictions leads us to introduce an element of cognitive uncertainty that fits within the recent contributions of Donna Haraway on the narratives of the Chthulucene and Mark Fisher on the forms of the weird.

Haraway proposes to integrate forms of narratives that are not exclusively human (multi-species[27]) through a "clouding" of the narrative that, going back to the French etymology of the term "trouble",[28] therefore becomes more opaque, less intelligible and therefore less deterministic. For Fisher, the most effective interpretation of the present (social and spatial) is instead the use of the declinations of the concept of *unheimlich* and uncanny[29], or the weird and the eerie: two aspects that define a form of cognitive uncertainty (and therefore of discomfort) linked to the unjustified presence/absence of an element (which therefore becomes disturbing) and the impossibility of identifying an agency of known origins.[30] The redemption from the hegemony of the visual, the acceptance of a margin of inaccuracy and non-measurability, the experiential dynamics of a plurality of bodies, the opening to agencies that are not completely decipherable or knowable are significant characteristics in outlining a new mode of representation of urban space, with particular relevance to what we will define as an infrastructural space.

Representing infrastructure space: the Falin Mynd case

The path followed so far has taken its cue from the representation of the urban space by critically reading the forms and strategies of its visual representation. However, before addressing the case study related to the Falin Mynd project, it seems appropriate to recall the definition of infrastructure space developed by Keller Easterling. This will allow us, after having questioned the methods of representation, to better define the object of said representation.

"In the retinal afterglow is a soupy matrix of details and repeatable formulas that generate most of the space in the world—what we might call infrastructure space".[31] This uncertain and subliminal view, composed of a matrix of recognisable and recurring formulas, forms a spatial fabric that goes beyond the idea of urban space as the sum of interventions and buildings designed or determined by a human agency: "Buildings are often no longer singularly crafted enclosures, uniquely imagined by an architect, but reproducible products set within similar urban arrangements. As repeatable phenomena engineered around logistics and the bottom line they constitute an infrastructural technology with elaborate routines and schedules for organizing consumption".[32]

Infrastructure space has a component that is only partly physical as it is configured as a software or operating system that imposes its shape on the city[33] through what Easterling defines as a disposition, or an action in power that creates an agency usually not attributed to buildings as such: infrastructure space, even regardless of our action, is in fact constantly doing something[34] simply by virtue of the relationship with the other elements of the infrastructure.[35]

In this system, buildings are only one of the possible forms, along with many others (such as "the multipliers that circulate within it—cars, elevators, mobile phones, laws, real estate formulas, structural innovations, and security technologies among them"[36]). Infrastructure space is configured as a dynamic structure that is constantly committed to functioning and replicating itself. It is evident that in order to identify a representative strategy for infrastructure space it is necessary to integrate forms of representation that take into account what is illustrated in the previous chapter: any form based

exclusively on the representation of the built spaces would in fact not be adequate to convey the dimension of variability and complexity of the agency expressed by the infrastructure space.
The case study under consideration, the "Falin Mynd"[37] project by Fuse*,[38] seems particularly relevant in this regard. Compared to other recent and interesting experiences related to digital urban narratives[39] or in general to data visualisation experiences related to so-called big data, the experiment in question has some innovative characteristics that make it particularly relevant with respect to the above.

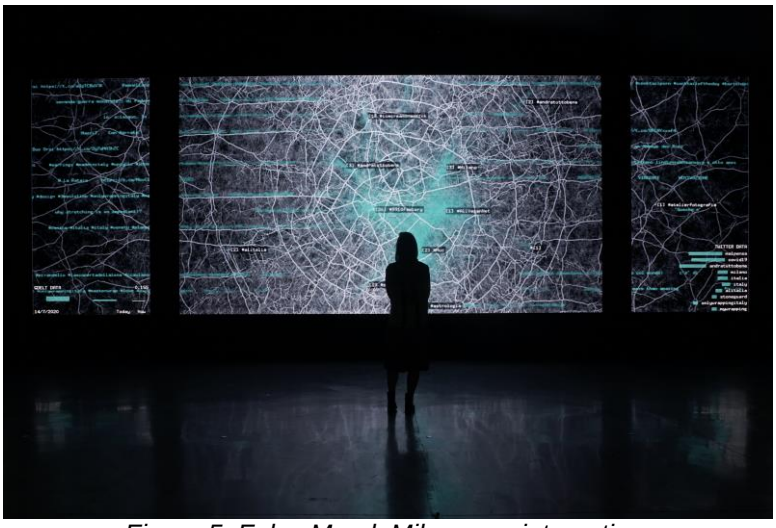

Figure 5. Falyn Mynd, Milan map interaction.

Falin Mynd is an audiovisual installation dedicated to the city of Milan that is inspired by the concept of latent image in the photographic field: the data generated by the inhabitants of the city (specifically, tweets in Twitter) generate in turn digital landscapes leaving a trace that influences the space. The fact that this trace is latent in the infrastructure space makes this project even more relevant to the definition of Easterling: in fact, the work makes visible an aspect of the infrastructure space that normally would not be (if not in a partial, unstructured way). The data thus define a latent image of the city that in this case works on the relationship between space and who lives in it.
The visual data of the urban fabric, i.e. the street layout, is used as a layer over which a reading of the intangible data acting on this infrastructure is placed, taking into account what Easterling suggests.
The structure of the empty and full spaces of the city of Milan therefore interacts with the geolocation of tweets valued according to an index of positivity-negativity attributed on the basis of a semantic analysis. The tweet is the result of an action triggered by a human operator moving in the space of the city, mediated by the social aggregator and the mobile device used: a mobile infrastructure space connected to the network of repeaters and cells scattered throughout the city.

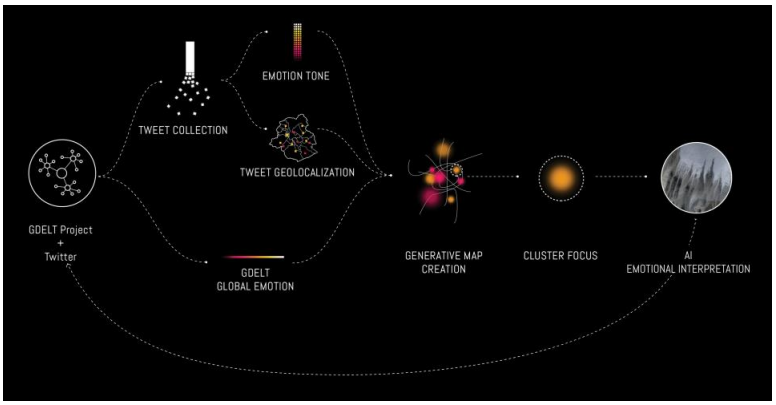

Figure 6. Falyn Mynd, semantization of localized data process.

This space releases a stream of particulate agents that explore the space produced by interactions between geographic layers and aggregate data. These agents act on the basis of an algorithm with an operation inspired by the behaviours of ants and termites: in fact, each agent releases some information with respect to its interaction with the maps, influencing the behaviour of subsequent agents and allowing the observation of emerging and self-organized structures. The agency of these swarms of agents recalls a multi-species narrative space, and not just from a visual point of view.
With each iteration a cluster is selected on the map, and, depending on its location, an exploration is triggered that exploits an artificial intelligence trained on thousands of photographic images taken by users (again, multiple latent images of the city). This space-image in turn becomes a map of the path of the automata: this transition from an overhead view to a perspective view (again used as a space to be explored by the swarms) produces an alienating effect, a disturbed familiarity that mixes different, divergent points of view that coexist with difficulty in traditional forms of representation.
For all intents and purposes Falin Mynd's enigmatic mobile map generates a state of cognitive uncertainty: while knowing that all information flows and interactions are traces of known phenomena (there is therefore apparently nothing mysterious in the generative process of this flow of images), the high level of complexity and the reference to an immaterial perception (the data that crosses the urban space in a physical system made up of devices, repeaters and servers) produce a sensation of cognitive imbalance that we can only observe with a disturbing sensation.

Figure 7. Falyn Mynd, space-image interaction.

CONCLUSION

By tracing the evolution of the relationship between observer and observed in connection with urban space, it is possible to identify a precise path in the development of the visual languages of the metropolis, the ways in which the image of the city is received and represented. This relationship, characterised by the predominance of the scopic regime, has produced a short-circuit between vision and the production of imagery which, in the long term, has weakened the debate on the representation of urban space.

Without a truly alternative strategy of restitution, the urban imaginary has turned into a system of visions that are self-fulfilling in their contents and repeated in their modes (as cited, for example, viewing the city from above). It therefore becomes useful to include in this discussion eccentric contributions (Fisher and Haraway) that challenge the primacy of the scopic regime and also, more radically, the centrality of human agency to allow "weird" visions able to reactivate, even in an enigmatic way, the representation of the urban.

Aware of the risk of falling into representative forms that directly influence design choices, and aware that the elements that structure the geometry of the infrastructure space transcend the urban scale and traditional measurement tools, the need to conceive experiences of representation of the city that deviate from normal infographic interpolations to incorporate elements of authorship is established.

In this context, the Falyn Mind project is a prototypal experience which, by integrating intelligent artificial agents into the process of simulation, generates an immersive experience that challenges the viewer by unbalancing their awareness and interpretative habits in a context of cognitive uncertainty, which may represent a stimulus for reflection and a way to overcome traditional predictive or design models. The emergence of an agentivity of the data, or rather of the infrastructure space innervated by the data, and the perception of the otherness of this agentivity are probably the two fundamental elements for a critical reading of contemporary space.

NOTES

[1] Here we extend to urban visual narratives the concept of cinema as negotiating space of urban experience expressed in Francesco Casetti, *L'occhio del novecento*. *Cinema, esperienza, modernità*, Milan, Bompiani, 2005.
[2] "The psychological basis on which the type of urban individuality stands is the intensification of nervous life, which is produced by the rapid and uninterrupted alternation of exterior and interior impressions". "The Metropolis and Mental Life" in Kurt Wolff (Trans*.) The Sociology of Georg Simmel* (New York: Free Press, 1950), 410.
[3] Keller Easterling, *Exstrastatecraft. The Power of Infrastructure Space* (London: Verso, 2014), 72.
[4] "A landscape crossed or broken by a car or a highway loses its descriptive value, but gains in synthetic value." (trans. by the author). Fernand Léger, *Fonctions de la peinture* (Paris: Gallimard, 1997), 20.
[5] "The railway landscape is original: it is a landscape seen and only seen, the other senses being inhibited; it is a landscape traversed according to a mechanical translation and not approached according to an individual movement." (trans. by the author). Marc Desportes, *Paysages en mouvement* (Paris, Gallimard, 2005), 135.
[6] Desportes, 153.
[7] Benjamin Gastineau, *La Vie en chemin de fer* (Paris: E. Dentu Editeur, 1861), 26.
[8] "landscape in the doorframe" (trans. by the author). Paul Verlaine, *La bonne chanson* (Paris: Alphonse Lemmere Editeur, 1869), 15.
[9] For an in-depth study on "panoramatic view" see Wolfgang Schivelbusch, *The Railway Journey, The Industrialization of Time and Space in the Nineteenth Century* (Oakland: University of California Press, 1986)
[10] "Each major transport technique therefore models an original approach to the space it crosses, each major technique carries a 'landscape' in itself". Desportes, 8.
[11] Hugh Ferris, *The Metropolis of Tomorrow* (Princeton: Princeton Architectural Press, 1986).
[12] We refer to the Carceri in a broad sense, including the two existing editions edited during the author's lifetime: *Invenzioni Capricci di Carceri all'acquaforte datte in luce da Giovani Buzard in Roma Mercante al Corso* (1745) and *Carceri d'invenzione di G. Battista Piranesi archi. Vene.*, 1760-1761.
[13] Esther Da Costa Meyer, "Antonio Sant'Elia: La città nuova", in Marco De Michelis, editor, *La città nuova oltre Sant'Elia. 1913-2013 Cento anni di visioni urbane* (Milan: Silvana Editoriale, 2013), 29.
[14] "The most important fact is that cinema records movement. [...] Moreover, thanks to editing, the cinema is able to render the sequence of visions that impose themselves on the city dweller. This sequence is rendered not as a jumbled, syncopated sequence, but as a unified whole, carrying a subjacent meaning." Desportes, 202.
[15] Sophie Hackett. Andrea Kunard and Urk Stahel, editors, *Edward Burtynsky, Jennifer Baichwal, Nicholas de Pencier, Anthropocene* (Fredericton: Goose Lane Editions, 2018).
[16] Jean-Baptiste Fressoz, "L'Anthropocène et l'esthétique du sublime", in *Sublime, les tremblements du monde, catalogue d'exposition* (Paris: Centre Pompidou Metz, 2016), XX.
[17] Hackett, Kunard and Stahel, 16.
[18] Hackett, Kunard and Stahel, 23.
[19] Nicholas Mirzoeff, "Visualizing the Anthropocene", Public Culture 26, no. 2, (Durham: Duke University Press, XX), 216.
[20] Susan Sontag, *On Photography* (New York: Farrar, Straus & Giroux, 1977), 177.
[21] Walter Benjamin, "Percezione e architettura nell'età della tecnica" (1939), in Enrico Rocca, editor, *Estetica e architettura* (Bologna: Il Mulino, 2008).
[22] Tim Ingold, *Making, Anthropology, Archaeology, Art and Architecture* (London/New York: Routledge, 2013), 109.
[23] Juhani Pallasmaa, *The eyes of the skin, Architecture and the Senses* (New York: John Wiley & Sons, Inc., 2005), 24.
[24] David Micheal Levin, editor, *Modernity and the hegemony of vision* (Berkeley: University of California Press, 1993), 1-29.
[25] Sontag, 56.
[26] Pallasmaa, 26.
[27] Donna Haraway, *Staying with the Trouble, Making Kin in the Chthulucene (*London: Duke University Press, 2016), 27.
[28] Haraway, 18.
[29] Anthony Vidler, *The Architectural Uncanny. Essays in the Modern Unhomely (*London: MIT, 1992).
[30] Mark Fisher, *The Weird and the Eerie* (London: Repeater Books, 2016) 63.
[31] Easterling, *Exstrastatecraft,* 11.
[32] Easterling, 11.
[33] Easterling, 13.
[34] Easterling, 13.
[35] Easterling, 13.
[36] Easterling, 74.
[37] "Fuse Works – Falyn Mynd" Accessed at August 20, 2021 - https://www.fuseworks.it/en/works/falin-mynd/
[38] Falin Mynd, production: fuse*, artistic direction: Mattia Carretti, Luca Camellini, concept: Mattia Carretti, Luca Camellini, Samuel Pietri, Riccardo Bazzoni; Software artists: Luca Camellini, Samuel Pietri; Sound design:

Riccardo Bazzoni; Hardware engineering: Matteo Mestucci. The project opened on 20 July 2020 at Malpensa airport as part of the “Nice to MEET you” project, curated by MEET Digital Culture Centre with the support of SEA.

[39] See for example Maria Valese, Herbert Natta, “Digital Urban Narratives: The Images of the City in the Age of Big Data”, In_Bo, volume 11, no (2020), 68-79.

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HEREWEART: CHILDREN'S CIVIC ENGAGEMENT THROUGH AUGMENTED REALITY PLACEMAKING

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INTRODUCTION

HereWeArt is a smartphone app that combines Augmented Reality (AR) technologies and geolocation to position the artworks of children and youth as a site-specific public art exhibition.[1] As an exhibit, *HereWeArt* visualizes child-like wonder through art. As an AR placemaking project *HereWeArt* also raises questions around collaboration, youth civic engagement, and sustainability in digital artwork. With reference to the notion of placemaking this project considers how AR and geolocation amplify children's voices in civic engagement.[2] Geo-located AR art as a placemaking project amplifies the social and cultural contexts of a place. Engaging children in the initial creative process has important implications for cognitive development related to learning, creativity, and civic engagement. *HereWeArt* makes the most of these opportunities by involving children in civic engagement through inclusion of their creative artwork into a placemaking project. This paper offers a self-reflexive account of the development, production, and deployment of *HereWeArt* at an urban art festival. We find that including children's voices in an AR placemaking project provides a variety of empowering narratives: initialization of youth civic engagement, raising agency of young people, developing new associations with mobile devices, and new approaches to sustainable placemaking. In the age of ubiquitous mobile computing, these reflections open up the possibilities of AR for application in a variety of civic and social engagements.

BACKGROUND

Responding to the growth of Augmented Reality (AR) technologies, and leveraging the increased accessibility of AR, artists and researchers have explored various permutations and intersections of the medium. Research of AR in educational contexts demonstrate significant pedagogical value. Introducing AR to education settings has produced consistent trends: increased student motivation, learning gains, creative thinking, and collaborative relationships between students.[3] Other research has explored the impacts of AR in new media, sociology, and contemporary art practices.[4] AR has been found to enhance the social meanings of a space.[5] Nancy Baker Cahill's art application *4th Wall*, [6] Christo and Jeanne Claude's *London Mastaba*,[7] CH2's *unattendedVapourware*,[8] and John Craig Freeman's *Frontera de los Muertos*,[9] are examples of artworks that combine AR with geolocation in this way to produce a meaningful effect. The site-specific aspect of these AR projects leverage the power of a space to contextualize the issues they address. When AR is integrated into an environment

the medium uniquely highlights the social meanings associated with that space. The potential to leverage these intersecting applications of AR to engage children in placemaking efforts deserves further exploration.

Engaging community in creative placemaking efforts provide opportunities to increase local civic engagement. Broadly speaking, community oriented placemaking can be referred to as a "culturalization of space".[10] Placemaking developments can reflect the diverse range of local identities and are thus a starting place to raise awareness of, and subsequently remedy social inequalities.[11] Local collaboration for enhancing a space strengthens the social networks of that place, raising the community members' self-perceptions of self-esteem and agency.[12] Placemaking projects bring communities together by combining the collaborative cultures of that place.

We have seen a few projects that involve children in placemaking. Researchers used a social network interface to connect children's ideas with an urban planning council and found that this improved children's civic engagement.[13] Other research projects that utilize new media platforms to involve children in local urban planning found that children civic participation through media raised their agency and notions of civic engagement.[14] In this context we see many benefits to involving communities in creative placemaking.

There has been a plethora of research that connects creative activity in children to their cognitive development. Piaget suggests that children learn best through participation.[15] *HereWeArt* is focused on play, exploration and participatory civic engagement. Play is an essential component to the development of a culturally rich child.[16] Creative and playful self-expression in education affirms an individual's sense of identity.[17] Creative exploration engages children in possibility thinking, provoking the mind to re-imagine the world from "what is" to "what might be".[18] Possibility thinking can also lead an individual to better understand and accept cultural differences.[19] This shows us that participation and creativity are both vital to expanding a child's world view.

PROJECT DESCRIPTION

HereWeArt leverages the potential for community participatory enhancement of a place. Located at York Boulevard in the Canadian city of Hamilton, *HereWeArt* is a smartphone app that combines AR and geolocation to position the artworks of children and youth as a site-specific public art exhibition. The project resists an authoritarian urban developmental position. Instead, it unobtrusively invites community members to participate in a locally developed environment. Involving the community in the creation of a space, with reference to "placemaking" *HereWeArt* considers how AR and geolocation amplify children's voices in civic engagement. The app utilizes AR to represent an art installation created by children. *HereWeArt* invites viewers to consider the role of children in civic collaboration by foregrounding children's creative visions of their neighborhoods. It places children's art quite literally above us. The *HereWeArt* mobile app was developed in the context of Artasia, a summer arts program by Culture for Kids in the Arts, the charitable arm of the Hamilton Conservatory for the Arts. For this project the app was deployed at Hamilton, Ontario's Supercrawl event, an annual city-wide art exhibition, in 2018.

Figure 1. Through the #HereWeArt app, children's artwork appears in augmented reality on York Boulevard, in the city of Hamilton, Canada. (Graphic: Harold Sikkema)

Figure 2. #HereWeArt lamp post icons used to signal augmented reality display locations. (Photo: Harold Sikkema)

HereWeArt was geo-located at the annual SuperCrawl festival, an event that brings the region's population together. Leveraging the communal power of this site, *HereWeArt* seizes upon the metaphoric narrative of illuminating a neighborhood through the image of a streetlamp. Through the app each lamppost becomes a portal to a neighborhood-oriented art gallery full of local children's creations. Geolocation is thus integral to the interface of *HereWeArt*, but also to its narrative.

Figure 3. Storybox examples featuring the work of young artists in augmented reality.

Through *HereWeArt* Children's art is digitized, projected onto a 3D Cube, and made into an AR asset that we call a "storybox". These storyboxes are prompted through street lamp posts. We have derived this idea of storyboxes from the notion of a skybox in 3D gaming and virtual environments, elevated 3D volumes that are used to display virtual content.

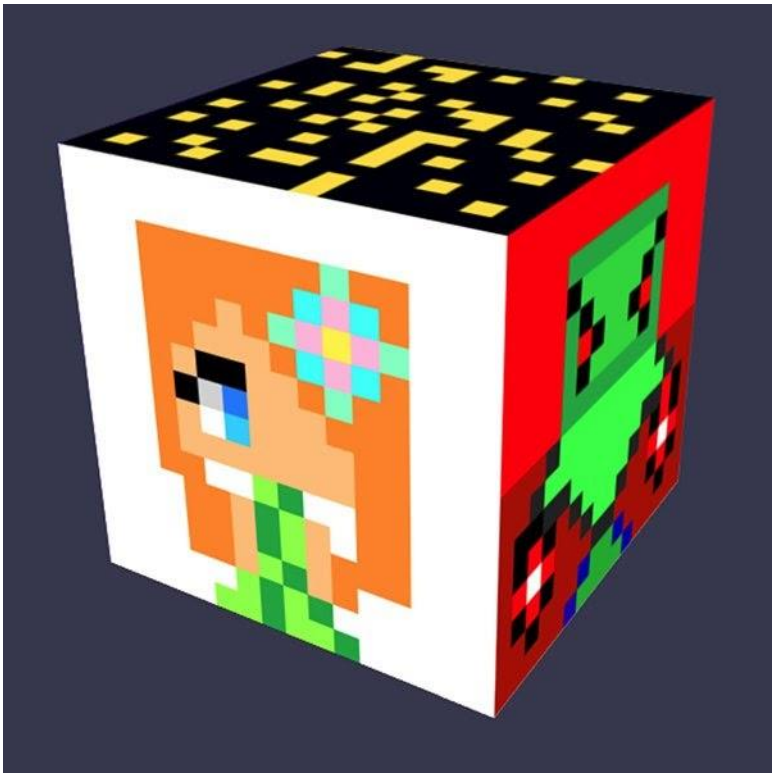

Figure 4. Storybox asset featuring children's pixel art.

We might consider *HereWeArt* as a mere display technology, but this would sidestep the embedded developmental context of the project. The Artasia camp emphasizes giving children a voice. Initially for this project, children were given black and white photos of neighbourhoods. They were then

prompted to draw in response to the question “What would you like to see in your neighborhood?”. The resulting creativity served as our content bank. We think about the whole of *HereWeArt* as its own kind of artwork, while at the same time we present *HereWeArt* as a platform to host the children’s artworks.

Figure 5. Artasia’s integrated tactile and digital workflow culminate in the HereWeArt Augmented Reality exhibition (Photos: Harold Sikkema)

In *HereWeArt*, each lamppost plays host to a weatherproof graphic place marker in the mode of Aram Barthol’s *Map*.[20] These markers provide a link to the *HereWeArt* app. The lamppost beckons users through a portal, on the other side of which lives an AR layer containing artworks. In fact, a full gallery space awaits: a digital space with as much wall-space as might be desired by the vigorous and creative minds of children.

Figure 6. Lamppost augmented by children’s sculptural place-marker and graphic weatherproof sticker with link to AR content. (Photos: Harold Sikkema)

The "gallery” employed in *HereWeArt* takes the form of our above noted storybox. Storyboxes are also viewable online at the Culture for Kids in the Arts website.[21] Thus situated, the artworks enjoy a multimodal presence on the street and in web browsers. In both environments the artworks are viewable from inside and out. The floating cube expands the four walls of the gallery to the six sides of a cube. We describe this as the gallery becoming art, and the art itself is now a gallery. Through this utilization of public space *HereWeArt* can be considered as “post-gallery”.[22] We find that the virtualization of the gallery, and the movement of the art gallery into the street, places *HereWeArt* within a larger discussion of democratization of knowledge, and the deconstruction and reinvention of public institutions that is common to postmodern life.

Figure 7. Viewers encounter storyboxes in augmented reality. (Photos: Harold Sikkema)

The Storyboxes in *HereWeArt* present a range of mixed media content, which gives rise to considerations around media hybridity. As we have discussed some of the artworks in *HereWeArt* are produced by children in tablet apps and thus are natively digital, while other pieces have been digitized "in post", following a more traditional hands-on community arts practice. In our background research we have seen many examples of native digital AR content, however we did not find many uses of analog works embedded in AR. *HereWeArt* takes this approach of projecting 2D analog works onto a 3D digital object. We want to situate this as an example of a hybrid modality, which also provokes further inquiry into a wider spectrum of modalities that are possible in this AR domain.

Documentation of App building Process

The design requirements for the *HereWeArt* app responded to the anticipated user experience of urban art festival attendees, specifically attending to the experience of the young artists and their families. These users would attend at random times throughout the three day event, begin at different locations, and require minimal orientation to the app and art viewing conditions. The result was its construction as a reliable “storybox” embedded-narrative application for AR. The application reflects this through its use of specific geographic access points at the art festival that allowed users to access and read site-specific history on each of these points with their phones. The key design requirement for content creation was allowing children to develop their real-world interpretations of the sites’ history and representation through the integration of their drawings into the application. This resulted in a mediated interactive experience for children and parents to both educate themselves on their everyday environment’s history, as well as give an option to showcase the child participant’s artwork in an augmented environment.

Figure 8. Simple program flow for users of the HereWeArt app.

The *HereWeArt* app was developed with the Unity engine and an Online Maps plugin that renders the world map behind the scenes. This was mainly used to place the AR content relative to the user’s position, in order to avoid making the user interface of the application seem jarring for some people. A custom gyroscope script to handle orientation was also developed as the Google Cardboard software developer’s kit (SDK) script would often dim user’s screens, likely due to the application’s expectation of the user being placed in a VR headset that blocks out light. An earlier iteration of the application had previously loaded all the beacons from Google’s *Firebase*, a mobile development

platform. For *HereWeArt* this was deemed too slow of a process and used too much data. Currently, in *HereWeArt*, the only online functionality is GPS. The application does not take into account real-world occlusion. Normally digital objects in AR would be obscured by physical objects and depth and perspective would be confounded. To circumvent this issue the beacons for reading this information in the augmented plane are minimized and hidden entirely when far away. This results in the user being able to see what is currently in front of them without posing as much risk to the digital objects being confounded in the real world or the screen's interpretation. iOS deployment was omitted for *HereWeArt* due to side-loading work requirements. Android users can download an Android application package (APK) which will help to ignore some of these warnings/issues; however, iOS needs a user device attached to a developer laptop in order to achieve functionality.
A 90-minute sample during the festival indicated roughly 40+ people per hour were interacting with the application either as a family unit, group, or individual.

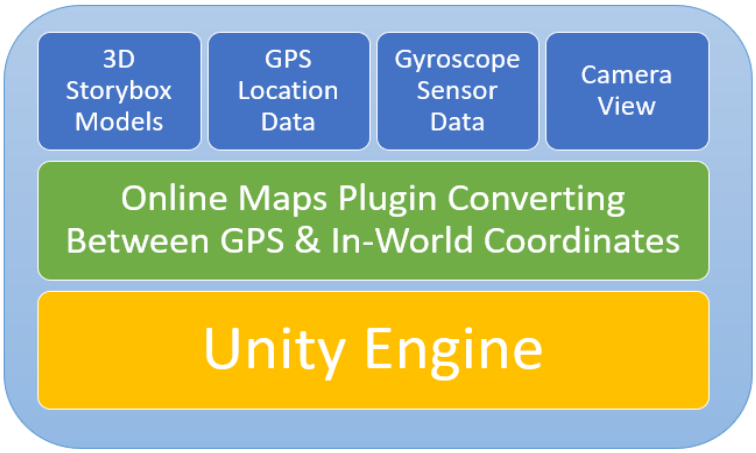

Figure 9. Data stack for HereWeArt app.

DISCUSSION

Through creative development and then later participation processes, *HereWeArt* provides children with exposure to a diverse range of creative modalities. It provokes further possibility thinking which leads to increased sensitivity towards and acceptance of cultural differences.[23] This expansion of milieu is necessary for improving an individual's understanding of broader society. In a culturally diverse society, such as Canada, there is an extra emphasis on the need for this exposure.
HereWeArt showcases young people's imagination in augmented reality. It is a sharing of space through augmented reality placemaking in which children learn that their self-expression is able to shape the world around them. As a placemaking effort it allows them to value their creativity as a form of civic engagement. The future implications of this are involved in discussions with both raising agency in young people as well as re-imagining the way that they can use mobile technologies for civic culture.
HereWeArt is thus also concerned with broader discussions of mobile technology use. The *HereWeArt* app is used only through real-world prompts, thus situating mobile phone use as a tool for real world enhancement, not digital compulsion. There are no vibrating interruptions, or the distracting beeps and pings of notifications. As such, the app does not participate in behaviours associated with problematic phone use. In our age of ubiquitous smartphones finding counter-narratives to resist youth participation in problematic phone use is a social responsibility. Problematic phone use is usually referenced to in context of social media as the addictive and habitual attachments between

mobile phones and their owners,[24] and while initial studies are not conclusive,[25] some researchers have linked smartphone use to mental health issues.[26] This responsibility is amplified in the consideration of children and youth's mobile phone use. Belk suggests that we identify with an object through how we control it.[27] When we consider how *HereWeArt* acts as a sort of social networking tool, it is in opposition to major social media platforms. *HereWeArt* prompts smartphone use in the context of art-based placemaking. Through the *HereWeArt* app smartphones are used as a local cultural networking tool.

There are identifiable challenges within creative placemaking projects: forging community partnerships, countering community skepticism, ensuring maintenance and sustainability, and avoiding displacement and gentrification.[28] *HereWeArt* provides an opportunity to explore these challenges from a variety of perspectives. First, *HereWeArt* involves the root of the community, children. Through contributing to neighborhood placemaking at this level we hope to develop long lasting and meaningful relationships between young people and their communities. Second, the AR component of *HereWeArt* places it into a discussion of digital sustainability, and subsequently sustainable and eco-friendly art. The app plays with multi-modal forms of expression, placing the physically digitized and digitally created artwork of children into an augmented digital reality. There is very little, if any, environmental impact in this placemaking process. Third, as an AR piece *HereWeArt* is inherently unobtrusive to its geo-located environment. The app operates as an invitation for community members to participate. It does not find itself physically imposed into an environment, it is an enhanced layer. This invitational aspect resists negative impacts of physical placemaking efforts which may not be desired by all members of a community. Fourth, exploring further benefits as an AR piece, *HereWeArt* does not change the tangibles of the environment in which it is found. Thus, it does not fall into the typical traps that instigate criticism for placemaking projects, such as gentrification, which usually stem from changes in the material aspects of a neighborhood. *HereWeArt* makes a place more livable, without leading it to become unaffordable.

CONCLUSION

Despite some expected difficulties in developing for the relatively new field of AR geo-located artworks, the application was able to be deployed for the Supercrawl 2018 art festival event with pending approval for iOS store and Google Play options to download. With the inclusion of willing children and youth in the front-end artistic development of content for the nearly unexplored avenue of AR geo-located artworks, *HereWeArt* is able to pose new options for experiential learning in mediated environments. It is also able to explore the conservatory practices of making and preserving art works for potential communities' historical and new media artworks' pedagogical purposes. Future expansion on works like this could include the use of more concise beacons in different, underutilized parts of urban locales for app-holders to explore in a less controlled environment, similar to data drops. Additionally, user participation could be expanded into a database to deploy related works to site-specific AR art. User participation could range from something similar to a collective of works that are able to be deployed, at the curatorial discretion of developers or mediators, at different beacons. This could involve people creating digital artwork submissions to a dropbox-type system and choosing where to deploy thematically appropriate art pieces into the digital sphere in order to be later seen in the AR camera view by others.

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CITY AND THE CINEMATOGRAPHIC MACHINE

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INTRODUCTION

This text will examine the allegoric concept of the cinematographic machine, which can be seen as autonomously constituted entities that are embedded in the phylum that construct the interplay between non-anthropocentric agency of media and human perception.[1] These cinematographic machines not only aid the understanding of a particular area in human sensitivity that deals with the urban everyday, but also play a crucial role in establishing the existence of such area all together. Their capacity to act stems from a recursive function consisting of anamorphisms (unfolding outcomes without a concept) and catamorphisms (folding outcomes into a concept), based on cinematographic percepts and agencies. As I have argued elsewhere, within this intensive and continues process, coagulations of actualizations arise that the human sensorium can detect as densities.[2] In this context the city shows a certain 'iridescence' of its urban agency: often densities (effects) are perceived as causes, and vice versa, whereby the elements perceived are not the elements that act by default.[3] Elements that construct our perception of the (built) environment) can be measured categorically, cartographically, volumetrically or in any other type of analytical scheme, yet that surpasses the most important elements that are being 'mapped' by our soma-aesthetic perception. Not only is the mental 'angle' of perception, which shows the 'iridescence' of the city, but also the salience of particular elements that gain considerable influence despite being insignificant on an analytical scale. These elements can be actualized, meaning consisting of matter (whereby time and space are part of matter) or virtual, meaning potentiality (whereby time and space are potential). Both types of elements have a strong affective agency and their influence on perception is depending on their (conditional) salience.[4] In this context the use of the terms past and future seems of lesser relevance than the affective effects the elements have: past events and the expectancy of the future can greatly influence our perception of the presence, both in an actualized or virtual state.

This perceptual playfield of the perception of urban daily life consists of a subjectively balanced, yet precise and subjective critical distances between on the one hand approaching life too near (with keywords such as perversion and melancholia) and on the other hand getting too far away from it (utopia/dystopia and indifference). Both positions are aionic states of time in the virtual, whereas the area in-between is an intensive and actualized becoming, including, but not equal to what is colloquially known as the aesthetic.[5] Given that daily life is the exception, rather than the norm of an outcome of all potentiality, it needs to be produced by a type of double helix of existence: one strand of actuality twisting around another strand of virtuality, both producing each other (both domains folding into each other). We - the mundane human receptor – can perhaps only witness this process if

we keep equal distance to both strands: that of getting too close and that of getting too far away from the exceptional state of the everyday. This 'area of operation' has no fixed or quantified demarcation, its definition is self-referential: it always contains more and less than the elements that are contained in its definition. This 'impredicativity' of the city thus simultaneously never and always defines what the area.[6] The cinematographic machine can aid us in that understanding, as it filters or polarizes the field of potential by adding a plenitude of dimensions, surprisingly reducing the number of outcomes dramatically.

PERCEPTION

Stemming from Affect Theory, a major prerequisite that will be made is that all reality exists of two parts: the actualized and the virtual.[7] Philosopher Gilbert Simondon's notion of *transduction* can be seen to describe the relation between the virtual and the actualised. As both exist in the relationship itself, there is no order or prerogative as neither is able to dwarf or to be overshadowed by the other.[8] The virtual is thus a contingent state for the actualized and vice versa. In this context everyday life is the exception, rather than the norm, of all contingent occurrences possible. Of all potential coagulations – both actualized and virtual – the everyday life is the most unlikely to occur: statistically every other (yet non designated or specified) outcome is almost infinitely more likely to occur than the one that we can detect. Yet still, within this actualization, there seems to be a second process of selection occurring: that of perception. This process involves the combination, recombination, interpretation and reinterpretation of all stimuli, both actualized and virtual. This might be an artificial division between actualization and perception: there is no ontological ground on which to claim that the actualization takes place without its perception, as this perception is never objective. To avoid getting drawn into the discourse on the (im-)possibility of unperceived existence, we need to reverse the argument: when dealing with everyday life that what is perceived is caused by a percept - actualized or virtual. In this context, perception is thus the qualifying hurdle for existence, albeit this does not need to be actualized or objectified.

Architectural philosopher Andrej Radman therefore states that: 'Experience is never *of* something, rather it *is* something.', as there is no predetermined or finalized actualization before it is experienced.[9] Radman's claim resonates with the Deleuze's concepts of difference; there is no identity, and in repetition; nothing is ever the same. We - the human spectators and actors in all this – can shift our perception from a subjective point of view to the embodied perception of the event itself by repeating and differentiating dimensions. Philosopher Gilles Deleuze summarizes this concept:

"I make, remake and unmake my concepts along a moving horizon, from an always decentered centre, from an always displaced periphery which repeats and differentiates them".[10]

In this process an 'unlimited finity' is produced by the addition of new dimensions that in itself produce a limited number of outcomes. This process works as a cinematographic machine which constructs our individual experience of an actualization known as the everyday life. Its cinematographic character is gained by the combination and recombination of information, sounds, visions, smells, tactile and haptic perceptions (in short; the full somaesthetic perception) and many more stimuli. The reason to involve the allegory of cinematographic machinery, lies in the potential fallacy of flattening the relation between the virtual and the actual to a system of cause and effect. Daily life (which is as argued an exceptional state of occurrences) is not a fixed outcome of cross-referenced potential in a deterministic way. It still involves many elements of anticipation, expectation and stimulation which find their origin in the virtual, without having to become part of the actualized. Hence we experience both 'more and less' than there is actually there. Philosopher Brian Massumi argues that affect is a threshold experience, a conceivable transition in everyday life, in which it is

inevitably embodied. Affects cause auto-responses in the body and thus circumvent consciousness.[11] A simple exemplification is the anticipation of an upcoming holiday that charges one's last days before summer with a special aura of excitement and energy, and in doing so charges the everyday situation in such way that work is done more efficient and pleasant, in its turn affecting others as well, who react positively to this energy, making work go faster and smoother, affecting oneself again, etcetera. Despite the fact that the holiday might never actually occur because of some unforeseen event. It is a butterfly-effect fading in- and out the virtual and actualized.

Media have been playing an increasingly growing role in this process, although they do not form a crucial element in the machine, as experience is not depending on media by default. As it is not my key objective to explore the role of media in this context here, it is important to regard most if not all encounters with the built environment as mediated, meaning that everything constructed conveys a type of (ideologic, plano-logic, historic or ego-logic) communication that contributes to the affective responses it provokes. Media are the bluntest in this regard, the built as such is no less effective though. Even – or specifically - when not perceived consciously, all and everything we encounter acts on us. Key to my argument is to make thus the fundamental shift from the anthropocentric supremacy of experience based on consciousness, to a multichannelled 'non-understanding' of perception that renders the everyday life into existence. This needs to be caused by affect and perceived to be effective, but not necessarily be understood or registered.

FOLDING

Philosopher Gilles Deleuze offers the concept of *folding*, that involves a 'doubling' or folding and unfolding of 'forces of the outside' to create an interior that is not an inside because of its contingent connection with the outside. In *The Fold* Deleuze majors three of these finitudes.[12] Philosopher Simon O'Sullivan elaborates:

"[] the concept of the fold allows Deleuze to think creatively about the production of subjectivity, and ultimately about the possibilities for, and production of, 'non-human' forms of 'subjectivity'. In fact on one level the fold is a critique of typical accounts of subjectivity - those that presume a simple interiority and exteriority (appearance and essence, or surface and depth) - for the fold announces that the inside is nothing more than a fold of the outside."[13]

The *fold* is partly caused and fed by the existence and actions of mediality in the actualization of the everyday.[14] The *cinematographic machines* are parables to indicate a process of folding of the virtual (as in the non-actualized), the mediality of events and perception as an act in the construction of everyday life. The *cinematographic machine* has the capacity to perform an oscillating reaction between producing outcomes without a concept (anamorphisms) and folding outcomes into a concept (catamorphisms) to construct the everyday. This Deleuzian 'fractal ontology' could also be seen as an activation of immanence, which specifically links the affective registers of non-human forces to the most fundamental languages such as coding, meta-linguistics and meta-stable systems.[15] These registers have enabled us to put an amount of trust in the 'un-sensible', which involves both a replacement of the senses and an adjustment of the 'sense ratio'- the ratio of the input of the individual senses in how we understand the world. An eye for an ear. Media theorist Anna Munster handles a similar relation between the materialized and the informational values of metastable media when she argues:

[T]he notion of the machinic is an expansive concept that draws elements such as the technical (including particular technologies like the digital) or particular social formations into its field to produce both an abstract *diagram* that traces the field of intensive relations between elements and an

actual *assemblage.* Machinism is therefore both an abstract and a concrete movement that operates between two limit poles: diagram and concretization.[16]

Machinic systems thus act without the need to establish their position in any ontological constellation. The fact that they act is sufficient to prove their position in the assemblage, the focus should not on the actors in this relation (senders or receivers) but it centres around the change of the 'information organism' itself. In this light, the concept of *folding* can be interpreted as the production of a cinematographic machine without any type of signification upfront: it is only the result that signify the events. For Deleuze and Guattari, organizations of signification reinforce expression on one side and reinforce content on the other side. This is not a metaphorical enterprise as Deleuze and Guattari emphasize:

'The diagrammatic or abstract machine does not function to represent, even something real, but rather constructs a real that is yet to come, a new type of reality.'[17]

The signification itself takes place when the folding forms a multiple helix which constitutes the emergence of the exceptional state of being (both actualized and virtual) that we call the everyday. Laying emphasis on perception as an act, rather than its signification, enables the process of directly perceiving the impredicativity of the urban fabric, however, laying the emphasis on the machine that performs the perception, exposes the fragile and unstable middle ground called the everyday without being diverted by its iridescence.

THE MACHINE

Perception as an act brings a multitude of impressions which cannot be placed under the umbrella of everything already known, forcing the individual to rethink and redevelop 'basic' modes of thought and understanding. Following psychologist Leon Festinger's concept of cognitive dissonance - which focuses on how humans strive for internal consistency - this rupture could cause a massive internal friction. I would call this an *anamorphism*, an unlimited spray of outcomes that do not have any shared central logic or overarching concept. Anamorphisms differ from the process of 'deterritorialisation' developed by Deleuze and Guattari in the sense that they do not necessarily work on any predetermined or defined body: the territory.[18] It is the sheer production of new thought, affect, perception, somaesthetic experience. Festinger already argued that the 'internal frictions' caused by cognitive dissonances are very likely to be 'compensated' by the mind rather than to cause a change of the mind. This might be applicable on an individual level, yet that would not account for the collective development of our relationship with (mediated) experiences.[19] Despite the resistance of individuals to resist internal friction caused by conflicting information as Festinger argued, seen on a scale of 'the population' it is clear that changes can and will occur. This is a force I would call a *catamorphism*, this means the folding of 'unrelated outcomes' into a new concept, obviously connecting them by a new definition and in doing so creating a new internal stability. This can best be measured by the affective qualities these outcomes produce, which are affective chains that are highly significant, yet signify nothing. Such chains can also be found for instance in the formation of (domestic) traditions or rituals. To give a highly simplified example of the latter; at first 'random' elements are incidentally produced (anamorphism): We have gone swimming, walk home because the bicycle tire is flat, it starts raining heavily although sun was predicted, we find an abandoned yellow umbrella, seek shelter under a big tree, hear slivers of a specific song floating through the park, eat falafel to strengthen the soul and envision the next holiday destination to feel warmer, in the end it was a beautiful day. This highly affective chain of events can be long remembered and cherished. Therefore, later these elements would be catamorphized and folded into a ritual: we always discuss the next holiday after swimming under the special umbrella whilst eating falafel and listening to that

specific song. Obviously, the original affective elements had been connected randomly and perhaps any substitution of an element could have had the same effect, or completely not. Any perception of 'what was crucial' in that day could differ completely, and that would only the smallest part of it. All non-actualized agencies, such as anticipations, connotations, aspirations, connections (to thought, memory or imagination) and many more had an effect on the event as well. This *assemblage* was defining itself by unfolding and could never be repeated again. Its catamorphism into a ritual is an attempt to preserve the un-preservable, at best the repetition of the ritual would produce a new set of non-actualized agencies. This is the impredicativity of the formation of perception: any definition is more and less than the set of its elements. In any case, in daily life many of these affective chains are formed unnoticed, they do not stand out because they are not separate from daily life, yet they are the very fabric of the everyday.

EVERYDAY

The events in the last example are utterly cinematographic by nature, they recombine, add and subtract different percepts in order to create a specific perception. These chains are produced, induced, absorbed and reflected in a nebula of both human and non-human forces, equally displaying their affections and desires in a recursive complexity that holds no internal hierarchy. This process is highly cinematographic because it is an edit of events, movements, visuals, sounds, atmospheres, percepts and somaesthetics generating affective perception. It is for this reason that the cinematographic machine is at the core of the building of our everyday life: all and everything within our experience is a *montage*, it is edited and signified through the addition of a multitude of dimensions: connecting two or more unrelated events, reversal of cause and effect, transposal of affect (music whilst riding a bike for instance), fastforwarding or skipping events, loss of memory/gain of imagined potential (daydreaming), combining several affects in an a-synchronized way, combining the far and near (through media for instance), recombining the actualized and actual (through imagery for instance) and so on. We limit the actualization that is called everyday life, very much similar to the way a *montage* (not edit) of film produces cinema by the limitation of the majority of events. The cinematographic machine works autonomously and provokes encounters with the forces and desires of other elements (human, non-human, non-biological, non-actualized) in the area that it defines itself. As argued before, potential does not have to be actualized to have an effect; there are many forces in daily life that draw their strength from potential without ever having to be actualized, among them are chance, risk, leverage, anticipation, longing, and so on. These forces can be grounded in moral and religious codes, traditions, laws, memory or other 'distant' yet present actors that create a fear of retaliation or exclusion (the Lacanian Other, *der Andere*); but perhaps even more often, they emerge from the individual psyche (the Freudian other, *das Andere*). [20] It is most probably precisely because these forces are not actualized, that they are able to gain significant strength and impact. And it is exactly this formation and non-formation of properties that we call everyday life.

Another definition of the everyday is supported by the element of time. Although widely supported, the acknowledgment of the existence of a phylum that enables space-time to convert both elements in a non-universal and interdependent way, lives mainly in academia. In daily life the use of a four-dimensional system is still the basis of our 'navigation' through events.[21] In this specific context, the virtual can allegorically be regarded as a 'place' in which events are not subject to chronology, literally waiting to happen.[22] The position of static and non-linear time is called aion, which is time before its unfolding in some type of chronology. Philosopher John Mullarkey explains:

"Deleuze talks of the paradox of the present as the need for a time in which to constitute or synthesise time (as the succession of past, present, and future): "there must be another time in which the first

synthesis of time can occur". This time, moreover, cannot be time understood as succession, as change or tensed, for this would just bring us back to the question of how and where such a time was constituted, how did it flow. Rather, it is empty, the time of eternity—what Deleuze calls the Virtual or Aion." [23]

Within this potential of events 'waiting to happen', we can 'see' two psychological directions, which are both infinite in distance and finite in perceptibility. They are significant because pondering in either direction too far causes the cinematographic machine 'to spin out of control'. One direction is the movement towards nihilism, with 'stops' at utopia, dystopia, indifference and absurdism. Travelling here will render all value to nil as the scale of thought becomes much bigger than the scale of our individual lives. It is a self-destructive road as any progress undoes the previous. The other direction is towards the minute, towards the ultimate perversion of understanding, which is destined to end in a type of self-imposed fascism. In this track we encounter fetishism, melancholia, religion and other bifurcations of control, causing a loss of scale ultimately based on a conflict within *'das Andere'.* Obviously, the question arises how far one needs to go on either road in order to disrupt the cinematographic machine to produce other things than the everyday, but this is fallacious reversal of the concept. The everyday is defined by *what is left over*, the area that is not exploited and dominated by either of the directions, as both directions are very well capable of producing violence and destruction. It is the 'unlimted finity' produced by perception through the cinematographic machine that is bearable and sane because it is liberatingly limiting and comfortably claustrophobic. The number of components involved is (in contrast to the *fold*) no longer infinite but involves a 'finite number of components produce an infinite number of combinations'.[24] The everyday is thus a balance between exceptionally powerful forces, yet itself is the exception, it is the catamorphism of perception in order to perceive a logic that in itself is not logical.

CONCLUSION

I argue that in everyday life, the abstract machine that produces unlimited finity is the cinematographic machine. It is capable of both limiting the number of potential outcomes without any predestination ('unlimited finity') as well as producing affects that construe (not represent), the area in which human sensibility and non-antropocentric agency meet.

Through the introduction of an area that is a contingently meta-stable product of exceptional actualizations of an overwhelmingly greater field of potential, called the everyday life, we have been able to detect the workings of the allegoric *cinematographic machine* that filters and forms the perception of that area, and by doing so establishes that area all together. The tensions and frictions erupting from the actions of these *cinematographic machines* produce, new and unprecedented events (anamorphisms) emerge that indicate an existence of a non-essentialist smallest denominator (the catamorphism). The influence of these forces is non-linear, yet radical and rests on non-local causalities and contingencies. These systems are meta-stable and indicative and can be named a *folding* of actualized and non-actualized forces that act in correlation to each other's actions. In the middle of this meta-stabile force, the balances shift from a significance on basis of codification, situation, commodification and signification to a significance of affects and capacities.[25] Hence, the cinematographic machine is a non-anthropocentric trope that is engrained in human perception in order to produce the extraordinary state of everyday life.

NOTES

[1] For an extensive theorizing of the concept of the desire of the medium, see Marc Boumeester, *The Desire of the Medium* (Arhem: ArtEZ University Press, 2016).
[2] Marc Boumeester, "Un-framing Reality: Sets of Intensities as Smallest Common Denominator in Film and Architecture" in *Architecture Filmmaking*, ed. Igea Troiani (Bristol: Intellect Publishers, 2019), 255-266.
[3] Iridescence or goniochromism is an optical effect which causes surfaces of objects to change color with the viewpoint of observation and the slant of illumination.
[4] The salience of elements that are perceived is caused by a number of effects. For instance, elements that are placed out of context tend to stand out (cognition rupture) as well as elements that have recently gained significance (the Baader Meinhof effect) or that are deeply rooted in our previous experience (affective recognition). In the same way that the human eye is most receptive to light at a wavelength of 555 nanometers (bright green) at daytime and yellow at low light conditions, the salience of perceived elements is conditional.
[5] John Mullarkey,"Thinking Time Beyond Philosophy: On Widder's Nonsense of Time" in *Parrhesia* No. 9. (Melbourne: Melbourne School of Continental Philosophy, 2010), 52- 54.
[6] Andrej Radman and Marc Boumeester, "The Impredicative City: or What Can a Boston Square Do?" in *Deleuze and the City*, ed. Hélène Frichot (Edinburgh: University of Edinburgh Press, 2016), 46-63.
[7] For an introduction on Affect Theory see Melissa Gregg and Gregory J. Seigworth, eds. *The Affect Theory Reader* (Durham: Duke University Press, 2010).
[8] George Simondon, "The Genesis of the Individual', trans. by Mark Cohen and Sanford Kwinter in *Incorporations*, ed. by Jonathan Crary (New York: Zone Books, 1992), 296-319.
[9] Andrej Radman, *Gibsonism* (Delft: Delft University of Technology, 2012)
[10] Gilles Deleuze, *Difference and Repetition* (London: Continuum, [1968] 2012), XXI.
[11] Brian Massumi, *Parables for the Virtual: Movement, Affect, Sensation* (Durham, NC: Duke University Press, 2002),195.
[12] Gilles Deleuze, *The Fold: Leibniz and the Baroque* (Minneapolis: University Of Minnesota Press, 1992).
[13] Simon O'Sullivan, "FOLD + ART + TECHNOLOGY." in *The Deleuze Dictionary* ed. Adrian Parr (Edinburgh: Edinburgh University Press, 2005),105-115.
[14] Gilles Deleuze, *Foucault* (Minneapolis: University of Minnesota Press, 1988),131 and Gilles Deleuze, *The Fold: Leibniz and the Baroque* (Minneapolis: University Of Minnesota Press, 1992).
[15] O'Sullivan continues: 'Deleuze, it [the superfold] will be the result of three 'future' folds: the fold of molecular biology - or the discovery of the genetic code; the fold of silicon with carbon - or the emergence of third generation machines, cybernetics and information technology; and the folding of language - or the uncovering of a 'strange language within language', an atypical and asignifying form of expression that exists at the limits of language.' Simon O'Sullivan, "FOLD + ART + TECHNOLOGY." in *The Deleuze Dictionary* ed. Adrian Parr (Edinburgh: Edinburgh University Press, 2005),106.
[16] Anna Munster, *Materializing New Media; embodiment in information aesthetics* (Hanover: University Press of New England,2005), 35.
[17] Gilles Deleuze and Felix Guattari, *A Thousand Plateaus. Capitalism and Schizophrenia 2* (Minneapolis: University of Minnesota Press, 1980), 142.
[18] Gilles Deleuze and Felix Guattari, *Anti-Oedipus; Capitalism and Schizophrenia*. (Minneapolis: University of Minnesota Press, 1983).
[19] Leon Festinger, *A Theory Of Cognitive Dissonance* (Redwood City: Stanford University Press, 1957).
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[21] Sean Carrol, *From Eternity to Here, The Quest for the Ultimate Theory of* Time (New York: Dutton Publishing, 2010).
[22] Marc Boumeester, "Eight avatars of time; An affective-temporal taxonomy of the epistemology of time beyond chronology." in *Parse* ed. Dave Beech (Gothenburg: University of Gothenburg Press, 2017), 132-145.
[23] John Mullarkey,"Thinking Time Beyond Philosophy: On Widder's Nonsense of Time" in *Parrhesia* No. 9. (Melbourne: Melbourne School of Continental Philosophy, 2010), 52- 54.
[24] Gilles Deleuze, *Foucault* (Minneapolis: University of Minnesota Press, 1988),131.
[25] For an extensive exposé of the system of codification, situation, commodification and signification, see Marc Boumeester, *The Desire of the Medium* (Arhem: ArtEZ University Press, 2016).

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THE ORIGIN OF THE SUSTAINABLE CITY: GARDEN CITIES OF THE PAST, PRESENT AND FUTURE

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INTRODUCTION

Why analyse the history of the Garden City? Because despite its conceptual non-fulfilment in its materializations, its ideological and morphological conceptual success is undeniable. In a world stressed by problematic issues of overpopulation, access to housing, mobility and ecological collapse, the Garden City continues to represent a possible sustainable solution to all these problems. From the proposal of the Garden City by Ebenezer Howard in 1898,[1] to the project of The Orbit presented in 2019 by the Canadian architecture studio Partisans, more than a century has passed, during which time the concept of the garden city has been developed, analysed and criticized *ad nauseam*, both in its morphological dimension and in the multiple theoretical aspects that make it up, encompassing historical, economic, ecological, ideological and sociological aspects, but that despite its patent failures to materialize the original idea, continues to exert a collective fascination that allows it to continue in full force today.

Using a comparative methodology, we can perceive with the naked eye the historic and global impact of the morphology of Howard's diagrams, whose preference for the circular layout –so that the town centre can be easily reached by all its citizens– can be seen reflected both in later examples and in historical prototypes of concentric cities, both built and imaginary. But beyond the appearance of its streets, we can find references in conceptual aspects in the projects recently presented in ideas such as the union of the country and the city, illustrated in Howard's work with the diagram of the third magnet, whose antecedent can be found in recognized authors from various ideologies, such as in the highly influential texts written by the anarchist Kropotkin,[2] and which is described in the project presentation brochure of the Canadian office mentioned at the beginning, where it says: "The Orbit is our vision for a complete, cutting-edge community where our small town and rural lifestyles are enhanced by the benefits and attributes of urban living".[3]

This time, the Garden City of the past is presented as the sustainable city of the future, and we can see that its influence reaches multiple corners of the world and is presented in different aesthetics that reference the past and a possible future.

FUTURISTIC MODELS FROM THE PAST

Ebenezer Howard's idea, illustrated conceptually by the well-known three magnets image from his book, where he showed the benefits of fusing the best of the urban and rural modes of living, has been used and abused for over a century, and nowadays it's been adapted once again to represent the sustainable city of the future. But this time, sustainability is not only linked with tradition, but with state-of-the-art technology as well.

Technology and architecture have always had an intense love relationship when it comes to representing the city of tomorrow. One very relevant and visually futuristic representation of this notion can be found in an illustration from 1910 by Eugène Hénard, a visionary from the beginning of the 20th century, titled *Une ville de l'avenir, vue ä vol d'aéroplane*, where we find elements such as high-rises, ample avenues and the importance of transport (including aerial) when planning the city of the future, all elements taken into account in present developments.

Other models from the nineteenth century that intended to unite town and country, such as Arturo Soria's Linear City or Ildefonso Cerdá's plan for Barcelona are being updated as well. One of the main differences between Howard's idea and that of these urbanists is that in both of the Spanish plans, the proposal was to present a model that was integrated in the existing city and limitless, more in accordance with the capitalist metropolis. Instead, the British proposal insisted on the concept of a limit in size and a limit in the number of citizens that could live in these communities, and it's this concept that is tied together better with the principles of sustainability. Related to Soria's design we find The Line,[4] in Saudi Arabia, a proposed smart city for one million people that will preserve 95% of the natural surroundings. With no cars but with ultra-high-speed transit and zero net carbon emissions, is presented as a city for the future but with a plan anchored in ideas present more than a century ago. And in Barcelona, the much-celebrated concept of the *supermanzana* o *superilla*[5] is being recovered to fix the damage done by the alterations to Cerdà's original project, and presented nowadays as a revolution for a greener city.[6]

THE ORBIT: THE FUTURE SHAPED BY THE PAST

One of the most recent proposals that takes Howard's concept as a model and brings it to the 21st century is The Orbit. So, what is The Orbit? The Orbit is a project by Partisans, an architecture studio based in Canada, developed together with the Cortel Group.[7] The description of the project says it will be "a cutting-edge new central neighbourhood for the Canadian town of Innisfil, designed in response to the arrival of high-speed mass transit that connects to downtown Toronto". The Orbit will be located 60 km north of Ontario's capital, and this area is already "one of the fastest-growing communities in the region as people seek more affordability outside of the city" and it will accommodate a population of up to 150,000 inhabitants. The province has a Transit Oriented Community program with a new GO Train Station that will start construction supposedly next year, which will inevitably lead to further major growth in population.[8] Let's point out that the architecture studio refers to it as a neighbourhood and the town of Innisfil simply as a forward-thinking community, but the press defines it as a smart city or a green city of the future.[9]

The place chosen for the development, even though it's apparently a rural town, has a history of progressiveness regarding new modes of communication and transport, since it accepts cryptocurrency for payments for city services and taxes. It was also one of the first towns to test out Uber.[10] The Orbit is presented to have leading-edge technology to create a city that is more accessible and sustainable, with a plan for mass fibre optic cable systems that will provide connectivity across sidewalks, streets, and buildings as well considering future forward concepts such as drone ports and self-driving cars to anticipate future development over the longer term. The idea is a new

technological version of a rustic lifestyle with the benefits of urban living, it says it has the capacity to expand but preserving the agricultural and natural lands. Once again, Howard's three magnets become relevant in the 21st century.

So here we have a presentation that relies on technology as its big selling point. Apart from the aesthetics, high-tech is what makes it futuristic. But when we look at its concept and morphology, inspiration from Howard's idea is more than evident, and it's not something they hide, since they describe it as an extension of the Garden City tradition. And even though the mixture of the circle and the square in the shape of its grid –what they call *squircles*– is defined as innovation, we can see the result it's a classic shape for new settlements, with a concentric plan that was present also in Howard's diagrams –a social diagram that became a physical diagram– and description of its organization, even if they were not meant to be a literal illustration of the building plan. Of course, it is also found in other examples related to the Garden City, such as in Raymond Unwin's drawings, like in the illustration inspired by Howard's 'Social City' from the pamphlet Nothing Gained by Overcrowding. Unwin was the planner –together with Richard Barry Parker– of Letchworth, the first of a long line of garden cities. But it is also present many times throughout history, like in famous older historic models such as Vitruvius' octagonal ideal city, Filarete's Sforzinda, Karlsruhe or Palmanova. It's a form we also find in more recent utopian models like the alternative and sustainable community of Auroville, in India, founded in the late 1960s, that is having a resurgence and is becoming worldwide known.[11]

FUTURISTIC GARDEN CITIES IN OTHER PARTS OF THE WORLD

Even though the Garden City model is an idea better adapted to the Northern European tradition and also to the urbanistic development of North America, it's also present in the southern hemisphere and in the Mediterranean countries, as it constitutes a way of live that seems attractive and aspirational to a large chunk of the population. In Spain, the Garden City Movement has never really been materialized in the way that Howard intended, but there are certain colonies that were named garden cities in different parts of the territory.[12] There were also important figures in the history of urbanism that tried to make known this kind of development, like Cebrià de Montoliu, a big anglophile that founded the Societat Cívica La Ciutat-Jardí in 1912.[13] Later on, while the New Towns were being developed and built in the UK, at a time when multiple futuristic utopias where being presented by different avant-garde groups such as Archigram, in Spain, while the country lived under a dictator, we find proposals like that of the architect Miguel Fisac, called *The Urban Molecule*,[14] published in 1969, were we find many similarities to Howard's project and also to The Orbit, except that in the former case, Fisac also suggests to change and adapt existing large cities, to make them healthier and more efficient, as well as building them from scratch to house the increasing population. In his proposal, inspired by the teachings of his urbanism professor, César Cort, who wrote a book titled *Urbanized Fields and Rural Cities* (1941),[15] Miguel Fisac proposes a city limited in size, were the contact with nature is essential, where its citizens would be able to walk everywhere, connected by rail and with all the services for everyday needs. There would be tall buildings to house a population of maximum 600,000 people. These would have between four and eight floors, but there would be also single-family homes. Pedestrians and vehicles would be separated, and he even thought about adapted terraces for the air traffic of the future, just like we've seen in Hénard's illustration as well as in the Canadian example.

Other recent proposals for new garden cities or suburbs all over the world change in scale but have acquired a certain look, that is less vernacular or modernist and more Scandinavian, that makes sense in places like Denmark, with projects such as Effekt's Naturbyen project,[16] but that has become

appealing to be placed anywhere in the world, like Valenmtino Gareri's 3D printed Sunflower Village,[17] or adapted to the Mediterranean needs, such as a new neighborhood in Valencia called La Pinada, that looks like something built in Copenhagen instead of in Spain. It's co-created by its future inhabitants, but it's not a bunch of hippies, since its founder, Iker Marcaide, created Flywire, a start-up company valued in 3,000 million euros and who has launched a venture capital fund for green projects.

THE HIGH-RISE GARDEN CITY

Garden cities and suburbs have been blamed for the never-ending sprawl, which meant extensive use of land and car dependency, so the new garden city models, such as The Orbit, marketed as Rural Re-Imagined, have incorporated the high-rise as a sustainable solution, trying to merge what James Wines drew in the 1980s with the sci-fi options shown at the New York World's Fair of 1939, named aptly World of Tomorrow, or those utopias that surged after World War II, like the drawing of the Aerodynamic Radial City by the architect Casto Fernández-Shaw from 1951, where citizens returned to the countryside and modern locomotion would link residential areas with the city. This rounder futuristic aesthetic of what a green city should look like has a continuation in recent proposals, such as those imagined by Vincent Callebaut for the Paris of 2050.

The idea of a modern city with tower-like buildings surrounded by greenery is certainly not new and can be found in famous examples like Le Corbusier's visions or Hilberseimer's *Urbs in Orto* from his book *The New City*, from 1944, and in drawings such as in *The City in a Landscape*, a plan for Chicago to have housing in a garden setting, a metropolis that coincidentally also served Howard as an inspiration. In the United States, they had fascinating suburban developments like all the residential parks in the Garden State during the Progressive Era, that have been the model for many suburbs, or the famous example of Radburn, founded in 1929 and designed by Clarence Stein and Henry Wright. It was described at the time as a "garden city for the motor age", but stripped of the collectivist principles of the original garden city. These two planners, together with Alexander M. Bing, designed in 1923 a Garden Community in the New York City Region, where they used the word "progress" to define the evolution from the detached single-family house, through row houses to multi-family houses of various heights.[18]

In the Orbit, we no longer find quaint cottages surrounded by their own private garden. Not even popular neo-traditionalist models such as those proposed by Leon Krier, creator of Poundbury. Here, when we leave the aerial view and land at street level, it's a certain look that seems repetitive in today's projects. We have to take into account that Canada has managed to make the high-rise a liveable option, where cities like Vancouver are always at the top of the charts of every classification of the best cities in the world, where the integration with nature, mixed-used neighbourhoods, ample public spaces and dynamic lifestyle set it as a very successful example of modern living. Also, Singapore has become a trade-mark for a dense, trendy and green city, but there are thinkers, such as the philosopher Thierry Paquot,[19] that as well as emphasizing the regional model as the best ecological option, also suggests that to make a city friendlier and more pleasant, buildings shouldn't be more than four or six floors in height.

CONCLUSION

There is a booming of new cities and neighborhoods. They are being developed everywhere with technology at their center point, and many of them are labeled *sustainable*. We already have built examples such as the smart cities of Songdo or Masdar, both of them not exactly a success so far. Or projects meant to be built in the next few years, such as BIG's 'city of the future' for Toyota[20] or

Norman Foster's project in Amaravati, India.[21] We can also find polemic developments by private enterprises linked to the technological world, like Elon Musk's plan in Boca Chica or Apple's development in Raleigh, North Carolina, that in a way are a reminder of the paternalistic and controlling tendencies of 19th century company towns, but with a touch of elitism and a lack of consideration for those outside those communities. Also, the results of these projects when they are built don't always live up to the hype, at least in the short term, and we have to wonder what kind of technology will really make our cities resilient to the challenges we are facing now and in the near future, how will we solve and adapt to climate change, how will we confront the growing population, the diminishing biodiversity and the increasing inequalities.

Present and future projects for the city of tomorrow take into consideration many every-day problems that cities and its inhabitants have, and it is interesting how technology can improve our lives, but the kind of technology proposed for these communities doesn't change the bigger problems that we need to face, like the global housing crisis. It's good that in The Orbit's statement it says that it will provide housing for those who would normally not be able to afford it. We'll see if this becomes true. These kinds of projects are a solution to create an attractive and well-designed environment with great transport and perfect digital connections, but normally they are destined for middle-class inhabitants in rich countries, which is actually what critics have always said about Howard's Garden City. Some say what we need are low-tech solutions, like those researched by Julia Watson,[22] that don't become obsolete quickly and that are easy to construct and to maintain everywhere in our planet. But we must remember that central to Howard's concept was the idea of community-owned land, and this is a principle that has never managed to materialize and that would make any built project much more revolutionary.

The persistence of the Garden City model and its metamorphosis and evolution throughout the decades is obvious. It's influence in every corner of the world throughout the twentieth century it's undeniable. Even if we look to the future in the form of new modes of technology that intend to make our lives easier, we seem to dive into the past for models and recurring ideas,[23] such as the importance of the contact with nature and the relevance of having a healthy environment, or even the practicality of collective transport, as the inspiration for the resolution of our repetitive and never-ending urban problems.

NOTES

[1] A digital copy of the first edition of Ebenezer Howard's book has been consulted for this paper, but also three later editions from 1902, 1965 and 2003.
[2] Piotr Alexejewitsch Kropotkin, *Campos, fábricas y talleres*, Madrid: Júcar, 1978.
[3] There are numerous articles online about this development, but the basic information can be found on the architecture studio's website and also in the website of the town where the development will be constructed, Innisfil:
"Innisfil: The Orbit", https://live-partisans.pantheonsite.io/project/innisfil-the-orbit/.
"The Orbit: Innisfil", https://innisfil.ca/orbit/.
[4] "The Line", https://www.neom.com/en-us/regions/whatistheline.
[5] "Superilles", https://ajuntament.barcelona.cat/superilles/en/.
[6] Such as in Gabi Martínez's recent book, *Naturalmente urbano*.
[7] "The Orbit", https://cortelgroup.com/theorbit/.
"Innisfil's Newest Development *The Orbit* is Out of this World", https://cortelgroup.com/news/innisfil-newest-development-the-orbit.
[8] The transport hub as a way of urban planning has worked well in countries such as China, with an enormous population growth; The Netherlands, a country with a great spatial policy; or Japan, this last one a clear example of not promoting the use of the private car in its big metropolitan areas.
[9] A simple search in any engine will show multiple results from all over the world, from Canadian media, to specialized websites, such as Arch Daily, to Spanish online newspapers.
[10] They even used it to replace public transport, which can seem problematic. See: Leyland Cecco,"The Innisfil experiment: the town that replaced public transit with Uber", The Guardian. *The Guardian*, (July 16, 2019).
[11] Anupama Kundoo's successful Wall House is in Auroville, and BuzzFeed prepared a documentary about the community in its *Follow This* series titled *India's Utopia*, available on Netflix.
[12] Eduard Masjuan Bracons, «La ciudad-jardín o ecológica contra la ciudad lineal: Una controversia histórica», *Ecología política*, n.º 10 (1995): 127-40.
[13] Horacio Capel, *La morfología de las ciudades. I, Sociedad, cultura y paisaje urbano*, (Barcelona: Ediciones del Serbal, 2002). It's also interesting to see how the anarchist movement in Spain was favorable to the Garden City ideal: Eduard Masjuan Bracons, *La ecología humana en el anarquismo ibérico: urbanismo "orgánico" o ecológico, neomalthusianismo y naturalismo social*, (Barcelona: Icaria, 2000).
[14] Miguel Fisac Serna, *La molécula urbana: una propuesta para la ciudad del futuro* (Madrid: EPESA, 1969).
[15] César Cort, *Campos urbanizados y ciudades rurizadas* (Madrid: Federación de Urbanismo y de la Vivienda de la Hispanidad, 1941).
[16] "Naturbyen", https://www.effekt.dk/naturbyen.
[17] "Sunflower Village", https://valentinogareri.com/Sunflower-Village.
[18] Bing, Alexander M., Henry Wright, and Clarence S. Stein, *Preliminary study of a proposed Garden Community in the New York City Region*, 1925.
[19] Thierry Paquot, "High Rise, Low Spirits", *Le Monde Diplomatique*, March 1, 2008, https://mondediplo.com/2008/03/15towers.
[20] "Toyota Woven City", https://www.woven-city.global/.
[21] "Amaravati Masterplan", https://www.fosterandpartners.com/projects/amaravati-masterplan/.
[22]Julia Watson y Wade Davis, *Lo-TEK: design by radical indigenism* (Cologne: Taschen, 2019).
[23] Even BIG's latest book, *Formgiving. An architectural future history*, takes a look into the past to explain how the future will look like, and past examples of utopian cities, such as those proposed in the Soviet Union or Ford's Seventy-Five Mile City, are techno-cities that wished to be defined by technological progress but where its citizens would live in a rural setting.

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AMBIGUOUS ASSEMBLAGES: THE SUBLIME IN ARCHITECTURAL NARRATIVES OF HYPERREAL FOLLIES

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INTRODUCTION

Hyperreal architectural assemblages are pervading our daily experience and progressively disrupting our spatial practices. Thought-provoking paradigms using VAM (virtual, augmented and mixed) realities profoundly transform our perception of space, ascribing new spatial qualities to architecture. Instantly activated digital spatial transductions juxtapose, superimpose, permutate and blur the elements of incompatible systems producing spatial assemblages with powerful emergent properties.

Long before digital augmentations, creative practices widely experimented with transductive techniques. Numerous architects, artists, and photographers, such as Giovanni Battista Piranesi, László Moholy-Nagy and Aldo Rossi, and visual arts movements and styles, such as dadaism, surrealism and cinematographic montage, have used representational means to produce speculations in the form of hyperspatial assemblages. Recently though, assemblage research by artists such as Laurent Chéhère, Dionisio González and Noémie Goudal has deployed digital technologies to challenge "reality" by recreating, manipulating and "agencing" [1] spatial qualities that redefine the way we sense, conceive, and perceive space. These artists have in common the prolific production of distinctive works that we propose to call *hyperreal follies*: instances of imaginable futures that offer recombinant, translocalised and deterritorialised visions.

This paper discusses hyperreal follies as artworks that explore the creative power of hyperreality through the most accurate technique of visual reproduction, photography. It aims to shed light on the fundamental connections between analogue and digital creative practices, and to describe what enables photographers to produce assemblages of particular relevance for architecture: *the sublime*.

The sublime, though, is not intended as the superlative or the lofty, but rather as the embodiment of both the fabulous speculative and the awful reinterpretive. Such sublime, in the reading of the follies, is the engagement with the real through the production of fictitious spatial qualities that decode and deterritorialise buildings and environments to constitute assemblages differentially emplaced, synchronised and considerately set within *othered* mundane landscapes. Sublime hyperreal follies are made of components manifestly disembodied from their original contexts to annihilate their beauty, as ascribed by Edmund Burke,[2] and provoke astonishment and mystery, albeit, as Kant[3] observed, appealing to the realm of the "idea" of the sublime rather than the "object" representing beauty.

The approach by which these assemblages are interpreted is dialogic, manifold and heterologous. It firstly addresses the terminology and meaning within the field of art theory that ambiguously

distinguishes, as near-synonymous, pastiche, montage and collage, and assemblage.[4] Insights and readings of their multiple components, sets of relations and narratives will depend on the specific intent and the designated output of each representation. Case studies and analytical methods vary to cope with plural and instable sources, techniques and meanings that often belong to the ever-transforming electronic space where spatial properties are in continuous becoming. Comparative analysis is used to detect differences and repetitions among key *actants* (people and objects), relations and themes of the assemblages. It is anticipated that there will be commonalities across the case studies as well as a new narrative with which to investigate the significance of these works. The Deleuzian concept of "assemblage" (agencement)[5], is used to disentangle the representations of hyperreal follies and expand the understanding of their spatial qualities. This enables a focus on the emergent properties of concatenating heterogeneous elements of the hyperreal follies, which belong to systems liberated from rigid and unproductive relations, by foregrounding the effects of their deterritorialised associations.

Figure 1. Dionisio González, Inter-acciones 8 (2013)

Ambiguous Space

Photography and architecture share an uneven symbiotic co-dependent relationship. While architects progressively use photographic imagery to showcase and describe buildings for actual construction plans, the images used in their presentations abound with hyperreal images that do not require plausible spatial constructs. Such a relation between architecture and photography has profoundly revised the "telegram-approach" montage of the visionary architecture of the 1960s and 1970s. The new hyperreal follies have furthered that approach, which is epitomized by the collaged assemblages of Hans Hollein's *Aircraft Carrier City in Landscape*, Archigram's *Instant City*,[6] and Rem Koolhaas, Elia Zenghelis, Madelon Vriesendorp and Zoe Zenghelis's *Exodus, or the Voluntary Prisoners of Architecture*,[7] by bringing the visionary dimension to the core of the creative production process.

Admittedly, the lineage of such vanguards can be found in contemporary spatial constructs created by subversive photographers, the likes of Chéhère, González and Goudal, who break the normative boundaries of their discipline. With the introduction of incompatibilities, disturbances, uncertainties and conflicts, these authors force the viewer to reappraise and rethink their relationship with the partitions, systems, and values of their societal, environmental and cultural existential condition. Yet, by creating multi-referential, multi-scalar and multi-narrative spatial instances, their speculative-

hyperreal spatial constructs move beyond the elements of plausible buildings, creating objects, relationships and manifestos characterised by unlimited openness, multiplicity and recodeability.

This paper ventures into the spatialities of these subversive photographers to explore the unique deployment of their "transductive method." This method, which we define as a *creative despatialisation*, was initially described by Gilbert Simondon and latterly by Paulo de Assis and David Scott [8] as a means to restructure given systems by suffusing iterative processes that produce consistent domains with incompatible juxtapositions of heterogeneous elements. This method allows photography to produce innovative spatial conceptions of great importance for the field of architecture. On the one hand, architectural photography contributes to the deployment of complex representative methods that use new technologies to blur the boundaries and operate in the liminal space of the progressively digitally augmented architectonics. On the other hand, photographic representation enables seamless merging of the opposite realms of material structure and digital construct into hyperreal formations of hybrid utopia, as elaborated by Cristian Farinella and Lorena Greco, and Luis Miguel Lus Arana. [9]. Such hybridity of the representative and representational spatial-conceptual nexus makes the photographic representation of the hyperreal sublime follies a unique, yet *inconsequential* laboratory for the novel representation of space: an uncharted heterotopic topoi where discourses on spatial emplacement and temporal synchronization have the potential to affirmatively sublate the limits of the sublime.

Through a visio-centric analysis of these purposefully manipulated images, we study the visual elements, relations and narratives of the hyperreal follies and describe their deliberate abandonment of any formal attempt of documenting "objectively" actual architectural spaces. On the one hand, the affirmative sublation builds upon critique of the "functionary" role of the photographer by Vilém Flusser, [10] who submits that an inescapable hierarchical relation of power between the author and the audience prevents any documentary non-judgmental viewpoint. On the other hand, this sublation brings to bear the emancipatory power of representation. It uses the capacity of imaginative appropriation to subvert the illusory eye and gaze of the objective representation that, as Henri Lefebvre posited, "fetishises abstraction and imposes it as the norm. It detaches the pure form from its impure content—from lived time, everyday time."[11]

The multiple relationships created by the hyperreal follies produce new understandings about the production of placeness in the hybrid spatialisation of actual and digital age. In Lefebvrian terms, the layer of the photograph as an expression of the "lived" and emancipatory experience and the layer of the photograph as a "conceived" and dominating instrument are dialogically engaged with oppositional agencies that the "perceived" dimension records and moderates in their normativity. The dissonances intrinsic to this triplectic enable the affordances of the object to serve, at the same time, for the opening affirmation of individuality (the lived space), the enclosing formulation of overcoded subjectification (the conceived space) and the networked territorialization of transindividuation (perceived space). Once unveiled, such a dissonant realm exposes these representations as complex entanglements of differentiation, abstraction and tensional reconciliation, showing that photography is much more than "the most realistic, therefore facile of the mimetic arts."[12]

This approach shows a gap in the current discussion on architecture and photography, highlighting its transdisciplinary flaw. Architecture, primarily concerned with the control, organization and predictability of its creative realm fails to mobilise the germinative and emancipatory power of emergent, indeterminate and open systems produced by visual arts that the sublime folly embodies. Rather, it reduces this power to illustrative scopes that alienate and fragment the utopian dimension, which has been described by Fredric Jameson as "*textualities"* or textual production.[13] Theoretical studies on narrative are commonly employed to describe "*complex*" meanings informing the forms

and materiality (architecture) of expressions (representation), yet these often remain within the limits of the architectural discipline and miss the contribution of a substantive body of literature advocating for the capacity of assemblages to address the new complex systems composed of heterogeneous and incompatible elements such as the studies of Lus Arana and Pedro Leão Neto. [14]

Figure 2. Dionisio González, Inter-acciones 9 (2013)

Alternative Identities

As presented in *A Thousand Plateaus,* the central tenet of the assemblage theory is that emancipation results from the formation of alternative identities and possibilities via a mechanism of deterritorialisation. Deterritorialised elements are freed from constraining systems, *plateaus,* constitute wider *constellations, bodies without organs,* and can be associated in assemblages that make "worlds of worlds"[15] to "capture forces that are not thinkable in themselves." [16]

Within our study context, the assemblage thinking addresses the follies' deterritorialising concatenations as this,

offers four things to contemporary social-spatial theory that, when taken together, provide an alternative response to the problematic of "relational" thought; an experimental realism orientated to processes of composition; a theorisation of world of relations and that which exceeds a present set of relations; a rethinking of agency in distributed terms and causality in non-linear, immanent, terms; and an orientation to the expressive capacity of assembled orders as they are stabilised and change. [17]

Anderson et al. further elaborates on this, noting that assemblage thinking is a technical operator *"that enables heterogeneous phenomena to be classified and ordered."* [18] For them, it draws multiple insights and readings that depend on the specific intent or designated output of each undertaking. Indeed, the articulation, terminology and meaning of "assemblage theory" also vary conjuncturally, as demonstrated by the perceptual and conceptual distinction in its adoption in different disciplinary fields. For example, within the field of art theory, it is synonymous with allegory and continued metaphor, as well as montage and collage[19] (all pertinent to hyperreal follies).

The complexity of assemblages is moderated by a central engine that—using Deleuze and Guattari terms—can be defined as a *revolutionary machine*. In the hyperreal follies, this machine determines the optical or rather visual determinations of conceptions and actions, offering to perception multiple possible associations and, thereby multiple productive readings. These readings circle around and come back to the image, subverting, opening slippages, interrupting paradigms and disrupting codings that are conventionally attributed to it as originary, intrinsic and permanent content.[20] A critical

analysis of the vital play of signs that produces these lenses or viewpoints shows the evolving and complex multidimensionality of the representational, conceived, and perceptual machines upholding the follies. This not only illuminates the holding together of the machines as mutually formant and inclusive, it also detects the potential overcoding through which these machines are controlled and disciplined to produce dominated *milieus* and *negative reterritorialisation* that constrain their reading within the imposed logics and make it not valuable and pertinent to describe the novelty of the follies.
The multidimensionality of the assemblages also mobilises the disciplinary domains of architecture and photography. As posited by Portuguese architect and curator Pedro Gadanho, in his essay "Coming of Age: On the Furtive, Shifting Nature of Architectural Photography," architecture and photography have a deep-rooted relationship in "the adoption of photo-collage as a standard design procedure, or the use of photography as a privileged means."[21] He further affirms that
architectural photography seems to be at a curious crossroads. While still having the built environment as its subject matter, its artistic autonomy is now arising from the ability to establish an expressive dialogue with…, more than a portrait of contemporary architecture and urban landscape.[22]
The assemblages producing negative deterritorialisation create what Baudrillard defines as hypotyposis[23]: a plagiarism and self-recopy of anything, such as a vivid, picturesque description of scenes which can transform and influence the manner in which a building can be viewed, consumed and valued. The hyperreal follies are not immune from this as photography can create highly dominant and prescriptive views of the world that are more akin to annihilating creativity and innovation.[24] This sheds its decoding and deterritorialising agencies, and produces commodities of consumption that lose the lively, dialectical, full, dramatic relationality of the imaginary.

Figure 3. Dionisio González, Inter-acciones 15 (2013)

Positive assemblages, however, liberate extraordinary vehicles, the *abstract machines* of Deleuze and Guattari,[25] which give access to a new world, the *cosmos*. Whether these be fantastical or brutalist hyperreal follies, their production of hyperreality has complex workflows: the camera shutter clicking is but a part of the journey that uses a toolbox that includes multiple digital and analogue devices that are integrated much like paintbrush, palette and canvas of the traditional painter.[26] New means for moderating representation through light allow the photographer to transform the static reproduction of the camera into a process of continuous reproduction with reproductive capacity: the image as production point, rather than medium for consumption, is an open assemblage, a *mutable mobile* akin to evolutionary incremental architecture.[27]

Bricoleurs and case studies

Chéhère, González and Goudal are three photographers, artists whom one may call "visual interpreters" operating with a medium of prime assemblage capacity. They operate at a multiple disciplinary intersection or liminality, being photographers, visual artists, and architects. One may turn to the notion of the bricoleur in this case, as consolidated by writings of Norman Denzin and Yvonna Lincoln who consider the *"bricoleur"* as a *"person who assembles images into montages."*[28] By using the analogy of the quilt-maker, the researcher (and maker) is perceived as being a bricoleur (maker of montages) Michael Crotty[29] also uses the analogy of Denzin and Lincoln's bricoleur and binds it to Claude Lévi-Strauss' book *The Savage Mind*,[30] albeit Crotty's interpretation of Lévi-Strauss is that of *"A dialogue with materials. Interrogating all the heterogeneous objects."*[31] These multitudinous references, from which Denzin and Lincoln source the definition of bricoleurs have them establish four typologies: interpretative, narrative, theoretical and political. However, fundamentally, the bricoleur is concerning borrowing from multiple disciplines.

French artist Laurent Chéhère's series "The Flying Houses"[32] offers a surreal poetic viewpoint of Paris dislocated and deterritorialised from its normative context and "flying" within the skies. Created contemporaneously between 2012–2020, it details a nostalgic view of elements of the Parisian cityscape, a sort of hyperphantasia (in one's mind's eye) representation of memories connected with possibilities. Details and snapshots of moments within the fabric of the cityscape, loosely tethered to the ground and reality by the power cables, drifting off-frame, left and right.

Spanish artist, architect, and photographer Dionisio González's (1965-) extensive series of more than 25 images entitled in Spanish as "Inter-acciones" (English, Inter-actions; 2013) offers a surreal possibility of contemporary habitable spaces, offering aesthetically crafted architectural "possibilities" within largely barren landscapes, not unlike built follies within the picturesque landscape of the 1700s and 1800s. The more recent series "Trans-acciones" (2014–2015), are in colour and offer more connectedness and context and perhaps more believability for the hyperreal follies within the landscape. The most recent imagery, Wittgenstein's Cabin (2021), set within the Norwegian Fjords, offers a beautifully crafted "image," almost a 1970s version of a futuristic possibility—curves, glass and pods within a fjord—but could just as easily be a set from the 1972 movie *Solaris*.

French visual artist Noémie Goudal (1984-), residing in the UK, creates "fictions" such as the "*Observatoires* 2015"[33] (English, Observatories), which covers a range of imagery made from 2013–2015 which question the relationship of the built form and its relationship with context and landscape. Black and white brutal concrete singular follies reside within a landscape bisected horizontally, some with reflections in what one assumes must be a fine plane of water: potentially a sandbank. The brutalism owes a nod to the types of military structures one would find along the eastern English coastline and Brittany coast of the Second World War "Pillbox" and "Tigers Teeth" which were used as coast defences and, of course, the Martello Towers[34] of the Napoleonic Era, many of which are crumbling into the North Sea: all of which have elements of the folly. However, Goudal's follies have been constructed from photographic evidence of concrete structures and then printed and reformulated, constructed in-situ and then rephotographed, a simulacrum of a folly.

Figure 4. Noémie Goudal, Observatoires III (2013) Lambda Print on Baryta paper

CONCLUSION

Chéhère, González and Goudal's hyperreal follies are conspicuous examples of deterritorialising assemblages that combine exogenous and heterogeneous elements, relations and narratives with unprecedented seamlessness. Their images are highly deterritorialising machines that affirmatively sublate the early assemblages of both fantastic architecture, composite photography and cinematographic montage, allowing the visionary dimension to irrupt with dramatic relationality in the constant present of the advanced digital age. As visual interpretations, they offer bricolages of architectural possibilities that purposefully deal with issues of decoding, displacement and disconnection of cultural superstructures and dominating communicative practices. They create new possibilities within the landscapes, subsequently opening the fields of architecture and photography to the sublime, the transduced and the deterritorialised. Drawing from threads of multiple aligned disciplines, frequently using the plethora of ever-transforming images on the electronic space and constituting assemblages in the form of photographs, they elaborate narratives and discourses of emancipation that liberate the space of representation from reifying hegemonic culture in both the design and implementation practices of architecture and photography. Concurrently, their "sublime" production, both aesthetically deceiving and credible, opens their ambiguous, sublime architectural narratives to open and generative dialogues with the viewer/producer.

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FROM SIMPLICITY TO CHAOS: TOWARDS AN ULTRADISCIPLINARY STANCE FOR DESIGNING ORGANIZATIONAL BUILDINGS

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INTRODUCTION

The development of technology opens up new possibilities for designing and constructing buildings that are increasingly *phygital*.[1] Phygital is a neologism that indicates the fusion of physical and digital dimensions; in other words, it is the concretized encounter of "bits and atoms"[2]. Phygital means that physical and digital elements coexist and are respectively augmented by digital interfaces and by a sort of physicality. In general, phygital is phenomenologically recognizable when the following three characteristics permeate an environment (e.g., a building): "context awareness, embeddedness, and natural interaction"[3]. In practice, the three phygital characteristics are respectively observable when the building is enabled to: capture people while they inhabit the place, automate processes and decrease the amount of people mediation required, and make human-machine interaction natural and multimodal[4].

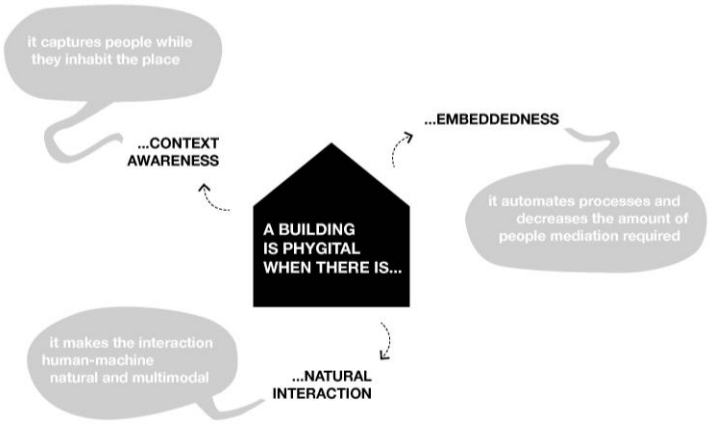

Figure 1. Three characteristics of phygital buildings. Elaboration by the authors

After clarifying the meaning of the term "phygital", its phenomenology (i.e., three characteristics), and how the phenomenology is observable, this contribution focuses on a specific kind of phygital buildings, the organizational buildings, and on how they can be designed or implemented/redesigned.
The organizational buildings are the ones where an organization is settled. Organization refers to an entity that is constituted around an organizational aim (e.g., producing a product or offering a service) and a primary (symbolic) task (e.g., the meaning and the affection related to producing a product or offering a service)[5]. The organization is identifiable through the existence and the contingency of six dimensions: context (e.g., economic context), social structure (e.g., roles and relationships among them), technology (e.g., production technology), culture (e.g., values and assumptions)[6], physical structure (e.g., headquarter building) and power (e.g., social dynamics related to the authority).[7] An organizational building, since it is the organization's physical structure, should be functional to the achievement of the organizational aim and of the primary task. In fact, in a chapter about the physical structure of organizations, Hatch underlined that the space (e.g., a building) is linked to organizational members' performance and efficiency. The organizational aim and the primary task achievement can be accomplished through the performance that results from the socio-technical system configured as the combination of organizational members and technological artefacts included in the organizational building(s).[8] Consequently, designing phygital organizational buildings must lead to realizing an effective and efficient environment where human behaviors are empowered by phygital in achieving the organizational mission and vision (i.e., organizational aim), and primary task.
However, referring to the authors' experience (one of which is a digital business practitioner[9]), designing phygital buildings is a challenging path. From the authors' perspective and their matured experience in this field, designing efficient and effective phygital buildings requires that the team in charge of the project adopts an ultradisciplinary stance. The prefix "ultra" means going beyond, outside, more than.[10] Consequently, an ultradisciplinary stance "cares not at all where knowledge comes from"[11] and abandons the intrinsic reductionism of other stances (i.e., multi-, cross-, pluri-, inter-, and trans- disciplinarity).[12] For example, the *simplest* stance[13] in designing organizational building is multidisciplinarity. A multidisciplinary perspective implies that the team who designs the building brings together professionals who pertain to various professions/disciplines and with different skills. Instead, adopting an ultradisciplinary perspective implies that the team who designs the building brings together skills and backgrounds of multiple professionals (as in multidisciplinarity), such as architects, building engineers, and ICT experts, but also the client – who is co-creator –, UX designers, business designers, and social psychologists, but goes beyond professions/disciplines. This team, who adopt an ultradisciplinary stance, can be called "ultrateam". The ultrateam follows the logic of *chaos*,[14] trying to make sense of it and opens breaches to explore outside and between the professions/disciplines involved.
The present paper aims to use a reflexive reasoning to: illustrate how a team can design (with an ultradisciplinary stance) a phygital organizational building where human behaviors are empowered by the phygital to achieve the organizational mission and vision, and detail some ultrateam characteristics. To fulfill the illustrated aim, in the present section the theoretical background was defined, in the following section a qualitative analysis of two case studies was presented, and in the last section practice-centered considerations emerging from direct observation and desk analysis of the case studies were illustrated to clarify some features of the ultradisciplinary stance that a potential ultrateam should use in designing a phygital organizational building.

ULTRADISCIPLINARY STANCE AT WORK

How does the design process work for making an organizational building phygital? This section attempts to answer that question by testing the ultradisciplinary stance introduced in the previous section. Thus, two case studies are presented. The authors of this paper have direct knowledge of both cases,[15] which are here reported in narrative form, interweaving direct experience, desk analysis based on press, seminars[16] and project reports.[17] Both cases are realized in Italy, the first in Bologna and the second in Milan. One case is about a temporary prototype, the other refers to a permanent implementation. One is the implementation of an already functioning building, the other is the redesign from scratch of an existing structure. Neither of the two case studies is an idealistic example of ultradisciplinarity or fully phygital organizational building, both cases have encountered difficulties, failures, and dead-ends along the way, and for this reason, the authors of this paper have tried to synthesize, from the sources available, some lessons learned that they considered helpful steps on the path to ultradisciplinarity.

Navile House of Health in Bologna

In the process towards an ultradisciplinary stance, the first of the two case studies works on the difficulties embedded in the user experience of an organizational building. Making this building phygital (even if for a temporary testing period) has meant innovatively dealing with these difficulties, starting from the specificities of the context.

The organizational building concerned is the Navile House of Health in Bologna, which opened in 2018 and is part of a regional network of public Houses of Health. A House of Health is a long-term needs healthcare facility for, i.e., pregnant women and elders with neurodegenerative diseases.[18] The staff comprises different kinds of doctors, paramedics, psychologists, patient advocates, and social workers. From the first months of activities, Navile managers realized that the management approach could not be that of a hospital (that focuses on short periods of acute treatments or intraday exams). Thus, to explore innovative paths for the user journey, they contacted C.O. gruppo (strategy and organizational development consultants), e:lab (digital business consultant), Engineering group (ICT), putting them in contact with the medical staff. This composite team designed a prototype, tested for three days during 2019, where a digital layer (an app) could guide the user journey within the physical structure of the House of Health.[19]

The prototype geolocalizes the patient arriving at the House of Health and informs the staff. If the patient does not speak Italian, an automatic translator (also attentive to emotions) assists him/her all along the staying. Furthermore, the app allows the staff members not only to update the medical record but also to share observations among them. Finally, once at home, the patient can use the app to keep in contact with the staff that monitor remotely his/her health conditions.

According to the professionals who took part to the project,[20] the design process has not been straightforward. The team has resorted to a bounded rationality model to limit the entropy of the project, setting a clear perimeter of the user journey (start/end). Furthermore, it is not easy to interact between very different professional figures, who are rarely trained to dialogue fluidly with other disciplines.[21] For this reason, considering the sensitivity of a project dealing with health, team members needed to have both technical and humanistic skills, as well as an open-minded attitude and positive critical thinking. Above all, during the project development, it was necessary to alternate leadership between different practitioners in a transparent relay program that would lead to mutual trust and exchange of knowledge, challenging the traditional juxtaposition of different knowledge. This method has allowed the designed prototype to give good results. So much that a simplified version of the app will be released for Navile and the other regional Houses of Health in late 2021.

Phyd Hub in Milan

The second case study deals with sensemaking in chaos. The Phyd Hub project,[22] implemented between 2019 and 2020, gave a physical dimension to a digital platform dedicated to employability [23] and provided by the Italian chapter of the Adecco Group (a multinational recruitment company). The design team was composed of il prisma (architects), e:lab (digital business consultant), and Microsoft (ICT), who worked closely with Adecco.

Figure 2. Phyd Hub building entrance. Photo by wired.it / CC BY-NC-ND

Integrating a physical layer with an existing digital layer means that the Phyd Hub has been designed to perform and implement the services provided by the online platform.[24] On the one hand, the digital platform crosses the user's skills and attitudes with labor market data, providing suggestions: the emerging professional figures closer to the user (which may be a student, a NEET, or a worker), potential mentors to meet, helpful readings, and events to participate in. On the other hand, at its entrance, the building of the Phyd Hub has facial recognition systems that allow access to restricted areas where the user can perform AI-assisted assessments, receiving the suggestions of the digital platform. The Phyd Hub is organized with single capsules for individual work, a "forge" room for user-mentor meetings, a café for informal gatherings, and an arena for bigger events. Each environment is equipped with: motion and listening sensors, spaces for multimedia production, video projections, and screens to access the digital interface.

The project is sophisticated but, up to now, it is only partially working, as pandemic conditions limit an experience conceived for live interaction and some systems need further improvement.

According to the practitioners who took part in the design process,[25] the team that worked on this project had some difficulties along the path. First, a project like this requires a very high level of communication between different practitioners involved, who, in retrospect, would have appreciated the use of a social platform from the beginning to the end of the process. Second, the practitioners underlined the necessity to keep the same team, with no hand-off from concept to execution. Indeed, in such a project, theory and practice (the vision and its implementation) are deeply intertwined and mutually influencing, as the culture of environments designed in an integrated physical and digital way is still at the beginning of its potentialities.[26] For the same reasons, in a project like this, it is important to have room to maneuver to continuously adapt and modify the choices in search of a

working result. Paraphrasing the Lean Startup approach, it means to design a Minimum Viable Product: first testable, then usable, and finally lovable.[27]

CONCLUSION

The experience matured during the projects illustrated in the previous section makes clear the advantage of having an ultrateam in charge of designing the phygital building. Considering the definition of ultra and of an ultradiscipinary perspective adopted by a team, and the presented case studies, the ultrateam can be finally defined as: a team that comprises professionals (included academics), with various disciplinary bases, who adopt an ultradisciplinary perspective. These professionals accept the logic of chaos in their projects that pushes them to go beyond disciplinary boundaries and to experiment continuously in order to achieve the project's ultimate aim. Adopting an ultradisciplinary stance changes how each professional uses his/her professional identity and its elements. Referring Galimberti's intersubjectivity model,[28] the subjectivity of each team member changes from what can be called professional subjectivity to practitioner subjectivity. Subjectivity is the making of identity through the subject's movements on the thread of events[29] where the "thread of events" means in the encounter of the other during a communicative interaction. The difference between professional subjectivity and practitioner subjectivity can be clarified through the meaning of the terms "professional" and "practitioner". Professional indicates a subject that pertains to a specific profession and follows the technical and ethical norms of his/her profession.[30] Instead, the practitioner is a subject who puts into practice his/her profession.[31] Consequently, on one hand, the term "professional" recalls adhering to a profession and emphasizing professional rules/standards. On the other hand, the term "practitioner" focuses on doing or using something related to the profession that he/she knows. Following norms, as the professional does, suggests that the professional works in his/her professional comfort zone and that the norms establish which path he/she should take. Instead, the practices allow the practitioner to have a certain degree of discretion in exercising his/her profession and to introduce changes.[32] In the case of practitioner subjectivity, the profession becomes a springboard for going beyond professions/disciplines and, e.g., designing a phygital building.[33] To summarize, professional subjectivity can be associated with the team members of a team that adopts a multidisciplinary stance and the practitioner subjectivity can be associated with the team members who adopt an ultradisciplinary stance.

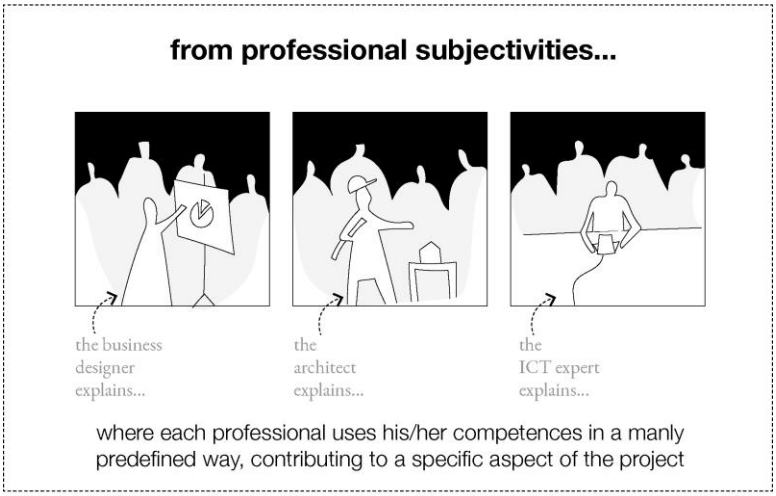

Figure 3. From professional subjectivities… . Elaboration by the authors

Figure 4. … to practitioner subjectivities. Elaboration by the authors

Regarding practically designing a phygital building, the ultrateam and its members' characteristics, in terms of hard skills and technical knowledge, and soft skills, are the following ones. Regarding hard skills and technical knowledge, the ultrateam's practitioners master their professions/disciplines and navigate free and curious among other professions/disciplines. They are not know-it-alls. They accept that the designing path is not pre-defined, so they embrace the chaos due to going beyond profession/disciplines. Consequently, they are curious and attend nanodegrees[34] to add bits of knowledge from disciplines to which they do not pertain to that allows to experiment outside disciplinary boundaries and to find the best match that makes possible the creation of an effective and efficient environment where human behaviors are empowered by phygital in achieving the organizational mission and vision (i.e., organizational aim), and primary task. The attitude to experimenting outside disciplinary boundaries is due to their focus on doing and their awareness of discretion that allows for innovation in designing. Regarding soft skills, the ultrateam's practitioners could be described as open-minded people. They exercise positive critical thinking, follow a shared leadership, and adopt a collaborative attitude because, without these skills, each practitioner will not be able to go beyond his/her profession. In fact, without the encounter with the other team members, the practitioner will not use his/her discretion to design the phygital building. He/she will follow a designing path that he/she knows or that derives from his/her knowledge. These soft skills can be observable in the following behaviors. These practitioners learn from each other, listen to each other, accept partial failures and dead-end explorations, are enthusiast about random discoveries, are aware that communicative interactions permeate all the projects' elements and processes, and that communicative interactions allow to introduce and follow novel practices.

In conclusion, how can an ultrateam exercise the aforementioned skills and technical knowledge?

The answer may lay between two concepts: intersubjectivity and intercomprehension.

Intersubjectivity implies the presence of at minimum two subjects.[35] It is the space, or the shared world, between two or more subjects that interact with each other, so it is the space where the subjects' subjectivities manifest. It is the space where: (a) the subjectivities are constructed and communicative interaction objects are defined, (b) the relationships between subjectivities and objects are negotiated, and (c) the rules of the communicative interactions are established. The definition of this space is not always explicit and it is also based on the subjects' previous experiences. Intercomprehension indicates the understanding among two subjects.[36]

Therefore, to become an ultrateam made of practitioners that go beyond professions/disciplines thanks to nanodegrees, discretion, and the contribution of each member to the design project, a team should create an intersubjectivity where: (a) there are practitioner subjectivities; (b) the objects are chosen in function of the design of an effective and efficient environment where human behaviors are empowered by phygital in achieving the organizational mission and vision (i.e., organizational aim), and primary task, and not in function of professional knowledge that each member has; and (c) the relationships between members allows to exercise the hard skill and technical knowledge, and the soft skills in the way detailed above. One practical suggestion can be to use social platforms[37] to enable effective communicative interactions aligned with the defined intersubjectivity.[38] The use of adequate context for communicative interactions (e.g., social platforms) can enhance the level of intercomprehension among practitioners and, consequently, the project's success.

This paper aims to be useful both for practitioners and academics involved in the design of phygital spaces.

In future studies, it would be interesting to understand if organizational phygital buildings that are designed following an ultradisciplinary stance consist of a nudge[39] in creating organizational ultraluoghi/ultraplaces.[40] It means that the building itself will become the result of the phygital and digital components which will facilitate the organizational practitioners' encounter/communicative interaction. In other words, this building, as ultraluogo/ultraplace, is a "real" psychosocial reality (i.e., an environment that include an efficient and effective socio-technical system) made up of a continuous intertwining of communicative interactions. The latters are realities in which specific human activities (such as listening, interpreting the other's discourse, structuring actions consistent with such listening and interpretations) are facilitated, supported and enhanced by phygital technologies, giving rise to an incessant dialogue. For example, a kind of technology that can be used in organizational phygital spaces is augmented reality.[41] The possibility of having this technology inside the organizational building allows giving rise to real "augmented" interactions, which result in the creation of "constructive and provocative relations between people and places, leading to unpredictable results".[42]

To conclude, our contribution claims that designing phygital efficient and effective organizational buildings requires bringing together undisciplined and talented practitioners around a visionary client that follows an ultradisciplinary stance.

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NOTES

[1] On this topic, see Andrea Gaggioli, “Phygital Spaces: When Atoms Meet Bits [Editorial],” Cyberpsychology, Behavior, and Social Networking 20, no. 12 (2017): 774, doi: 10.1089/cyber.2017.29093.csi.
[2] Gaggioli.
[3] Gaggioli.
[4] Concerning “multimodality”, see Carey Jewitt, Jeff Bezemer, and Kay L. O’Halloran, *Introducing Multimodality* (London, New York: Routledge, 2016).
[5] See Cesare Kaneklin and Laura Metitieri, “Gruppi e Intersoggettività [Groups and Intersubjectivity],” in *Psicologia Delle Organizzazioni [Organizational Psychology]*, ed. Piergiorgio Argentero et al. (Milano: Raffaello Cortina Editore, 2009), 187–206.
[6] See Edgar H. Schein, *The Corporate Culture Survival Guide* (San Francisco: Jossey-Bass, 1999).
[7] See Mary Jo Hatch, *Organization Theory: Modern, Symbolic, and Postmodern Perspectives*, 3rd ed. (Oxford: Oxford University Press, 2013).
[8] On these topics, see Frederick Edmund Emery, *Systems Thinking: Selected Readings* (Harmondsworth: Penguin books, 1971); Eric L. Trist and Ken W. Bamforth, “Some Social and Psychological Consequences of the Longwall Method of Coal-Getting: An Examination of the Psychological Situation and Defences of a Work Group in Relation to the Social Structure and Technological Content of the Work System,” Human Relations 4, no. 1 (1951): 3–38, doi: 10.1177/001872675100400101.
[9] In the final section of this paper, the authors will dwell on the essential difference in meaning between *practitioner* and *professional*. This reflection is central to the paper’s arguments, clarifying the mindset shift appropriate to transform the multi- inter- trans- disciplinary team into an ultrateam.
[10] See the entry “Ultra,” Merriam-Webster.com Dictionary, accessed August 21, 2021, https://www.merriam-webster.com/dictionary/ultra.
[11] Keith C. Clarke, “Exploring the Past and Future of Our Planet: Not Bit-by-Bit but All at Once,” The Professional Geographer 63, no. 3 (2011): 323, doi: 10.1080/00330124.2011.566512.
[12] To deepen this topic, see Monica Cini, “Oltre La Disciplinarità: Le Humanities al Confronto Con Le Altre Scienze [Beyond Disciplinarity: Humanities in Comparison with Other Sciences],” in *Humanities e Altre Scienze: Superare La Disciplinarità [Humanities and Other Sciences: Overcoming Disciplinarity]*, ed. Monica Cini (Roma: Carocci editore, 2017), 23–47.
[13] Cini.
[14] See Giuseppe Leoni, “Hamlet, the Place to Be,” Progetto Hamlet, accessed August 21,2020, https://progettohamlet.it.
[15] In particular, Giuseppe Leoni, founder of e:lab, took part directly in the design process of both case studies. Moreover, Carlo Galimberti and Ilaria Vergine, academic researchers in the social psychology field, are part of the assessment process of the Phyd Hub.
[16] See the sequence of seminars hosted during the conference “After. Futuri Digitali,” Bologna, October 24-27, 2019, accessed August 25, 2021, https://www.afterfestival.it/2019.
[17] The analysis also draws on interviews with practitioners of the “ultrateams” who worked on the two design processes presented. In the eventual extended version of this paper, there will be room to include the most significant passages from these direct voices.
[18] In this regard, see Giovanna Borrelli and Francesco Sparano, “La Medicina è Anche Cura Sociale: L’esperienza Delle Case Della Salute [Medicine Is Also Social Care: The Experience of the Health Houses],” Altraeconomia, May, 2021, accessed August 25, 2021, https://altreconomia.it/la-medicina-e-anche-cura-sociale-lesperienza-delle-case-della-salute/.
[19] See: the Engineering’s report “After Futuri Digitali: Le Case Della Salute Come “Ultraluoghi” [After Digital Futures: Health Homes as “Ultralogues”],” Engineering, accessed August, 25 2021, https://www.eng.it/resources/newsroom/press-release/doc/2019/Engineering_After2019_Casa%20della%20Salute%20Navile_26%2010%202019.pdf; and the article “ICare, l’App Che Accompagna La Persona Da Casa Fino Alla Casa Della Salute Navile,” BOLOGNATODAY, October 27, 2019, accessed August 25, 2021, https://www.bolognatoday.it/benessere/salute/app-i-care-assistant-navile.html.
[20] See notes 15 and 17.
[21] To deepen this topic, see Lara Furniss, “Beyond Discipline: Evolving Design Practice and Design Education in the Twenty-First Century,” Architecture_MPS 18, no. 1 (2020): 4, doi: 10.14324/111.444.amps.2020v18i1.004.
[22] See “Phyd Hub,” Phyd, accessed August 25, 2021, https://www.phyd.com/Hub and the following articles: Federica Frosini, “PHYD, nutrimento per il capitale umano,” Rivista Studio, November 11, 2020, accessed August 25, 2021, https://www.rivistastudio.com/phyd-adecco/; “Professione futuro [Future profession],” la Repubblica, September 6, 2020, accessed August 25, 2021, https://www.repubblica.it/native/scuola/2020/09/07/news/professione_futuro-266223512/; “Occupabilità e Nuove Competenze: La Formazione Professionale Tra Fisico e Digitale [Employability and New Skills: Professional Training between Physical and Digital],” Wired.it, September 9, 2020, accessed August 25, 2021,

https://www.wired.it/economia/lavoro/2020/09/09/occupabilita-competenze-formazione-professionale-phyd/?refresh_ce=.

[23] Employability is the ability to gain initial employment, to maintain it and make "transitions" between jobs, and to obtain new employment, according to Sumantra Ghoshal et al. "A new manifesto for management," in Sloan Management Review 40, no.3 (1999): 9–20, accessed August 25, 2021, https://sloanreview.mit.edu/article/a-new-manifesto-for-management/.

[24] Philosopher Luciano Floridi would call it an *onlife* example, see Luciano Floridi, ed., *The Onlife Manifesto. Being Human in a Hyperconnected Era* (Cham, Springer, 2015).

[25] As for note 20, also in this case see notes 15 and 17.

[26] On this issue see Glenda Amayo Caldwell et al., ed., *Digital Futures and the City of Today. New Technologies and Physical Spaces* (Bristol, Intellect, 2016).

[27] See Eric Ries, "The Lean Startup Methodology," The Lean StartUp, accessed August 25, 2021, http://theleanstartup.com/principles.

[28] Carlo Galimberti, "Segui Il Coniglio Bianco: La Costruzione Della Soggettività Nelle Interazioni Mediate [Follow the White Rabbit: The Construction of Subjectivity in Mediated Interactions]," in *Identità in Relazione: Le Sfide Odierne Dell'essere Adulto [Identity in Relationship: Today's Challenges of Being an Adult]*, ed. Camillo Regalia and Elena Marta (Milano: McGraw-Hill, 2011), 72–127; Carlo Galimberti et al., "Intersubjectivity as a Possible Way to Inhabit Future Cyberplaces," in *Annual Review of Cybertherapy and Telemedicine 2010*, ed. Brenda K. Wiederhold et al. (Amsterdam: IOS Press, 2010), 9–13; Carlo Galimberti et al., "Contruction of Intersubjectivity in Psychosocial Interactions," in *Applied Psycholinguistics: Positive Effects and Ethical Perspectives,* eds. Giuseppe Mininni and Amelia Manuti (Milano: Franco Angeli, 2012), 176–183.

[29] Galimberti, "Segui Il Coniglio Bianco: La Costruzione Della Soggettività Nelle Interazioni Mediate [Follow the White Rabbit: The Construction of Subjectivity in Mediated Interactions]," 109.

[30] See the entry "Professional," Merriam-Webster.com Dictionary, accessed August 23, 2021, https://www.merriam-webster.com/dictionary/professional.

[31] See the entry "Practitioner," Merriam-Webster.com Dictionary, accessed August 23, 2021, https://www.merriam-webster.com/dictionary/practitioner.

[32] Hatch, *Organization Theory: Modern, Symbolic, and Postmodern Perspectives*, 137–138.

[33] The reasoning about the possibilities of practitioners could take advantage when put in relations with the notion of the "reflective practitioner", see Donald A. Schön, *The Reflective Practitioner: How Professionals Think in Action* (New York: Basic Books, 1983).

[34] See the entry "Nanodegree," Macmillan Dictionary, accessed August 23, 2021, https://www.macmillandictionary.com/buzzword/entries/nanodegree.html.

[35] On this topic see: Galimberti, "Segui Il Coniglio Bianco: La Costruzione Della Soggettività Nelle Interazioni Mediate [Follow the White Rabbit: The Construction of Subjectivity in Mediated Interactions]"; Eleonora Brivio et al. "An Integrated Approach to Interactions in Cyberplaces: The Presentation of Self in Blogs," in *Handbook of Research on Discourse Behavior and Digital Communication: Language Structures and Social Interaction*, ed. Rotimi Taiwo (Hershey: IGI GLobal, 2010), 810–829; Matteo Cantamesse, "Reciprocal Presence: A Qualitative Analysis of Psycho-Social Interaction in Virtual Reality," (Doctoral dissertation, Milano: Università Cattolica del Sacro Cuore, 2008), DocTA, http://hdl.handle.net/10280/314.

[36] See Marco Lecci, Sara Gabri, and Carlo Galimberti, "Comunicazione, Impegno e Conoscenza [Communication, Commitment and Knowledge]," in *Digital Enterprise: Innovare e Gestire Le Organizzazioni 2.0 [Digital Enterprise: Innovating and Managing 2.0 Organizations]*, ed. Giuseppe Albeggiani et al. (Milano: Ulrico Hoepli Editore, 2015), 17–76.

[37] This suggestion resonates with the point of view of the practitioners who designed the Phyd Hub in Milan, where social platforms would have made the design process more fluid.

[38] Lecci, Gabri, and Galimberti.

[39] See Richard H. Thaler and Cass R. Sunstein, *Nudge: Improving Decisions about Health, Wealth, and Happiness* (Grand Rapids: The Composing Room of Michigan, 2008).

[40] Carlo Galimberti et al., "Ultraluoghi. Città Aumentata, Impatti Sociali e Nuove Pratiche Di Cittadinanza [Ultraplaces. Augmented Ciy, Social Impacts and New Citizenship Practices]," (presented at the conference After. Futuri Digitali, Bologna, Italy, October 24-27, 2019).

[41] Ilaria Vergine et al., "Introducing and Implementing Phygital and Augmented Reality at Work," Studi Organizzativi, no. 2 (2019): 137–163, doi: 10.3280/SO2019-002006.

[42] Marcella Del Signore and Gernot Riether, *Urban Machines: Public Space in Digital Culture.* (Rovereto: List Lab, 2018), 23.

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JAIN MANDIR (LAHORE): THE FRAGMENTED MEMORY

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INTRODUCTION

This research is dedicated to understanding the role of architecture and technological advancements as medium to moderate spaces of conflict within the urban fabric. Evaluating the cultural city of Lahore, Pakistan, as a case study, the research delves into statistics, memories, and potential future narratives formulated through architecture and technology. A city with a historical and cultural significance that dates back to the 1st century AD, present-day Lahore is a depiction of flamboyant new infrastructural additions within the urban fabric that seemingly divide and suppress the original structure of the city[1]. In the past three decades, the city has undergone mass urbanization.

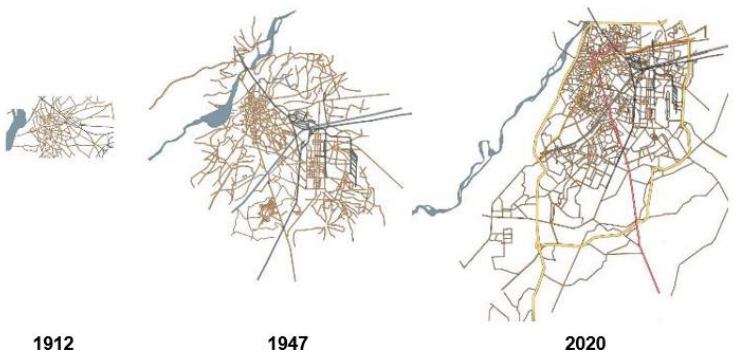

Figure 1. Demonstrates the urbanization and rapid expansion of Lahore in recent years.

Expanding far beyond the original periphery of the Walled City, Lahore now has a mass transit and road network that aims to regulate mobility throughout. However, the mass transit systems and ever-growing road networks have built literal foundations on the predominant heritage sites of the city.
Historic cities are an amalgamation of layered narratives and associations embedded within the urban fabric. These narratives are reflections of the inhabitants and their interaction with the built urban landscape of their cities. However, in recent years, urbanization has been an imminent threat targeting many cities worldwide[2]. The ever-expanding city plagued by urbanization loses many of its original collective narratives that become suppressed by the newer harsher intervention that pays little heed to the original historical and urban framework. This kind of haphazard transformation of the city's evolution under the banner of development often ignores the historical relevance of specific areas,

requiring a more sensitive approach to keep the city tightly knit with its memories, culture, and values. The objective to convert cultural or historical hubs into some urbanized version of modern requirements impacts the communities and their residents directly without taking into account the intangible elements of the city. Consequently, compromising the collective memory and putting the essence of the urban areas in question.

Dilemma of the Urbanized Lahore

A city known for its cultural heritage has vitiated with lost and missing collective narratives. Urban memories within the city emerge in fragmented abstraction in nooks and corners of the city in the form of mere glimpses. One of the many glaringly absent narrative from the city's memory are more often of the minorities in Pakistan. Once known for its secular and cultural past, Lahore was known for its harmony, peace and prosperity.[3] Today, local architects and planners extensively criticize the 'Urbanized Lahore' for its insensitivity and disconnected approach towards the city's heritage. Urban infrastructure has become exceedingly dominant in the city's central core as it struggles to deal with the demands of the increasingly populous inhabitants. This surge towards meeting urgent demands has caused a significant influx of mass-scale transit projects that have been built dangerously close to many heritage sites of Lahore, directly harming the integral memory of the city.

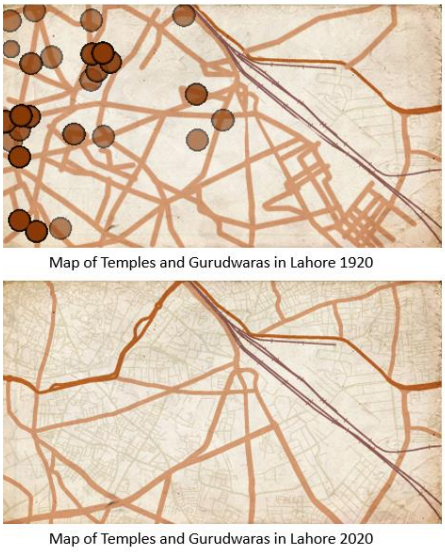

Figure 2. shows a comparative analysis of the presence of temples, gurudwaras and shrines in Lahore's urban fabric in 1920 versus in 2020.

Within this city, the multi-secular and cultural narrative has transformed into one where socio-religious and political factors dominate its urban structure. Raising concern, as depicted in Figure 2. an alarming reduction in the presence of the religious communities classified as minorities since the Indo-Pak partition in 1947 was observed. These transformations are reflected in the urban fabric of this historic city that it has witnessed. This socio-political crisis resulted in the disappearance of temples, gurudwaras and shrines from the context, resulting in a significant loss for a city known for its multi-secular past, rich and diverse culture.

The Fading Narrative: Jain Community of Lahore

In the present Lahore, many minorities community's footprint is missing, which had previously dominated and contributed to the city's context in the 1900s. The partition of the Indo-Pak sub-continent in 1947 leads to severe concern for the Jain community due to religious differences, which resulted in the abandonment of historic temples in the existing local context. However, this specific community has had strong roots in the region since the early historic period[4]. Data analytics suggest that the communal narrative and literature of the Jain community has also vanished due to a lack of presence in the city. [5] An astonishing discovery can be verified by analyzing the city's-built fabric today because rising tensions amongst religious groups led by the Indo-Pak partition incapacitated them to migrate from their ancestral land (Lahore). The traces of the Jain community are buried under the new city's heavy infrastructure due to the negligence of city development authorities and societies' reluctance to accept them as a member of the community turning these sites into ruins. Therefore, the condition of these heritage sites is marred by tragedy.

Figure 3. The map shows focal areas of concentration which the Jain Community occupied in Lahore during the 1900s.

Later, in a series of unfortunate events that garnered the attention of the international media, socio-political tensions between Indo-Pak swept a wave of anger and retaliation that materialized in the form of urban destruction within major cities. An attack by extremists on the historical Mughal Babri Masjid in India was retaliated by local radicals in Lahore, who set out to attack all city temples. As a result, in December 1992, one of the most prominent Jain Temple of Lahore fell prey to a raging mob of angry protestors. They attacked the tallest temple of the city and brought it down while hundreds of locals gathered on nearby rooftops and streets to watch.

Due to the lack of solid documentation about the prominent Jain temple before destruction, facts about its timeline were missing. However, local witnesses, inhabitants of the area and local media reports often recall the community's historical existence and significant presence in the context.

Destruction of the Jain temple during riots of 92' devastated the community entirely across the globe, leaving a hole in the context of the city. The socio-political tensions led to a tragic division of land and narratives, secularism, and communities' division.

Figure 4. The Jain Mandir Chowk – with the abandoned ruined spire of the destructed Jain Temple lying in the centre of the node surrounded by bustling activity.

To this day, the temple site is known as the 'Jain Mandir Chowk' *(Jain Temple Node).* One of the busiest nodes of the city, located near the historic urban market – the Anarkali Bazaar; it witnesses the movement of a significant number of citizens daily. Particularly in the current urban chaos, only a few citizens are aware that the ruin of the Jain Temple still lies nestled under an old Banyan Tree enclosed by a triangular brick wall enclosure right in the center of the Jain Mandir Chowk.

Government encyclopedias house is short of historical documentation of the temple. The current dilapidated state of the fragmented ruin creates room for an investigation into its significant presence in the context. Incentivised research for this project led to a tentative formation of the timeline of this temple; while local witnesses claim the temple to be over a hundred years old, snippets of records testify to its presence and active use as a place of worship before the partition in 1947. However, after the partition and the consequent move of the Jain Community, literature states that migrants arriving in Lahore found the temple abandoned. Converting the temple into a sanctuary in a strange land, the migrants readapted the temple to a place of living. The authorities who recovered the temple building converted it into a primary school for local children.

Students from the school recall memories about fifty years old; they remember instances of their time within the temple and frames of spaces that existed in physicality. Consequently, the attack in 1992 led to the demolition of the temple by the local mob. Some of whom still live within the present context of the temple, claiming no guilt over their past action.[6] Since the past three decades, urban and infrastructural development in the area has radically transformed the blueprint. They have alarmingly impacted the collective urban memory as well. While recent flyover bridges and underground train stations have set out to dominate the context, the ruins of the Jain Temple, albeit hidden from the public eye – still hold a compelling quality, attracting the visitor to delve into its tragic historical tale.

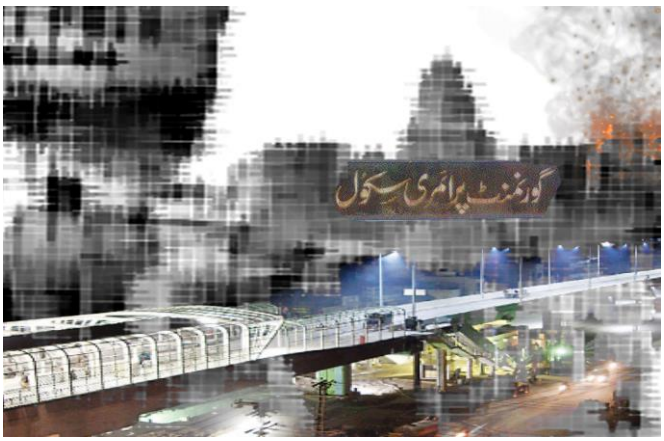

Figure 5. Collage depicted the current narrative of the context in reference to its blurred out past and fragmented collective narratives.

This research incorporated the aspect of urban collective narratives as the primary point of introspection. Through recorded interviews and analysis of the site, a mixed opinion regarding the presence of the temple was documented. While some recalled the temple and the 'primary school' with nostalgic undertones, others rejoiced on its destruction – claiming that did the opportunity to demolition the temple again arise, they would gladly do so. The sentimental tones and the misbegotten sense of patriotism were recorded on entirely opposing ends of the spectrum.

A visual was generated in order to piece together the fragments associated with the context. Understanding the underlying narratives, 'The Panoramic Memory' was designed to depict the transformation of the Jain Mandir Chowk in Lahore. The visual represents the experiences that had existed within the context and their consequent evolution regarding the timeline of events associated with the Jain Temple. From experiences of harmony, sense of belonging to chaos and eventual threat to identity consequently turned into detachment. The city has tangibly transformed from an open, welcoming one with high walls and barriers, losing its past values & culture.

Figure 6. The Panoramic Memory: Compiling the evolving experiences of the site in an attempt to formulate the fragmented narratives of the urban setting.

The Panoramic Memory is a tribute to the Jain Temple and its past. It studies and shares the very intricate relationship between the inhabitants of the built environment and their surroundings while simultaneously marvelling over the element of time and its character in an urban environment. From lived experiences of harmony, sense of belonging to contrasting experiences of chaos and eventual threat to identity converted into detachment not only for the temple but also for the citizens—the drawing remarks on the direct bond between the citizen and his city. In Lahore's case, the Panoramic Memory tries to manifest the layers of activities that co-existed while struggling to survive the multi-dimensional pressure of society's political, religious and socio-economic dynamics.

The Digital Reconstruction of the Fragmented Ruin

Multiple authorities and international organizations were approached to share data and information for the digital reconstruction of the fractured Jain temple. Unfortunately, it was established that conspicuously less information was available to conform with the digital reconstruction of the temple. The local authorities, including the Evacuee Trust Board Punjab and the Punjab Archaeology Department, stated that most data about the Jain Mandir had been destroyed years ago. No other attempt was made regarding the documentation since the Jain Community no longer existed within the province.

The lack of data available made it imperative that documentation of the ruins was to be made a crucial part of the research.[7] Utilizing the mediums of photography and on-site measurements, the ruins were carefully recorded and translated into digital two-dimensional detailed elevations. These detailed elevations then aided the process of the digital 3D reconstructions of the fragmented ruin.

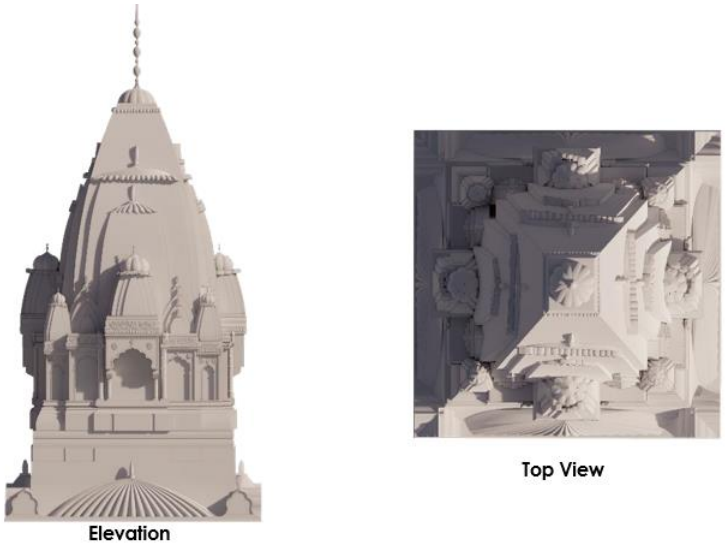

Figure 7. Visuals from the 3D reconstructed model which was developed on the basis of onsite measurements and data collection of the fragmented ruined spire of the Jain Temple.

The reconstructed digital model served as a window to the past. The reconstruction was developed on approximation and was vital for archival purposes as there was no data or information available linked to this specific temple. The documentation and its use required an interdisciplinary approach to mediate the acceptance of this temple's existence. Therefore, the potential of virtual reality technology was devised to maximize the utilization of this documentation process. This method was a safe room for the turbulent memory, where it could exist in a safe, secure and unbiased environment without affecting any community. The virtual existence aimed to help suppressed perceptions associated with the temple's past. While simultaneously stitching the void of memory manifested next to the existing context of the city.

Affiliated with the digital reconstruction of the temple was also an attempt to frame the materiality of urban memory and narrative. Scholars have proven through research that urban memory as an entity is often situational or spatialized. If the places or events associated with this urban memory disappeared, the urban narrative would follow closely. Statistics have indeed corroborated this finding, ever since the attack on the temple in December 1992 and its subsequent erasure from the physical fabric - the tales associated with it gradually trickled away.[8] This method of recollection and data also served as a means for future generations to look into their heritage, reconnect with the environment, and encounter their city with a new perspective. This presence of the temple in the digital world provided means for the community to understand the potential of this medium and its prospects that Lahore's current crisis of urbanization and expansion can be studied to indulge more neutral standard zones for the marginalized communities.

Evolving Technologies as a Mediator in the Contemporary City

The initial documentation of the destroyed structure of the temple was for archival purposes. After the detailed study of the principles and values of the Jain religion, another proposal was developed to manifest them in the form of a virtual architectural spatial environment. The aim was to generate dialogue within such a charged historical urban environment where hostility amongst radicals dominates the city's perception and memory, and it becomes essential to breach the subject with the utmost sensitivity. The immersive experience of architecture through VR can touch upon some intangible notions of architecture that cannot be experienced or translated in any other mode of

communication, lending access to humans beyond common perception, creating a room for possible imaginative narratives. Hence, VR technology was utilized to connect the past with the present, filling gaps of lost memories with the help of the Jain community's religious beliefs manifestation in an environment to step into the future. This technique of interpreting the temple journey is like entering the void where VR is just a mediator. Prevailing the context without inciting/triggering the local community presumably steadfast and concrete opinions about the past, the immersive experience for the Jain Temple invites communities globally to understand and analyze perceptions of the past without the segregation of reality. A journey through a virtual world, mediating barriers and limitations of the physical and historical context.

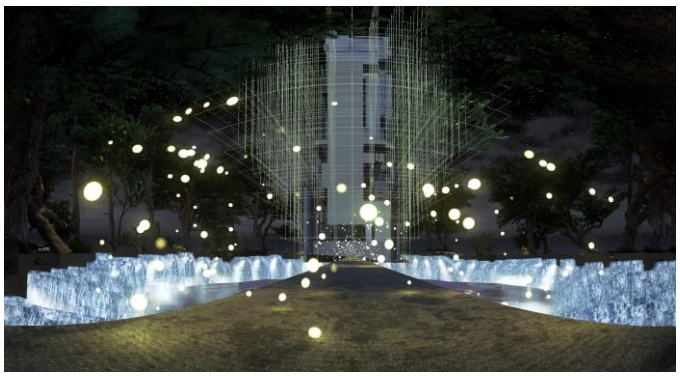

Figure 8. Visual from the VR experience – materialising the fragmented memory and its journey in an intangible environment.

This proposed VR experience is derived from the universal principles of the Jain Community. They were preaching values such as purity, peace, contentment, silence and the confrontation with reality, the virtual experience incorporated architectural elements that induced an experiential journey for the viewers. Each architectural space formulated becomes part of the virtual tower of memory. It inspires the user to learn and re-evaluate perceptions through an immersive space where architectural scale, gravity, light, element of water and nature come together. The journey is based on the transformation of principles aligned with the context's transformation over the years. Spaces are designed to confront the inhabitant; the virtual tower of memory symbolizes the Jain temple appears as a beacon of hope. It provides a reprieve for the user from the delusions of the world, inviting them to uncover a unique journey that ends in a space where one confronts self.

Figure 9. VR Prototype for the proposed theoretical experience.

The application is based upon primary research generated & documented involving photogrammetry, advanced computer software and specific equipment to experience the space. The involvement of these unique mediums resulted in a far open-ended design process which is apparent within the virtual

environment. The virtual journey was also presented to audiences to educate and analyze their responses towards this theoretical experience. This immersive environment experience corroborates by simulating as many senses as possible, such as vision, touch, hearing, even smell; the computer transforms into a gatekeeper to this artificial world. These unique experiences and perceptions are often reconsidered at the end of the virtual journey.

An example of virtual realities potential or digital documentation of architecture is the Paris Notre Dame Cathedral fire as France rebuilds Notre-Dame Cathedral, the French studio behind 'Assassin's Creed' offered up over 5,000 hours of research on the 800-year-old monument. The historian Durand oversees historical representations in the blockbuster "Assassin's Creed" franchise. He spent four years overseeing the creation of "Assassin's Creed Unity" — a game set during the French Revolution that contains a stunningly accurate depiction of Notre-Dame Cathedral as its centrepiece[9]. The example of Notre Dame is a precedent that can be considered for the Jain temple's catastrophic cases. This archaeological approach can add more depth to the existing paradigm synthesizing context, narratives and memories related to the physical space. Incorporating such a medium tends to widen the horizon of improvement and discovery in tumultuous scenarios where the need for arbitration becomes imperative in a narrow field. As proposed by this research, VR tends to take on the role of a subtle mediator; through the architectural experience, it works to erase boundaries and walls erected in the past and diffuse the fiery divide. It tended to return an essential narrative to Lahore's highly fragmented fabric in the past and had ceased to exist for many.

CONCLUSION

The immersive experience within itself serves as a liminal threshold for this kind of project. It encourages individuals to re-orient themselves with their past and the contemporary urban environment of their city. The idea of religious sites and their extension into virtual reality for believers to experience is inconclusive in some cases. However, in situations like the Jain temple, incorporating architecture with VR can open up a gateway for tolerance and vice versa allows for a much-diversified response amongst individuals. It also depicts the possible potential of Virtual Reality as a medium concerning architecture, of limitless possibilities that can be utilized to address and negotiate urgent socio-political, religious and cultural issues that currently divide and fragment the world. A neutral platform equipped with cloud technology can facilitate millions around the globe by virtually teleporting them to sacred sites that have never been possible for them to experience. Encouraging the designers to seek beyond physicality to address global issues allows future generations to reconnect with history, re-evaluate the urban memory, and finally allow citizens and community to reinstate their past within an unbiased, safe, and secure virtual setting.

ACKNOWLEDGEMENTS

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NOTES

[1] Abdul Rehman, *Mapping Lahore: Tracing Historical Geography of a City through Maps.* (Al-Mezan Publishers and Book Sellers, 2013).
[2] Turok, Ivan, and Gordon McGranahan. *Urbanization and Economic Growth: The Arguments and Evidence for Africa and Asia.* Environment and Urbanization 25, no. 2 (October 2013): 465–82. https://doi.org/10.1177/0956247813490908.
[3] Various pieces of literature on the history of Lahore give insight to the diverse culture the city was popular for in the early 1900s. Pieces by local authors and even renowned tourists have penned down accounts of the experiences within the city.
[4] The Lahore Museum has a dedicated section to artifacts and relics belonging entirely to the Jain Community as proof of their strong associations with the land prior to the Partition of 1947.
[5] Peter Flugel and Muzaffar Ahmad, *An Exploratory Survey of the Jaina Heritage in Pakistan*. CoJS Newsletter no.13: 27 – 32, (2018) https://www.eprints.soas.ac.uk/25638/1/Flugel_Pakistan_Off%20print.pdf.
[6] Interviews of the inhabitants of the context was one very essential part of this research. Recorded on-site interviews were documented of the local community members of various age groups and backgrounds in order to understand and analytically evaluate their approach to the series of events associated with the Jain Temple in the past and their opinions about the contemporary urban condition of their own city.
[7] An extremely challenging part of the project was the research on such a sensitive social issue. Local authorities claimed the lack of data record about the Jain Mandir since it's demolition in 1992. While local narratives became an important turning point within this project – only snippets of data available within literature gave insight to what existed in the past. An important and compelling reference for this project was found in David Pinault's "Notes from a Fortune-telling Parrot: Islam and the struggle for religious pluralism in Pakistan." Pinault regaled his experience as a tourist in the late 90s on a visit to Pakistan, his recollection of the Jain Mandir and his consequent interviews of the by-standers who had witnessed the attack of 1992.
[8] Human memory is quite often categorized as spatialized and situational with associations to either a built physical space or an event. In the case of the Jain Temple – the urban recollections were dominated by the events of December 1992. Locals recalled the event with great clarity, while most were expressing doubt at any prior recollection of the Temple.
[9] Gilbert, 2019

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A SMART SYSTEM APPROACH FOR URBAN ENGINEERING

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INTRODUCTION

Past and current urban systems evolved supposedly to provide organised solutions to resolve specific problems, yet when these problems are viewed through lenses shaped by their sectoral constraints it becomes evident that a monolithic view can also be part of the problem. For example, to design a transport initiative only viewed through a transport lens, rather than systemically and holistically (combining social, environmental, economic and governance lenses), risks not only inefficiencies, but ineffectiveness. To avoid the adverse consequences of a sectoral approach to problem definition and design, in this paper we propose a holistic engineering ('ingenious') approach to urban solutions to understand the multiple implications of design options now and in the future. The aim is to provide a systems approach to overcome sectoral silos between professionals who are involved in the creation of the urban assemblage[1]. The methodology is founded on an understanding of the urban context in terms of its smartness: through societal, environmental, economic and governance impact assessment of the proposed solution(s)[2] . We use Lancaster City Centre as a case study to demonstrate the methodology for assessing the likely impacts and opportunities presented for a proposed urban solution and illustrate our systemic approach. We thereby show that understanding the engineering system in its urban context validates the hypothesis that 'interdisciplinarity' is essential in urban solutions, combining as it does both 'soft' and 'hard engineering'. It is equally essential in informing policy and decision-making in the urban context, and thus city governance structures can benefit from using the smart methodology. We propose that urban interventions need a design approach which exemplifies how urban engineering provides benefits for all stakeholders, which in turn means developing the ability to co-curate policy with communities of practitioners, policy officers, academics, and the wider public.

WHAT WE MEAN BY URBAN ENGINEERING

For a city (ifself a system-of-systems) any civil engineering system change to the infrastructure or the urban systems they support affects the overall system. As Bozza[3] note, complex theory usually evaluates the resilience capacity of any change in the engineering network within its urban context. A similar notion for cities is likely to confuse because of the precision of focus and accuracy of designs often required in engineering and the ambiguity in organic societies that make up cities, because we cannot engineer how humans will act in organised societies[4]. Thorn (2012) notes that this dichotomy

between engineers and urban scientists is a topic worth researching. Much earlier theories underpinning the current broad approach to engineering showed that often political systems would determine spatial layouts, like in the case of the 1930's and 1940's view of what would be good for the people, enforced by the architects and planners of the time; this led to the misconception of an *ordered* society, one which was overturned by the 1960's expression of ideas and participatory planning, which engineering might struggle to achieve[5]. Although organic systems in urban contexts should not be explored only in engineering terms, often engineering can provide clarity in developing predictive models to evaluate resiliency and sustainability outcomes – for different urban scales (at both neighbourhood and city scales), to build in adaptability, and to inform future decision-making to cite only a few examples[6]. Urban engineering needs to adopt a bottom-up approach: systems exist in the underground networks, and indeed the utilities buried underground can reflect the characteristics of urban areas that are of interest (for example, high concentration or complexity) and that require careful systems' governance [7]. Inevitably, these engineering networks (controlling and directing utilities, materials, flows, etc.) affect the systems on the urban surface and the way that their engineering design will have a long-lasting impact on the environment, economy, and the daily functions of cities[8,9]. Urban engineering facilitates those solutions needed to combat urban challenges via a holistic approach, using both engineering and urban paradigms.

The problems of urban development

Urban developments around the world have been focusing on maximising land value and achieving the highest earning potential. This has led to the commercial approach to urban development. Such models appeared often as a profitable solution to the problem of low-cost land in underdeveloped areas, in the Middle and Far East particularly, before the economic downturn of the late 2010's. These were graphically represented developments that emerged immediately from the drawing board and were sold to investors or developers as a way of making profit: a capitalistic western idea that Hillier and Hanson[10] (p. 264) call "*an industrial bureaucracy*" of urban development. However, focusing on land profit could result in manifold risks for future living. Large urban developments require excessive resources during construction, and construction materials are responsible for a disproportionate amount of environmental impact on the planet. Issues of massive immigration and social inequality also result when construction workers migrate from nearby countries and often work under difficult working conditions (Figure 1a&b).

Figure 1. (a) Fast Urban Development and (b) Construction Workers (Cavada, M. 2009)

Additionally, urban developments following the economic crisis started to consider their environmental impact and carry out impact assessment – this was probably done as an exercise during

planning, and avoided consideration of future use and operations. Additional emerging technological advancements to support urban efficiencies came to fruition as one suite of solutions to the overdevelopment of urban areas. In contrast to the profitable view of urban development, Parc de la Villette[11] in Paris can be seen as an early example of re-configuring space for socio-economic intentions in the urban landscape. It compromises of a series of 'foliage' – buildings systematically arranged in a grid of points, lines, and surfaces[12]. It also perceives urban space (although it is a park) in an alternative mode, contradictory to the fast urban developments and the technological advancements that are briefly discussed here. It predisposes the ideas which urban scientists, architects and often civil engineers have been researching as alternative models for growth, often rethinking the purpose of growth itself. In the next section, we explore from case studies another concept for urban areas: the 15/20-minute city as a system. Subsequently, we explore what this concept could mean for Lancaster City Centre.

The 15/20-minute city as a transport system

The 'minute system' discussed here as a holistic engineering system, i.e. a time-defined city[13,] is a concept articulated first by Professor Moreno at Sorbonne University to describe how urban planning is ordered by the time constraint of mobilities. For example, Moreno[14] explain the ways in which proximity to amenities could yield positive outcomes for sustainability – a notion also deeply rooted in *true smartness*, where technological and other advancements aim to bring together, and help engineer, the overarching qualities of city living[15,16].

It appears that the Covid-19 pandemic has exposed the fragility of urban planning, and highlighted (or exacerbated) contemporary challenges, such that urban mobility became a defining moment in cities: people needed to move easily around for pleasure, activity, and socialising according to healthy (physical) distancing rules; this also meant that access to places became a challenge for which the 15- or 20-minute city could provide alternatives[17]. In their efforts to embrace walkability as a mobility system, the Congress for the New Urbanism (CNU) Strategic Plan 2020[18] aims to inform urban design principles in the 15-minute city[19] and counter the danger of the idea becoming a gimmick in the political agenda. The 15-minute area is spatially divided in a radius accessed on the basis of walking, cycling, and even short public transportation distances (Figure 2).

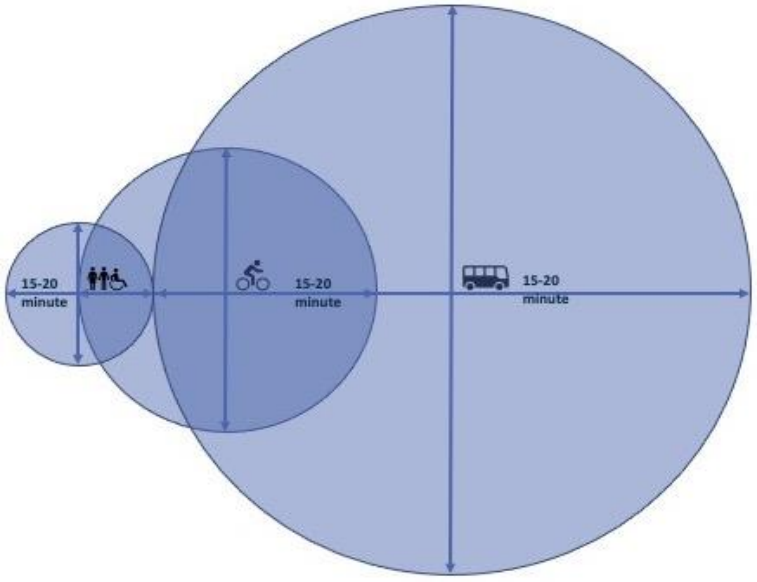

Figure 2. A 15/20-Minute City Radius (M.Cavada, 2021).

These might bring benefits of liveability to the city centre of a city, for example to increase walkability and exercise using cycling. Careful consideration is needed to superimpose this radial axis on a cityscape; often perfect circles on a map, whether for existing cities or for newly developed urban areas, fail to respresent reality due to topography or barriers (large private sites, water features, major transport routes). It becomes a risk that the n-minute-system becomes a two-dimensional graphical exercise, while the full potential of the n-minute-system city needs to embrace holistic thinking and adjustment according to the local context to inform engineering, urban planning and urban design. For example, one way would be to connect walkable areas, which are the focus of existing liveable urban areas, which could lead to formalising a pattern in urban design and enable engineering systems to be adjusted so that they support urban areas more effectively.

Therefore, to understand all of the interconnected systems involved in the n-minute-system city, urban engineering needs to consider the nature and shape of boundaries and influences arising from urban design and engineered infrastructure systems, so that their designs can be adjusted accordingly. Engineering networks are characterised by data, can provide accurate modeling of different scenarios and enable performance measurements to be taken, and therefore positively impact decisions with confidence both in the delivery and assessment of the multiple benefits they typically offer. A positive impact of this systematic approach would be to provide insights into how we could quantify the system's impact across different cities offering different contexts and, therefore, different modelling scenarios. In the context of this study, we are then faced with the question of how the spatial arrangement of the n-minute-system city would differentially affect UK cities such Manchester, Birmingham, or Lancaster. In this research, we explore generic examples of the n-minute-system city and apply the findings to the city of Lancaster.

The 15/20-minute city case study

Cities which are responding to their urban challenges have done so in similar ways, and the n-minute-system is one such current response. The Mayor of Paris, Anne Hidaglo[20], following Moreno *et al*.'s (2021) advice, announced plans for a n-minute-system founded in the 'Paris en Connum'[21] principles (ecology, solidarity, engagement, and the 15-minute city). As reported by the Parisian administration[22], a graphical representation[23] shows how neighbourhoods can be transformed into a 15-minute city around the school, the neighbourhood street, and the neighbourhood square. It claims that proximity can lead to a lower carbon footprint and act as a response to a health crisis (for example, the current Covid-19 pandemic) to limit traveling to other parts of Paris. A strong element of the Parisian 15-minute city paradigm is democracy, in the sense of participation, following the idea that the 17 sub-areas in Paris each have a unique character and should be shaped to reflect this character.

An advancement to the graphical representation of n-minute-system is contained in the Portland (Oregon) City Plan[24]. It indicates how planning for a 20-minute city is represented spatially, showing good accessibility at short distances in the centre (as might be expected) and also which areas need to be improved in the outer parts of the city to conform to alignment with what is considered a 20-minute radius. The plan is based on measurable objectives; for example, what does the 20-minute city walk mean in terms of (reduced) health risks and the impact on the city finances? Oregon's City Plan reveals the importance of other factors (evaluating specifically economic and health impacts) which can be addressed by the n-minute-system concept. Similar to the Oregon critical view is Paolini's Degrowth Manifesto on decision making for the post-Covid era[25] sent to the Barcelona Mayor. In principle, it emphasises a mobility system based on walking and limited car use, and articulates the benefit of these; for example, lowering noise levels, –encouraging tourist activity and increasing

children's activity, and providing tree canopies, all having the effect of improving the image and branding of Barcelona.

These examples of Paris, Oregon, and Barcelona highlight the future possibilities for UK cities when designing a n-minute-system. One particular challenge when it comes to designing such schemes in UK cities is their long history (their fabric is often old and complicated) and the fact that they are often very dense. To build on these ideas for a UK context, we explored how Lancaster could perform if the n-minute-system were introduced. The reasons for choosing Lancaster are because it is old and dense, it is a medium-size city (this means that interventions would be easier to scale up or down for larger or smaller cities) and it is a subject of the northern investment policy by the national government, a good opportunity for local redevelopment alongside actions to meet the current housing demand[26]. In the next section, we use the smart cities engineering approach to explore the benefits that would emerge from the n-minute-system.

Engineering the n-minute-city system for a truly smart Lancaster

In this section, we explore the current urban reality of Lancaster, proposed changes, and how these changes might fit with an n-minute-system concept founded on a 'truly smart' engineering approach. This is done using the Smart Model Assessment Resilient Tool (SMART, using Lenses, Goals, Actions and Impacts[27], in its framework of anlysis which has been used to assess 'true smartness' of cities that claim to have adopted smart city actions[28]. Lancaster City Centre is characterised by a loop system (Figure 3a), which is highly congested by private cars that dominate mobility in the centre. Due to the pedestrianised area within the centre, public transport (buses) runs around the loop and crosses twice to connect towards the western areas of Lancaster. This loop system, almost of an elliptical shape (Figure 3b), brings huge delays to transportation, with the congestion (hence stationary and slow-moving traffic) exacerbating the already serious air pollution issues that the traffic presents. The cycling route (Figure 3c) exists beyond the boundaries of the central part of Lancaster, crossing twice the centre loop (where uncertain safety issues arise).

Figure 3. Lancaster City Centre: (a) Cars, (b) Public Transport, and (c) Cycling Route

In response to the congestion, compromised air quality, contested mobility strategy, and contested liveability of the centre, those responsible for local governance (Lancashire County Council and the Lancaster City Council) jointly published a document[29] and received consultation on envisioning Lancaster as a 2031 city largely freed from cars, and associated air pollution, with attractive walkable spaces. The strategy aspires to support inclusivity, quality and safe living along with an array of emerging fiscal benefits, all which are anchored in an easy and joyful movement around the centre. Places of interest, for example Dalton Square, the Penny Street Bridge and Castle Hill, sit on the edge of the gyratory and perform as connectors to places outside the centre.

These aspirations, found in the Lancaster City Centre Movement Strategy, also conform to some of the characteristics of the n-minute-system city as well as aligning with 'truly smart' city aspirations,

described in terms of city living quality[30,31]. We believe these can be accomplished by the mobility initiatives, as described in the Public Realm Strategy. We explore these by superimposing the n-minute-system strategy on the Lancaster central area and assessing the initiatives in the Public Realm Strategy using the SMART (Cavada *et al.,* 2019). Figure 4 shows how n-minute-system thinking plays out in Lancaster: the central gyratory in red, 15 minutes for walking in yellow, and 15 minutes for cycling in purple[32]. The 15 minutes' reach for public transport, if unaffected by congestion, extends beyond the central area of Lancaster and is, therefore, omitted in the figure.

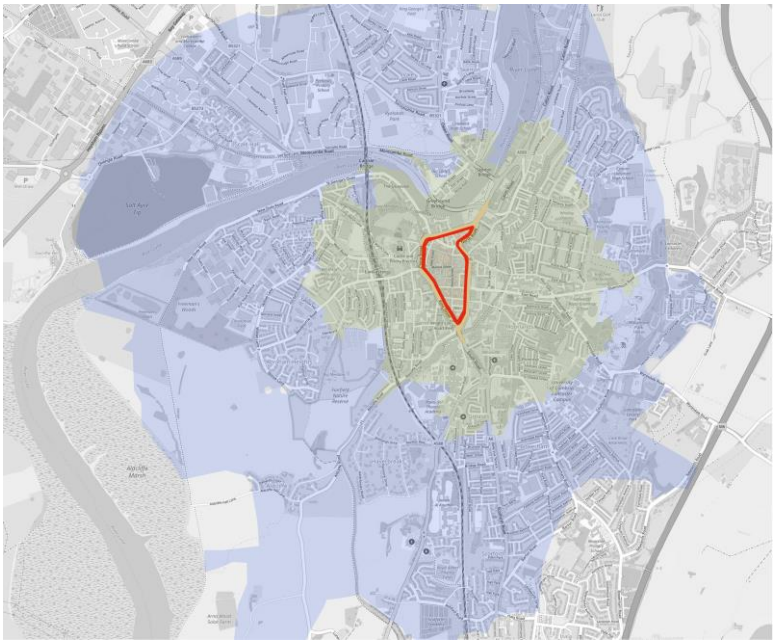

Figure 4. The 15/20-Minute City Radius in Lancaster

A 15-minute or 20-minute system includes all of the area of the 'gyratory' system, as named in the Public Realm Strategy, and extends to the Castle, this being one of the major cultural attractions in Lancaster, and other nearby areas of interest. This also means, however, that the gyratory system falls within, and potentially creates a barrier to, the walking area: there is a conflict between vehicles and walkers. A cycle path, largely existing beyond on the outer radius of the gyratory, is similar to that which currently exists (Figure 3c). To access public transport, the n-minute-system strategy clearly shows that pedestrians can reach the train station, Greyhound Bridge and the Moorlands area (to access buses). For these reasons, the centre of Lancaster provides a good fit for the n-minute-system and the benefits that the system can offer. However, it needs further investigation into how the three radii can intersect to provide connections between walking, cycling and public transport, and specific connections to places of cultural and environmental value. Moreover, an exploration of how the n-minute-system then plays out in the areas beyond the purple shading in Figure 4; in particular access to essential facilities (shops, schools, health, areas of cultural and environmental value, etc.) without resorting to the use of the private car, via routes that are free from danger and pollution and aesthetically and ecologically pleasing. For example, the creation of interconnected green infrastructure corridors to enable pedestrians and cyclists to move free from traffic[33], while also benefitting from ecological ecosystem services[34] would provide multiple benefits for Lancaster's citizens, and ultimately the city itself.

We explored the benefits for the area by assessing the Public Realm Strategy (PRS) through the Environmental, Societal, Economic, and the Governance Lenses of the SMART (Cavada *et al.,*

2019), notably to indicate areas which need support or show future potential. The PRS offers eight options (1. Maintain the Existing One Way Network, 2. Two-way Gyratory, 3. One lane and one way gyratory for vehicular traffic with second lane dedicated to sustainable travel, 4. Sustainable Travel Corridor East, 5. Sustainable Travel Corridor West, 6. Principle of No through City Centre Traffic, 7. Principle of Gyratory Closed to Through Traffic Except for Exemptions, 8. Principle of City Centre Clean Air Zone) for solving the problems caused by the gyratory system and these were evaluated by a five-point appraisal (Environment, Mobility, Place, Safety, and the Economy – these were set out by the Chartered Institution of Highways and Transportation in the Public Realm docuement (CIHT).
There are similarities between the CIHT five-point appraisal and the SMART analysis, but also the key differences concerning the Societal and Governance Lenses. The PRS evaluation (rating the options as red, amber, green, and greener) showed that out of the eight options responding to the gyratory issues, three achieved a 'green' appraisal or above. Option 8 – Principle of City Centre Clean Air Zone – aims to enforce a Clean Air Zone (CAZ) for the gyratory, achieving a greener level of appraisal for Environment, Mobility, and Safety, and a green level for Place and Economic levels.
We assessed Option 8 as the proposed initiative for the SMART analysis by reviewing the information provided in the PRS, i.e. we explored to what degree this solution is 'truly smart' and proposed further system interventions in order for it to become truly smart. As shown in Figure 5, the SMART analysis provides a view across four Smart Lenses. Across the four Lenses, the CAZ initiative achieved some impact in the Societal, Environmental, and Economy & Finance Lenses, and none for the Governance & Policy Lenses. This indictes that the design of the CAZ should specifically include Actions related to Governance & Policy impact, or at least articulate the benefits to this Lens. The impacts on the Societal, Environmental, and Economy & Finance Lenses are direct (i.e. specifically target direct benefits), but also indirect (not the specific target of the Actions, but likely to be delivered nevertheless).

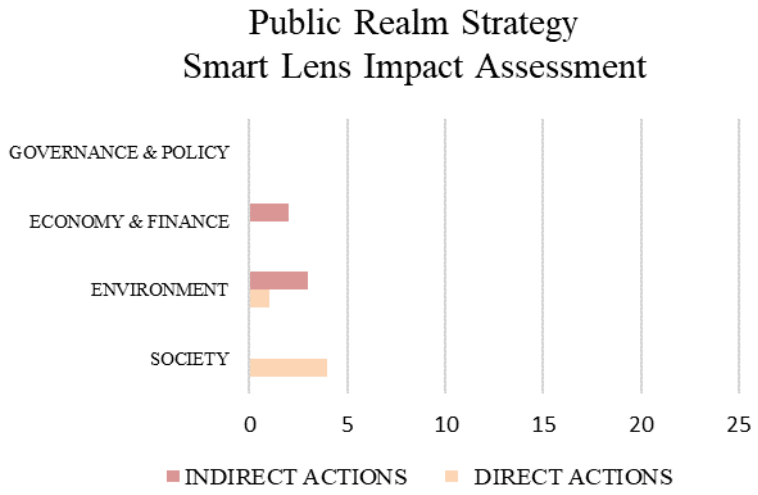

Figure 5. The SMART (Lenses) Impact for the CAZ, Lancaster.

More specifically, the CAZ impact is targeted directly at the Societal, and to a lesser degree to the Environmental, Lens, while the Economy & Finance Lens is shown only to benefit indirectly. The SMART analysis overall includes the possibility of an initiative impacting on 28 Actions in support of 'true smartness'; analysis of the CAZ initiative in the PRS showed there to be intended benefits (i.e.

have a direct impact) on five with most impact targeted at societal improvement (enhancing well-being and ensuring fairness) and some targeting of environmental improvement, as shown in Figure 6.

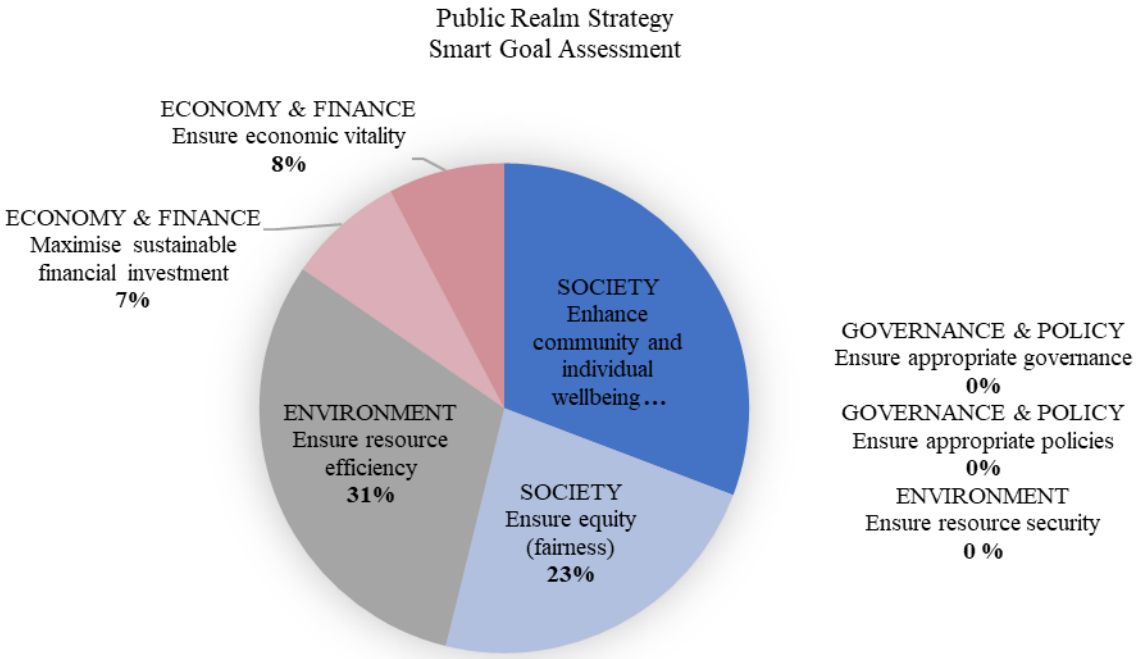

Figure 6. The SMART (Goal) Assessment for the Lancaster Principle of City Centre Clean Air Zone (CAZ; an Initiative in the SMART Analysis)

The SMART assessment therefore has shown that the CAZ initiative has some positive impacts on the Lenses, yet broadening its engineering design brief has the potential for the initiative to deliver a greater range of benefits and enhance its credentials in terms of 'true smartness'. This is because the CAZ initiative is designed to deliver social and environmental impact, which is understandable. However a deeper analysis, enabled by SMART, demonstrates there are indirect economic benefits that would be realised by implementation of the CAZ initiative, benefits that might be either implicit or unintended, or even counterintuitive, as far as the designers are concerned. While the analysis has shown that a more explicit design focus should be brought to bear on the societal, environmental and economic benefits to realise better outcomes, the governance lens has apparently been overlooked; while benefits to governance and policy can also be specifically designed into the initiative, cognisance of all of the forms of governance is crucial if the implementation of the initiative is to proceed smoothly and successfully – if it is to realise its full potential. For this to be achieved, a systemic approach to the design is essential [35].

These results can benefit Lancaster's CAZ not only in terms of efficacy of benefit delivery, but also in terms of rge development of a more compelling business model, based on the value (the multiple benefits) identified, and thus the business case for change[36]. Considerations in the SMART analysis related to the Governance & Policy Lens include, for example, a conscious effort to *uncouple governance structures and policy making timescales from political cycles and 'colour' of governing bodies* so that bis seen to be done for the good of the city and not for political reasons. Under the Economy & Finance Lens, specific consideration should be given to: *investment and economic vitality should maximise well-being* and *maximise investment to support liveability objectives*; while it can be argued that this already seems to happening (i.e. it is implicit in the presentation of the initiative),

more explicit consideration is needed to provide a clearer articulation of the benefits, which in turn might lead to a refinement of the design. Such a systemic analysis would accord well with approaches to planning such as that advocated by Space Syntax[37].

CONCLUSION

As argued in the introduction, holistic and systemic design of urban interventions can yield multiple benefits across the social, environmental, economic and governance domains. The delivery of such benefits, however, can be both extended and enhanced by the application of 'truly smart' criteria in a comprehensive assessment framework, such as that in the SMART analysis. Moreover, these benefits, or sources of value, can be used to underpin more copmpelling business models and support the business case for change. To understand some of the impacts of Lancaster's Public Realm Strategy on the Lancaster urban context, this research has studied mobility initiatives proposed by those responsible for local governance to establish where it coincides with ideas of (true) smartness. It has been shown that the plans for the central area fit well with the aspirations of the 15/20-minute system, and that the plans could be enhanced by organising the system around places of interest, for example the Castle and other historical features of the city. Moreover, consideration should be given to such n-minute-system zones for the surrounding areas, linked where possible to the introduction of pedestrian and cycling routes free from traffic and in association with the green infrastructure that cities aspire to incorporate.

However, this two-dimensional approach to urban planning for a n-minute-system might not be adequate; for example, it can result in unintended consequences, such as spillover traffic to other areas. Here a systemic approach could explore and analyse how to engineer urban solutions, for example combining democratically the formal rules and unplanned controls for an urban system as advocated in novel planning approaches. The systemic engineering approach could allow future projection of these actions, and their impact delivery, alongside other urban developments; in the Lancaster case, for example, future housing and mobility connection to other areas.

To demonstrate this thinking further, a specific initiative – the Lanacster Clean Air Zone – was analysed using the SMART tool. While this demonstrated that social and environmental benefits were directly articulated, and these would presumably form the case for the implementation of the CAZ, several indirect economic benefits would also be realised. However little consideration of governance, and the additional benefits that this would bring, was found. Drawing in such a comprehensive analysis of (truly) smart criteria into design thinking could lead to far more effective, and joined up, improvements to the city, delivering a greener and smarter future for Lancaster and its people.

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LIVING IN THE PETRI DISH: ACCLIMATING TO LIFE ALONGSIDE SMART CITY SYSTEMS IN MILTON KEYNES

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INTRODUCTION

Oftentimes when considering the theory and practice of Smart City technology it is difficult to narrow the scope of its concept. The joining factor between almost all pieces of smart city technology is the use and collection of data, as Guru Banavar explained in 2012 during a discussion of the success of Rio De Janiro's smart city infrastructure. He stated that the concept of "Smart" was all about information or data and possessing the understanding of how to use it[1]. This understanding of what it means to be smart is what allows for Smart Cities to employ a wide range of concepts that all vary in their use of current and future technologies. Such is the case in Milton Keynes where the range of implemented smart technologies varies from public Wi-Fi on the bus network to a fleet of independently navigating delivery robots. Milton Keynes has been, and will continue to be, a city that is used as a test bed for experimental smart city technologies; a petri dish for the benefit of tomorrows Smart City architects[2]. The term Smart City encapsulates a wide variety of technologies, systems and solutions that all apply varying degrees of complexity and technology, the definition of the Smart City itself varies because of this. Often such definitions include reference to the use and development of Information and Communications Technologies (ICTs) within the Smart City[3] but there are other instances of governmental bodies viewing the Smart City as a city that is more focussed on the citizens within it rather than the technology, defining it as a place that acts to improve the efficiency of local services and networks, in turn improving the lives of the citizens within them[4] [5]. In the instance of Milton Keynes both of these definitions would line up with the city's development.

DEVELOPMENT AS A SMART CITY

The beginnings of Milton Keynes process of becoming "Smart" can be traced back to 2013 when the MK:Smart project was formally announced; the project would be headed by Enrico Motta and would receive £16m in funding over the course of a three-year agreement beginning in January of 2014[6]. This agreement came thanks to the situation that Milton Keynes had put itself into, the city faced a difficult situation in which their previous growth as a city had led in turn to a progressively larger growth forecast of the city's population - thanks in part to the fact the city had been host to the fastest growing UK city economy outside of London between 1997 and 2011[7]. With this impending growth in mind the city sought solutions that would allow them to develop sustainable growth to their existing infrastructure without destroying it, a task which smart city technology would indeed aid

with. The MK:Smart project proceeded to create a comprehensive network of sensors and other devices in order to jumpstart one primary goal; the creation of a data hub that would inform important decisions within the city through collected – decisions such as the demands of key infrastructure networks, pollution and weather data, social media and communications data and more[8]. This would become known as the MK Data Hub, a project that would find international attention and praise in publications such as the World Bank's Internet of Things Review in which they issue their belief that MK:Smart was among the first city-based projects that tried to understand data at the heart of the Smart City[9].

Figure 1. Enrico Motta speaking at the MK:Smart announcement

The MK Data Hub would prove useful in the creation of several applications that would rely on the datasets that were shared, some of these projects included a Quality Of Life map, a robotics competition, a health and safety monitor robot and a datamap that tracked the active cases of Covid-19 within the city[10]. The foundation that had been established by the MK:Smart project and the creation of the MK Data Hub has enabled Milton Keynes to pursue other projects that build upon the existing smart systems – one such example is the MK:5G Project that was agreed upon in 2019. Once again headed by Enrico Motta this project instead focussed primarily on the development of a substantial 5G network that covered central Milton Keynes and other important buildings around this area such as the hospital, rail stations and universities[11]. This project, in turn, would be successful and would once more feed into other projects and initiatives such as the CityLABS Initiative, SciRoc and SPICE[12]. Despite the success and informative nature of many of these projects a majority of these initiatives and projects have created systems that a fairly opaque to the average citizen of Milton Keynes. The MK Data Hub creates, effectively, an endless cycle of data collection and storage for data, and in return users who are aware that the system exists are free to use these datasets to create individual projects informed by these datasets. But the data hub is not well known locally, and at the time of its creation was hardly covered by local or national news outlets. In this way, acclimating to life alongside the data hub was seamless as nothing seemed to change for the citizens of Milton Keynes. On the other hand, the creation of the 5G Network in Central Milton Keynes had provided a service that was visible to its citizens – a characteristic that another Smart City system implemented into Milton Keynes shared with this initiative.

INDUSTRY DEVELOPMENTS

Starship Delivery is a company that specializes in the operation of a fleet of small scale hospitality delivery robots these robots are not restricted by static residence or address like a package delivery from Amazon, for instance, as they operate instead based on the location of the mobile device that placed the order[13]. The fleet of robots arrived in central Milton Keynes in 2018 and the autonomous delivery industry within the city began to see a rise in popularity with citizens finding charm in the robots autonomous mobility and quickly integrating them into their daily shopping routines[14]. The service expanded to other areas of Milton Keynes and surrounding towns such as Newport Pagnell in late 2019 – proving to be a benefit for the company as the Coronavirus pandemic dissuaded many people from visiting stores in person and instead they were able to order using the Starship service for direct delivery, leading to the company reaching the milestone of 1 million completed deliveries in early 2021[15].

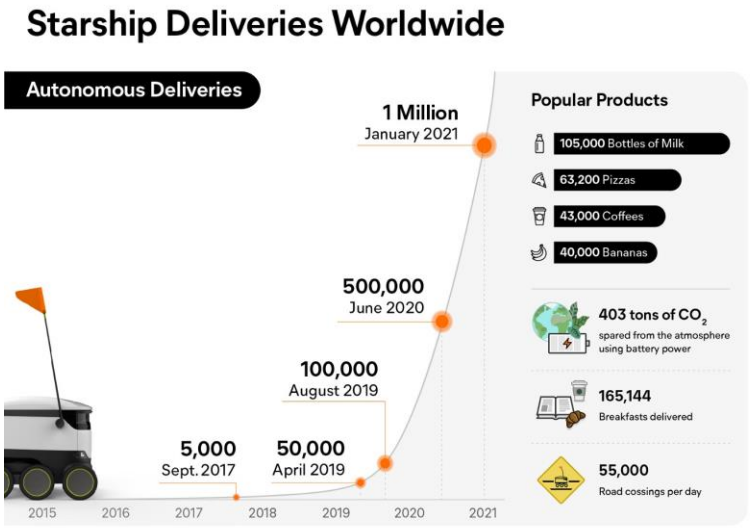

Figure 2. Starship completed deliveries

The introduction of Starship Delivery within Milton Keynes has been a success for both the company and the citizens, a smart city citizen that serves the people and introduces Information and Communication Technology. Whilst the appearance of automated delivery robots may seem to be an introduction of disruptive technology within the city that would detract from the efforts of large grocery companies and their individual delivery services the system has instead seemingly created its own niche, small scale express delivery for local shops, cafes and restaurants. As for the general public perception of the project, the robots seem to have been quickly accepted as a part of daily life – as MKFM reports; the delivery robots have won over the hearts of many locals, with it becoming the new normal to greet them as they pass[16]. Starship has not been the only industry development that has taken place in Milton Keynes. The addition of outside factors such as Starship Delivery present an alternative way to develop a smart city in a seemingly organic or natural way, in some instances the funding and creation of smart cities can be seen as the result of sold physical or digital advertising within the city, as Aron Shapiro describes the creation of Public-Private partnerships have become the de facto model for smart city financing, a future in which brilliant innovation is funded by Smart Advertising[17]. But as with any rule there are exceptions, as the not all initiatives within the smart city rely on this model of Public-Private partnerships. Milton Keynes has benefitted from the majority of

their initiatives being supported by departments of government such as the Department for Digital, Culture, Media and Sport.

PAVING THE FUTURE

One such partnership between can be seen within Milton Keynes once more in the instance of Milton Keynes 5G testbed named MK5G or MK5G Create, an agreement between the Milton Keynes Council and its partners with the MK Dons stadium to develop 5G technology that develops advanced logistics solutions for the hospitality industry within and around the stadium[18]. The MK5G project intends to effectively offer a similar service to the service provided by the Starship Delivery robots. If previous initiatives completed within Milton Keynes provide any evidence of what to expect, future initiatives may build off of the 5G infrastructure that is implemented into the stadium into other areas of the city such as the shopping centre or surrounding areas such as “The Hub”.

Figure 3. MK Dons Stadium

Another initiative that Milton Keynes has agreed upon is the MK Futures 2050 strategy. In a similar way to MK:Smart the goal of the MK Futures 2050 Strategy is to adjust existing systems to accommodate for a predicted population growth, estimating that by 2050 the population of Milton Keynes will be around 500,000[19]. The primary goals, or “Big Ambitions”, of the strategy is to strengthen the existing qualities of Milton Keynes that make it a unique city, push Milton Keynes to be a leading green and cultural city by global standards, ensure decent housing, build safe communities, offer educational opportunities and make it easier for citizens to use and find public transport[20].

SONGDO INTERNATIONAL BUSINESS DISTRICT

The aforementioned concept of Public-Private partnerships being a driving factor for the development of smart cities can be seen in the Songdo International Business District. The district was aided by companies such as Cisco in the development of their smart city infrastructure, which has resulted in the creation of robust solutions such as the waste disposal system of pressurised underground tubes that pull waste directly from trash cans to a waste disposal centre, this system eliminates the need for waste vehicles such as trucks[21] [22]. Despite the robust systems that Songdo has in place, unlike Milton Keynes the city has struggled to attract a population on par with the targets set out by their planning[23].

Ultimately, the methodology of Songdo Internatonal Business District is very different from the approach employed by Milton Keynes.

CONCLUSION

Milton Keynes has created a smart city through gradual integration of completed or developing systems or technologies into an existing city infrastructure, this methodology has proven to be very successful for the city in terms of the city's ability to implement systems and actions that build a trust or understanding between citizens and city systems. The continued chance to develop new systems or technologies in a public setting has aided not only the companies, projects or initiatives that aim to develop these technologies but also the Milton Keynes city council's ability to deploy these technologies when they are ready with a fairly unanimous acceptance from the citizens of Milton Keynes. The unfortunate side effect of developing an integrated system within an existing infrastructure is that the end product will never be as comprehensive or wide spanning as those that are developed in infrastructures that are built from the ground up simply to accommodate the technologies, such is the case in the Songdo International Business District. It is extremely unlikely that, for example, Milton Keynes will ever develop a system as robust as the system of underground pressurised waste disposal tubes that the Songdo International Business District has created. Citizens of Milton Keynes have been gradually, and in some cases unknowingly, acclimating themselves to Smart City systems as they are slowly deployed within the city. An approach that has proven on numerous accounts to bring primarily apathy or ignorance to the existence of such systems; the Starship delivery robots were not run off the streets by citizens fearing for their safety for instance in much the same way that the MK Data Hub had developed a comprehensive data network of the city's activities and saw no resistance because of the lack of news coverage. Arguably, Milton Keynes has reached an ideal middle ground of "Smartness" for the development of the city.

Although this apathy or ignorance may exist on a citizen level the interest displayed by the Milton Keynes city council is made clear by their ability to draw and distribute funding to local or international initiatives, projects and companies that develop smart solutions – as well as the city council's willingness to use the city itself as a testing ground for new and developing technology. Milton Keynes may have become a "petri dish" for the benefit of future smart cities, it may be a laboratory that welcomes experimental systems and technologies into the lives of its citizens – but it is such a place that offers its citizens transparency and visibility to these systems, and these systems are eventually accepted. Ultimately, the point of developing smart city solutions is to improve the efficiency and sustainability of the world's cities. But the developers of such technology must be cautious, because the city is for the people who live within it – not a storage facility for experimental technology.

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THE HISTORICIST AND THE ALGORITHM: AN EXPLORATION OF 3D PRINTED COLUMNS BASED ON THE ARCHITECTURAL LANGUAGES OF GLYPTOTEKET IN COPENHAGEN

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INTRODUCTION

It is now more than 30 years since the dawn of the digital revolution and through various evolutions within the architectural profession; we have entered what architectural scholars and practitioners have described as the Post Digital Era.[1,2] The 'post digital' is paradoxically a thoroughly integrated digital world[3] where digital fabrication tools and computational procedures, previously the dominion of the digital elite, have begun to permeate a broader segment of architectural practitioners and researchers, resulting in new design methodologies.

There are exceptional laboratories and research environments[4] that describe many aspects of digital fabrication; but, research that addresses the artistic and figurative aspects of this emerging design paradigm and its relationship to the history of architectural expression from the voice of the architectural practitioner are much more limited. Through this research I intend to contribute directly to this discourse by reporting on a design experiment that interrogates artistic practice when working with 3D printed clay in an architectural context.

Using scholarly criticism of 'digital architectures' lack of sensitivity to context as a catalyst, a 3D printed clay column is designed as a research experiment for the Glyptotek[5] art museum in Copenhagen in order to directly assess how the expression of the piece can informed by both context, material and fabrication technique. The design intention pivots on the historicist[6] ambition of being sensitive to cultural condition and working with artistic forms and motifs while engaging with and exploring the post digital notion of direct engagement with fabrication and the act of construction.

The paper presents a critical reflection of the experimental design process and is supported by tectonic theory from the field of architecture to make the claim that through the motif,[7] a more nuanced reading of a tectonic element, we find a place to mediate between artistic expression, structure and context.

RESEARCH CONTEXT

If we look back a decade to the previous generation of the digital era, as described by Mario Carpo in *The Second Digital Turn*, [8] the style and artistic expression of digital and parametric architecture received marked criticism from several scholars and architectural practitioners as being difficult to comprehend and lacking sensitivity to context.

Architecture conceived in the 'digital style' was described as having a kind of "digital hyperrealism" where perception of the overwhelming richness of digitally created detail could induce feelings of discomfort and estrangement.[9] Another aspect of this sense of unease stemmed from the homogeneity of new forms that did not allow the viewer to perceive a comprehensible system of joints, or understand how the material was performing in a way that reflected known systems and typologies of structure that we have been accustomed to reading in architectural form. In a sense, the new style heralded the death of the tectonic, as structures born of the digital world became blurred; materials were no longer distinct from structures and in some cases appeared to have contradictory properties.[10]

As computers prompted new ways of finding, conceiving and playing with form, the architect could produce novel structures, which from an aesthetic perspective were oblivious to the past. Where works like this might have expressed the fleeting zeitgeist, Adam Caruso has described them as being unable to grow old, and given their lack of restraint are often not ordinary enough to fit into an urban background.[11] The rapid onset of the digital revolution presented architects with a predicament somewhat reminiscent of the dilemma faced by architects of the historicist era, who grappled with the desire to be innovative and utilise new technologies while at the same time trying to respect tradition and honour a connection to the past.

METHODOLOGY

In response to the catalyst for this project as outlined in the research context, a hypothetical design brief was set (by the author) to design and fabricate a freestanding 3D printed ceramic column for the art museum Glyptoteket, in the centre of Copenhagen. The experiment was site specific in order to directly address critical issues about digitally fabricated detail and relationship to context, and employed the use of 3D printed clay, as the experiment forms part of larger research project[12] using this medium.

Glyptoteket was selected as the site for the experiment as its rich architectural expression is a vivid interplay of cultural narratives and visual languages. Motivated by Caruso's observations on novel structure and form,[13] the bricolage of motifs, details and symbols in the museum presented many opportunities for the design of the column to forge connections to the historical context and to look at ways to use the computer and digital fabrication to design elements that were influenced by, rather than oblivious to the past.

Using a Research through Design[14] (RtD) approach this research is characterised by the act of "exploring architecture through architecture"[15] as way to develop new knowledge. The design and fabrication of the column is treated as an epistemic practice that aims to generate knowledge through the actual process of designing and is supported by critical reflection from the practitioner.

The analysis is conducted using 2 methods of evaluation in this paper; a critical reflection of the design process and piece in situ, and a discussion of the piece in relation tectonic theories from the field of architecture to examine whether they can provide a contemporary framework to investigate and challenge structures born of the digital world.

The column is placed in the context of the museum in order to be able to see, understand and feel the tangible aspects of the work, which means the theoretical discussion and analysis occur in a scenario as close to reality as possible.

Figure 1. 3D printed ceramic column assembled at Glyptoteket, Copenhagen

Description

The column was designed and produced over a 4-month period and temporarily assembled at Glyptoteket in Copenhagen as a speculative research artefact (Figure 1). 220 cm tall and 30 cm in diameter at its broadest point it is made up of 24 interlocking 3D printed elements that fit together in vertical and horizontal planes. The pieces are printed in stoneware clay, are unglazed and bisque fired to 950 degrees to give a rough finish, similar to the raw expression of the brickwork in the museum.

The elements are assembled around a hollow steel section but are not structurally dependent on it and in its current iteration, the tectonic system represents the potential to become load-bearing if filled with concrete, or to be developed as a non-structural cladding system (Figure 2).

The column can be understood as an ornamented structure where the expressions of the motifs on the outer layer behave simultaneously as decorative elements while acting as well as illustrating the structural anatomy of the column itself.

Figure 2. Column elements interlock in a horizontal and vertical plane

PROCESS, DEVELOPMENT + CRITICAL REFLECTION

In order to examine the relationships between the mode of digital of fabrication and artistic practice within this experiment, this section presents key critical reflections from the design process and observations of the final piece in situ.

The questions posed through reflective practice within the experiment are driven by the two main themes outlined in the problematisation of this paper. Namely the lack of discourse around the artistic application of digital fabrication tools in architecture and scholarly criticism of some digitally produced architecture lacking sensitivity to context.

Fabrication and material driven ornamentation: A unified approach to structure and expression

From the start of the design process, it was crucial to experiment directly with the clay 3D printer. This was done in order to understand how the interplay of material and fabrication method might be manipulated to develop an architectural expression that capitalised not only on technique, but that was relative to the proposed context of the museum.

As one of the catalysts for the experiment was criticism of digital architectures lack of sensitivity to context, I took the approach to try and work with some of the existing architectural languages and motifs within the museum building as a point of departure. This was an explicit decision to take a figurative approach to the expression of column in order to attempt to make an aesthetic connection to the existing building. Following rigorous site analysis, I based the first ideas for the surface of the column on a series of decorative ceramic tiles found on the interior and exterior facades of the museum (Figure 3.1). They were selected due to their materiality, geometric and figurative qualities in addition to the speculation that they would translate well into 3D printed clay (Figure 3.2).

Figure 3.1. Decorative ceramic tiles at Glyptoteket

Figure 3.2. Test prints based on motif from tiles

3D printing in clay is a precarious practice and the material in its freshly printed state is very wet and prone to collapse. In addition to artistic considerations, a tectonic approach to the column elements was at the forefront of the design process. Initial tests demonstrated that the patterns, based on the motifs on the decorative tiles in the museum, had a direct tectonic trade off ie. certain iterations of the pattern had much greater structural integrity than others and resulted in more structurally sound and successful prints.

This set up a dynamic where the evaluation of a particular iteration of the motif in printed form was always an interplay between the artistic expression of the surface and the structural principles of that particular geometry, hence making the motif a powerful element in the sense that it became a mediator between the context of the museum and the engineering of the column.

This interrelation meant a potentially ambiguous building system where the viewer may question whether they are observing decorative or structural material. Picon's observation that contradicting traits can be problematic in a positive perception of digitally fabricated architecture[16] lead to a decision to make explicit in the design that the motifs and their configuration are in fact doing both.

On-site evaluation and material qualities

When evaluating the artistic expression of the pieces; I questioned whether they related to other known form and how they related to context of the museum. I was also conscious to apply a level of restraint to the designs and to try and avoid any kind of overwhelming richness that may contribute to feelings of estrangement and discomfort.[17] The evaluation criteria were openly subjective, highly flexible and related to artistic practice as opposed to a much more binary data related success v's failure set of criteria related to engineering practice or a heuristic method common to computational design practice where an algorithm will produce many iterations of an idea for human selection. As part of the development and analysis process I took test pieces back to the museum to explore the relationships between the expression of the pieces and the existing building (Figure 4).

Figure 4. Testing relationships to elements of the architectural and museum context. Unexpected dialogue between the shadow play on the hair of the statue and the expression of the patterns.

This allowed for a more traditional architectural analysis of the progress of the experiment, as qualities like shininess, surface texture, colour, the effect of light and the scale of the individual motifs against the architecture of the museum could be evaluated (Figure 5). With the criticism of digitally produced architecture by Picon and Carpo in mind where detail is beyond the level of human comprehension, I used a means of analysis that is explicitly at the level of human comprehension with an intention that this might counter the inhuman or alien aspect of some digitally fabricated works.

Figure 5. On site testing of material and surface qualities

A promiscuity of influence

Although starting with a relatively tight set of parameters at the outset, the project became more promiscuous in terms of its influences as it progressed. I made a connection between the process of 3D printing in clay and the process and expression of cable knitting in wool (Figure 6). These 2 means of construction share several qualities, notably the fibril like quality the raw material has been formed into prior to the manufacturing that allow it to be woven and bound to itself during the fabrication process. This results in the more explicit expression of a continuous thread of material assembled into knots and layers.

Although the motif was originally developed from the tiles in the museum, making the jump to imitating the knitting patterns still presented a figurative expression and I made a conscious decision throughout the design process work with the ‘known’ as opposed to the ‘unknown’ or abstract form wherever possible in order to avoid any sense of alienation in the expression of the final piece.

The size of the 24 elements that make up the final column were largely dictated by what the machine is capable of printing before the clay collapses. I contemplated trying to maximise the pieces to make larger elements, but noticed the size of the individual pieces is very convenient to physically hold and carry with both arms therefore has a direct but unintended relationship to the human body, much like the scale of the brick which is able to be held in the human hand.

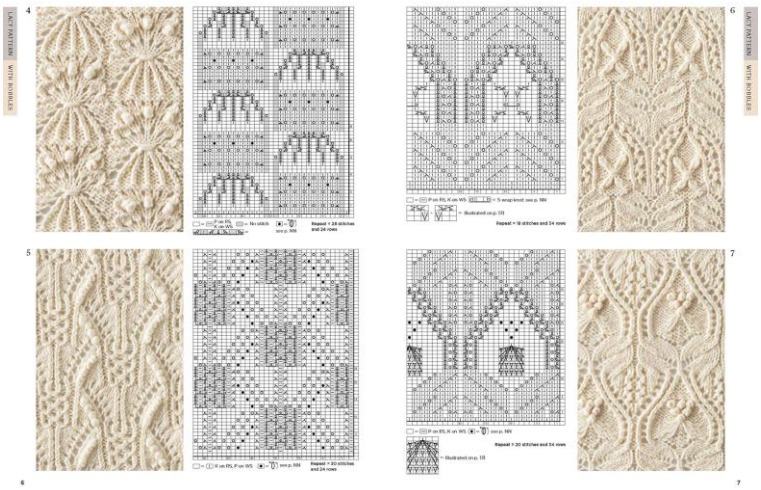

Figure 6. Cable knit patterns that share characteristics to the 3D printing process in clay

As I worked with tectonic considerations as to how the individual elements or ‘bricks’ fitted together to make up the column I recognized how the articulation of these joints could be designed with to be almost invisible or much more conspicuous. The gaps or joints between these elements were ultimately designed to be explicitly emphasized and make larger than necessary to reveal a monolithic yet also interspatial structure within the column (Figure 7). This was intended to expose the nature of the clay fabrication process and give clues as to what constituted the internal construction that is not visible. That of a continuous clay thread that is as honest on the outside as it is on the inside diminishing any ambiguity as to how the structure was working (Figure 8).

Figure 7. Conspicuous joints between column elements designed to allude to its inner structure

In its final position in situ in the museum the visual relationship between the motif on the existing tiles on the wall and the motifs on the 3D printed column are all but diminished although this does not remove its significance in the design approach. The greatest insight from the perspective of the design process is that the figurative aspect of the motif, its scale and how it informed structure of the column and the site itself had become the mediator within this project that almost all the design decisions had centred around (Figure 9).

Figure 8. Continuous clay extrusion making up a monolithic interspatial structure

MOTIF AS MEDIATOR BETWEEN CONTEXT AND STRUCTURE: USING TECTONIC LITERATURE TO ILLUSTRATE THE CASE

In this section I will discuss individual elements of the pattern on the column, understood as the 'motif' and how these forms have the potential to act as mediators between the context of the museum and the structural principle of the 3D printed column elements. I have used arguments and principles from a body of tectonic literature within the field of architecture to present an idea that the 'motif' can be understood as a tectonic element in itself that becomes a locus point to unify a discussion on contextual, artistic and technological pursuits.

The collection of essays *Studies in Tectonic Culture*[18] articulate a framework to discuss architectural expression through tectonic innovation. An element of this theory draws on Gottfried Semper's notion of the 'knot' as the primordial joint.[19] If we take this notion and indeed the scale of a 'knot' and apply it to the clay printed column at Glyptoteket, it could be equated that two individual layers of printed clay and the way they are bonded together in both a material and topographical sense, are a physical embodiment of this idea. Moving up a scale, if we consider the motifs that constitute the pattern on the surface and internal structure of the column, they can be read as a configuration of knots woven together in clay. At the scale of the knots themselves, they do not hold any particular aesthetic connotation but when read at the scale of the 'motif' they are suddenly loaded with symbolic significance as they start to become a recognizable or relatable form.

Where Frampton searches for the poetics of construction in the joint, Semper looks to the knot and the motif as the metric to discover a cultural narrative. The clay 3D printed column as a product of the digital age heralds the return of ornamentation in architecture so when viewed against this backdrop of historic tectonic theory it is pertinent to suggest that we can comprehend and discuss the poetics of

production and expression again through the motif, a more nuanced and revisited understanding of the tectonic.

The essay *Tell the Tale Detail*[20] describes the tectonic as a joint being present at different scales within architecture. By applying this interpretation in the context of this experiment, where the column meets the floor within the museum building is as much a detail or a joint, as the point where 2 layers of clay meet at a micro scale within the piece. Unfolding this idea into further delineations of scale, a joint can also be understood as one of the motifs on the column where it suddenly becomes an artistic device as described in the previous paragraph. It is only when interpreted at this scale, it unlocks and represents the origin of the design idea and becomes the point of mediation between the context of the museum and the structural principle of the column itself. Frascari's notion of scaling provides a telescopic device to use tectonics to examine digitally fabricated architecture. It is by adjusting our gaze that we may find ways to use the tectonic to mediate artistic, technological and contextual ideas in architectural production at a time where digital fabrication allows control over a new spectrum of scales.

What these two examples provide is evidence that tectonic theory can support a deeper understanding of the legibility of new forms digital fabrication. Ongoing debate and deliberation through the examination of the detail and joint at a variety of scales has the potential to support a discussion around the artistic and figurative aspects of digitally fabricated work.

CONCLUSION

Research that addresses the figurative and artistic application of digital fabrication in architecture is developing through experimental practice, yet the scholarly aspects are not widely investigated to date. This paper proposes that through a method of RtD alongside critical reflection against tectonic theory, we can further develop the intellectual framework to discuss the artistic application of digital fabrication tools.

The re-examination of historic texts related to tectonic theory can provide a more nuanced framework to interrogate not only the design process, but to examine final works in situ. There will always be a challenge for architects to capture the zeitgeist yet simultaneously position their work in historic urban context, but a slight shift in our understanding of tectonic from that of the joint to that of the motif we find a contemporary locus point to discuss and evaluate the new architectural languages made possible through digital fabrication.

Figure 9. The greatest insight from the perspective of the design process is that the figurative aspect of the motif, its scale and how it informed structure of the column and the site itself had become the mediator within this project that almost all the design decisions had centred around

NOTES

[1] Mario Carpo, “Post-Digital “Quitters”: Why the Shift Toward Collage Is Worrying,” Metropolis, May 10, 2021, https://www.metropolismag.com/are/post-digital-collchitecturage/.
[2] Bob Sheil, “Research Summary,” UCL, accessed July 19, 2021, https://www.ucl.ac.uk/bartlett/architecture/people/prof-bob-sheil.
[3] Adam Fure, “What Does It Really Mean to Be “Post-Digital” in Architecture?,” The Architect’s Newspaper, May 10, 2021, https://www.archpaper.com/2018/05/postdigital-for-the-record/.
[4] The FABRICATE Triennale is the leading international peer reviewed conference with supporting publication on theme of Digital Fabrication. Its founding partners represent the leading academic research environments, and the publication reflects the dominant themes within the field. See ”FABRICATE 2020,” FABRICATE, accessed June 1, 2021, http://www.fabricate.org.
[5] Ny Carlsberg Glyptotek was founded by the brewer, Carl Jacobsen (1842-1914), who was one of the great industrial magnates of the 19th century and the greatest art patron Denmark has seen. From the profits generated by his brewery Ny Carlsberg, he built a rich collection of art and cultural artefacts. In 1888 Carl Jacobsen gave his art collection to the public and began the building of Glyptoteket to house it. Glyptoteket has been open to the public since 1897 and holds over 10,000 works primarily divided between ancient antiquities and Danish and French sculpture and painting from the 19th century. The original building by Vilhelm Dahlerup was built in the historicist style and was inspired by the Venetian Renaissance.
[6] It is two of Alan Colquhoun’s three definitions of historicism in “Three Kinds of Historicism (1983),” *In Theorizing a New Agenda for Architecture*, ed. Kate Nesbitt. (New York, NY: Princeton Architectural Press, 1996), 202-209, that are used for this research: a concern for the institutions of the past, and the use of historical forms, which are defined as; an attitude and an artistic practice respectively. These notions are relevant as they underline design principles of the experiment that aims to challenge criticism of some digital architecture not being sensitive to context and using novel form.
[7] The definition of ‘motif’ is understood as: " a recurring fragment, theme or pattern that appears in a work of art” See “Art Term: Motif,” Tate, accessed May 19, 2021, https://www.tate.org.uk/art/art-terms/m/motif.
The term is later described in relation to Gottfried Semper’s definition of the ‘motif’ as which is understood as the transference of a symbol from one material or context to another. See “Semper, Gottfried,” Encyclopedia, accessed May 19, 2021, https://www.encyclopedia.com/people/literature-and-arts/architecture-biographies/gottfried-semper.
[8] Mario Carpo, *The Second Digital Turn: Design Beyond Intelligence* (Cambridge, MA: USA: MIT Press, 2017).
[9] See Michael Young, *The Estranged Object*, Treatise Series (Chicago, IL: The Graham Foundation, 2015) as cited by Carpo in *The Second Digital Turn*, 80-81.
[10] See Antoine Picon, “Architecture and Technology: Two Centuries of Creative Tension,” in *Liquid Stone: New Architecture in Concrete*, by Jean-Louis Cohen and Gerard Martin Moeller (Basel; Boston: Birkhäuser, 2006), 17.
[11] See Adam Caruso, “Traditions,” OASE, no.65 Ornamentation (2004): 82.
[12] The experiment forms part of a larger research project by the author called ‘The Developed Surface’ that investigates the architectural application of 3D printed ceramics.
[13] See Caruso, “Traditions,” *82*.
[14] Research through Design is further defined as ‘action research’ where a research diary describes a practical experiment in the studio, followed by a report that aims to contextualize it. Christopher Frayling, “Research in Art and Design,” Royal College of Art Research Papers 1, no.1 (1993-1994): 5.
[15] As described by Johan Verbeke, “This Is Research Through Design,” in *Design Research in Architecture: An Overview*, ed. Fraser Murray. (Ashgate, 2013), 150.
[16] See Picon, “Architecture and Technology: Two Centuries of Creative Tension,” 17.
[17] See Young *The Estranged Object* as cited by Carpo in *The Second Digital Turn*, 80-81.
[18] Kenneth Frampton, *Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture*, ed. John Cava, Reprint edition (Cambridge, Mass. London: The MIT Press, 2001).
[19] See Frampton, 86.
[20] See Marco Frascari, *The Tell-the-Tale Detail,* In Semiotics 1981, edited by John N. Deely and Margot D. Lenhart, 325–36. Boston, MA: Springer US, 1983.
See Marco Frascari, “The Tell-the-Tale Detail,” in Semiotics 1981, ed. John N. Deely and Margot D. Lenhart (Boston, MA: Springer US, 1983), 325–36.

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INTEROPERABLE WORKFLOWS: INFORMATION LIFE CYCLE AT LANDSCAPE AND ARCHITECTURAL SCALES

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INTRODUCTION

Nowadays big data, cyber-physical systems and the internet of things (IoT) produce and share a huge amount of information potentially enabling 'smart' systems, capable - by definition - to effectively fulfil their purposes, bringing together all their resources[1]. Within the Architecture, Engineering, Construction and Operation (AECO) sector, the wide amount of information involved in a new construction process, from design to realisation, becomes even wider in an intervention on the built environment, requiring the preliminary integration of several pieces of existing information. For example, to represent the complex geometries characterising the built heritage, the integration of different digital survey and modelling tools is required, involving further interoperability issues[2].

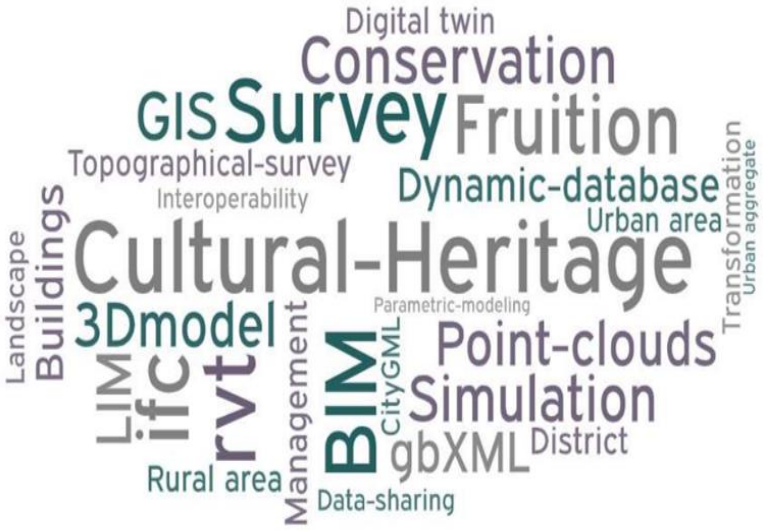

Figure 1. Intervention on the built environment: word cloud.

Indeed, as the built environment has progressively assumed an extended meaning - comprehending natural environment and resources together with cities, buildings, and anthropic artefacts[3] - the

acquisition, processing, management and monitoring of the related information are characterised by a high level of complexity and require the integration of different expertise.
The ability, known as 'interoperability', to seamlessly and efficiently interconnect, share and use data is one of the current main challenges in the AECO sector, where collaborative processes involve not only professionals (i.e. architects, engineers from several specialties - civil, structural, hydraulic, mechanical, electric, etc. - and contractors) but also administrators and the larger audience of citizens.
This paper, after defining the term 'interoperability', presents an overview of its theoretical framework to face the 'multiple perspectives' of this concept: such a framework informs our approach to the interoperability issue in the AECO sector. Some applications in the field of landscape and architectural heritage, where the adoption of interoperable workflows is crucial, are identified: in particular, the exchanging of specific information is necessary for (i) the management of facilities and infrastructures, (ii) the renovation and reuse of buildings or urban areas, (iii) the simulation of design ideas and (iv) the fruition of the cultural heritage. By shortly analysing recently developed Italian examples of these applications, through the 'lens' of the illustrated framework, a picture of different interoperable workflows for data exchange is outlined. Finally, a discussion of challenges in the definition of repeatable workflows, capable of optimizing interactions between the involved parts, is presented to support future studies.

THEORETICAL FRAMEWORK

The original definition of 'interoperability' was provided in 1990 by the Institute of Electrical and Electronics Engineers (IEEE): "The ability of two or more systems or components to exchange information and to use the information that has been exchanged"[4]. Since then, beyond this particular definition strictly connected to the technological domain, the interoperability concept has evolved within different knowledge fields - such as information systems, military and healthcare research first, then business, enterprise, and semantics - to encompass further aspects[5]. In particular, in 2017 the new European Interoperability Framework (EIF), providing specific guidelines to set up interoperable digital public services, defined interoperability as "the ability of organisations to interact towards mutually beneficial goals, involving the sharing of information and knowledge between these organisations, through the business processes they support, by means of the exchange of data between their ICT systems"[6]. Such definition includes four "layers" of interoperability: (a) legal interoperability which ensures collaboration between organisations operating under different legal frameworks, policies and strategies[7]; (b) organisational interoperability which aims to align administrations' business processes, responsibilities and expectations towards their common goals[8]; (c) semantic interoperability which ensures to preserve and understand data format and meaning throughout exchanges between parties[9]; and (d) technical interoperability which is related to "applications and infrastructures linking systems and services"[10].

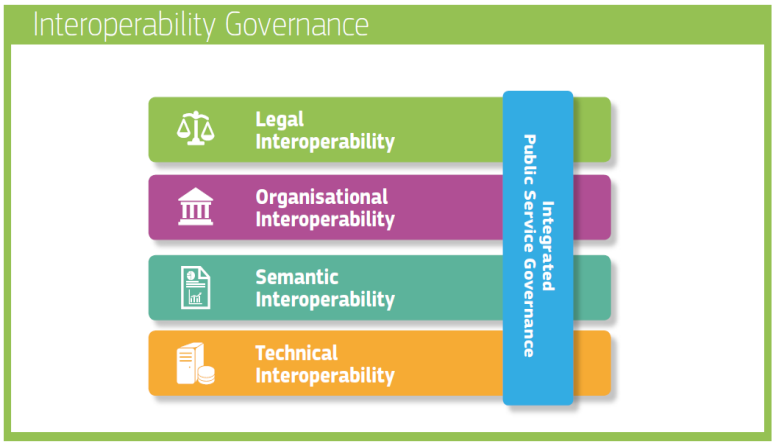

Figure 2. The interoperability model proposed by the EIF: the four main layers are included in a background layer, the "interoperability governance", and are crosscut by the "integrated public service governance" component[11].

Despite such a structured framework, within the AECO industry these layers have yet to take root: there are limited studies focused on interoperability issues which consider wider aspects than the technical domain[12]. For this reason, a brief chronological excursus concerning interoperability 'dimensions' - intended as different perspectives to assess the maturity and the scope for improvement of interoperable processes - for the AECO sector is presented and discussed.

An initial set of 110 documents resulted from a specific query performed in the Scopus database, chosen because of its popularity and its update rate. The search string "(TITLE-ABS-KEY ("interoperability" AND ("AEC" OR "heritage"))) AND (dimension*)" was formulated taking into account previous literature reviews[13] and addressing publications explicitly related to the multidimensional concept of interoperability in the AEC sector and in the cultural heritage field.

After a preliminary analysis of titles, keywords and abstracts, a total of 15 documents between the ones in the resulting list were entirely read because of their specific focus on interoperability 'dimensions' from a theoretical point of view. In the following, the highlights of this overview are chronologically presented.

A first interesting reference appeared in 2010 in the work of Grilo and Jardim-Goncalves who tried to stress the need for the AEC sector to extend the technical notion of interoperability towards "organizational and operational aspects"[14]. Indeed, they claimed that the concern has to be about business processes, culture, and management of contractual issues between the interacting parties and not only about connecting information systems[15].

In 2014, after conducting a systematic literature review, Poirier et al. identified a structured conceptual framework for the interoperability construct[16]. Within a contextual dimension made of "norms, regulations, policies, markets and cultures"[17] addressing different perspectives in the AEC sector, three interrelated dimensions are defined to set up a collaborative project delivery system: (a) the technology dimension, "related to the exchange of data and information within digital environments"[18]; (b) the process dimension, "related to the generation of information and knowledge, its management, and its exchange across the project network and throughout the project life cycle"[19]; and (c) the organization dimension, related "to the ability of organizations to collaborate across boundaries, setting collective goals and objectives and assessing performance"[20].

Another interpretation is given in 2017 by Muller et al. who reported a collection of four interoperability 'dimensions' named 'concerns'[21]: (a) business, including strategic and organizational aspects shared among stakeholders; (b) process, referring to the necessary requirements to manage

design, building and operation; (c) service, related to the need of coordinating external services (e.g. through common data dictionaries for products); and (d) data, with reference to data exchange among different software, platforms and systems in use by different stakeholders.

In 2018 Golzarpoor et al. listed three interoperability 'layers'[22]: (a) technical or foundational interoperability, concerning data transfer and exchange; (b) information interoperability, distinguishing between syntactic (i.e. the format of exchanged data) and semantic (i.e. the meaning of different types of data); and (c) organizational interoperability, related to coordination and workflow processes.

Finally, in 2021 Shezahd et al. analysed fifteen international documents (i.e. government level standards, owner's manual, and guidelines published by academic institutes), searching traces of the four interoperability 'layers' defined by the EIF[23]. These authors have highlighted that technical interoperability is emphasized in most of the studies, only four documents discuss organizational interoperability, while semantic and legal interoperability got minimal attention in existing guidelines.

The various interoperability 'dimensions/layers' meet the need of defining macro categories of connections to group features that have a common perspective on interoperability issues.

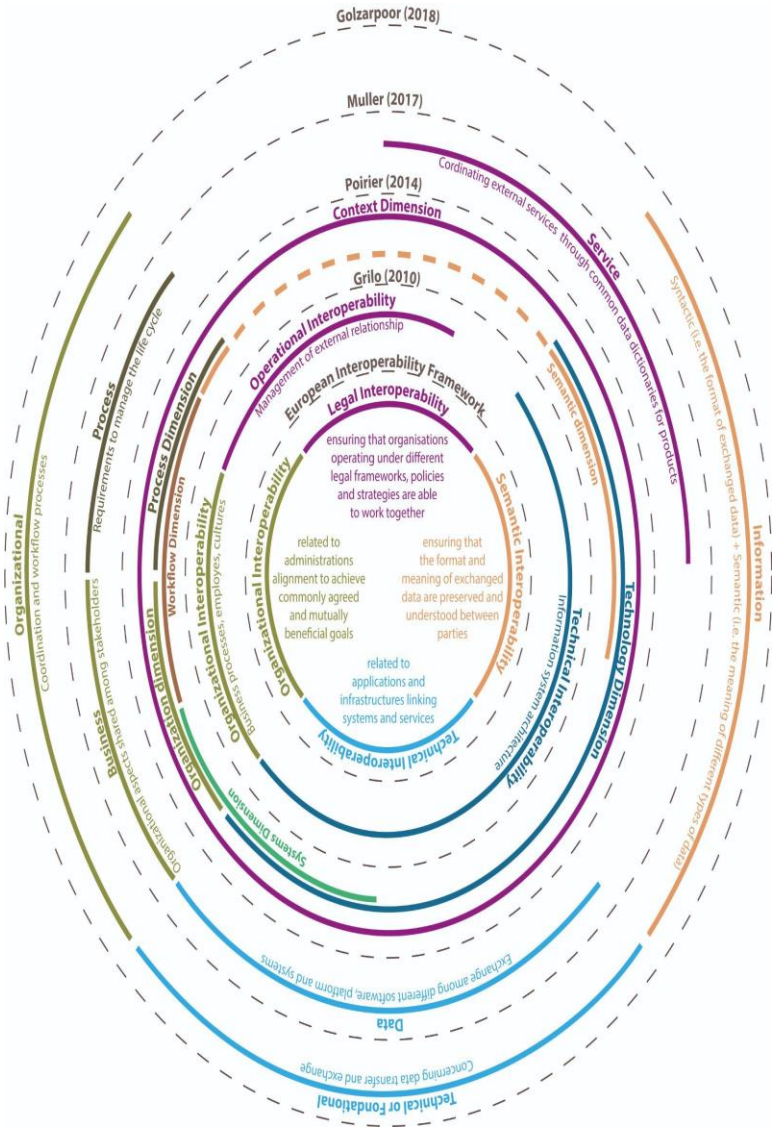

Figure 3. Summary of the presented theoretical framework.

Figure 3 compare the analyzed studies and put them in relation with the European Interoperability Framework presented above and adopted as a reference by the authors[24].

MULTISCALE INTEROPERABLE WORKFLOWS

The presented theoretical framework results in a comprehensive definition of interoperability and its dimensions which are validated by comparison with practical applications in the field of AECO sector. This comparison has to follow a clear structure, based on (i) the recognition of the various dimensional perspectives of which the interoperability problem is composed, (ii) the level of maturity with which these perspectives are addressed, and (iii) the possibility of implementing the missing perspectives by acting on the workflow.

For such a validation, the identified practical applications, where it is crucial to adopt interoperable workflows for information exchange because of different uses at different scales, are strictly related to the landscape and architectural heritage[25]: (1) the management, aimed at maintaining existing buildings, monitoring historic centres, conserving and protecting cultural landscape; (2) the simulation, related to the prefiguration of future scenarios and the evaluation of specific features, such as energy consumption, environmental impacts and structural analysis; (3) the transformation, referred to the renovation, refurbishment, retrofitting, reuse and recycle of single buildings or urban areas; and finally (4) the fruition, connected to the possibility to visualize, communicate and represent information related to the present, the past or the future.

For each application, recent Italian researches - one of which from the authors' department - have been selected and analysed in the following paragraphs.

Interoperability and management

The project "Main10ance"[26] from Politecnico di Torino is a comprehensive example of the management application. The work aimed to implement a plan of maintenance and conservation of the Italian and Swiss Sacri Monti, groups of chapels and other architectural artefacts perfectly integrated in their landscape. Starting from the survey campaigns of the historical architectural heritage, conducted through integrated 3D metric survey techniques (as terrestrial laser scanner and photogrammetry with UAVs) and rapid techniques (as smartphone and GoPro), the collected data were processed to develop 3D models with BIM software. Then, these Historical Building Information Models (HBIM) were integrated in their geographical context through GIS support[27] and an object-relational database was created.

The result, from an operative point of view, is that different users can have access to information which belongs to different domains and has different levels of detail according to their use[28]. To reach this, particular effort was taken in enhancing interoperability from the perspective of technology and semantics.

Interoperability and simulation

For the simulation application, a project developed in the authors' department, at the University of Trento, was selected, involving the discipline of architectural survey and digital representation together with the discipline of energetic engineering in order to develop an energy retrofitting project of a residential building in the Province of Trento[29].

A laser scanning survey and a drone survey are integrated in a Building Information Model (BIM) which collects information about components, materials and their physical properties, also considering the surroundings of the analysed single building. Then, this model has been transferred into a Building Energy Model (BEM) to perform energy analysis.

The interoperability between the survey data and the Building Information Model resulted quite seamlessly, while some interoperability issues between the architectural and energetic aspects were registered even if technological solutions were tested to guarantee an effective data exchange between the involved parties. The project also involved three different local building companies, trying to align their processes and technologies in order to improve collaboration opportunities.

Interoperability and transformation

The Smart Swap Building project, developed by the University of Ferrara, proposes a methodology aimed at defining an interoperable strategy for building refurbishment, to reduce energy consumption and improve indoor comfort[30]. Single buildings are considered as part of an urban aggregate, preliminary analysed to define needs and priority of interventions, and, during refurbishment operations, identify unsold building stock to host tenants and check the availability of warehouses to displace furniture elements. The refurbishment projects start with a laser scanner survey and are based on the creation of a federated model as the results of the collaboration between architects, engineers and other professionals.

Thus, this work considers an integrated network of operators for the building's refurbishment and promotes interoperability both at vertical level, during the different phases of the life cycle of these buildings in relation to a process perspective, and at horizontal level, among different disciplines involved during the same phase considering the organizational aspect.

Technological issues are not further specified but could be interesting to define a strategy for the integration of Building Information Models (BIM) of single refurbishment interventions within a larger territorial context.

Interoperability and fruition

Finally, as an example of the fruition application, the experience of the Virtual Museum of Como Lake Landscape, developed from Politecnico di Milano[31], was selected. The project aimed to complement the physical museum by developing a multimedia system which includes an interactive map navigation, a Web3D application and a virtual immersive tour to provide a different mode to discover the cultural landscape[32].

This work testifies the importance of taking into account ‘legal’ aspects as guidelines regulating data creation, access and management because, during the development of the Web3D application, the policies of the private service Google Earth© changed (i.e. the customization of the graphics interface was no more allowed to the developers) and the team had to develop its own Web application through an open source geoportal. Moreover, technical issues related to the inclusion of immersive contents within Web platforms or applications seem to require further efforts.

DISCUSSION AND FUTURE CHALLENGES

The contribution aimed to critically explore the "interoperability" concept in the AECO sector. It outlines four perspectives, respectively suggesting to:

- develop a framework of norms and policy, defining rights and duties of different parties;
- align processes to reach common goals among actors;
- adopt common ways to describe data among disciplines and applications;
- study and compare available tools for creating and exchanging data.

The presented examples are not described exhaustively but with the intent of showing how in different applications these perspectives can be more or less developed and studied. A larger set of examples

developed worldwide, could be helpful to verify and further develop the analysed conceptual framework.

It could also be interesting to define what are the stated objectives[33] for which data exchange takes place and what types of interoperability interaction[34] appear.

Challenges in the definition of repeatable workflows in the AECO sector, capable of optimizing interactions between the involved parts, are presented to support future studies.

Some of the main issues are around software compatibility (i.e. file formats, plugins) and licensing related to the collaboration between professionals, also from different fields. This challenge is strictly related to the development of standards for data models which can include the domains of different expertise and design scales (i.e. from regional to executive). Another aspect which surely requires further investigation is linked to the formulation of guidelines regulating data creation, access and management, also taking into account the emerging updating issues related to real-time data collection and processing.

NOTES

[1] Aaron Costin et al. “Need for Interoperability to Enable Seamless Information Exchanges in Smart and Sustainable Urban Systems”, Journal of Computing in Civil Engineering 33, no. 3 (2019): 04019008, doi: 10.1061/(ASCE)CP.1943-5487.0000824.
[2] Cinzia Tommasi, et al. ”Interoperability matter: levels of data sharing, starting from a 3D information modelling”, International Archives of Photogrammetry, Remote Sensing and Spatial Information Sciences, 42-2/W3 (2017): 623-630, doi: 10.5194/isprs-archives-XLII-2-W3-623-2017.
[3] Bosse Lagerqvist et al. “Integrated Conservation of Built Environments: Swedish Reflections from Three Decades of Program Development”, in *Preservation Education. Sharing Best Practices and Funding Common Ground*, ed. Barry L. Stiefel et al. (Hanover and London: University Press of New England, 1996), 120.
[4] "IEEE Standard Glossary of Software Engineering Terminology," in *IEEE Std 610.12-1990* (1990): 42, doi: 10.1109/IEEESTD.1990.101064.
[5] Erik A. Poirier et al. “Dimensions of interoperability in the AEC industry” (paper presented at the Construction Research Congress, Atlanta, Georgia, May 19-21, 2014). Doi: 10.1061/9780784413517.203.
[6] European Commission, *New European Interoperability Framework. Promoting seamless services and data flows for European public administrations* (Luxembourg: Publications Office for the European Union, 2017), 5.
[7] With this respect, the main barriers to overcome are “restrictions in the use and storage of data, different and vague data licence models, over-restrictive obligations to use specific digital technologies or delivery modes to provide public services, contradictory requirements for the same or similar business processes, outdated security and data protection needs” (European Commission, 27).
[8] The requirements of the user community are also considered in aiming to make “services available, easily identifiable, accessible and user-focused” (European Commission, 28).
[9] This “layer” covers both semantic aspects (the meaning of data elements and the relationship between them, i.e. vocabularies and schemata) and syntactic aspects (the exact grammar and format of the information to be exchanged, i.e. taxonomies, controlled vocabularies, thesauri, code lists and reusable data structures/models).
[10] As “interface specifications, interconnection services, data integration services, data presentation and exchange, and secure communication protocols” (European Commission, 30).
[11] European Commission, 22.
[12] Hafiz Muhammad Faisal Shehzad et al. “The role of interoperability dimensions in building information modelling”, Computers in Industry 129 (2021): 103444, doi: 10.1016/j.compind.2021.103444.
[13] Erik A. Poirier et al. “Dimensions of interoperability in the AEC industry” (paper presented at the Construction Research Congress, Atlanta, Georgia, May 19-21, 2014). Doi: 10.1061/9780784413517.203; Hafiz Muhammad Faisal Shehzad et al. “The role of interoperability dimensions in building information modelling”, Computers in Industry 129 (2021): 103444, doi: 10.1016/j.compind.2021.103444.
[14] Antonio Grilo et al. “Value proposition on interoperability of BIM and collaborative working environments”, Automation in construction 19, no. 5 (2010): 522-530, doi: 10.1016/j.autcon.2009.11.003.
[15] The technological interoperability developments in AEC sector recalled by these authors was exemplified, on one hand, by the creation of the first IFC file format in 1997 by the Industrial Alliance of Interoperability (IAI, currently known as buildingSMART) and, on the other hand, by the effort toward Building Information Modelling (BIM) standardization related with its linkage to Geospatial Information System (GIS) developments. With respect to the other ‘dimensions’, they have been only partially addressed by the BIM community with the Information Delivery Manual (IDM), an initiative developed by the IAI which considers, in addition to the IFC's standards, a methodology to support the implementation of BIM addressing the business processes and information exchange requirements.
[16] Erik A. Poirier et al. “Dimensions of interoperability in the AEC industry” (paper presented at the Construction Research Congress, Atlanta, Georgia, May 19-21, 2014), 1987-1996, doi: 10.1061/9780784413517.203.
[17] Poirier et al., 1993.
[18] Poirier et al., 1991.
[19] Poirier et al., 1992.
[20] Poirier et al., 1993. At the interface between these three main dimensions, there are three sub-dimensions of interoperability: (a) the semantic sub-dimension (between the procedural and the technological dimension), related to understanding the ‘language’ of information systems in interpreting information; (b) the systems’ sub-dimension (between the organizational and the technological dimension), related to the ‘elevation’ of the domain of data and information to the domain of knowledge and awareness; and (c) the workflow’s sub-dimension (between the organizational and the procedural dimension), related to the integration of use of the technology within the project team.
[21] Marina F. Muller et al. “Data interoperability assessment through IFC for BIM in structural design–a five-year gap analysis”, Journal of Civil Engineering and Management 23, no. 7 (2017): 943-954, doi: 10.3846/13923730.2017.1341850.
[22] Behrooz Golzarpoor et al. “Improving construction industry process interoperability with Industry Foundation Processes (IFP)”, Advanced Engineering Informatics 38 (2018): 555-568, doi: 10.1016/j.aei.2018.09.001.

[23] Hafiz Muhammad Faisal Shehzad et al. “The role of interoperability dimensions in building information modelling”, Computers in Industry 129 (2021): 103444, doi: 10.1016/j.compind.2021.103444.
[24] To deepen this interoperability conceptual framework, the complementary concepts of ‘interaction types’ and ‘levels’ could be mentioned. In particular, Grilo (Antonio Grilo et al. “Value proposition on interoperability of BIM and collaborative working environments”, Automation in construction 19, no. 5 (2010): 522-530, doi: 10.1016/j.autcon.2009.11.003) highlighted five different types of interoperability interactions, subsequently recalled by Muller (Marina F. Muller et al. “Data interoperability assessment through IFC for BIM in structural design–a five-year gap analysis”, Journal of Civil Engineering and Management 23, no. 7 (2017): 943-954, doi: 10.3846/13923730.2017.1341850): (a) communication, related to the possibility to visualize the model content; (b) coordination, including material alignment, comparison and clash detection; (c) cooperation, connected to works sharing among different agents in order to perform analysis, simulations and further project development; (d) collaboration, referring to the adoption of a collaborative environment; and (e) channel, based on the introduction of an automatized environment from design to production. In 2019, Sattler (Léa Sattler et al. “Interoperability aims in Building Information Modeling exchanges: A literature review”, IFAC-PapersOnLine 52, no. 13 (2019): 271-276, doi: 10.1016/j.ifacol.2019.11.180) presented seven interoperability levels to distinguish among different possible aims connected with data exchange: (a) access, (b) re-use, (c) check (e.g. through clash detection), (d) retrieve (e.g. through query), (e) link (e.g. connect different AEC domain for simulations and analysis), (f) combine data from multiple heterogeneous and (g) combine data hubs (e.g. creating connections between platforms, cloud and web-based tools).
[25] A similar approach could be found in: Anna Osello et al. “The centrality of Representation with BIM”, DISEGNARECON 9, no. 16 (2016): 5.1-5.12.
[26] Ilaria Bonfanti et al. “Development of an integrated BIM-GIS management tool for maintenance plan of historical heritage” (paper presented at the 9th ARQUEOLÓGICA 2.0 & 3rd GEORES, Valencia, Spain, April 26–28, 2021). Doi: 10.4995/Arqueologica9.2021.12131.
[27] The importance of the BIM-GIS link was already one of the main challenges in: Antonio Grilo et al. “Value proposition on interoperability of BIM and collaborative working environments”, Automation in construction 19, no. 5 (2010): 522-530, doi: 10.1016/j.autcon.2009.11.003. These authors claimed that “this convergence is important as building information models will define what is inside the outside skin of a building/structure, completed by the information defined in the geospatial world outside the boundaries of the facility to perform many types of analysis. This is also true in GIS systems where information from inside a building/structure is needed in order to accomplish a proper analysis” (Grilo, 526).
[28] I.e. maintenance technicians can access all levels of detail for scheduled maintenance, meanwhile tourists only enjoy a structured documentation of the heritage.
[29] Alessia Maiolatesi et al. "Analysis of the Surroundings Impact on the Building Energy Performance by Means of a BIM Analytical Model Coupled with Dynamic Simulation", in *Building Simulation Applications - BSA 2019*, ed. Giovanni Pernigotto et al. (Bolzano: BU Press, 2020), 315-322, http://pro.unibz.it/library/bupress/publications/fulltext/9788860461766.pdf.
[30] Marco Medici et al. “Information-representation methods and tools or the Smart Swap Building strategic project”, DISEGNARECON 9, no. 16 (2016): 9.1-9.8.
[31] Raffaella Brumana et al. “Virtual museums and built environment: narratives and immersive experience via multi-temporal geodata hub”, Virtual Archaeology Review 9, no. 19 (2018): 34-49, doi: 10.4995/var.2018.9918.
[32] The interactive map navigation, implemented offline, correlates the historic water view-front map digitised from Europeana Collection and the current panorama of the lake obtained from image acquisition; the Web3D application, originally based on Google Earth©, includes different layers of information on historical cadastral maps, itinerary trips and other relevant information; the virtual immersive tour develops across the historic vaulted passages of the hamlets through different low-cost immersive contents as panoramic photos, 360° videos and 3D photogrammetric model.
[33] In 2019, Sattler presented seven interoperability levels to distinguish among different possible aims connected with data exchange: (a) access, (b) re-use, (c) check (e.g. through clash detection), (d) retrieve (e.g. through query), (e) link (e.g. connect different AEC domain for simulations and analysis), (f) combine data from multiple heterogeneous and (g) combine data hubs (e.g. creating connections between platforms, cloud and web-based tools).
[34] Grilo highlighted five different types of interoperability interactions, subsequently recalled by Muller: (a) communication, related to the possibility to visualize the model content; (b) coordination, including material alignment, comparison and clash detection; (c) cooperation, connected to works sharing among different agents in order to perform analysis, simulations and further project development; (d) collaboration, referring to the adoption of a collaborative environment; and (e) channel, based on the introduction of an automatized environment from design to production.

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AICO – SMART HYDROPONIC SYSTEM

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INTRODUCTION

During the 20th century, cities all over the globe have grown their population by higher rates each year. According to the UN, more than half of the world population are currently living in cities. In Portugal and Brazil, this percentage is already 65% and 85%, respectively. These numbers tend to grow at a fast rate of 2% every five years. By the year 2025, almost 85% of the population will be living in urban areas. The figure below shows this trend since the 1950s when the percentage of the urban population surpassed the rural population (Figure1). [1][2]

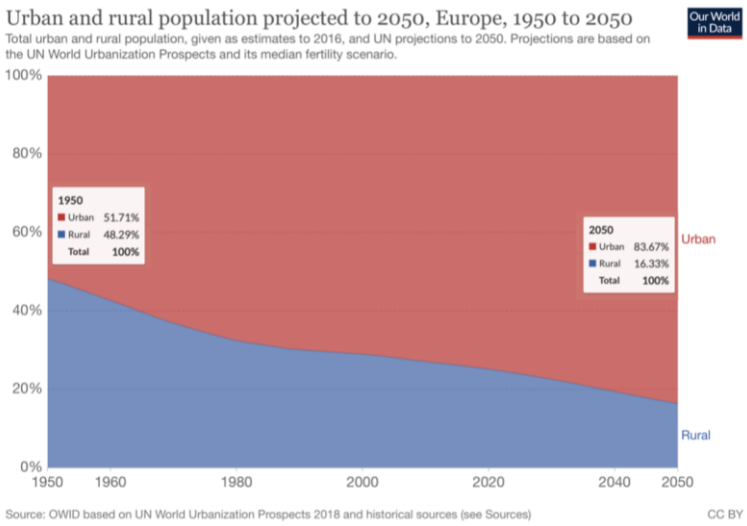

Figure 1. Urban and Rural populations are projected to 2050.

The expansion of the urban population affects the green area coverage throughout countries. As stated by Kabisch et al. [3] this is most related to political attitudes toward urban living and environmental conservation. Also, northern countries tend to have larger and denser forests and tree coverage due to their biophysical conditions. According to Fuller and Gaston [4], the reduction of green areas within cities is not directly connected to urbanisation trends. Thus, it is an issue related to the overgrowing urban population in Europe. As urbanisation progresses in the 21st century, more cities want to establish green spaces in their areas.

Urban green spaces can also impact carbon dioxide absorption, although at low rates as air pollution increases each year. These spaces are important to help maintain urban quality of life and [5] studies show the benefits both physically and psychologically. It can help reduce stress over air pollution and noise and increase the overall well-being of the population.

Demand for natural resources also grows with the increasing numbers of the urban population around the world. Resources have been depleted each year leaving nothing but what would be virtually available for the next year to be consumed. Data related to the overconsumption of Earth's resources have been collected by the Earth Overshoot Day organization within the Global Footprint Network [6]. The overshoot day is the date on which all resources related to a whole year are all consumed, and we start to consume what is supposedly related to the next year. In the year 2019, the Overshoot Day was July 29th. However, in 2020 the date fell back to August 22nd due to restrictions imposed by the Covid-19 pandemic. Unfortunately, in 2021 the date was once again on July 29th, which means that 365 days' worth of natural resources were poorly managed and consumed in 209 days.[7]

Since 2019, we have been dealing with the Covid-19 pandemic. The disease impacted food production and distribution around the globe, causing urban populations to search for ways of buying and producing their own food. [8] [9] [10]

The scarcity of natural resources and food shows the need for a device that can help the population of cities find ways to produce their food. The Aico project is made for hydroponic indoor gardens with Internet of Things (IoT) [11] technologies. The goal is to create a product that can be compact and help improve the health of the urban population. The project is divided into two phases - the first phase was focused on the research of methods of cultivation and IoT technologies; the second and current phase is focused on developing a service that accompanies the Aico and interacts with the users. This paper was divided into the following sections: Research and State of the Art, Development, First Product and Conclusion.

RESEARCH AND STATE OF THE ART

Many initiatives have been created in the last decade to bring back green spaces viable to produce food and to revitalize urban health. This is the context of the Green Revolution [12] where projects and companies were created similar to the Industrial Revolution.

Companies like Aerofarms [13], Square Roots [14] and NooCity [15] are building urban farms. Aerofarms is building vertical farms capable of growing four times more food than conventional farms.

The approach developed by NooCity and Square Roots is more related to the goals of this project. Both companies are specialized in cultivating food in town. Square Roots repurpose old ship containers to serve as farming modules and NooCity builds gardens on top of buildings. Their mission though is to teach and capacitate urban dwellers to grow their gardens and be part of small communities that manage and maintain food production. Each company built a service around the concept of teaching their residents the basics to grow their crops.

This project aims to build the same experience of cultivating a garden in town, however in a small form factor, as indoors farming. Thus, research has been made around cultivation methods that can be small, easily available for the everyday consumer and require little or no use of electricity.

The first issue addressed in this project was the research of methods for cultivating plants indoors with reduced requirements of space, watering and electricity.

Alternative methods for cultivating food have been researched since the nineteenth century. They are called Hydroculture methods, in which, by definition, no soil is used to provide nutrients to the garden and a nutrient solution is used instead, making it possible for the plants to grow faster. [16][17]

Hydroculture includes methods such as Aquaponics [18], Aeroponics [19] and Hydroponics [16]. Aquaponics and aeroponics require constant use of electricity to cycle the water and vapour around chambers to prevent microorganisms from growing in the solution and damaging the crops.

HYDROPONICS

The methods created for hydroponic cultivation were largely researched and developed in the last decades by NASA for the Controlled Ecological Life Support System (CELSS) [20].

Plants need a nutrient provider, a medium to sustain the weight of leaves and stem, water and sunlight to grow. Hydroponics uses a series of materials and techniques to replace the use of soil. Growing media are made of Rockwool or Coconut fibre. The water is provided with nutrients in a sealed container. The amount of sunlight can be replaced with Grow LEDs [21], which can provide almost the full spectrum of light required.

In hydroponics, it is common to use a Net Cup (NC) [16], which holds the plant and growing medium. The NC has holes or vertical openings on its wall to let the roots grow freely and reach the nutrient solution.

The nutrient solution consumed by the plant is made of a mixture of Nitrogen, Phosphorus and Potassium (NPK). The percentages of this mixture can vary between plant species, their stage of growth and results desired by the farmer. This data was first produced by Dennis Hoagland and Daniel Arnon [22] who wanted to find which nutrients and their quantities are essential for plants to grow efficiently in hydroponic farms.

There have been many hydroponic methods created throughout the 20th century. There are five major methods largely used nowadays, which are the Ebb and Flow, the Drip, the Wick, the Deep-Water Culture and the Kratky method. In the context of this project, the only methods found which require less to no electricity to work are the Deep-Water Culture and the Kratky Method (Figure2).

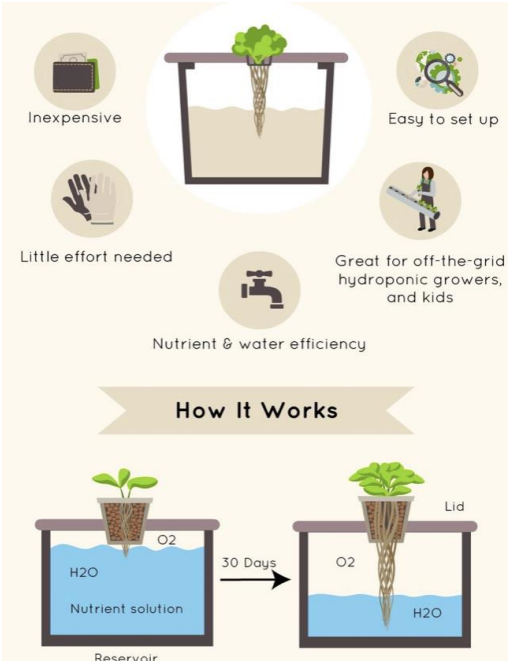

Figure 2. Kratky method, infographic, https://www.greenandvibrant.com/sites/default/files/inline-images/kratky-method-infographic.png

Both the Wick, Ebb and Flow and the Drip [23] require a water pump to cycle the nutrient solution to the plants in a periodic flow. These methods are the most used in large farms and present issues regarding cleaning and access of the nutrients.

The Deep-Water Culture (DWC) [24][25] and the Kratky [26] methods are the most simple and affordable for the average consumer. They can be built utilizing common materials such as small water containers, coconut fibres and a common aquarium air pump. Both have no cycling nutrient solution. In DWC, the air pump is required to introduce Oxygen (O2) into the nutrient solution.
In 2009 Bernard Kratky created a method for non-circulating hydroponic crops, with reduced maintenance and no use of water pumps or electricity. Kratky proved it was possible to grow lettuce heads with only the initial amount of nutrient solution added to a sealed water container without contact with sunlight.
During the germination phase, part of the solution is evaporated and keeps the air humid enough for the plant to begin the growth process. At the same rate at which the solution is evaporated and consumed the roots grow longer to reach the liquid. The solution mustn't fill the container entirely, thus the air inside is needed for a healthy crop. In this way, the Kratky method is a dual-phase method.

HOME AND FARM AUTOMATION

A smart farm is a conventional farm enhanced with technology to monitor crops, the weather, livestock and resources supplies to achieve higher efficiency. Smart farms use a mesh of sensors spread over the land to gather data and send it to cloud services to analyse and produce reports. Farmers can make decisions with enough data to support them.
The mesh of sensors implemented on farms is a bigger version of IoT devices, commonly used in home automation nowadays [27][28]. They are used in house appliances to give users full control over their homes using a smartphone or a smart hub to control the objects and read data collected by sensors. It is important to notice that IoT can help people with disabilities have access to many objects and controls through motion sensors, voice controls and touch displays.
Once everything is connected to the internet over Wi-Fi, users also have access to their appliances when they are not at home. This function has great benefit for this project; thus, it enhances the capabilities of an indoor hydroponic farm. The home garden health can be checked with a smartphone from anywhere with a connection to the internet. Also, the amount of data collected from sensors can help the user maintain the garden in good health.

DEVELOPMENT

The development phase was divided into the following stages: Questionnaires, Prototyping, Sketching and 3D Modelling.

Questionnaires

To comprehend the opinions and knowledge around the subject of hydroponics and home automation, a questionnaire has been made to gather information from students at the Federal University of Rio de Janeiro (UFRJ) in 2017 and a new version of it was conducted in 2021 with students from the University of Porto (U. Porto).
The questions asked were elaborated to understand how much users know about planting if they were living in the country or the city, their ages if they heard about hydroponics before, and if they were willing to use the product. Also, they would answer which species of plants they would like to cultivate. There was a total of 105 responses on the first version, then 341 (in Portuguese) and 71 (in English) on the second version.
As expected, the responses were mostly from people around the ages of 18 to 30, who lived in urban areas. Most of them have a short knowledge for cultivating a garden - English speakers had more

knowledge than Portuguese speakers - and only 52% of the respondents knew about hydroponics. Almost 75% would like to have a home garden and 46% answered they might be willing to be part of an urban farming community. The respondents also wanted to grow greens - lettuce - and aromatic flowers.

Prototypes

To learn and test the efficiency of the methods researched, two prototypes were made, one intended for the DWC method and the other one for the Kratky method. 20 seeds of lettuce were used, 10 natural and 10 pelleted - sprayed with a nutritious layer on top. Both coconut fibre and Rockwool were used, though the Rockwool showed no results. After the seeds were germinated, both types showed no difference. The natural seeds were chosen for the project because the pelleted ones require manufacturing, thus are not good for the environment.

The plants were transplanted to the hydroponics systems and their growth was documented. The Kratky showed the best results of growing as the lettuce head reached the peak in 6 weeks. As the DWC lettuce only peaked in the 10th week and the system required the air pump to stay on consuming electricity it was not good enough for the project (Figure 3).

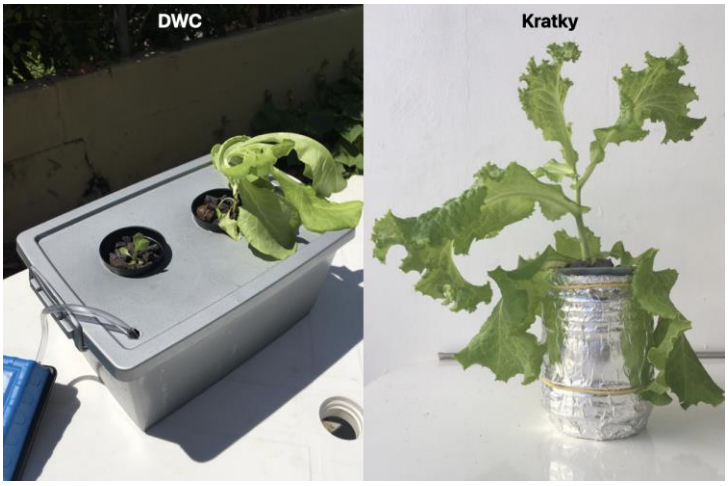

Figure 3. Prototypes to test hydroponic methods.

To test the concept for IoT technologies, the container for the Kratky method was adapted with sensors to monitor the plant environment. The container had a light sensor, a water temperature sensor and an air humidity and temperature sensor, with a Grow LED installed on top of it. Data were collected in a laboratory in UFRJ, and the experiment was successful (Figure 4).

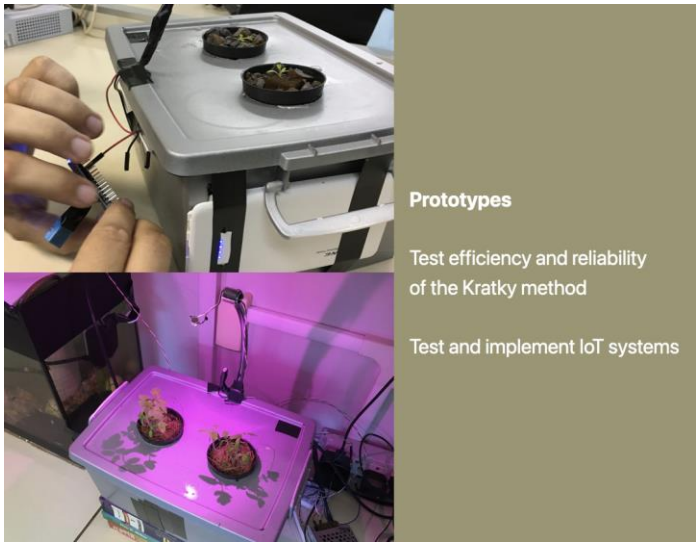

Figure 4. Prototypes to test IoT technologies.

Sketches and models

The designing stage consisted of sketching and modelling the final product. In this stage, all the information from research, testing of prototypes and questionnaires were gathered to draw and to decide on the form and function of the product.

To help users and make the cultivation process easier, a dome was designed for the seed to germinate inside the Aico. This way users won't need to transplant the seeds into the product once they start growing. The dome maintains the environment warm and humid for the seed.

The final product [figure] was made in a cylindrical shape, divided into 7 components: starter dome, net cup, lid, container, electronics chamber, connection arm and light rod. Aico was also divided into 2 different versions, a 1-plant module - to grow spices and small plants - and a 3-plant module, both capable of producing greens and vegetables (Figures 5 and 6).

Figure 5. Aico final product, 1-plant and 3-plant modules.

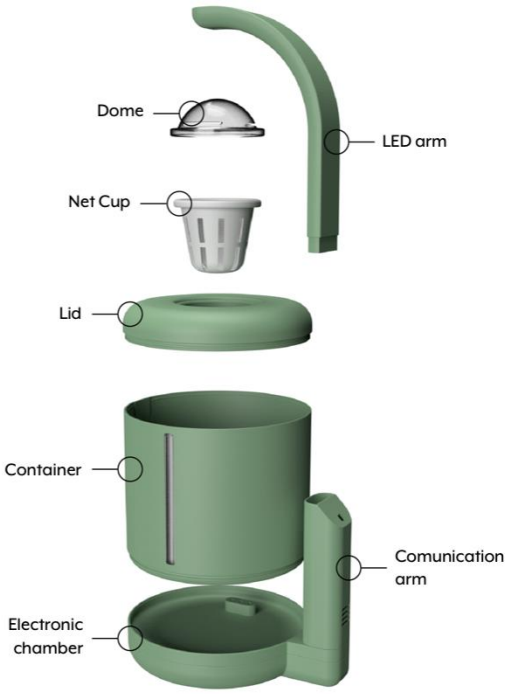

Figure 6. Aico – individual parts and assembly.

The container of the 1-plant module can hold up to 2 litres of nutrient solution and the 3-plant module can hold up to 5 litres. Both modules follow the Kratky method, which does not need to replenish the solution during the development phase of the plants.
The following sensors are installed on the final product: water temperature sensor, humidity and temperature sensor and light sensor (Figure 7).

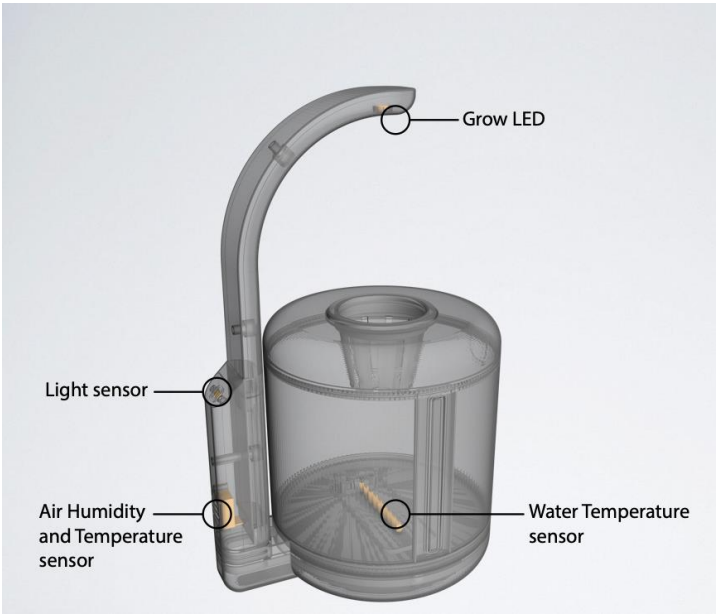

Figure 7. Aico – electronic components.

A Grow LED is installed in the lighting rod and it is turned on when there is not enough sunlight for the plants. Inside the electronic chamber, there is an Arduino WeMos D1 Mini, with a Wi-Fi chip, and a 5-volt relay. The Arduino controls all the sensors and communicates with a computer over the internet. The light rod has two extensors that connect to the connection arm so the plant can grow higher without the rod blocking it. A 3D printed model was produced to present the Aico at the end of the first phase and later used for usability tests. The materials used to manufacture the Aico are part of the current research on the second phase. The goal is to find recycled plastics to help reduce the carbon footprint of the project.

Service development

As part of the ongoing research, the concept of building a community would begin with a service located into the application used to control and assist the Aico. The study is made around the concept of Product-Service Systems, developed by Nicola Morelli in his paper published in 2003 [29]. The goal is to build an ecosystem where the users can interact with their plant modules, engage in activities within the application - recipes, tips and tutorials - and connect with other users in the community. It is the first step towards making an impact on a larger scale. The app will also teach and help users to maintain their crops in a healthy and efficient state (Figures 8 and 9).

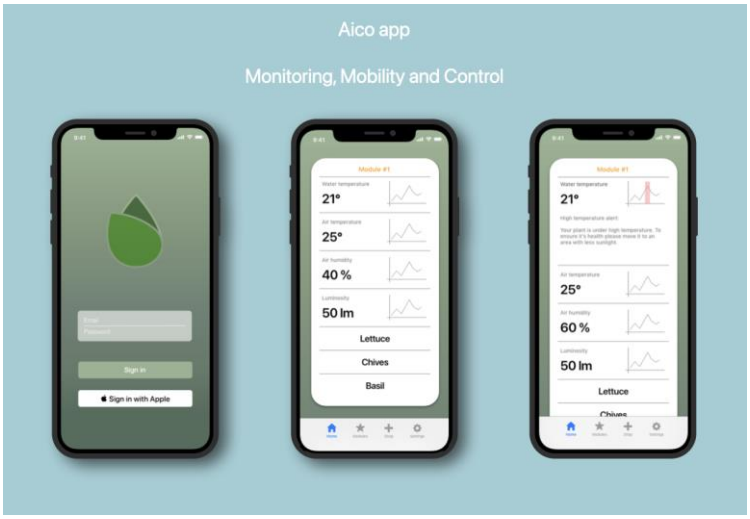

Figure 8. Aico – smartphone application.

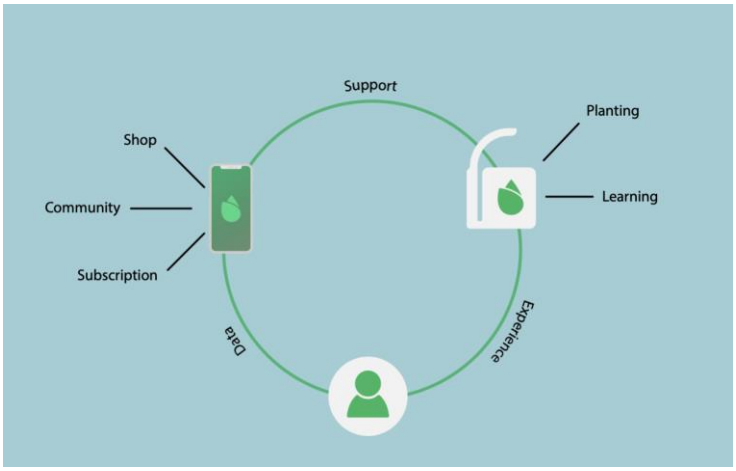

Figure 9. Aico – cloud-based service.

CONCLUSION

The goal of this project is to develop a product capable of helping users to cultivate fresh food in their apartments using methods of growing gardens and technologies available.

Aico has great potential to become a friendly device in every home to help users to have access to natural and fresh food. This product provides a hydroponic method - known as the Kratky method - to grow a garden indoors with sensors to work as a smart farm for urban dwellers. The use of IoT technologies helps users achieve an efficient way for growing indoor gardens, providing alerts and directions to better suit the needs of the plants.

Hydroponic methods can be simple and highly efficient. The solution implemented in this project meets the requirements observed early through research. The Kratky method is an easier way to cultivate a hydroponic garden without the need for any electricity and no need to revolve the water inside the container. Also, the use of coconut fibre keeps Aico at an affordable level.

Integration with electronic and smart devices still is a challenge for future projects. For now, the product can read the environment surrounding the garden. The solution developed accommodates all the sensors placed in the product regarding their efficiency and overall aesthetics.

Data collected and processed by the Aico application can help users to manage and to take care of their plants. A cloud-based service stores data and compares them to a plant species database with specifications for proper cultivation.

The current stage of the project is the development of a service that accompanies Aico. Within it, users will have access to a store where they can shop for more plant modules and more seeds for their gardens. They will also be able to find tips and recipes for the plants they harvest. The service will help them to engage not only with their gardens but also with other Aico users. The goal is to nurture a community of urban farmers who trade their production, share knowledge, and make an impact on the environment of urban living standards. On a larger scale, it provides an efficient and harmonious way to look after the environment.

NOTES

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POINTS, DOTS, PIXELS

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INTRODUCTION

Point, Dot, Pixel reflects on a set of digital, architectural drawings completed for two exhibitions in early 2020. The title for both exhibitions is *New Image of Home* and is part of a larger research project examining the evolution of the Canadian domestic space from 1956 to 2017. In this paper, I discuss the images produced as a commentary of the broader research project;[1] the larger research project is on-going.

The visual intent of *New Image of Home* project was to develop new methods of digital image making, methods that subvert the hegemony of the line and the pervasive use of digital visualization techniques.[2] To undermine this representational tradition, the work focused on the dot as a novel method of image making.[3] As the work progressed, I realized that it became a deeper mediation on the opportunities and pitfalls of dots and their relationship to other small elements, the point, and the pixel. As a result, this paper considers how dots, points and pixels relate to one another and how they offer different conceptions of an image and its intent.[4]

The structure of the paper starts with a general description of the completed images, their process and intent. These images explore different characteristics such as geometries, structures, overlaps and halftone techniques, each with a particular effect on the fidelity of the image. After the descriptions, I consider the conceptual differences between points, dots, and pixels. Using literature from art and architecture, I convey how points have been extensively considered in past discourse, but that the three units, have not been theorized in relation to each other. The paper concludes by speculating that if a shift from lines to points, dots and pixels is comparable to the broader cultural and technological shift - a change in organizational logic of networks to clouds - then the use of these three units as elements of architectural drawing might better visually represent the emergent, open-ended pluralism of our contemporary condition.

Description: Technique & Intent

The initial interest in the dot was to expand and customize the generic techniques of reprography. In working with dots, I realized they had much in common with their digital sibling, the pixel. As I explored dots and pixels, I further realized that it was only through a matrix of points, that dots and pixels could be located on the screen, and resultantly, the page.

My broader research interests in terms of architectural representation is reconceptualizing image-making practices. A starting point of the larger *New Image of Home* project examines how domestic

space is represented in art and architectural photography. My intent in producing the images was to firstly understand, and thereafter subvert, the contemporary domestic image. both those produced through the conventional render and captured through the lens of the camera (I consider those two processes almost synonymous today).

The practice started with a digital model of an imagined home. This house served as a basic platform to facilitate experiments and iterations using a series of simple Grasshopper scripts. I considered the home because many, if not all viewers have an idea of home and its attendant use. Therefore, the house and its spaces are readily identifiable.

The subject of domestic space was a counterpoint to pointillist and fauvist subjects. These historic pictures were almost exclusively figurative, landscape, still life, and later abstract works. They dealt with interiors as backdrop or staging; they rarely expressed space. My attempt was to bring the point and dot to bear on space, and for these images, to subvert the lineage of image-making that saw both interior, and particularly the domestic interior, as too mundane a subject for study and artistic expression.

I situate the work within a longer lineage of image making; it is placed both in present day and distant past. In the present, it mirrors the perspectival composition of contemporary architectural photographs and their stark one-point perspective view of domestic space. In the distant past, my work is inspired by the interior paintings by Johannes Vermeer and Vilhelm Hammershøi. Hammershøi is a particularly important reference because his severe interiors and ambiguous relationship to the subject mirror the photographs of today, and by extension, the intent that I had for my own images. In his interior paintings, his wife Ida Hammershøi is commonly seen from the back, or far away in an adjacent room. This use of the occupant, distant, is like my own Diptych images.

Hammershøi was doubly important for his perspectival composition. The frontal, one-point perspective further parallels the composition of contemporary domestic photography and forms an artistic link with the past, pulling the images back to the present.

Before moving to the work, I will start with the basic definition of points, dots, and pixels, contextualizing the terms before elaborating their differences.

A point has the greatest number definitions. In my usage, it is from the Latin and Old French word *punctum* which means “something that is pricked”. Therefore, a point makes a hole in the surface, or through the surface. As an action it is to literally to make a point, an argument, to point out something either physically or mentally; it is explanatory, decisive.

This is conceptually different from the dot, which from Old English means the “head of a boil”, a small lump or clot. As a lump, it sits proud of the surface - a small deformation. As a verb, it pursues this incongruity further as in the sentence “large rocks dot the field.”

The most recent term is pixel.[5] Coined in 1969, it describes the elements of a television image,[6] a synthesis of the term *pix* and the first syllable of the word *el*ement.[7] A pixel is a “small, square single-coloured display element that comprise an image.”[8]

In summary, the distinctions are that a point as a hole through a surface, the dot a protuberance on the surface, and the pixel as the surface itself.

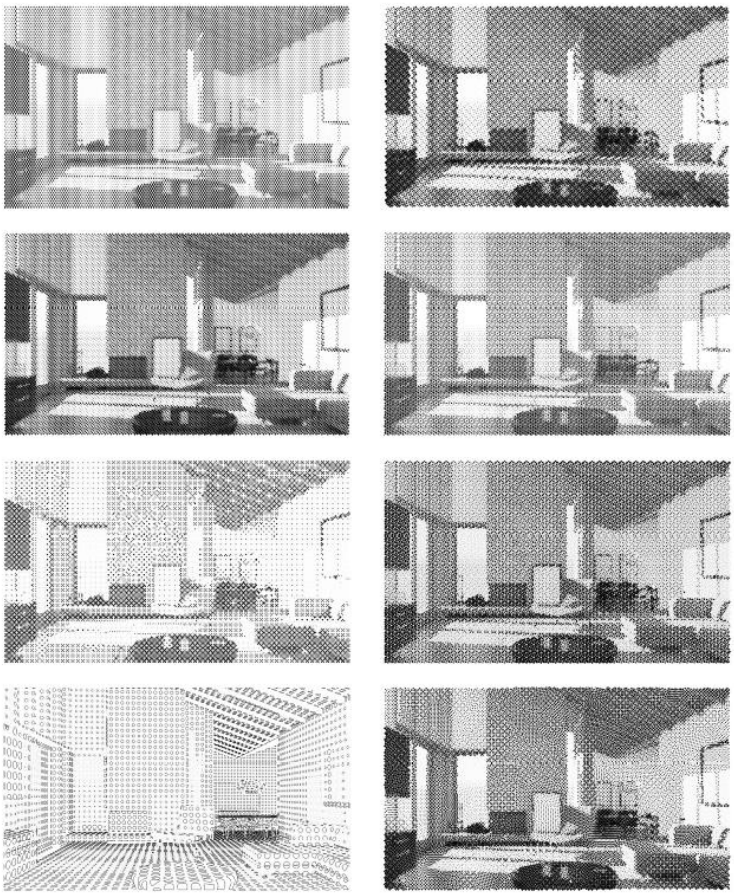

Figure 1. Dot Series, a comparative study of different dot configurations. The top four images in clockwise order from top left are diamond, rectangle, star and fish scale, the bottom four images in clockwise order are tone, fillet, variable and perspective dots.

Dot Series

The Dot series is a comparative study. Using the same background image, it investigates how a dot might be manipulated by different geometries, overlaps, and tones.[9] The background image is the living room of an imagined house. To create the drawings, the space was first digitally modelled in Rhino 6.0., then rendered in V-Ray. The final images were computationally generated through Grasshopper. The first four images show different geometries: diamond, rectangle, star, and fish-scale, to show how different geometries change the fidelity of the image. The images are black and white, the different geometry and varied scale of the dots determines the tonal value – larger dots for dark areas and smaller dots for lighter areas.

The next four dot images explore tone, fillet, perspective, and variable dots to understand the broader characteristics of new geometries on describing perspectival space. This reading is not always clear. The tonal image picks up very little information while the fillet is hardly different from the first four images. This consistency is undermined in the variable image, where the changing dot geometries creates a patchwork of legibility, some dots can pick up the nuance of the background image where adjacent patches are less successful. The perspective dot image offers new opportunities and argues most persuasively for a new method of dots reinforcing the perspectival construction of the larger drawing. While I titled these images the Dot series, their relationship to their visual brethren is more

nuanced. In their production they use the pixels in the background V-ray render, to locate points in the grasshopper script to generate the dot matrix of the final image.

In addition to the drawing elements themselves, is the space between the elements – the white space. Points are the most minimal, located *in* space they are found anywhere in a volume. From its inception in digital architecture, they form an important scaffold to anchor lines and their possible surfaces. As such, points can exist either very close together or very far apart. While a point is *in* space it has a variable relationship *to* space. The point is both everywhere, in that any point can be a point in space, and nowhere because one can never drill down precise enough to really find the point.[10]

Dots are *on* the surface. In the case of the graphic arts, they are often surrounded by white space. Dots can be singular (with only one on the page), or many, but the background is key to defining the dot. The background defines the edge and tempers its color to aid in reading the image. Dots might merge in one of two ways: either the edges blend to form a surface, such as in painting, or the background all but disappears as in the matrix of a pixelated image.

Pixels have *no* space; they are tightly bound in a matrix. The tight boundary preventing any wayward light from seeping between the seams.[11]

If we consider the boundary between a dot and its white space, the dot tightly packed in an image forms a grain. If one where to zoom in further and further, the image would eventually break down. Pixels have equal limitations but the zooming in has no effect. Its coloured element will continue to emit light, the colour pure, and with no degradation. [12] Therefore, the more pixels, tightly packed together the better the image. This is not necessarily true for dots. In printmaking, dots need a particular size – they have a range. When the individual elements are too large, pixels have pixelization, and dots have graininess. This is not true at the opposite end of the spectrum. A pixel can never be too tight, too many or too small. If dots are too small, however they blend, blur and bleed - muddying the image.

What matters in the Dot series is the realization that dots can become more varied to focus the visual content of the image. The geometry and spacing can be varied; the underlying matrix manipulate to pick up particular details while leaving others astray.

Figure 2. Diptych Series: Dining Room, the backlit night-time rendering and the daytime embroidery, a fragment of the same space.

Diptych Series

The Diptych series shows the four main spaces in the home: living room, dining room, kitchen, and bedroom. The images have a night scene paralleled with a daytime fragment of the same view. To distinguish between the night and day image, I decided to make an 'analog' counterpoint to the digital rendering.[13] This counterpoint is the daytime fragment which is (digitally) embroidered on cotton twill.

The night scene includes a broader view of the room with a collection of material possessions, technology, clutter, and a fraught relationship to the occupants of the space. Like the subjects in Vermeer and Hammershøi's paintings, the occupants refuse to acknowledge the viewer as they go about a series of mundane activities: watching T.V., working, walking out of the room, and sleeping.

The daytime scene excludes the material content and occupants from view in line with compositional characteristics observed in contemporary architectural photography. These counter-images serve as the cropped, deeply curated depiction of the home, perfect in its peaceful domesticity.

The nighttime renderings are backlit, substrate printed on glass; the daytime images are embroidered.

The rendering is a tight configuration, the light emanating from the light box behind operates much like a television, laptop, tablet, or mobile phone screen shown lit in the image.

Historically a handcraft, the embroidery comments on the sterility of the architectural rendering. The embroidery is made through a series of points, each stitch puncturing the cotton twill with a needle - the four images made with over a million punctures, but only a machine could make that many points that quickly, so its tactility is awkwardly positioned between its (digital) fabrication and its (analog) lineage.

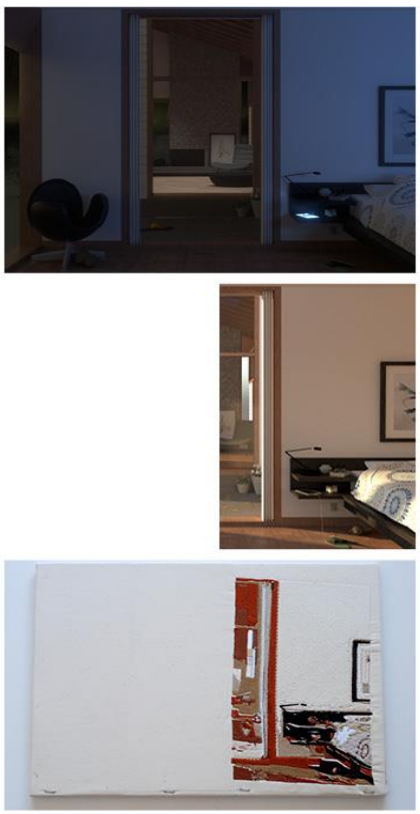

Figure 3. Bedroom Diptych, from top to bottom: the night-time rendering, the daytime fragment rendering, and the digital embroidery of the daytime fragment.

Panorama CMYK

Panorama CMYK shows the exterior of the home. The images sought to make a different kind of colour image. Inspired by the point cloud of a 3D scan, the image aims to scatter the drawing with dots, blurring the organization and order of the interior and exterior, and merging the different layers of the drawing. Here the inside maybe outside and vice versa because the white space between the dots leaves room for background to seep and become visible.[14]

Figure 4. Panorama K and Panorama Y with interior furnishings bleeding through the structure and envelope of the home, literally turning the residence inside out.

Panorama CMYK aimed to actively subvert both the photo-realism of the nighttime renders in the Diptych series, and traditional halftone printing, where colors work together to form a cohesive image. In this series, the colors remain separate and never properly align. The drawing is made up of four layers: landscape, facade, building structure and furnishings, each layer rotating through the four CMYK (cyan, magenta, yellow, and black) colours and each colour using a different dot geometry.
To conceptualize the resultant effect, in Panorama Y – the predominately yellow image the strength of the black (K) furniture layer pushes through the magenta (M)-colored façade layer and the yellow (Y)-colored context to literally turn the house inside out. As a result, the work is like a misaligned point cloud, staring through the dots, revealing what would otherwise be hidden from view.

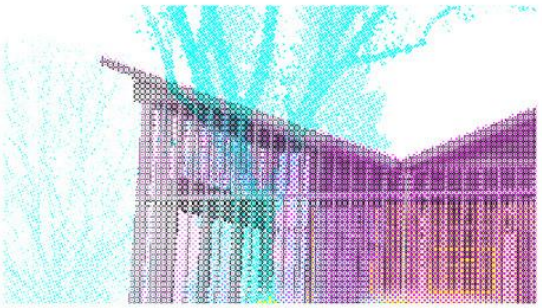

Figure 5. A detailed of Panorama C showing how the varied dots overlap, to generate a gradient of colour and geometric patterns

To further the broader theoretical position of points, dots and pixels, the point is the very smallest unit, the singularity, the indivisible, and in the case of a prick, a void, a puncture. Maybe this puncture is to let through a line of thread as in the Diptych images, or, if in a sheet to let through a single ray of light from the other side, but in any case, the point is both a position to be measured, and a void in which to disappear.

If I compare the Panoramic CMYK, to the previous Perspectival Dot images, the point in the former is positional (everywhere) and in the latter is absent (nowhere). On the underlying grid, it is easy to define position through its coordinates, but this matrix is very different from the Perspective Dot image. In the Perspective Dot image, the (vanishing) point is perceptually furthest away from the viewer - it is where all the drawing elements converge, but also where they disappear.

In opposition to the disappearing point, a dot is a notation, like an exclamation point, braille, or the beeps of Morse Code. Dots are visual, tactile, and auditory.[15] Dots are variable in size with a range of wobbly shapes. They are used to make an image, as in the use of Ben Day dots or halftones, or they can be used to censure an image – placing a dot to hide a face, for example, pixelation has similar qualities.

The pixel, in comparison, is simple. Where the point is conceptually rich; the dot is sensorially resonate; the pixel is visually pure. Beyond its status as a unit of colour display, however, the pixel is unique. Where the dot is pigment - the pixel is technological, emanating light from a screen.[16]

Therefore, in coming full circle, if the puncture of a point is not through a sheet, but through a screen, then the single ray of light through its surface is not a point, but a pixel. In this instance it does not place ink on, but light through, the surface. Here, the point is to reveal a pixel to visualize a dot.

Media Series

The last series in this portfolio are the Media images. Their conceptual intent is to make explicit the intricate relationship of digital devices to the occupants of the home. Here, the devices act as the only windows to the outside world, reflecting a view of the room in which the device is located. This mise-en-abyme comments on the pervasive use of media technology, and how this world reflects back on our own domestic environment.

The images are made using both dot and pixel geometries. The pixel geometries of each device are the shape and pattern of the pixel configurations used in televisions, laptops, cellphones, and tablets. They are displayed as an RGB matrix against a black background. The pixel geometries are placed in perspective, to connect the screen to a different spatial system. This system is not the flat page on which the image is printed, but the technological domain off the page.

The rooms are visualized in CMYK dots, but unlike the Panorama series, the Media dots are more akin to conventional halftones. Like the Dot and Panorama CMYK images however, these Media dots lie flat as pigment on the page, eschew the perspectival construction of the room they visualize. This difference aims to conceptualize the growing gulf between the printed and digital world, while simultaneously oscillating between its perpetual virtualities.

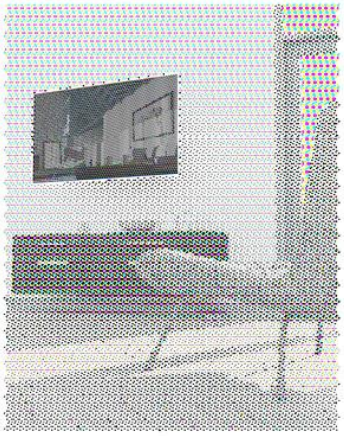

Figure 6. Media Series: Living Room Television showing the flattened dot of the space, and the perspectival pixel of the screen

CONCLUSION

The hegemony of the line is well established. When lines are married to points [17] they generate a different logic of drawing. In my mind, this logic is indicative of our immediate past as a representation of the networks that linked and globalized space. Increasingly, however, these lines seem limiting. The connections that now mark our relationships are more plural, nuanced, and open-ended. The line as a diagram of these relations simplifies to a degree that erodes as opposed to clarifies this tangled web.

The pixel, as a term, as a *method* of drawing, is new. While rendering is pervasive, the novel opportunities that the pixel affords is barely explored. The dot in graphics is also, relatively, recent; the point is old, but in relation to digital computation is also in its nascent stages of creative development. Designers have a huge opportunity to explore these novel units of image making. To not take their geometry, scale, and relationships for granted but to design the very units of their images in the same way that the gesture of the line is used as the unique generator of drawing.

By articulating our own dots and pixels we can move away from the photographic underpinnings the limit contemporary architectural production to develop new ways of image making. Ones that can use the elements of drawing to reinforce intent and image content, dots and pixels that can blur, or reveal, be playful or subversive.

This is both a comment on technics and technique. Technics because it requires a deeper understanding of the digital substrata that configures our digital world. Technique because it requires that we creatively express that scaffold as a foundation on which we project our later work. In my mind, freed from the hegemony of lines and surfaces, that new scaffold of representation is the cloud of our contemporary condition.

The cloud is both a natural phenomenon, and a technological system. It is simultaneously all-encompassing, yet fragile, ever present, but ever fleeting. To fully articulate this concurrent

environmental and technical present is to make visible this triad of points, dots, and pixels. The cloud is so many points, that they can shed the lines of the network. They radiate, shift, morph, all in free association. On the screen, the dot visualizes the point visualized by the pixel. They punch through the screen only to reflect back – radiantly.

We already draw with points, dots, and pixels. But to consider how to design with them, how to mould them, give them agency, foreground them as co-constitutive elements that makes an image - that is unique. If architects can design space, we can design points, dots, and pixels, small elements that reinforce the underlying position of our art; elements that don't just display, but that speak.

ACKNOWLEDGEMENTS

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NOTES

[1] This work was exhibited at the Shenkman Arts Centre (January 2020) and Lightroom Gallery (March 2020) in Ottawa, Canada. The work is the product of a larger sabbatical research project started in July 2018.
[2] Alan Balfour writes persuasively that: "A critical understanding of the technology maybe more important for designers than developments in the technology itself. To effectively tackle the problem of software driven design, we need to repeatedly unmask the biases the software introduces in the design as well as be vigilant about the arbitrariness that often seems to lurk behind computer-driven decisions."
Alan Balfour, "Architecture and Electronic Media," Journal of Architectural Education 54 (May 2001): 268-271.
- I am also inspired by Karen Kurczynski's description of the agency of drawing in relation to the market. My images aim to subvert the commercialization of established digital visualization techniques.
Karen Kurczynski, "Drawing is the New Painting," Art Journal 70 (Spring 2011): 92-110.
[3] I have sought to be careful in my terminology following John May distinction between drawing as an extension of orthographic marks, and digital images are an extension of electrical signals.
John May, *Signal. Image. Architecture.* (New York: Columbia Books on Architecture and the City, 2019), 26-56
- This project nuances this view with Tung-Hui Hu's book *A Prehistory of the Cloud* in which he describes how all new technological system are born and layered on top of past systems.
Tung-Hui Hu, *A Prehistory of the Cloud* (Cambridge: MIT Press, 2016), Chapter 1
[4] As an extension of the previous point, is to situate this work within either a postdigital, or postorthographic lens. Galo Canizares makes the distinction that "[postdigital] equates computation to an outsider at the service of some architectural thought, whereas [postorthographic] posits that computation has evolved into part of the thought process itself." In this definition the work teeters into the postorthographic, although I am skeptical of describing the work in these terms.
Galo Canizares, *Digital Fabrication: Designer Stories for a Software-Based Planet* (Columbus: ORO Editions: Applied Research and Design, 2019), 113-122
[5] Paula Birnbaum notes "The pixel is the primary digital module from which the face of our electronic visual culture is constructed… how the computer brings with it new ways of thinking about images and patterns, and also conventions of visual representation that are nonetheless rooted in tradition." In Andrew Atwood's "Rendering Air" he describes how "[computer graphic] techniques are not only analogous to processes found in traditional image making but also are sampled representations of those processes, and thus they operate as abstractions of their traditional counterparts."
Paula Birnbaum, "Elaine Reichek: Pixels, Bytes, and Stitches," Art Journal 67 (Summer 2008): 18-35.
Andrew Atwood, "Rendering Air: On Representation of Particles in the Sky," Log 31 (Spring/Summer 2014): 47-51.
[6] Friedrich Kittler reveals the military history and notes that "the techno-historical roots of computers lie not in television, but in radar…"
Friedrich Kittler, "Computer Graphics: A Semi-Technical Introduction," trans. Sara Ogger, Grey Room 2 (Winter 2001): 31-32
[7] Kittler notes the pixel illusion of the image as simultaneously text (0,1) and image (colour value)
Friedrich Kittler, "Computer Graphics: A Semi-Technical Introduction," trans. Sara Ogger, Grey Room 2 (Winter 2001): 32-33
- Luc Vanmalderen wrote in 1985: "The pixel is now familiar to anyone involved with computers. It is a distinctive unit of a numerical or digital image… The pixel is undoubtedly a distinctive nonsignificant unit. It is indispensable and will become increasingly more so for the autoreproduction of the image. This is its most important quality. We are again confronted with a double articulation: on the one hand, the pixel – a distinctive unit without meaning – and on the other, the pattern – an assemblage of points that acquires meaning from configuration. But the question remains: Is the pixel a determinant for the making of the picture? To pose the question is to answer it."
Luc Vanmalderen, "Investigations into the Image," Design Issues 2 (Autumn 1985): 50-55.
[8] Definitions by Oxford Languages
[9] I am at pains to distance my own interest from the broader narrative in digital and computational architecture of mass-customization, or variation for its own sake. Mario Carpo gives a clear overview of this history in a number of his writings, particularly: Mario Carpo, "Breaking the Curve," Artforum 52 (February 2014): 169-173
[10] A dated but compelling reference is Laura Kurgan's installation at Storefront entitled "You are Here: Information Drift" that used emerging GPS technology not to establish a fixed location, but to use the signal delay "to experience a drift and disorientation at work in may map of any architecture."
Laura Kurgan, "You are Here: Information Drift," Assemblage 25 (December 1994): 14-43.
[11] As a further argument, Vanmalderen shows the experiment conducted at the Ecole de La Cambre where a viewer will perceive a missing dot (pixel) from a rectangular grid of 9,740 dots, and that the eye perceives a missing dot even with four times as many (+/- 39,000 dots)
Luc Vanmalderen, "Investigations into the Image," Design Issues 2 (Autumn 1985): 50-55.
[12] However, because pixels are discrete units, Kittler writes that "digitalization, in terms of our perception, always also means distortion."

Friedrich Kittler, “Computer Graphics: A Semi-Technical Introduction,” trans. Sara Ogger, Grey Room 2 (Winter 2001): 32-33

[13] I use the term analog with trepidation because the embroidery is digitally fabricated. This does present an unique relationship the embroidery is fabricated through software that translates the visual information into what is regarded as a traditional handcrafted domestic object.

[14] While the methods and results are very different, I am compelled by Nat Chard’s notion of indeterminate conditions.

Nat Chard, “Fabricating Indeterminate Precision,” in *Fabricate 2011: Making Digital Architecture,* ed. Ruairi Glynn & Bob Sheil (London: UCL Press, 2017), 31-38

[15] Sam Jacobs writes about the dots and beeps of electromagnetic signals in space

Sam Jacobs, “Dot Dot Dot,” Perspecta 44 (2011): 136-144

[16] Luke Smythe makes a distinction in which a dot is pigment, and the pixel is light-based.

Luke Smythe, “Pigment vs. Pixel: Painting in an Era of Light-Based Images,” Art Journal 71 (Winter 2012): 104-118

[17] There are two ways to consider this point, first is the reference to the network, the second is in relation to the term “rubberbanding” in Ivan Sutherland’s Sketchpad - the snap of a line to a point.

Galo Canizares, *Digital Fabrication: Designer Stories for a Software-Based Planet* (Columbus: ORO Editions: Applied Research and Design, 2019), 138-145

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COULD VIRTUAL TOURISM OF AUGMENTED REALITY (AR) REDUCE GREENHOUSE GASES?

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INTRODUCTION

Overtourism[1] is the threat that prevents tourism from being viable and green.[2] Travel improvements has enabled tourism to development, which today unfortunately also makes it impossible. From the royals' peregrination[3], the nobilities' Grand Tour of the16th the mid19th century[4] until the mid-20th century, now possible for all social classes. Travel and improved opportunities to distribute information over time has also trigged tourism to expand.[5] In spite of the prodigious development from horse and carriages to aviation, still the introduction of new destination, with printed travel guides was slow thus, it remained in the *analogous tourist phase*. Today's *digital tourist phase* that commenced in the 1990s, with the home computers, enabled information to spread rapidly due to Internet[6] and everyone to become their own travel agent. This caused sales of travels to skyrocket, alas without increasing the number of tourist destinations on the bucket list, thereby the un-viable overtourism was a fact. Tourism cause 4, 4 % of global CO_2 emissions, which will grow by an average of 3, 2% per year until the year 2035.[7] With the extreme weather phenomena during this year fresh in mind, from heatwaves in Siberia, Canada and the US causing disastrous fires or the extreme raining leading to flooding in central Europe –climate change is accelerating.[8] A drastic decrease in travelling would reduce the emissions of greenhouse gases.[9] However, the maintenance of historical cities as well as monuments and sites depends on the profits of tourism, just as 300 million jobs.[10]

The Pandemic confinement during 2020 has clearly had negative consequences for tourism industry[11] ubiquitously and UNWTO's prediction on losses is the inconceivable 1,2 trillion US dollar.[12] Some nations are very exposed since depend on tourism such as Bangladesh where 100 tourists generate 944 jobs[13] or if its incomes exceeds 15% of gross domestic product (GDP) like in Mexico.[14]

Having to choose between livelihood and the global climate will never be fair, but to decrease tourism travel really makes a difference. The Covid-19 forced confinement 2020 reduced the CO_2 emissions globally by 17%,[15] but despite the decline, CO_2 reached its highest ever average annual concentration in the atmosphere -a 50% increase to what it was when the industrial revolution began.[16] IPCC's most recent report also underline that climate change is manmade. *"Human-induced climate change is already affecting many weather and climate extremes in every region.."* .[17] The real challenge is, both to ensure tourism's employment market and slow down future climate change. We urgently need to find new forms of tourism travel experiences that are consistent with a CO_2 emission reduction plan of up to 70%, required by 2050.[18]

The Relocation of Venice

As the Republic of Venice, Stato da Màr, was once Europe's first international financial center, this prosperity always was reflected in its architecture.[19] Nevertheless, when this empire stagnated by the end of the 17th century, tourism became its rescue. *"Her successor…." "..-so bereft of all but her loveliness, that we might well doubt, as we watched her faint reflection in the mirage of the lagoon, which was the City and which the Shadow"* [20]. Ruskin's mid-19th century tourism represent the first radical change for travelers thanks to the more reasonable priced steam-powered transportations.[21] Tourism in Venice increased the most in the last two decades, for example, the number of overnight stay doubled during 2003-2019.[22] Transportations in the former trading town, built on islands was always water. Even with the larger population of 200, 000 in the 17th centur[23], these were managed efficiently via the canals. Hardly as today, through the narrow walkways which leads to congestion. Especially as only large group trips of tourists can meet the demand for cheap tickets and what is worse is, today only fossil fuel vehicles has this transportation capacity. Social Medias' instant mobilization ability lit the spark during the heatwave Lucifer in 2017 to recurring demonstrations against tourism.[24] Attempts have therefore been made in Venice to modify the flow of visitors, from surveillance cameras to tax exemptions.[25] However, the lock down 2020 has clearly shown Venetians how dependent they are on tourism since just under 25% of travelers arrived last year and tourism spending in the entire Veneto region decreased by around 3.9 billion euros.[26]

Undoubtedly, destinations like Venice and not least the travel industry, need to enter the *digital tourist phase*.[27] Never before has there been such good opportunities for the industry to map or register the flow of global tourism since it is completely digital. Overtourism, which signify an imbalance between supply and demand actually can be avoided. When giving the opportunity to but a fraction of the world's population[28] for low costs to visit unique destinations, this will be to a high price for the rest of the globe. Virtual tourism by augmented reality (AR)[29] can instead Relocate Venice to us all.

Staycation –adapt, revive and CMT

Domestic tourist sites represent the *analogous tourist phase*, established when there were fewer vacation days and travelers and entertainments modest. In 2020 the staycation trend, (stay home+ vacation) grew. Unprepared places discovered by social media, such as Stekenjokk (Sweden), was hit by overtourism since visitors increased by five times in 2020.[30] Slovenia, on the contrary, successfully sponsored staycation with tourism vouchers to adapt.[31] Reviving forgotten locations, with exciting stories of past settlements or events, would therefore be important additions.[32] Hence, non-existing contexts materializes when they become Virtual Tourism, and intrinsic IndianaJonesEffects come alive. Finally, CMT, *Costume made trips* or individual staycation-travel, will have future prospects through the open access of VT's Relocations or Staycations. On the Internet, these become digital archives and the more of social media's involvement the better the fit.

Virtual tourism refers to computerized animation of cultural sites transmitted digitally via an augmented reality (AR) technique, to initiate Relocation or to encourage new Staycation trends. AR has strong value-enhancing capacities when experienced on site[33] and this paper therefore scrutinizes its ability to create experiences of non-existing contexts and hidden stories over the Internet. The qualitative studies 1-2 explores how future users respond to and receive digital feasibility study images to augmented reality (AR) to explore its use for Virtual Tourism. The ambition is to make a practical contribution to update today's leisure trips so that tourism will also be a potential joy for future generations. Virtual

tourism can be a cure for overtourism, by introducing site Relocation and upgraded Staycation and once again making tourism viable and green.

METHODOLOGY

Scanning at Fredriksdal museum

The purpose of Study 1-2 was empirically to investigate how respondents would reply and react when confronted with digital feasibility study images to augmented reality (AR) in order to explore its possible use for Virtual Tourism[34]. The use of an inductive approach was to reach a clearer understanding of Virtual Tourism as such, in dialog with future potential users. Study 1 refereed to still images and films in Study 2. The data was from three scanning campaigns at Fredriksdal Open Air Museum in Helsingborg, Sweden. The museum has expanded their house collections over time with buildings that used to be at risk of demolition. The scanned houses on the artificial street Stadskvarteret were built between the 1780s and 1910s and moved or *Relocated* to the museum in the middle of 20th century. The four films in this study were feasible studies to augmented reality, thus not completed. Still, in the skilled way that the brilliant colleagues at Lund University Humanities Lab (Giacomo Landeschi, Stefan Lindgren and Carolina Larsson), had processed the scan result, the films were of sufficient quality to be tested. The gained new knowledge from these studies will be guiding for to how to further develop augmented and virtual reality in Virtual tourism. Of particular interest was to map the demands for digital images, therefor the following questions were asked. *What general requirements must be met for digital images, (AR and Virtual Tourism) among future tourists in order to change peoples' travel routines, and thereby defeat overtourism? Will digital 3D technology be able to evoke adequate value-enhancing experiences over the Internet of non-existing structures and hidden stories at a distance?*

Study 1 Still Images

For the first inquiry a total of 18 still images of the street Stadskvarteret at Fredriksdal were used for testing digital feasibility study images to augmented reality (AR). Out of these, 12 pcs had been extracted from technically different reworked scanning's that initially had been processed into films. Yet, six were photos showing before -after situations. One with the museum house at its original site and the other one presenting the current situation, with a new building on the old building plot. The reason for the mix of media was to observe possible discrepancies among the respondents' impression of digital media compared to traditional photos.

Participants and procedures

The sample for Study 1 was made up by 14 respondents representing to main groups of museum visitors. In one, all participants were familiar with the museum's Stadskvarteret buildings, here referred to as the *Physical Visitors* (PV) while the *Virtual Visitors* (VV) in the other group, only had experienced the open air museum through the website, prior the interview. Museum staff also was included in the PV's and with a head start since already positively set to the prospects of introducing AR projects at the museum. Given the modest number of participants in the study, it should be noted that although only seven people were interviewed per group, but as a result after the regrouping, due to the thematic evaluation and coding, they corresponded to a total of 28 respondents. In the PV group the age span was between 20-60, with one male and six female. In the VV four were male and three female and it also had a wider age span between 20 and 70 years old. Though the sample structure individually was incomplete, but overall they received acceptable coverage with 12 F-2 M among the physical visitors and 6 F-8 M in the virtual visitor group. In total PV+VV consisted of 18 female and 10 men.

Physical visitors	Virtual visitors
Professional Physical visitor (PPV) -3/1M 2F	All Virtual visitors (AVV) -7/4M 3F
Laymen Physical visitors (LPV) -4/4F	Virtual visitor 60-70 yrs. of age (VV 60-70) -4/2M 2F
Physical visitor 40-60 yrs. of age (PV 40-60) -6/1M 5F	Virtual visitor 20-40 yrs. of age (PV 20-40)-3/2M 1F
Physical visitor 20-40 yrs. of age (PV 20-40) 1/1F	

Figure 1. The two respondents groups in Study 1-2 were the Physical Visitors (PV) and the *Virtual Visitors* (VV).

All respondents were interviewed in real time over Zoom. With open ended questions they initially were asked to comment or explain what impression they got from the 18 still images, shown one at a time. Finally they were asked to place each image in a timeframe out of a visitor's perspective, that is, whether the image would be more appropriate to experience (1) prior a visit to the museum, (2) during a museum visit or (3) after an imagined visit. To even out potential fatigue effects, that the first image might be more interesting than the last, the images always were exposed in different row orders during the interviews. All answers were registered directly during the interview and the thematically coding provided an outcome with a clear pattern of three observable themes to evaluate in relation to Virtual Tourism. Image Evaluation 1 (IE1) concerned usability of the image, when frequently mentioned indicate high. Image Evaluation 2 (IE2) was how to assess an image, from positive, neutral to negative for VT. Image Evaluation 3 (IE3) was about suitability in time, from pre-, during- to after visit. The registered answers of the interviewed were qualitative and quantitative evaluated according to the three themes IE1- IE3. Finally the Conformity out of all aspects was investigated in order to reveal what images that most respondents would agree to be most appropriate for Virtual Tourism our of "all" aspects.

Study 2 films

The group of respondent who evaluated the four films were the same individuals as in Study 1, but with two women fewer in the PV group. The total amount of opinions in this study therefor was 26 and PV+VV and consisted of 16 female and 10 men. In contradiction to the previous qualitative interviews, this time the respondents were confronted with a closed-ended survey and three multiple-selection questions to answer. Still, an open ended comment field was also added to all of them. The thematically coding of the comment field made the answers correspond to the previous still images study, the EI2 (assessment). The respondents downloaded all four films themselves for the individual reflection, to complete the survey one at a time. The first question asked intended to reveal the respondent's general opinion about the films, with the following alternatives; *Good overview, New Knowledge, Unrealistic Fairytale Word* or *Uninteresting*. The second more specified question intended to frame and relate to the first one by providing the following choices*; Colors, Details, Scale, Feeling of authenticity*. The third question was the same as in the previous Study. The respondents should here place each film in a timeframe from a visitor's perspective, i.e. when would the film fit in, (1) prior a visit to the museum, (2) during a museum visit or (3) after an imagined visit. Film 1 show a walk through the Stadskvarteret street with detail zooming sessions, Film 2 is a close up study of stone sculptures on a facade, Film 3 once more display the street from the ground level and Film 4 is an interactive birds eye view model of the street that can be zoom in on.

RESULTS
Study 1 Still Images

Group	Cluster of groups	Image	Photo	Digital	Frequence P-D-A
	L. Physical Visitors	no 6	X		12 (4-3-4)
PPV		no 5, 9	X		7 (2-2-3)
PV40-60		no 9	X		14 (4-5-5)
PV20-40		no 5-10	X		3 (1-1-1)
	All Virtual Visitors	no 8	X		14 (5-5-4)
VV60-70		no 8	X		10 (3-4-3)
VV20-40		no 1			4 (2-1-1)
		no 2			4 (1-2-1)
		no 3			4 (2-2-0)

Table 1. Image Evaluation 1(IE1) with best usability for VT.
The result showed that a majority in both groups selected photos no 8 and 9. The exception was that VV20-40s who instead chose different digital images, 1-3.

Figure 2. Two of the "before and after" photos that were more appreciated, though no. 8 to the left, became the most important one through the study. No 9 is to the right.

Group	Cluster of groups	Image	Photo	Digital
	L. Physical Visitors	3,10,13	33%	67%
PPV		1,2,5,11,14,15	16%	84%
PV40-60		2,3,10,11,15	20%	80%
PV20-40		1-3, 5,6,8-10,13	33%	67%
	All Virtual Visitors	5,13	50%	50%
VV60-70		5,7,8,10	100%	0%
VV20-40		1,2,12,14,15	0%	100%

Table 2. Image Evaluation 2 (IE2) the most positive image for VT
The result again reveal that the VV20-40s were only satisfied with a number of digital images, which corresponds to the PPVs. The VV60-70s were the exception that still only preferred photos.

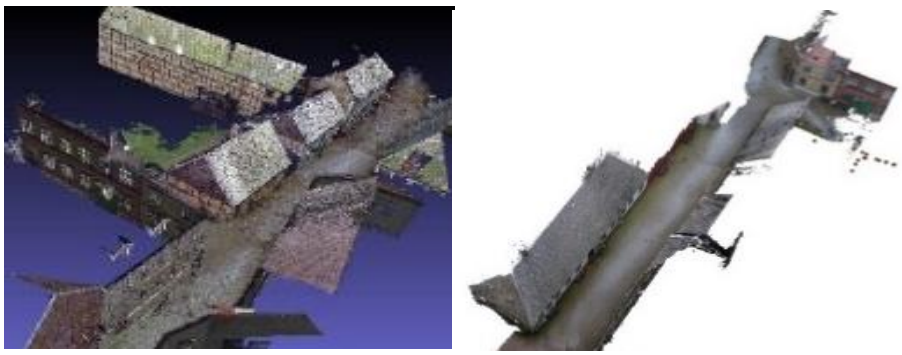

Figure 3. Two of the digital images that were mentioned in the study. Number 2, to the left, was the most appreciated one, but no. 17, to the right, was consider inadequate.

Group	Cluster of groups	Pre-visit			During visit			After visit		
		Image	Photo	Digital	Image	Photo	Digital	Image	Photo	Digital
	L. Physical Visitors	1,6,8,10	75%	25%	9	100%	0%	6,8	100%	0%
PPV		13,15,17,18	0%	100%	2,4,13-18	0%	100%	5,9	100%	0%
PV40-60		6,8,10,12,15,18	50%	50%	9	100%	0%	3,8,9	67%	17%
PV20-40		1-10,13.17	50%	50%	6-12, 16,18	60%	40%	5-10,12	86%	14%
	All Virtual Visitors	1,8,13	67%	17%	7, 10	100%	0%	5,8	100%	0%
VV60-70		1,5,8,13	50%	50%	6,8,9	100%	0%	8	100%	0%
VV20-40		1,3,8,11,12	20%	80%	2-5, 7, 10,11,13-17	25%	75%	1,2,5,7,8	60%	40%

Table 3. Image Evaluation 3 (IE3) temporal suitability for Pre -, During – or After Visit

Again, a majority preferred photos for all three situations. The two exceptions again were the VV20-40s and the PPVs who chose digital images, but not surprisingly for the After Visit, when photos were selected by everyone.

1. C- All Physical Visitors (PPV, LPV, PV40-60, PV20-40)									
	IE1	IE2-1	IE2-2	IE2-3	Pre Visit	During Visit	After Visit	Conformity	Digital
Still image	9	2	no	17	no	no	9	4 still images	50%
2. C- All Virtual Visitors (AVV, V60-70, VV20-40)									
	IE1	IE2-1	IE2-2	IE2-3	Pre Visit	During Visit	After Visit		
Still image	8	no	no	17	8	no	8	5 still images	40%
3. C- Laymen Physical Visitors and All Virtual Visitors (LPV, AVV, V60-70)									
	IE1	IE2-1	IE2-2	IE2-3	Pre Visit	During Visit	After Visit		
Still image	17, 13	no	16	17	1,8	no	8	7 still images	-71% 17 nox2
4. C- Physical Visitors 40-60 and Virtual Visitors 60-70 (PV40-60, VV60-70)									
	IE1	IE2-1	IE2-2	IE2-3	Pre Visit	During Visit	After Visit		
Still image	8	no	10	17	no	9	8	5 still images	**20%**
5. C- Physical Visitors 20-40 and Virtual Visitors 20-40 (PV20-40, VV20-40)									
	IE1	IE2-1	IE2-2	IE2-3	Pre Visit	During Visit	After Visit		
Still image	7,8,10,	2,15	7, 11		1,3,8,10	5,7,10,11,16	8	9 still images	**60%**
6. Prof Physical Visitors, Laymen Physical Visitors, All Virtual Visitors (PPV, LPV, AVV)									
	IE1	IE2-1	IE2-2	IE2-3	Pre Visit	During Visit	After Visit		
Still image				17				1 Still image	100%
summary	8 /50%	2/33%	no	17/83%	8 /50%	no	8/67%		

Table 4. Conformity

Here the trend, regarding the younger VV/PV20-40s preferring digital images contra the older VV/PV40-70 photo images, came clear once again. With regards to digital images, a majority (83%) were convinced that the digital image no. 17 was inadequate, but also quite a few (33%) found that no. 2, although digital had good properties. The general perception was that photos were required to attract visitors (Pre visit) and as memoirs for return visits (After Visit). Only the VV/PV20-40s promoted still images that apply to the stay (During Visit), which all were digital. This table also clearly revealed the importance of photo number 8 since it was promoted by all groups, both for its high usability (EI1- 50%), strong temporal suitability for Pre Visit (50%) and After Visit (67%).

Study 2 Films

Figure 4. Film 1 Faro Scanning; Stefan Lindgren, Digital Photos; Giacomo Landeschi, Megashape camera, Blender; Carolina Larsson Lund University Humanities Lab

Group/no.	PPV	LPV	PV40-60	PV2040	summary	AVV	VV6070	VV2040	Summary	Total
Number	3	2	6	1	12	7	4	3	14	
1 General	Good overview					Good overview				
2 Specific	Details					Details Scale				
3 Pre V	5	8	5	0	18	6	3	1	10	28
3 During V								1	1	1
3 After V								1	1	1
Positive	5	10	7	3	25	4		4	8	33
Neutral							3		3	3
Negative										

Table 5. Film 1 Result from survey of all groups

The VV group had a low appreciation for this one and the VV6070s were neutral, in contradiction to the PVs who were three times as positive. Especially the Laymen Physical Visitors. A majority believed this would be a perfect Pre Visit film, because tempting, but the VV2040s saw a much wider use. The VVs also added Scale to the general and specific comments (G/S).

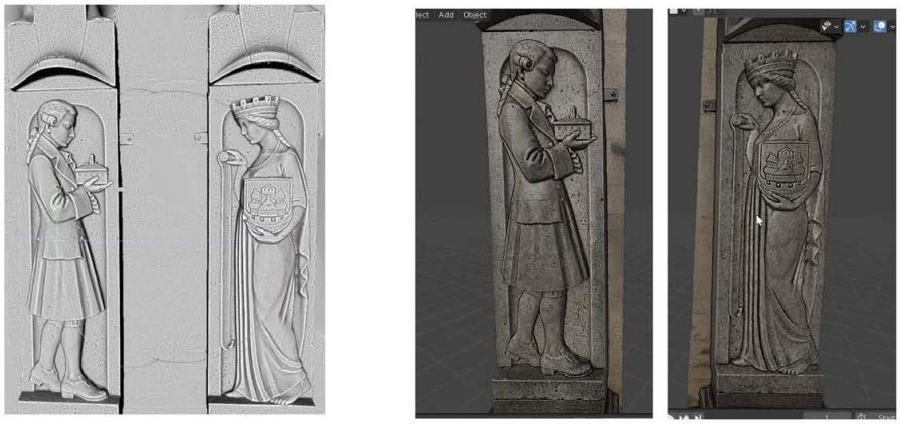

Figure 5. Film 2 Artec Eva hand scanner; Carolina Larsson Meshlab, Blender; Carolina Larsson Lund University Humanities Lab

Group/no.	PPV	LPV	PV40-60	PV2040	summary	AVV	VV6070	VV2040	Summary	Total
Number	3	2	6	1	12	7	4	3	14	
1 General	Good overview					Good overview				
2 Specific	Details					Details				
3 Pre V	2,5			0	2,5	7	4	3	14	16,5
3 During V				0						
3 After V	2,5	6	3	0	11,5					11,5
Positive	3	4	6	1	14	4	2	2	8	32
Neutral								2	2	2
Negative							2		2	2

Table 6. Film 2 Result from survey of all groups

Here once more the Virtual Visitors were half as interested, neutral and even negative to this film in contradiction to the Physical Visitors. This disagreement also included when to see it. The PVs suggested as an After Visit, a souvenir for returning, but the VVs were quite the opposite, suggesting this as a temptation to visit.

Figure 6. Film 3 Digital Photos, Megashape; Giacomo Landeschi
GIS pro; Giacomo Landeschi Lund University Humanities Lab

Group/no.	PPV	LPV	PV40-60	PV2040	summary	AVV	VV6070	VV2040	Summary	Total
Number	3	2	6	1	12	7	4	3	14	
1 General	Good overview					New Knowledge				
2 Specific	Details					Scale				
3 Pre V	5		6		11	8	5	1	14	25
3 During V		7		1	8			1	1	9
3 After V								1	1	1
Positive	7	10	7	3	27	6	2	4	12	39
Neutral							2		2	2
Negative										

Table 7. Film 3 Result from survey of all groups

This was the most appreciated film and with the highest score according to all respondents, but the VV6070s were also neutral. Most VVs suggested it to be for Pre Visits, with exception of the younger VV2040s who once again saw a wider use. This time the PVs were split up between for the Pre- and During Visit. The VVs changed their G/S comments to Knowledge and Scale.

Figure 7. Film 4 Faro Scanning/Point Cloud; Stefan Lindgren, MeshLab; Stefan Lindgren Lund University Humanities Lab

Group/no.	PPV	LPV	PV40-60	PV2040	summary	AVV	VV6070	VV2040	Summary	Total
Number	3	2	6	1	12	7	4	3	14	
1 General	Good overview					Good overview				
2 Specific	New Knowledge					Scale				
3 Pre V	1	1	1	0	3	7	4	3	14	17
3 During V	1	1	1		3					3
3 After V	1	1	1		3					3
Positive	6	8	6	2	22	5	2	3	10	32
Neutral										
Negative										

Table 8. Film 4 Result from survey of all groups

Just like for film 1 and 2, the opinions from the groups about this last film was the opposite, where the PVs were in favor, but the VVs only half so impressed. It is also remarkable that the PVs saw that the film had topicality for all levels, but the VVs, who for once agreed, suggested Pre Visits. The physical visitors added new knowledge as general/specific judgements.

DISCUSSION AND CONCLUSION

The purpose of Study 1-2 was empirically to investigate how respondents would reply and react when confronted with digital feasibility study images to augmented reality (AR) in order to explore its possible application for Virtual Tourism. The inductive approach, to register the respondents' or actually future users' conduct, was strengthened with respect to the interviewees' dissimilarities regarding age and pre-knowledge of the museum buildings. All in all, circumstanced that could increase the chances to approach and understand the essence or least what requirements to make on Virtual Tourism.

The outcome of the still image study first of all clearly stated the distinction between the younger and older respondents' relation to digital media. Comments like. "….I don't like these kind of images, they look fake….", male 69 or "…what is most disturbing are the colors and that it is incomplete..", female 65, talk for themselves. One explanation why the 20-40s choosing and seeing more possibilities in digital media is because they are the home computer generation that grew up in the 1990s. Computer games have encourage and given them a pre-understanding to see other potentials in this medium than the less initiated 40-70s do. Yet, the exception was the Professional Physical

Visitors (PPV) who often coincide with the younger, but this effect is most likely due to the fact that they want to increase the use of digital media at the museum. Nonetheless, many could agree on two digital images, one that they actually like a bit more (no. 2) and another that was inadequate (no.17). Additional reasons why the majority of the respondents often preferred photos and united saw the importance of photo number 8 can also be related to what they all represented. This was the narrative capacity or the IndianJones Effect (IJE), as it is referred to here, which was actually incorporated in all photos, that of urban renewal. The irreversible demolition involving 30% of all historical city centers, a phase which hit Sweden after World War II[35] and even stronger for those how hold the key to knowledge.

The result from the film study clearly reveal that all physical visitors enjoyed these much more than the Virtual Visitors did. The reason for this could either be that the films revealed more of the context which the VV new the least about, thus the films became uninteresting or confusing. On the other hand, it could also relate to what previously been said about the younger groups' pre-understanding of digital media. Comments like these explain the differences*"...where are all people, trees and animals?..",* male 64, in contradictions to *"..."...excellent digital 3D model* (male 32)*..."* or *"....I feel that I can walk around the corner in this film.."* , female 31. To focus on that what actually united them all was that there was a clear winner and one looser among the films. The least appreciated was Film 2, which is a close up study of stone sculptures, which oddly enough received many fascinated comments as a still image. The best appreciated film was number 3 that illustrate the street from different angels. However, it begins with a satellite image that zooms in on the museum site. In other words, the essential IndianaJones Effect (IJE) is present again.

Based on the findings from this study an attempt shall be made to provide answers to the questions initially asked: *What general requirements must be met for digital images, (AR and Virtual Tourism) among future tourists in order to change peoples' travel routines, and thereby defeat overtourism?* As this study has showed it will be impossible for Virtual Tourism to succeed if the guide lines were to work generally, with only one type of media. Prejudice against digital of photos for that matter, seems to be a generation issue, but hardly impossible to manage as there is so much to gain on trying.

Will digital 3D technology be able to evoke adequate value-enhancing experiences over the Internet of non-existing structures and hidden stories at a distance? Without question, the recipe for success is revealing depth and hidden layers, to establish IndianaJones Effects are essential. Digital media already has this capacity, which computer games already prove. In this study the equivalent effect even appeared as comments on photos at times *"....I never knew that the building came from this street...you get curious..and I have walked along this street so many times before..and you never knew that today it is moved to Fredriksdal..."*, female 27. The outcome of the two studies indicates that the acceptance of Augmented Reality, or scanned reproductions in general, vary more depending on age group than media form. This study pin points that for Virtual tourism (VT) ever to affect CO^2 emissions, augmented reality productions need to be more diversified to escape the computer game stamp. Once this is done, Virtual Tourism of AR hopefully will contribute to reduce Greenhouse Gases.

NOTES

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INSTA-TURIN. REVISING THE NOTION OF PROXIMITY AND MAPPING COMMUNITIES OF VENUES IN CITIES THROUGH INSTAGRAM SOCIAL URBAN DATA

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INTRODUCTION

The aim of this essay is to explore how the contemporary forms of social interactions occur in the urban space and how they affect the relationship between venues in the city.

Electronic communications have been described as new forms of sociality[1] overcoming the relevance of the face-to face culture and welcoming a new form of communities based on fluid personal networks.[2] The success of this phenomenon can be traced back to the loss of meaning in the previous forms of social interaction, with the new one ushering a more pivotal role for the subject.[3] These contemporary forms of "communitying" when taking place in the urban space subject it to a complex layering of different evolving and overlapping hierarchies.[4]

Under this perspective, Lefebvre's conception of the everyday as the "space" where the actual life occurs[5] and the Certeau's idea of "*Wandersmänner*", the general practitioners of the city writing the urban text[6], find further relevance. Indeed, the plural nature of life in the city finds its agency in the "banality of the everyday life" and in the so-called "recurring practices", characterized by transitivity, manifoldness, and the fact of leaving footprints and imprints.[7]

Research on these "recurring practices" have been recently made possible by the availability of an enormous amount of data[8] allowing urban scholars to rely on vast and heterogeneous datasets coming from different sources including social media. As any process of data gathering and analysis, however, any research founded on social urban data must be aware of the potential biases of the datasets.[9]

RELEVANCE OF INSTAGRAM SOCIAL URBAN DATA

Despite the growing interest on the application of social urban data, most scholars in the field of urban studies have only focused on Foursquare or Twitter, and little research have been deploying Instagram[10]. At the time when this work was developed, the situation was similar despite Instagram counting 894.9 million of accounts reached in the world and being the fourth most popular social media in Italy. [11]

As Boy and Uitermark drew, the reasons for such a scarceness seems to be related to the reliability of information depicted on the platform, which might not reflect reality. Users tend to select, filter,

edulcorate the reality of their lives before posting content on Instagram and therefore the information potentially obtained is biased and cannot be used as proxies of people's behaviour in the city.[12]
In the present paper, we claim that what is perceived as a bias is on the contrary what gives relevance to the data derivable from Instagram geotagged posts. As we will argue, the composing elements of each post make Instagram a reliable source of data, thanks to its three main components: the user, the image, and the geotag.

The user

Amin and Thrift underline the intrinsic unattainability of the "everyday" in the contemporary urban framework, partially uncovered by Walter Benjamin's "flâneur", whose idle walk through the streets and his receptive recording of the phenomena happening around him overcome the normal distract use of architecture. These findings, however insightful, are always to a certain extent obviously biased by being the personal accounts of single individuals.[13]
The users of Instagram experience the city during their everyday life till their attention is attracted by a specific aspect of the urban life, they record it and share it with the community of users. Thus, Instagram users may be regarded as "flâneurs".
The biases deriving from the one-sided perspective of traditional flaneurs' accounts are now absorbed by the pervasiveness of the practice among the whole audience of the social platform. The intrinsic subjectivity of flânerie becomes objectivity because this "can be pursued only by multiplying the point of observations. The more numerous and partial are the perspectives from which a phenomenon is considered, the more objective and impartial will be its observation"[14]
According to Venturini, objectivity is, then, directly proportional to the number of points of observation – and Instagram users are indeed a lot – and to the partiality of these perspectives. This process of pervasive flânerie described above is in line with the concept of the individual as an actor and a producer in contemporary society. In the postsocial environment the imagination is no longer an imposed category, but it has been replaced by an imagination centered on individual, self-constructing significations, and processes.[15] Hence, the sum of the contents produced by subjective self-centred users is per se relevant and objectively evaluable.

The image

The accounts of these masses of "flâneurs" are therefore images whose relevance in the network society is widely accepted and known. However, Instagram images have been described as partial – as they described only a part of the individual's experiences – and depicting a distorted reality.
The disproval of the critics is founded on two main claims: the first regards the construction of the image of the city itself and the second is the overcoming of the alleged virtual-real dichotomy from a philosophical perspective.
Considering the construction of the image of the city, Lynch describes "environmental images" as "the result of a two-way process between the observer and his environment"[16]. The selection of certain elements is at the root of the composition of these images as they are made by three main components. The first is identity, stressing the individuality behind the construction of that image, the second is the structure, as images should put in relation according to some logic the producer and the object, and the third is meaning, practically or emotionally related to the observer.[17] It emerges clearly that selection is the foundation of the construction of the image of a city for an observer. Therefore, the blamed selectiveness of Instagram contents is indeed what makes them extremely even more relevant for analysis, rather than if users shared every single space they encounter during their daily lives.

As far as regard the transfiguration of the "real" object into a "virtual" fake representation, a philosophical approach should be involved to discuss the nature of virtuality itself in the digital society and locative media.
The work of De Souza e Silva and Sutko[18] stresses how the Platonic-Baudrillardian approach, disregarding the virtual in any form to either simulation or representation, is not suited to describe the complex relationships occurring between the real and the virtual in locative media. The Aristotelean-Deleuzean approach, however, conceives the real moving across the states of "act" and "potential" and, under this perspective "while the virtual corresponds to the potential state, which is actualized through the act of becoming, the actual is realized potential" [19]
Therefore, the contemporary subject-centred imagination[20] does not simply embellish reality by depicting it with an Instagram post in a "nicer" manner. Instead and more profoundly, it unveils – during the process of "flânerie" previously explained – the potential state of places and venues.

The geotag

Instagram is a non-Location Based Social Network – it is not necessary to tag a venue to share contents – therefore the act of geotagging is a conscious choice of the user, whose motivations are under discussion. Two main theories have emerged: one claims that users are keen to "showing off" to other people where they have been,[21] the other that the act is built on the will to store memories connected to places to recall them in the future.[22]
These two motivations are not necessarily conflicting and, when related to previous social studies, they allow us to consider the act of geotagging a meaningful social act performed by the user.
According to Bourdieu, distinguishing oneself from others is a part of the humans' attitude. The aesthetic choices made by individuals have a classist dimension, as they are made in opposition with the choices made by individuals belonging to other social classes.[23] Distinguishing oneself by marking one's passage in a place should be then interpreted as a social act, through which the individual testifies his/her belonging to a certain social milieu.
Even the aspect of memory, generally referred to as a more intimate and personal sphere of the self, when it takes place through the sharing of that information may be regarded as a social act. Memory, in fact, has been theorized as a "collective construct" related to the dimension of the group identity.[24]
In conclusion, the conscious and deliberate choice of geotagging oneself in a venue with an Instagram post is a social act in the construction and definition of one's identity in relation to other individuals, through the category of distinction and memory.

DEPLOYED METHODOLOGY

The practical application of the theoretical framework presented above has been conducted in the city of Turin (Italy) on a dataset gathered during the research work, insisting on a period of one solar year from December 2018 to December 2019.

Data and methods[25]

Despite at the time of the research Instagram's application programming interface (API) were no longer allowing the direct collection of data, it was still possible the research of posts according to "places" on the desktop version of the social media, sorted by date from the newest to the oldest.
Data was mined by deploying several algorithms and with a methodology articulated in three phases. First, the individuation of venues on the platform Yelp, followed by the association to the univocal numerical Instagram code and, last, the data scraping of the posts geotagged in those venues up to a year before.

Fifteen out the twenty-two categories of Yelp were selected due to their urban and social nature and the pertinence to the research,[26] identifying approximately 6,300 venues in the city of Turin.
The association to corresponding venues on Instagram reduced the number of them to 2,178, furtherly reduced to 1,071 after the data scraping of posts, since not every venue present on Instagram had posts geotagged in them.
The final dataset consists of 354,503 posts geotagged by 140,363 users in 1,071 different locations, which have been later sorted by the authors in nine new categories based on Yelp's fifteen.[27]

Identification of communities of venues

The dataset was analyzed in order to detect communities of venues according to the affinity among them based on the number of users in common. This approach derives from the work developed by Cranshaw et al. in "The Livehoods Project ", without introducing, however, any spatial variable and by analyzing the venues without any reference to the physical space.[28]
To avoid redundancy and noise, the dataset was filtered keeping only the venues that had more than 52 posts – approximately one for each week of the year – and the users who had geotagged at least 3 posts in three different locations. The resulting filtered dataset consisted in 117,042 posts geotagged in 228 venues.
The Cranshaw's approach, here considers the set U of the n_U Instagram users, the set V of n_V venues and the set P of geotagged posts.
Each venue v is represented with the number of posts geotagged in v, computing "an n_U dimensional vector c_v. The u^{th} component of c_v represents the number of times a user u" geotagged a post in "v. Under this representation, we can compute a social similarity $s(i; j)$ between each pair of venues $i; j \in V$ by comparing the vectors c_i and c_j".[29]
The social similarity $s(i; j)$ is calculated with cosine similarity as:
$s(i; j) = (ci * cj) / ||ci|| ||cj||$ (1)
Resulting in an $n_V \times n_V$ "affinity matrix"[30]
$A = (a_{i;j})_{i;j=1;\ldots;nV}$ (2)
where:
$a_{i;j} = s(i; j)$ (3)
The subtraction from the 228 x 228 affinity matrix calculated as explained above of the corresponding identity matrix, allowed the creation of a graph with 228 nodes – representing the venues – and 15,495 edges weighted according to social affinity, with an average degree of 135.92°

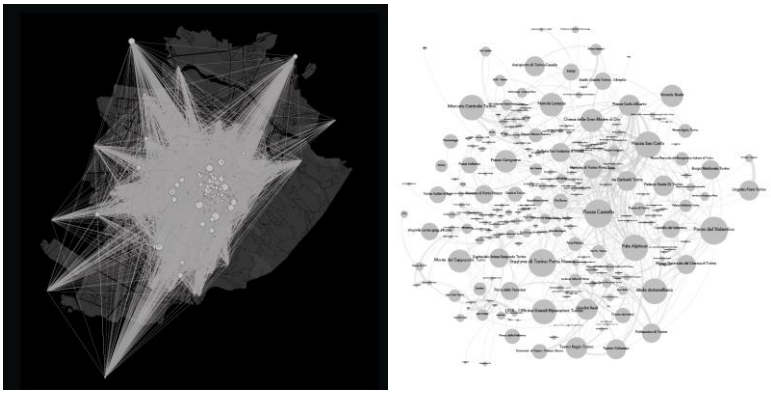

Figure 1. The graph of 228 venues (right) and its spatialization on the map of Turin[31]

Despite Cranshaw's approach would then continue analyzing the graph with spectral clustering, we deployed the technique called "community detection", also known as Louvain method of modularity optimization. This method allows the progressively grouping together of nodes in networks until it reaches an optimal level of clustering.[32]
The modularity was set on the software Gephi to 0.8, which detected 12 communities empirically evaluated as consistent and with a sufficient grain of accuracy.

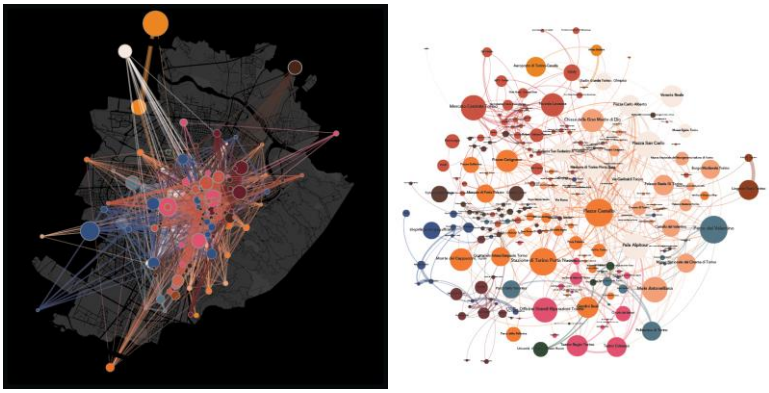

Figure 2. The twelve communities in the graph and on the map[33]

VENUES COMMUNITIES' ANALYSIS

Macro classification

The twelve clusters have been classified by the authors in three macro-groups according to the typology of venues within them.
The first one was defined as "Landmarks" and it is composed of three clusters containing mainly venues belonging to the categories of "Public", "Leisure" and "Religion", with the presence of the most important landmarks of the city of Turin.[34]

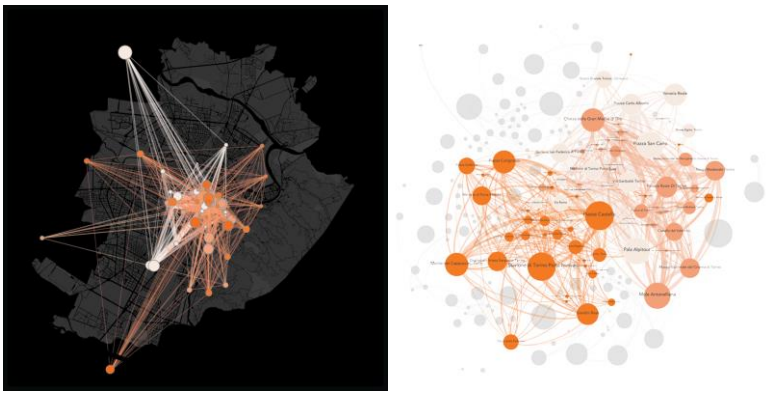

Figure 3. The three clusters of the "Landmarks" group in the graph and on the map[35]

The "Social life" macro-group is composed of five clusters with venues mainly belonging to the category of "Food", "Leisure" and "Night", as well as some to "Shopping". Although the claim should be scientifically sustained with interviews and questionnaires, it is not difficult for an average Turinese to see a social and elective affinity among the venues belonging to each of five clusters in terms of frequenters.[36]

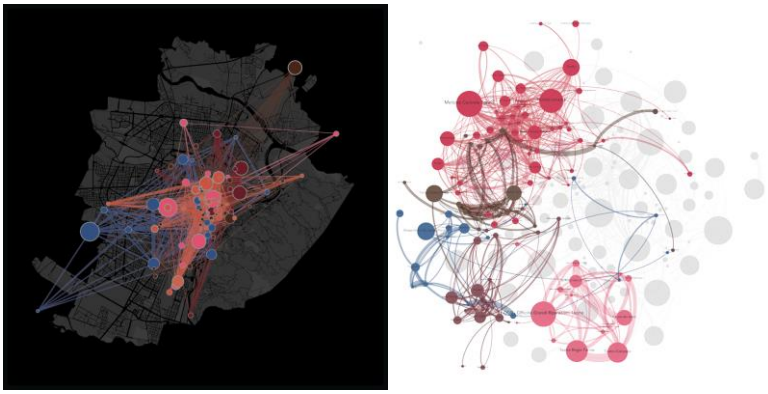

Figure 4. The five clusters of the "Social Life" group in the graph and on the map[37]

The remaining four clusters grouped in the "Isolated networks" macro-group do not share common characteristics, but they have their internal coherence. A cluster groups the main buildings of the University of Turin, another the Polytechnic of Turin with the main parks of the city, while in the remaining two it can be seen the Juventus Stadium together with its medical center and the airport, on one side, and two neighboring shopping centres, on the other.[38]

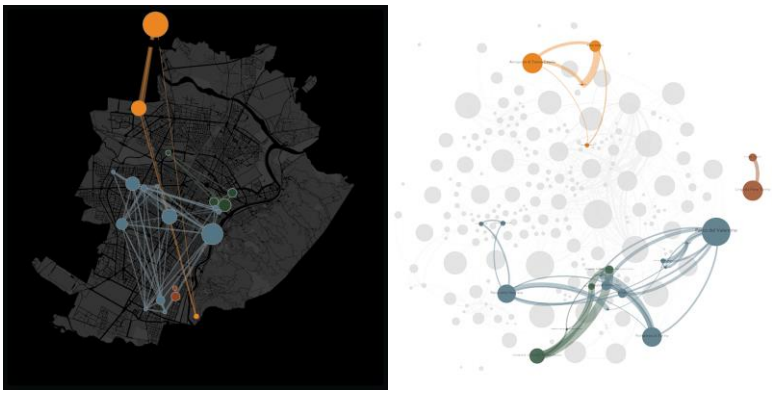

Figure 5. The four clusters of the "Isolated networks" group in the graph and on the map[39]

It is striking to notice how the methodology developed allowed to build a connection among places distant in space, but with an affinity in the typology of uses performed and of users. The "recurring practices" of Amin and Thrift or the "urban text" written by Certeau's "*Wandersmänner*" can be here read and decoded in the form of manifold communities of venues phenomenologically derived.

Proximity and centrality in the contemporary city

The operation performed on the data does not simply "group together" places in the terms of affinity, but it also unveils the structure of how these urban practices organize the urban space.
Confronting the spatialization of each cluster in the form of a network and in the physical space shows how the traditional notion of proximity and centrality might be redefined in the contemporary city.

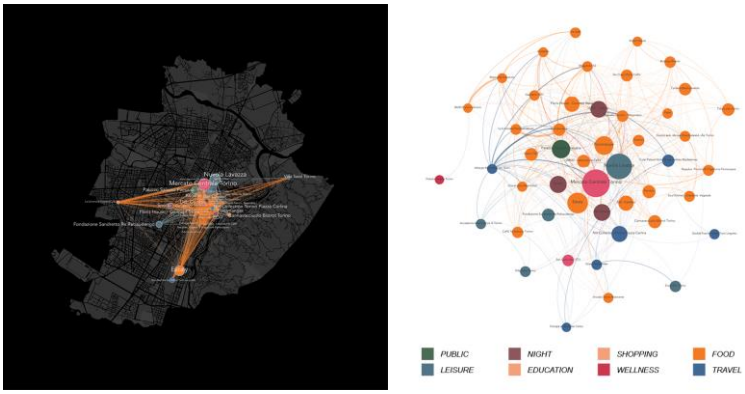

Figure 6. The cluster SL_1 spatialised according to nodes and arches weight and on the map[40]

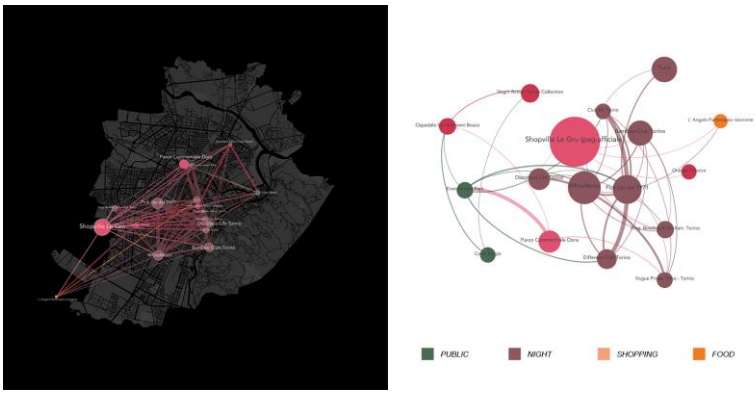

Figure 7. The cluster SL_4 spatialised according to nodes and arches weight and on the map [41]

We may draw connections from places even distant in space, by overturning a traditional concept of hierarchy and considering what is central and pivotal within the network does not necessarily find a physical correspondence in the urban framework.
This claim usher the urge to acknowledge the presence of these social structures of the urban space which respond to non-spatial logics, although taking shape in the physical dimension.

Social communities in the contemporary city

The community of venues identified should not be considered as “neighborhoods”, meaning that each of them pertains to a discrete set of users. Instead, the association of users to each cluster, according to whether they geotagged a post in one of the venues or not, shows how this relationship in not unique

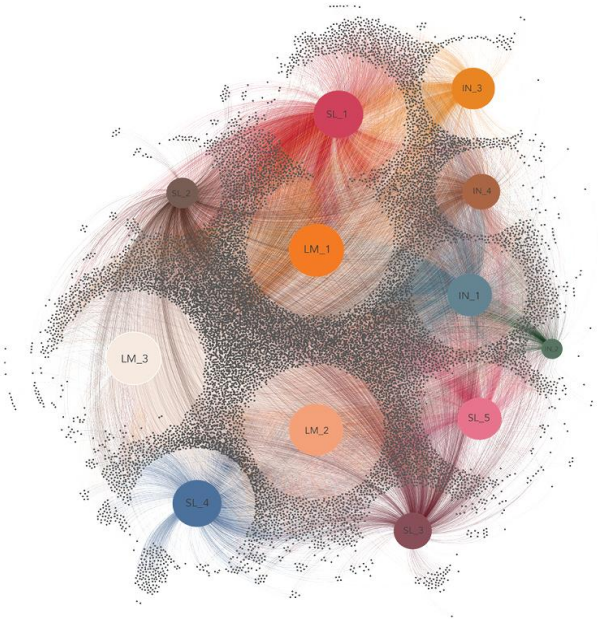

Figure 8. The users (smaller grey nodes) connected through arches to the venues of each cluster grouped together (larger nodes) if at least a post was geotagged in one of them[42]

This finding supports the previous thesis: how the contemporary subject-centered imagination does not limit to a priori categories the process of social identification through the act of geotagging one's life. Instead, the contemporaneity offers the individual lighter and more dynamic forms of "communitying".

To understand this perspective, Bauman's theorization of the liquid modernity may clarify the claim. In his anti-utilitarian philosophy, the subjects develop an understanding of themselves, escaping the alienation of a world where the power, in its multiple manifestations, offers a unique dimension of the real. The subjects become the actors of their own destiny, freed from aprioristic ethical codes and based on the principle of ethical responsibility.[43]

The Baumanian metaphor of the swarm, as an evolving and dynamic organism whose shape and movement are dictated by the sum of the individuals' ones, helps figurate a clear image of this process.

CONCLUSION

Overall, this study strengthens the idea that the network is a crucial and defining element of contemporary society thanks to and in its virtual multiform dimensions which needs to be deployed in the deciphering of the urban text and in the construction of narratives around the city.

The theoretical introduction established a bridge between pre-digital urban theories and modern practices, deductively validating the potential of Instagram social urban data as a source of knowledge to study the contemporary city. On the other hand, the analysis of the data and the critical discussion of them allowed to inductively prove those same theories by offering the same image of the urban scene.

From a methodological perspective, the integration of Cranshaw's approach and the Louvain method of modularity optimization offers an insight to analyze the current subject according to a critical interpretation of Lynch, Certeau, Bourdieu and Baumann. The bidirectional validation gained from this study may not only support the claim of this paper as far as regard Instagram, but at the same time invite urban scholars to deploy a more critical approach in the use and selection of the data available

nowadays. Research so far have privileged social media providing real-time data like Twitter, limiting the analysis to short temporality or limited urban phenomena, while n-LBSN might be even more representative of the complexity embedded in contemporary city

The dataset involved provides a valuable test of a practical application of a theoretical speculation on the shape of communities in the contemporary city. However, being limited to the city of Turin, this study still lacks a comparative perspective with other urban environments, and further studies are then suggested.

This work does not aspire to provide a finite tool for a locked analysis able to guide the urban planner in the design of the city, but at the same it ushers a conception of the urban space challenging the traditional approach still burdened by the cartesian plane.

ACKNOWLEDGEMENTS

This paper presents the work developed in 2020 by Adriano Aimar for his Master Thesis at Politecnico di Torino and cited in the bibliography.

NOTES

[1] See Manuel Castells, *La città delle reti [The city of networks]*, trans. Chiara Rizzo, 2nd ed., I libri di Reset (Marsilio Editori, 2004).
[2] See Harrison Rainie and Barry Wellman, *Networked: The New Social Operating System*, vol. 10 (Paris: Union générale d'éditions, 1980; Mit Press Cambridge, MA, 2012).
[3] Karin Knorr Cetina, "Postsocial Relations: Theorizing Sociality in a Postsocial Environment," in *Handbook of Social Theory* (London: SAGE Publications Ltd, 2001), 5, https://doi.org/10.4135/9781848608351.
The conclusion» to be drawn "from the contemporary re-imagining of the individual contradicts postmodern social theories which tend to postulate the eclipse and death of the subject. As a first approximation, we can associate a postsocial environment with an expanding sphere of the subject, where 'subject' stands not only for mental or existential conceptions of individuals but for an open-ended series of individual-centered significations and processes. The remarkable rise of subjectivity thinking and the concomitant emptying out of a social imagination and of social principles and structures act in concert, so to speak, to create and unfold the space for this expansion"
[4] Nigel Thrift and Ash Amin, *Cities: Reimagining the Urban* (Cambridge: Polity Press, 2002), 81.
This explains the idea of the modern forms of communities – or better of "communitying" – which when they take shape in the urban space turn it into a space of "flow and mixture, promiscuous 'meshworks' and hierarchies of different relations, rather than patchworks of different communities, hybrids involving almost continuous improvisation in which the in-between' of interaction is crucial"
[5] See Henri Lefebvre, *Critique of Everyday Life. Volume I: Introduction*, trans. John Moore (Paris: L'Arche, 1947; London: Verso, 1991).
[6] Michel de Certeau, *The Practice of Everyday Life*, trans. Steven Rendall (Paris: L'Arche, 1947; Berkeley: University of California Press, 1984), 93.
[7] Thrift and Amin, *Cities*, 9.
[8] See Phil Simon, *Too Big to Ignore: The Business Case for Big Data* (John Wiley & Sons, 2013).
[9] See Paolo Ciuccarelli, Giorgia Lupi, and Luca Simeone, *Visualizing the Data City: Social Media as a Source of Knowledge for Urban Planning and Management* (Springer Science & Business Media, 2014); Alexandra Olteanu et al., "Social Data: Biases, Methodological Pitfalls, and Ethical Boundaries," *Frontiers in Big Data* 2 (2019): 13, https://doi.org/10.3389/fdata.2019.00013.
[10] See Yuheng Hu, Lydia Manikonda, and Subbarao Kambhampati, "What We Instagram: A First Analysis of Instagram Photo Content and User Types," in *Eighth International AAAI Conference on Weblogs and Social Media*, 2014, https://www.aaai.org/ocs/index.php/ICWSM/ICWSM14/paper/view/8118.
[11] See "Global Digital Report 2019," We Are Social, accessed August 19, 2021, https://wearesocial.com/global-digital-report-2019; "Digital 2019 in Italia," We Are Social Italia, accessed August 16, 2021, https://wearesocial.com/it/digital-2019-italia.
[12] See John D. Boy and Justus Uitermark, "How to Study the City on Instagram," *PLOS ONE* 11, no. 6 (June 23, 2016): e0158161, https://doi.org/10.1371/journal.pone.0158161; John D. Boy and Justus Uitermark, "Reassembling the City through Instagram," *Transactions of the Institute of British Geographers* 42, no. 4 (2017): 612–24, https://doi.org/10.1111/tran.12185.
[13] See Walter Benjamin, *The Arcades Project* (Harvard University Press, 1999); Thrift and Amin, *Cities*.
[14] Tommaso Venturini, "Diving in Magma: How to Explore Controversies with Actor-Network Theory," *Public Understanding of Science* 19, no. 3 (May 1, 2010): 258–73, https://doi.org/10.1177/0963662509102694; as cited in Ciuccarelli, Lupi, and Simeone, *Visualizing the Data City*, 2.
[15] See Cetina, "Postsocial Relations."
[16] Kevin Lynch, *The Image of the City* (MIT Press, 1960), 6.
[17] See Lynch, *The Image of the City*.
[18] See Adriana de Souza e Silva and Daniel M. Sutko, "Theorizing Locative Technologies Through Philosophies of the Virtual," *Communication Theory* 21, no. 1 (February 1, 2011): 23–42, https://doi.org/10.1111/j.1468-2885.2010.01374.x.
[19] de Souza e Silva and Sutko, 32.
[20] See Cetina, "Postsocial Relations."
[21] See Dan Tasse et al., "State of the Geotags: Motivations and Recent Changes," *Proceedings of the International AAAI Conference on Web and Social Media* 11, no. 1 (May 3, 2017): 250–59.
[22] See Didem Özkul and Lee Humphreys, "Record and Remember: Memory and Meaning-Making Practices through Mobile Media," *Mobile Media & Communication* 3, no. 3 (September 1, 2015): 351–65, https://doi.org/10.1177/2050157914565846.
[23] See Pierre Bourdieu, *Distinction: A Social Critique of the Judgement of Taste*, trans. Richard Nice (Paris: Éditions de Minuit, 1979; Harvard University Press, 1984).
[24] See Maurice Halbwachs, *La mémoire collective [The collective memory]* (France: Presses universitaires de France, 1950).

[25] For further details please refer to Adriano Aimar, “INSTA-TURIN: Revising the notion of space, community and proximity in the contemporary city through Instagram social urban data” (laurea, Politecnico di Torino, 2020), 101–9, https://webthesis.biblio.polito.it/14124/.
[26] The chosen categories have been Active Life, Arts & Entertainment, Beauty & Spas, Education, Food, Health & Medical, Hotels & Travel, Local Flavor, Local Services, Mass Media, Nightlife, Public Services & Government, Religious Organizations, Restaurants, Shopping, excluding The categories of Automotive, Event Planning & Services, Financial Services, Home Services, Pets, Professional Services, Real Estate.
[27] The new categories were Public (public outdoors spaces likes streets, squares and monuments), Leisure (venues for the recreation from cultural activities to sports and social events), Food (restaurants of different typologies, but also street food and take away), Night (all the venues connected to recreational night activities), Shopping (shops, markets, outlets and other locations related to purchase), Travel (hotel and other typologies of accommodation, but also venues related to commuting and travelling), Education (institutions related to education at all levels and degrees), Wellness (locations where to take are of one’s body, from hospital and medical centers to hairdressers and gyms), Religion (religious organizations and related buildings).
[28] See Justin Cranshaw et al., “The Livehoods Project: Utilizing Social Media to Understand the Dynamics of a City,” *Proceedings of the International AAAI Conference on Web and Social Media* 6, no. 1 (2012): 58–65.
[29] Cranshaw et al., 59.
[30] Cranshaw et al., 59.
[31] The dimension of a node is directly proportional to the “betweenness centrality” of it within the graph. “Betweeness centrality” measures how often a node appears on shortest paths between nodes in the network and it accounts for the centrality of it within the whole graph.
See Andrew Disney, “Social Network Analysis: Understanding Centrality Measures,” Cambridge Intelligence, January 2, 2020, https://cambridge-intelligence.com/keylines-faqs-social-network-analysis/.
The thickness of arches is directly proportional to their weight in terms of social similarity between venues.
[32] See Vincent D. Blondel et al., “Fast Unfolding of Communities in Large Networks,” *Journal of Statistical Mechanics: Theory and Experiment* 2008, no. 10 (October 2008): P10008, https://doi.org/10.1088/1742-5468/2008/10/P10008.
[33] See note 31
[34] The three clusters of the group “Landmarks” are later referred to as “LM_1”, “LM_2”, and “LM_3”.
[35] See note 31
[36] The five clusters of the group “Social Life” are later referred to as “SL_1”, “SL_2”, “SL_3”, “SL_4”, and “SL_5”.
[37] See note 31
[38] The four clusters of the group “Isolated Networks” are later referred to as “IN_1”, “IN_2”, “IN_3”, and “IN_4”.
[39] See note 31
[40] See notes 31, 36
[41] See note 31, 36
[42] See notes 34, 36, and 38
[43] See Zygmunt Bauman, *Futuro liquido. Società, uomo, politica e filosofia [Liquid future: Society, man, politics and philosophy]* (Milan, Italy: AlboVersorio, 2014).

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CRYPTO ARCHITECTURE (A PRIMER IN ARCHITECTURE NFTS)

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INTRODUCTION

His whole retinue stared and stared. One saw no more than another, but they all joined the Emperor in exclaiming, "Oh! It's very pretty," and they advised him to wear clothes made of this wonderful cloth especially for the great procession he was soon to lead. "Magnificent! Excellent! Unsurpassed!" were bandied from mouth to mouth, and everyone did his best to seem well pleased. The Emperor gave each of the swindlers a cross to wear in his buttonhole, and the title of "Sir Weaver." […] "But he hasn't got anything on!" the whole town cried out at last. The Emperor shivered, for he suspected they were right. But he thought, "This procession has got to go on." So he walked more proudly than ever.
The Emperor's New Clothes, Hans Christian Anderson[1]

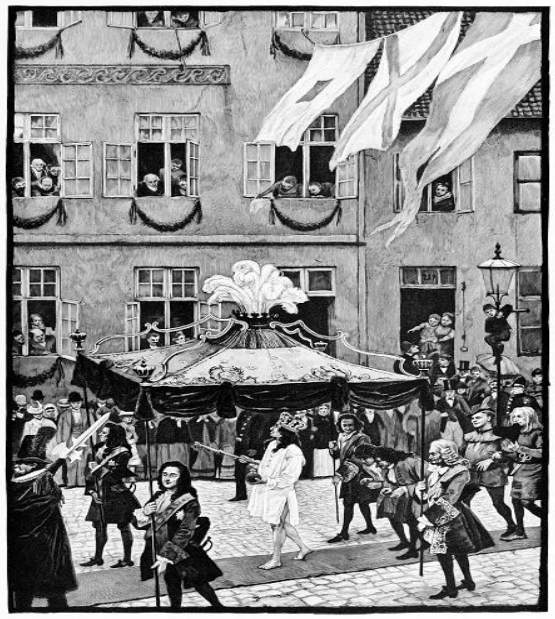

Figure 1. Scan of illustration from the Emperor's New Clothes in Fairy tales and stories (1900). Andersen, H. C. (Hans Christian), 1805-1875; Tegner, Hans, b. 1853, ill; Brækstad, H. L. (Hans Lien), 1845-1915 New York: The Century Co.

The Emperor has no Clothes, but he has an NFT - a digital outfit. In 2020 Benoit Pagotto, Chris Le, and Steven Vasilev founded Rtfkt Studios, a sneaker brand, whose NFT shoes exist only in a digital world. In seven minutes, they had sold $3 million, because the imaginary garment is more valuable than a wearable.[2] An intangible asset without use value is priceless in the Kantian sense, and *that* is what the Emperor understands. The Emperor is not stupid but prescient. He desires exposure lest he miss out on capitalising on this rare asset, while chancing his brand and influencer status to parade nothingness. The NFT tells us less about the value of a commodity than the values of the consumer, we the mass spectator, our love of pure digitality, weightlessness and the selling parade itself.

Figure 2. Torres, Chris. "Nyan Cat." Foundation, 21/02/2021 2021. Still of remastered NFT'd GIF animation originally uploaded to YouTube on April 2 2011. https://foundation.app/@NyanCat/nyan-cat-219.

One of the first big NFT sales was Chris Torres' Nyan Cat animated meme, a cat with a Pop-Tart body emitting a rainbow trail, shared hundreds of millions of times but ten years later sold on Foundation as an NFT for $580,000.[3] Twitter founder Jack Dorsey's first tweet recently sold as an NFT for $2.9 million, while Elon Musk just NFT'd his tweet of a techno song about NFTs with the lyrics: "NFT for your vanity. Computers never sleep. It's verified. It's guaranteed."[4] In February, Canadian artist Grimes sold a group of music videos for $6 million.[5] The highest NFT sale to date is Beeple's digital opus *EVERYDAYS: THE FIRST 5000 DAYS,* that seamed together digital works created over 5000 Days, selling in March for $69 million in the first Christie's auction to sell an NFT.[6]

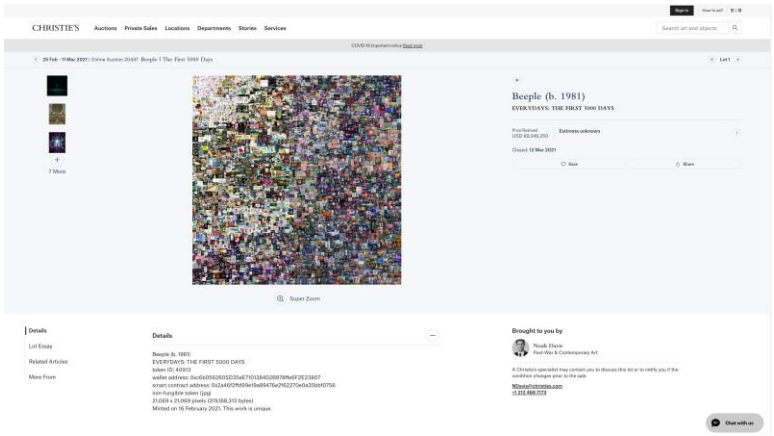

Figure 3. Beeple, Mike Winkelmann. "Everydays: The First 5000 Days." Screenshot of NFT Auction Listing: Beeple, Everydays: The First 5000 Days. New York: Christie's, 12/03/2021 2021. JPEG. https://www.christies.com/features/Monumental-collage-by-Beeple-is-first-purely-digital-artwork-NFT-to-come-to-auction-11510-7.aspx.

In the last three months, NFTs have exploded in the cryptocurrency industry. A Non Fungible Token is a unit of data stored on a blockchain (meaning a decentralised digital ledger or database), that certifies the uniqueness and authenticity of a digital asset such as a piece of music or art.[7] NFTs are stored on the blockchain and auctioned on NFT marketplaces (the main ones are OpenSea, Rarible, SuperRare, and Foundation). The token is linked to and represents a non-fungible—meaning unique and non-interchangeable—asset like a house or artwork, as opposed to a fungible or interchangeable asset like cryptocurrency (so e.g. 5 bitcoins can be substituted with any other 5 bitcoins).[8] NFT sales are executed with smart contracts–algorithms built into the blockchain which trigger actions based on pre-defined parameters e.g. they automate royalty-split payments at the end of an auction.[9]

Figure 4. Kim, Krista. "Mars House." Still of Mars House Animation NFT SuperRare, 2021. animation. https://superrare.com/artwork-v2/mars-house-21383.

Architecture NFTs have entered the market in a primitive state – but this I mean the work is neither by architects nor is it architecture. The first NFT house, the "Mars House" was created on an iPad by the artist Krista Kim for the metaverse, the sum of all collective 3D virtual worlds such as Fortnite, Decentraland and Second Life. It sold for 288 Ether, or $512,000, a flat unremarkable design, scarcely a house, rather a series of developer views framed by a dimensionless floor and roof hazily shrouded in rainbow light beams, but that Kim claims is her dream house. The artist said *when she advertised*

the Mars House on SuperRare, she wanted to see if it would sell for the amount of an actual house, which it did. It's clear that artists have seen the commercial potential for crypto-architecture before the architects.[10] One of the only practising architects to have sold NFTs is Chris Precht, but his NFTs are not architecture but digital art.

The Virtual Exhibition "Blocks of Blockchain" at the forthcoming Venice Biennale, curated by Tom Kovacs, includes a compelling Brutalist sculpture NFT of liquid raw blocks by designer Marc Leschelier entitled "Cryptoplasm."[11]

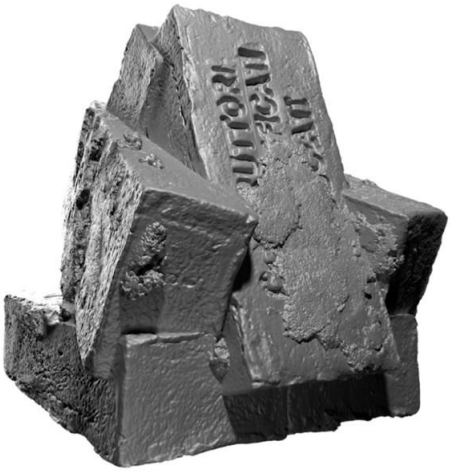

Figure 5. Leschelier, Marc. "Cryptoplasm, Ephemera." 3D Mesh NFT. Venice: Italian Virtual Pavilion "Blocks of Blockchain" at the 17th. International Architecture Exhibition in Venice, curated by Tom Kovacs, 2021. Digital Image. https://www.domusweb.it/en/speciali/venice-architecture-biennale-2021/gallery/2021/marc-lescheliers-digital-brutalism-at-the-venice-architecture-biennale.html.

In a further iteration, Andrés Reisinger sold his collection of "impossible" virtual furniture entitled The Shipping for $450,000.[12] Each of the virtual items can be placed in any "metaverse."[13] In a similar vein, Alexis Christohdoulou sells surrealist architectural renderings as NFTs.[14] NFT buildings that mirror iconic buildings in the real world like the Eiffel Tower are being auctioned en masse within Hrish Lotlikar's Virtual real-estate platform SuperWorld, that will soon introduce digital billboards to lease advertising space for SuperWorld architecture. This is Disney World NFT, it's neither new nor is it architecture. Buying NFTs for the metaverse is best illustrated by Jean Baudrillard's reading of the tale by Jorge Luis Borges where people live on an elaborate map, and the citizens obsessively invest all their resources to ensure their place in the map-world is accurately documented by the map-makers. Meanwhile reality withers.[15]

But NFTs are very real, and real buildings are also being traded in the NFT market. The Edersheim house, 862 Fenimore, in New York State developed by the architect Paul Rudolph, has been listed in OpenSea with an opening price of one Ether, worth $4,000. Buyers will bid on the real house using cryptocurrency.[16] Shane Dulgeroff, a real estate investor, has listed the title to a physical home in Thousand Oaks, California, on OpenSea, for 540 Ether, or $1.5 million, and it includes an NFT artwork by the artist Kii Arens.[17]

An NFT Manifesto that derives from these examples:

1. NFTs are about consumption not production,[18] while architectural production and labour have dominated architectural discourse of the last ten years, such as the fascination with construction and fabrication.

2. Architecture NFTs as purely visual, as architectural pornography or porntekture, are the territory of the *a*ddict, their platforms prize fetish over use- or exchange- value, which are increasingly irrelevant. Do you feel you *need* exposure to NFTs? That an asset bubble is underway, and you must have exposure? That you must buy an NFT? *That* is what drives the market.
3. The ideological genesis of *needing* NFTs is the ideology of what I call digital world capitalism that strives to replace real buildings with the hologram, with the hyperreal. A process already underway as I discussed in my book *Digital Monuments*.[19] The ideological need is backed by the desiring machine of capitalism that always pushes to unchain capital, to financialise dreams, lifted away from any hard underlying asset.
4. In NFT Hyperreality, Crypto architecture is entirely liberated from building codes, the laws of physics, ethics, social responsibility and all those other things. NFTs are therefore the dream of the iconic architecture industry. NFTs will kill architecture.
5. The NFT image precedes the original and originality is thoroughly meaningless.[20] But we can take Jean Baudrillard's formula further: NFTs reveal what was already the case: architectural images have functioned as the "original" since the start of the millennium, with large-scale iconic buildings such as Rem Koolhaas's CCTV tower only being realised some ten years after the image had already been aggressively downloaded over a million times, doing the architect's ideological work without any need of constructing any*thing*. The NFT market obviously obviates the need for anything to be built.
6. While NFTs destroy the sacred idea of objecthood and its authenticity, the NFT market is obsessed with digital authenticity, anointed by the blockchain, and from which NFTs derive their lifeblood.
7. Under the rule of the iconic architecture industry, NFTs are what Marx called *fictitious capital*, like stocks or securities, with their promises, claims and legal titles linked to future production (a real building), and with the promise of future income generated by a realised development that may never and need not happen.

Opinions on NFTs (and why these are bad arguments)

One critique of NFTs is that the image backing the NFT can be so easily copied. "Why pay $69 million for an NFT when you can take a screenshot of the work for free?" Because NFTs provide verifiable uniqueness or originality whatever that means (a downloaded version of Beeple's art is as worthless as an imitation Chanel bag). How do you value an NFT? It is what *anyone* is willing to pay to *own* the NFT rather than the *copy*.[21]

In a pretentious video posted on his Instagram account, architect Chris Precht announced he was withdrawing his NFT'ed artworks due to the environmental impact of mining digital tokens. He said the carbon emissions associated with the blockchain are "horrible".[22] My response to him is first, this is not architecture anyway. Second, the actual building industry is responsible for 40% of all greenhouse emissions worldwide (according to studies duplicated in the US, UK, and Australia), so architects criticising blockchain should stop building. Are NFTs worse than the traditional art auction system?[23] Is blockchain more energy inefficient than the cost of hosting eBay or Patreon?[24]

What is the real reason architecture has not entered the NFT space? Unlike art, architectural images have always been perceived as bundled to a future building as 1. advertising or concept images, or 2. as a visionary device that proposes a future world, like the revolutionary drawings of the Russian Constructivist avant-garde or Mies Van Der Rohe's radical glass skyscraper drawings for Friedrichstrasse - catalysts for the architectural imaginary - sacred, and never to be sold. There are exceptions. Frank Gehry has trademarked all images of the Guggenheim Bilbao. The increasing financialisation of architectural images can also be observed through visualisation studios or 'render farms' like Hoyne that sell city-visioning and place-branding, liberated from architectural firms.

Architects such as Vincent Callebaut who view built design as their core business, don't see they are giving away principal assets, their intellectual property intrinsic to their branding. This renders the architectural apparatus of electronic assets intangible and valueless.[25]

There is currently no framework for driving value and drawing investment to architectural images - it is hard to believe that Rem Koolhaas or Zaha Hadid Architects be willing to sell architecture NFTs like this alongside an animated cat. To be clear, when I say architecture, I mean it in the way *we* architects understand it: not as building or real estate, not as art, wallpaper, or pictures, but as formally radical intervention into architectural and urban space. An exclusive cryptoarchitecture platform for architects working at the cutting edge of practice like the elite highly-curated, competitive SuperRare platform for renowned digital artists - does not exist.

In future, original architecture will be designed purely for NFT sale. The NFT space represents the extreme limit of iconic architecture that already seeks to defy the laws of physics and stretch what is formally possible and buildable; while, financially, NFTs could open up a suite of new financial products that would revolutionise praxis.[26]

CONCLUSION

New Architecture NFTs

1. Zaha Hadid Architects could sell an image NFT to a developer who sells it on to other developers – at a profit and so on – without building anything. The firm would receive royalties each time the NFT is traded. Instead of financialising a small number of built projects over a lifetime, given buildings are so slow to construct, it could financialise thousands of designs adapted to any site.

2. The NFT could be securitised by being "fractionalised" into a 1000 NFT units, without building anything. Securitisation bundles the payment streams of a set of mortgages into a series of units or bonds sold to investors.[27]

3. The rights to sale of an architectural image could also be NFT'd and securitised, like the 1997 Bowie bond, an asset-backed security which used the current and future revenue from albums recorded by pop icon David Bowie as collateral.

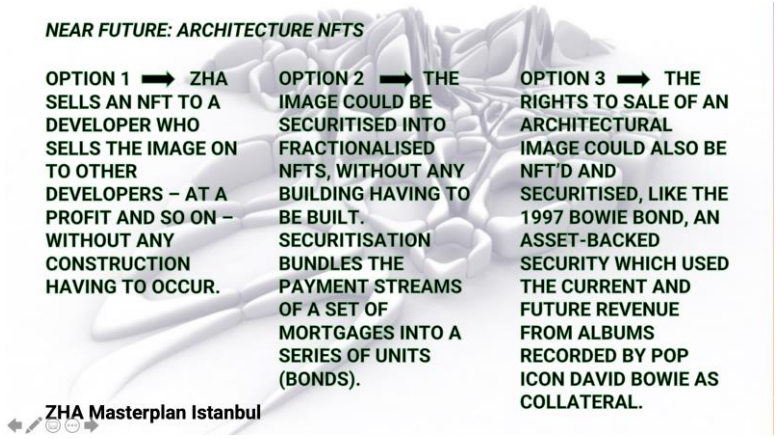

Figure 6. Brott, Simone. "Near Future: Architecture NFTs." Slide Image created for conference Urban Assemblage : The City as Architecture, Media, AI and Big Data. Background Zaha Hadid Architects Istanbul Masterplan. AMPS Architecture, Media, Politics, Society, 2021.

City NFTs

1. Patrik Schumacher could design a future city whose masterplan and associated renderings could be securitised into NFT-units and sold to investors. The rights to duplicate the masterplan 10 times in

different locations in the world could be NFT'ed. Eventually when built in Asia or the Middle East, NFT-units in that city design's revenue streams could be sold.
2. A Wall Street banker could create a new financial instrument by bundling multiple city masterplans by multiple iconic architects, securitised into 1000s of NFTs divided into tranches - assets grouped by various factors, each tranche carrying different risk and yields, without any involvement with architects.[28]
3. UN STUDIO and MVRDV would stop building anything at all and rather NFT their renderings of mega-cities for Asian and Middle Eastern clients.

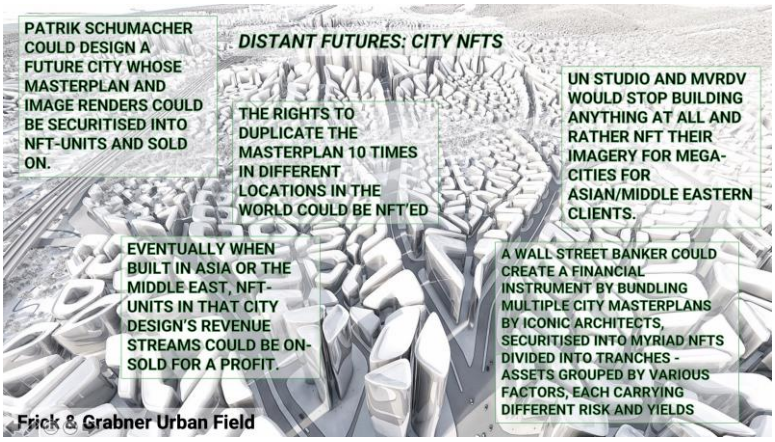

Figure 7. Brott, Simone. "Distant Futures: City NFTs." Slide Image created for conference Urban Assemblage : The City as Architecture, Media, AI and Big Data. Background Frick and Grabner, Urban Field. AMPS Architecture, Media, Politics, Society, 2021.

Experience NFTs

1. Gehry could auction 100 "Golden" NFT tickets to be one of the first 100 people to view a new iconic building. It could be an initial viewing before the building is open to the public, with one ticket = to 1 NFT token sold for $1000 and including renderings of the building. The ticket could become a collector's item, 'I was one of the first to see that building.' The owner could sell the token, with Gehry and the owner earning royalties each time it trades.
2. You could go to an iconic building and have your experience recorded and minted on the blockchain. You can then say, this NFT is proof I visited the actual Guggenheim in Bilbao. You would be filmed as you enter the building.

Real Estate NFTs

1. You could assign an NFT to any real estate property or plot of land. Users could transfer NFTs from the Ethereum account of the bank to another Ethereum account of the owner, after paying off the mortgage. All property and land purchases, contracts, and surveys could be NFT'd.[29]
2. You could co-own a holiday house with others and create a*n NFT to represent that fractional ownership and record the terms and sharing percentage between the owners.*
3. NFTs could replace shares of fractional interests in a real building owned by a housing cooperative - ownership of one apartment would be represented by ownership of a number of NFTs owned by the corporation.
4. Shares in iconic buildings such as the Shard that are currently being traded in the first iconic building marketplace IPSX, the international property securities exchange, could be NFT'd.

Real Estate NFTs are obvious inevitabilities that will improve efficiency and reduce fraud and friction in selling markets. But it’s clear that for architecture, in the supreme age of intangible capital, that the digital image is the liquid asset par excellence and the new NFT space represents a profound intellectual and financial opportunity for the discipline. The key to financialising the architectural image is to establish a singular market for trading architecture NFTs or their attributes and leveraging the blockchain to make it happen.

NOTES

[1] "'The Emperor's New Clothes' by Hans Christian Andersen," Kleio.org, 2021, accessed 6 August, 2021, https://www.kleio.org/en/extras/kaiserskleider/.
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In other words, instead of one NFT, the image can be physically divided into parts by overlaying a grid over it, and each square represents one NFT**.**

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HOW DIGITAL TECHNOLOGIES SUPPLEMENT HISTORICAL NARRATIVES ABOUT NEGATIVE HERITAGE: A CASE STUDY OF DIGITAL YUANMINGYUAN

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INTRODUCTION

Negative heritage, or heritage that commemorate collective trauma, war and destruction were usually vaguely and conclusively defined, with much less studies and preservation methods.[1] By studying the heritage preservation project Digital Yuanmingyuan, this paper aims to explore the socio-cultural values of digital technology in heritage preservation, and to evaluate its special contributions to the study and preservation of the negative heritage. And by comparing Digital Yuanmingyuan with other digital architecture analysis and preservation projects, this paper also provides ideas on the potential use of digital technology in the preservation of negative heritage.

The first main chapter introduces the history of Yuanmingyuan and concludes the two mainstream narratives of its historic values. The second main chapter then presents the research process of the Digital Yuanmingyuan team, and analyses how the digital research methods supplement the traditional methods and therefore critically reform the historic narratives. The third main chapter analyses the application of digital methods to the presentation and representation of the academic findings. This chapter critically review the supplementation and omission of details through rendering, filming and the creation of interactive and entertaining products. And in the last main chapter, the author introduces the Warchitectural Theory raised by Andrew Herscher and the research and presentation methods of Forensic Architecture agency to employ digital technology in studies of destructed architectures. The author proposes the adoption of their theories and methods in the studies and presentations of the Digital Yuanmingyuan project, which could lead to further supplementation and critiques of the historic narratives of negative heritage.

THE HISTORY AND HISTORIC NARRATIVES OF YUANMINGYUAN

Yuanmingyuan is the old summer palace of Qing Dynasty, which is the last feudal dynasty in China. As an imperial garden, it started to be built in the 18th century, at the most prosperous time of the Qing dynasty. Until the year of 1860, Yuanmingyuan has experienced constant construction and reconstruction over the 160 years led by four emperors. It was burnt down in the 1860 by the French and British army. In the following decades, it was frequently visited and photographed by European people, and was damaged several times by both foreign intrusions and the local residences.

There are two narratives that dominate the preservation and presentation of Yuanmingyuan. Yuanmingyuan has been officially preserved since the late 1980s as a heritage site park, and the chief purpose of the park is to serve education about the national trauma. The ruins of Yuanmingyuan were shown in patriotism education as a proof of the violence of the west, and the inability of the feudal Qing dynasty. Scholars such as Que Weimin, the dean of Yuanmingyuan academy, hold the opinion that Yuanmingyuan should only be preserved as a dark heritage that mourns the collective trauma, and he claimed that any form of reconstruction of the imperial garden would harm its value as a negative heritage (Que 2015).[2]

While on the other hand, the traumatic narrative of Yuanmingyuan usually acknowledges its cultural and artistic achievements before destruction. Paintings and literatures describing the garden's beauty and artistic values have been used to form sharp contrast with the remaining ruins, in order to emphasize the pity for its destruction. Since the ruin is concrete while the beauty of Yuanmingyuan is intangible, the public has voiced for reconstruction of Yuanmingyuan for decades. Scholars of art, architecture and history also call for attention to the cultural importance of Yuanmingyuan. There are self-funded reconstructions of Yuanmingyuan sceneries as film bases or tourist attractions. Films and games also produce scenes and plots about the grandeur of this imperial garden. (Figure 1)

Figure 1. Self-funded reconstruction of Yuanmingyuan in southern China (left) and the VR game Protect Yuanmingyuan (right)

These two sides of Yuanmingyuan generated debates about how to interpret its historic value, and how to preserve and present the history surrounding the construction and destruction of the garden. These seemingly contradictory characteristics of Yuanmingyuan also represent the prevailing habit of cultural and historical narratives: according to Andrew Herscher, people usually exclude violence and destruction from the narrative of culture, regarding them as the antithesis of culture, or simplified events that destroyed the continuity of culture.[3] In the following chapter, the author analyses the studies and productions of Digital Yuanmingyuan, and argues that they could support Herscher's opinion that violence is actually a continuous part within the wider history and cultural narratives. And the preservation of negative heritage should not only serve the mainstream historic narrative or simply emphasize this single spot in time without justifying the historical continuity.

THE RESEARCH PROJECT OF DIGITAL YUANMINGYUAN

Digital Yuanmingyuan is a project launched by architects in 1999, which is the first and most mature digital heritage preservation project until now in China. It started with collecting and publishing a database covering all kinds of archive related to Yuanmingyuan. And then through analysis of the historical materials, the team produced drawings, then 3D models and rendered pictures of almost all the architectures and scenery groups in Yuanmingyuan. The next step until now is to make the project more attractive and interactive for the non-academic audience. It developed an on-site tour guide device with tourist routes, navigation and location functions, it made the digital models into google earth files which could be accessed as street scene, and it developed fixed-spot panorama scenery

display on mobile phone, which have a mode to adapt to VR glasses. The recent effort and focus of the team are to curate digital exhibitions out of the historical site. Current methods combine material reconstruction of representative sceneries with virtual presentation on VR, AR devices as well as holographic projection. (Figure 2)

Figure 2. The research and production process of Digital Yuanmingyuan

In the first decade of the Digital Yuanmingyuan project, their translation of archive materials into digital drawings and models was a significant step to increase precision in the study of Chinese architectural heritage. Traditional Chinese architecture were built and preserved mainly according to the experience of practitioners. In Qing Dynasty, all the imperial buildings were built by the family whose sir name were Lei. The Lei's family only produce simple drawings and handmade models to present the layout and general view of the building complex to the emperor. While the details of structure, material and statistics were shared within the Lei's family in empirical ways. In modern times, preservation of traditional Chinese architecture was also largely based on the practical experience of practitioners. Direct and precise documents of architectural details usually do not exist. (Figure 3)

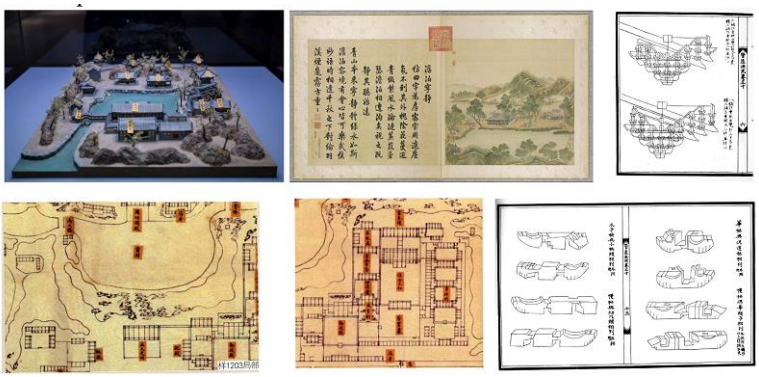


Figure 3. The unprecise references in heritage preservation: models and records of lei's family, literati drawings, official standards for architectural components.

As a result, there have been many arbitrary reconstructions in the name of historical preservation. For example, the 40 Scenery Paintings of Yuanmingyuan produced in 1736 became reference to almost all the film scenes and physical constructions of Yuanmingyuan, even when they are referring to a very different time period. This sweeping generalization of the cultural sceneries and the simplification of Yuanmingyuan's history were, according to Walter Benjamin, a falsely totalizing aesthetics that serves the contemporary ideology.[4] The traditional ways to document and study architecture reinforced this totalization of history.

The digital preservation methods could fracture these totality of culture and see the fragments and details in historical transformations. In order to form a 3D model, every drawing of the façades, plans and sections should match each other in every detail. Therefore, when the historical drawings were translated into CAD digital drawings, the unprecise details could make sense by cross referencing each other. The slight differences that might be considered as uncareful drawing matched into different sets that could build different models. Through this cross-referencing process, the Digital Yuanmingyuan project categorized the archives into 120 time-space units in six historical stages.[5] The digital drawing and models then proved that Yuanmingyuan has been continuously reconstructed by the emperors, and the scenery has been changing in both the general layout and in details (Figure 4). Similar to the layers in design applications, the digital research discovered historical layers that present the continuous destruction and construction of Yuanmingyuan. The digital Yuanmingyuan could inspire our understanding of historical continuity. By fragmenting the seemingly integral history of Yuanmingyuan before its destruction in the 1860, we could see that destruction and violence are not a time spot that stands out and breaks the continuity of culture, or is it limited to the foreign violence against the local population, but a continuous theme that links the entire history.

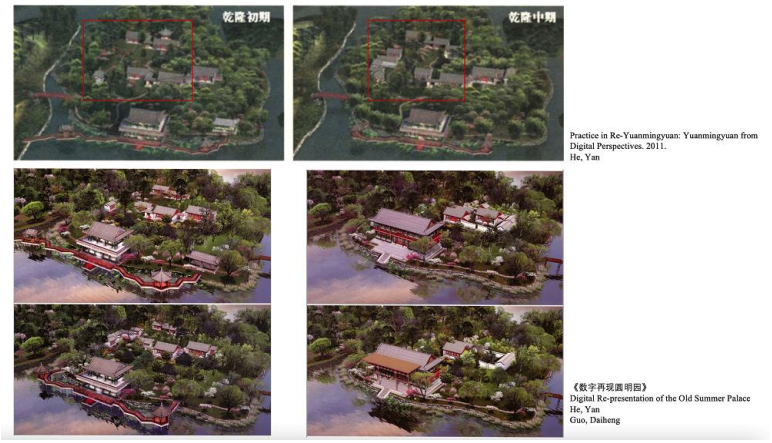


Figure 4. Findings of different historical stages and the continuous construction, destruction and reconstruction of Yuanmingyuan

The continuity of violence in history could also be proved in the study of ruins after the year 1860. The Digital Yuanmingyuan project studied the photographs of Yuanmingyuan in different times after the war to find out the textures, colours and dimensions of the original architectures. This study draws the attention of researchers not only to the ruin's information about the pre-destruction scenery, but also to the ruins' continuous change after the year 1860. Historic photographs were exhibited by the Digital Yuanmingyuan team to show the gradual destruction of the architectural remains after the 1860 war (Figure 5). The pictures recorded that the ruin we see at the park or in the textbook were not direct results of the war, but were actually largely caused by further destructions done by both foreign and domestic people. This exhibition called for people's awareness of heritage preservation in everyday life, while it also indirectly critiques the simplified cause and effect narrative in patriotic educations. Since the end of the 20th century, researchers have been digitally documenting and modelling the conditions of ruins through field survey and mapping. During the author's interview, Piao Wenzi, researcher in the Digital Yuanmingyuan team, shared her discovery of fresh damages to the remaining white marble handrail on site. 'The fracture surface is brand new and the cause is complicated. It reveals that the ruin is not rigid, changeless stuff. It is still active, and it still receives impact from the environment.'

Figure 5. Exhibition of the historic photographs that documents the deterioration of Yuanmingyuan's ruins

In conclusion, the digital documentation and modelling process of Digital Yuanmingyuan detailed the continuous transformation of the architectures both before, during and after the war of 1860. Digital drawing and modelling of the pre-1860 palace distanced people's interpretation of history from its cultural context, which helps people step out of the narrative subject that indicate a 'self' and an 'enemy' in history. In Haiyan Lee's words, 'visual and multimedia representations of the park thus tend to foreground the panoramic and the heterogeneous, highlighting its status as an estranged heterotopia marked by imperial exoticism at the zenith of the Manchu empire and its traumatic encounter with the West.'[6] The discovery and documentation of the transforming ruins disproves the assumed simple causal relationship between the 1860 holocaust and the present-day ruin circumstance. Furthermore, the value of the ruin site is broadened from what Alois Riegl describe as 'deliberate commemorative value' to the 'historical value (historischer Erinnerungswert)' and 'age value (Alterswert) (Riegl 2001),'[7] which are the value of the ruin itself.

THE PRESENTATION AND REPRESENTATION OF YUANMINGYUAN

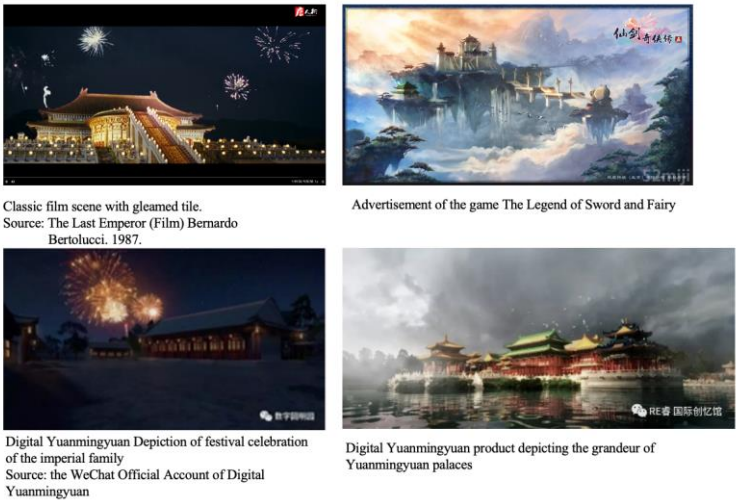
While the digital archive analysis and translation increased the professionality and objectivity in the study of architectural history, the author argue that the production of rendered scenery and expressive images risk losing the objectivity in presentation. The Digital Yuanmingyuan team cooperated with film producers and VR developers to produce historical documentaries and educational VR products to introduce the architectural research findings. The visual expressions of Digital Yuanmingyuan developed from the minimum rendering of architectural texture to the display of a specific time and environment, and then was added with activities and atmospheric expressions to refer to a certain event in history (Figure 6).

Figure 6. The development of visual expression of a palace in yuanmingyuan

At the initial stage, rendering was limited to the architectural texture and the confirmed environmental elements. Sky and plants that varied in time or cannot be traced were left blank or represented with obviously fake textures. These intentional choices to avoid fake authenticity was in accordance with the consensus in heritage preservation professions, that anything that does not come directly from the history should be distinct from the historical information.[8] The rendering of digital Yuanmingyuan translated this principle in physical heritage preservation to virtual preservation, by designating the 3D models translated from archives as the historical material, and separating everything else in the environment with a different rendering language.

However, in order to attract the general public and to serve the mainstream history narratives and official education, Digital Yuanmingyuan produced images and videos that contain narratives of

historical anecdotes or the Disneylandy fantasies about ancient Chinese cultures. For example, the two pictures on the second row in Figure 7 were produced by Digital Yuanmingyuan, which added the fireworks and the unrealistic weather to the scenery, making them similar to the classic scenes in film and in games that depict the imagined imperial palace and wonderlands. In these products to generate cultural empathies among audiences, the architectural precision compromised with the expression of cultural contexts and commercial appeals.



Classic film scene with gleamed tile.
Source: The Last Emperor (Film) Bernardo Bertolucci. 1987.

Advertisement of the game The Legend of Sword and Fairy

Digital Yuanmingyuan Depiction of festival celebration of the imperial family
Source: the WeChat Official Account of Digital Yuanmingyuan

Digital Yuanmingyuan product depicting the grandeur of Yuanmingyuan palaces

Figure 7. Images of Digital Yuanmingyuan that cater to the cultural aesthetics and consumer expectations

In films and social media publications, the findings of Digital Yuanmingyuan about historical layers stereotypically resided behind the narrative surrounding the 1860 war crime. For example, the first row in Figure 8 were three continuous frames in a film produced by Digital Yuanmingyuan. The film didn't present the architectural transformations, but followed the traditional narrative, which is typical in the film scenes on the second row: the intact buildings of Yuanmingyuan and the present-day ruins in the site park were joined by a scene of burning fire, omitting the gradual transformations before and after the year 1860.

Three contiguous frames in a video on Weibo published by Tsinghua University
Source: https://m.weibo.cn/1676317545/4562172820854191

Shots in the movie *Burning of Imperial Palace*.
Source: Burning of Imperial Palace (Film). Hanxiang Li. 1983.

Figure 8. Three contiguous frames in a Digital Yuanmingyuan video (2020) and the movie Burning of Imperial Palace (1983)

Besides the cultural aesthetics and the official narratives, the products of Digital Yuanmingyuan also consider the market demand of the general public. The major method to attract and involve the

audience is to present the emperor's life within the palace. For example, in the fixed-spot panorama of the inside of the palace Zhengdaguangming, the viewpoint is set on the emperor's body (Figure 9, left). And in interactive exhibitions, the team build a physical indoor environment of a spot in Yuanmingyuan, while the AR device could project an emperor to the scenery, in a way similar to the game Pokemon Go (Figure 9, middle). The mass consumption of the formerly privileged imperial life become the main attraction of Digital Yuanmingyuan, and the narrative of the emperors' stories become the major way to present the visual history of Yuanmingyuan (Figure 9, right).

VR interface to view the palace from the emperor's viewpoint. Source: Official social media of Digital Yuanmingyuan.2016.

AR exhibition produce to 'take a photo with the emperor. Source: Official social media of Digital Yuanmingyuan. 2016.

Images of emperor to represent 12 folk activities in the twelve months of a year. Source: Official social media of Digital Yuanmingyuan.2014.

Figure 9. Commercial products that emphasize the role of the emperor

Judging from these three directions of Digital Yuanmingyuan's visual presentation, the author concludes that the social values of Yuanmingyuan were centred on its witness of social transformations: the governmental narrative serves the transformation of the nation's political regime by critiquing the feudal and capitalist forces; for the mass public, it is the transformation from a hierarchical society to a democratic modern society that attracts the public interest. And people enjoy the social transformation by experiencing the previously exclusive life of the emperor through mass consumptions. However, the current studies and narratives of Yuanmingyuan mainly focus on the event of the 1860 war and the history of the garden before 1860. The next chapter argues, instead, that the gradually transforming ruins after the year 1860, should be paid more attention to and studied not only for reconstruction of the imperial garden, but should be studied as a cultural existence that witnessed the modern social transformations that defined the key values of Yuanmingyuan.

FURTHER POTENTIALS OF DIGITAL YUANMINGYUAN

The war of 1860 was the initiation of the collapse of the feudal society, and it is from that time spot, that Yuanmingyuan turned from a forbidden imperial garden to an open public space. Therefore, the history of Yuanmingyuan's ruins revealed how the private royal space and imperial culture become a public space and the mass culture. It was also since the colonial intrusions that the modern city of Beijing had grown out of the feudal city wall. And the location of Yuanmingyuan turned from the far suburb to a part of the prosperous urban space. While Digital Yuanmingyuan analysed historical photographs and relics to designate the colour, texture and proportions of the imperial architectures, researchers such as Andrew Herscher and Earl Weizman have investigated the ruined buildings and their photo records to re-present the damaging forces and events, and to study the history of destruction.[9] Their research critiques the official narratives about the destructive violence and discovers more about the underrepresented suffers of the attacked people.

While these scholars mainly use the forensic methods to investigate contemporary destructions, their concepts and methods could be adopted by digital heritage preservation. Taking the photo records of Yuanmingyuan as an example, the photos in the first row of Figure 10 were taken in time sequence in the 19th century.[10] The differences of the photographer's identity, their distance to the architecture, the place they stand, and the environmental elements surrounding the buildings, could reveal the process that Yuanmingyuan was gradually discarded by the Qing emperors, and the site become increasingly approachable by the photographer and other plain citizens. Photos on the second row documented the visitors to the ruins of Yuanmingyuan, as well as their further destruction and transportation of the

remaining architectural materials. It could also be recognized from these pictures the development of the surrounding neighbourhoods, and the interactions and integration of the local and foreign population. And pictures on the third row are taken after the establishment of the contemporary government, during which Yuanmingyuan had been occupied by homeless migrants, independent artists and had been a prosperous place to attract and nourish varied kinds of queer cultures. However, these histories of the mass public were not yet considered with importance by either the architectural researchers or social and historical preservers. And in order to preserve the official history of Yuanmingyuan, the queer communities were cleared out of Yuanmingyuan in the 1980s and 1990s, and their existence was negatively commented and criticized in newspapers.

Figure 10. Photographs of the Yuanmingyuan Ruins Site, arranged according to time sequence

CONCLUSION

This paper studied the digital preservation and presentation of Yuanmingyuan in China. The Digital Yuanmingyuan project revealed the advantage of digital preservation to study, discover and present historical transformations of the tangible heritage. The discovery and presentation of the reconstruction and destruction of Yuanmingyuan before and after the commemorated war crime could bring inspirations to the study and preservation of negative heritage. Preservation of traumatic events has to reach a justified balance with the historical continuity. And for history researchers and preservers, objective studies of the negative heritage without the ideological division between culture and violence, destruction and construction, could provide a critical review of the official and dominant history narratives. And as for the future development of digital heritage preservation, this paper suggests more effort on the study of evidence and events in the recent history, and more critical and restricted use of expressive technologies, such as rendering or derivative products. Although digital technologies could build a bridge between professional heritage preservation and public presentation and interactions, attentions should be paid to divide between digital heritage and the digital cultural and commercial products.

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NOTES

[1] See Sarah Moses, “Stigmatized Space: Negative Heritage in Historic Preservation,” (2015, January). Other related definitions of ‘negative heritage’ include Dark Heritage, see Que Weimin, "On the Civilized Behavior of Dark Heritage Protection: On the Occasion of the 155th Anniversary of the Yuanmingyuan Disaster" (World Heritage 2015.11: 20-21. In Chinese. 2015)
[2] Que Weimin, "On the Civilized Behavior of Dark Heritage Protection: On the Occasion of the 155th Anniversary of the Yuanmingyuan Disaster" (World Heritage 2015.11: 20-21. In Chinese. 2015)
[3] Andrew Herscher, “Warchitectural Theory.” (Journal of Architectural Education, 2015), 38.
[4] Anouk Bélanger, “Urban Space and Collective Memory: Analysing the Various Dimensions of The Production of Memory” (Canadian Journal of Urban Research 11 (1), 2002), 83.
[5] Liang Fulong, "Guo Daiheng's Team of Tsinghua University Spent 15 Years ‘Restoring’ Yuanmingyuan with Digital Technology" (https://www.guancha.cn/culture/2017_04_18_404271.shtml. In Chinese).
[6] Lee Haiyan, “The Ruins of Yuanmingyuan: Or, How to Enjoy a National Wound” (Modern China 35 (2), 2009), 175.
[7] Alois Riegl, “The Modern Monument Cult” (Socio-Anthropologie, no. 1: 5–7, 2001).
[8] See ICOMOS, International Charter For the Conservation and Restoration of Monuments and Sites (The Venice Charter 1964), in particular, Article 9.
[9] See Eyal Weizman, *Forensic Architecture : Violence at the Threshold of Detectability* (Brooklyn, NY : Zone Books, 2017), and Andrew Herscher, “Warchitectural Theory.” (Journal of Architectural Education, 2015).
[10] Pictures collected from multiple sources, including “The Romance of Ruins” (China Heritage Quarterly, http://www.chinaheritagequarterly.org/008/features/7_The_Romance_of_Ruins.pdf) , “Photos of Old Summer Palace a hit online” (https://www.chinadaily.com.cn/culture/2016-09/19/content_26827933.htm).

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