RESPONSIVE CITIES
ACTIVE PUBLIC SPACE

SYMPOSIUM PROCEEDINGS

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RESPONSIVE CITIES//
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13-14 NOVEMBER 2017

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NTRODUCTION

Over the last decades a new generation of cities and new city-planning paradigms have emerged. Urban development leaders and governments throughout the world have begun to consider innovative systems, driven by information and communication technologies, to be critical drivers with which to face today's urban challenges. Cities have started to invest in technology through the implementation of new transport management systems, water and contamination monitoring systems, smart energy grids and energy efficient buildings, to name a few.

The intelligent systems and devices have formed a new hidden layer, enhancing performances, but basically remaining separate from the city's materiality and spatiality. This hidden layer took the name of Smart City, the expression of the Information Age, a period dominated by the accumulation of information, its organization, and transmission through centralized monitoring systems or desktop computers.

The Information Age saw the role of architects and urbanists in generating visions for the city's future start to fade and the Smart City was theorized, described and developed by IT companies, who dominated the knowledge and access in technological advancements.

FOREWORD

Today's advances create a scenario where technology has started to be embedded in our everyday life in such ways that it is becoming part of our bodies and surrounding environment, hence overcoming the desktop era. Architecture transforms into an evolutionary organism, able to react in real time to various data, finally questioning the solid principles of durability, stability or longevity. Wearable and virtual reality technologies allow us to relate to each other and with the environment at augmented levels. New softwares and hardwares expand the possibilities of the internet of things, connecting object and users in spatial experiences: spaces are interacting with our body and neuro data, and building skins are becoming hyper connected interfaces. At the same time, DIY and open source cultures push towards the democratization of technologies and production means, bringing them closer to users, allowing them to actively participate through an experiential peer-to-peer learning and making process.

These epochal changes bring us to question, imagine and try to describe what is coming after the Information Age, when technology is not just a catalyst, but the foundation for social interaction. The day that internet connection

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APS PROJECT

The increasing availability of data creates new opportunities not only for the monitoring and management of cities, but also for changing the way we describe, understand and design them, challenging many fundamental assumptions of urban design and planning professions. In order to promote the innovative education and training that emerging technologies require, higher educational institutions together with industrial partners have created the Knowledge Alliance for Advanced Urbanism (KA-AU). KA-AU develops courses, symposia and an educational and training platform, offering participants an innovative education on planning and design. The group understands "Advanced Urbanism" as the sensitive integration of ICTs in cities, taking into consideration cultural heritage, environmental and social issues. "Advanced Urbanism" is about designing and planning processes, instead of just concrete artefacts, linking citizens, businesses and governments in a sustainable urban culture. "Advanced Urbanism" requires changing traditional design and planning practices towards a more open, collaborative and interdisciplinary approach.
KA-AU is co-funded by the Erasmus+ Programme of the European Union.
CONFERENCE PROCEEDINGS

Responsive cities 2017 - Active Public Space in the Experience Age Conference Proceedings collects the papers selected and presented during the Symposium.

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DIGITAL TECHNOLOGIES ACTIVATING PUBLIC SPACE

Chiara Farinea

Institute for Advanced Architecture of Catalonia

The rapid diffusion and uptake of digital technologies presents a new and unique challenge for cities as social life and urban space becomes increasingly (yet unevenly) mediated by new technologies and digital devices.
The way cities are perceived todays is quite different with respect to last decades, as a result of new hybrid realities to which we are constantly exposed (Castells, 2004). In planning literature and debate, many people allude to the ability of digital media to create urban publics in new ways (Foth, M., et al., 2011; de Waal, M., 2014).
As digital technologies continue to infiltrate urban and social realms, there is a pressing need to understand the complexity of this rapidly expanding social and spatial phenomenon. The Responsive Cities - Active Public Space Symposium call for papers and projects was targeted at generating knowledge in order to better understand the impact of digital technologies on our cities public space.
There is no denying that the proliferation of, and accessibility to, new technologies has raised significant questions to both research and practice, Technology has redefined our lifestyles on a day-to day basis and our relationships with one another. It has challenged our conventional outlook towards time and distance and required us to re-evaluate our connection with physical space. It has also made us re-question the value of urban space and the extent to which we may still create meaningful 'places' as opposed to anonymous 'spaces' – an increasingly challenging concept given the risk of alienation brought about by technology

and that
constitutes an unfortunate, but very real, prospect.
Hence, in the RC Symposium our major objective was to advance knowledge on the contribution of technology to transform our cities into more social environments, rather than just more high-tech.
It opens an opportunity to widely discuss the emerging challenge that the fusion of the digital into the real world poses. The advancement in technology, also with regard to the urban environment, becomes challenging for all, from policy makers and urban designers to social scientists and ICT experts, to citizens – in our case the public open space users.
Opportunities are generated by emerging applications to improve legibility and liveability of urban spaces, as well as new forms of integrating people into the urban design processes.
The challenge is how to make use of the opportunities offered by digital technologies, so that they can provide support to decision making planning, production, and maintenance of public spaces, providing them with the features that best meets the needs of their users.
The RC symposium - Active Public Space explored the benefits of interweaving an outdoor experience with digital engagement, via sharing knowledge, discussing experiences and ideas, and analysing the production and uses of public open spaces.
The papers in this collection present interdisciplinary perspectives from architects, computer scientists, sociologists, urban planners and designers, among others. Diverse approaches to the research field are also offered, including work on new methodologies, new theoretical or conceptual models for the digital era, as well as preliminary studies of peoples' use of, and engagement with, technology in public space and presentation of implemented projects. At the heart of these discussions lies the term 'enhancement', understood in terms of the added value that the may bring about, contributing to broader quality of life objectives.
The papers contribute to an emerging body of work that seeks to understand how emergent technologies are influencing planning (Design section), relations (Share section), sustainability (Adapt section), city perception (Experience section) and knowledge development (Learn section).

DESIGN
urban analytics | physical and digital merge | fabrication protocols | real time data
This section explores the contribution that digital technologies have given to the development of urban design, intended as both, design of physical parts and of the processes that regulate cities.
The first two papers reflects on interactive installations and architecture: "Affectivate : Experiencing other senses within public artworks" (Anaisa Franco), focus on physical and digital merge with a theoretical approach, offering an analysis of the field of interactive

theoretical approach, offering an analysis of the field of interactive architecture in terms of theoretical background, evolution and relevant outputs. "Touchstone: a discussion of a digitally integrated artwork designed to facilitate community engagement" (Jordan Lacey, Ross McLeod, Charles Anderson, Chuan Khoo) presents a practical experience of an interactive installation implemented in public space. The artwork, located near Melbourne, converts the latent electrical charge emitted by human bodies into audio-visual outputs, engaging the community by populating the artwork's memory with locally-procured data.
A reflection about the use of form finding simulators to improve urban design is offered by "Waterfront//: Artificial Landscapes of Diagrammatic Narratives" (Dimitra Tsitsi, Zak-Markos Stefanou). In detail, the paper discusses about the development of new design protocols based on form finding simulators, allowing designers to process environmental and spatial data in order to develop shapes that better responds to users needs. The paper describes the creation of a computer-aided design application to re-configure Thessaloniki waterfront, processing data related to flows, points of interest and water limit.
The last paper of the session reflects on the optimization of real time mobility management systems. "Topological time-distance modeling for urban transportation systems" (Noam Naveh) discusses the possibility to base urban transportation systems' modeling and mapping on time-based computational models embedded in a topological environment, instead of on geographical environment, as in current practice. It explores this possibility through a study for London's tube network.

SHARE
citizen participation | ownership | accessibility | sharing economies
The share section explores the contribution that digital technologies have given to the enhancement of communities and citizens quality of life, thanks to the the possibility of communicating and sharing information through new media. New possibilities are today available thanks to the development of innovations such as participation and decision making platforms, open source systems for ideas and projects exchange, sharing economy platforms.
A theoretical reflection on an extensive application of the sharing economy is available in, "DO NOT OWN, ENJOY! Living without ownership" (Loes Thijssen). The paper reflects on ownership and access to good and services, envisioning the shift from a model based on possession to a model based on access. It develops the paradigm of the "on demand city", responding to the contingent needs of its inhabitants.
A practical example of urban accessibility enhancement is offered in "HERE: an interactive device for collaborative public space" (Alberto Benetti). The paper describes the development of a physical and digital interface offering services related to the surrounding space.

A reflection on citizen participation enhancement is available in "Symbiotic data platform" (Zeynep Birgonul, Ana Cocho Bermejo, Vicenç Sarrablo), which describes the development and the structure of a common decision making tool. 'Symbiotic Data Platform' Project is an 'analysis and visualization software', that aims to integrate data gathered by sensors and citizens feedback, developing a responsive system for decision making focusing on public space use.
The last paper of this session, "Communal hack Big Data and community in architecture" (Angelika Hinterbrandner, Mariana Riobom) reflects on the contribution that digital technologies can give to facilitate the integration of asylum seekers. The authors describes Society Lab app, which focus on offering services to asylum seekers through the development of a tool to get information, look for and find contacts, accommodation or work before arriving at the destination.

ADAPT
resilience | new materials | dynamic cycles | environment
This section address urban sustainability enhancement through the implementation of actions and projects using technologies targeted at increasing cities resilience and protecting the environment.
The paper "Biosensing Urban Interactions" (Hugo Larqué, Bárbara Marín) reflects on the use of bio-materials intelligence and behaviour in order increase cities responsiveness to unattended events. The authors presents a research on the development of biosensors that can harvest and transfer information, as for example the arrival of earthquakes.
The paper "Water management and community in public space. Recovering the thermal gardens of Caldes de Mintbui" (Elena Albareda-Fernández, Marta Serra-Permanyer, Jordi Calbetó-Aldomà) describes a case study focusing on environment protection: the experience of the recovery of historical irrigated gardens located in the metropolitan area of Barcelona is detailed, with special focus on water management strategies and community awareness enhancement.
Also targeted at environment protection is the project presented in the paper "Public space as an infrastructure for living: the experiment of Largo 2 giugno in Valenzano (Rossella Ferorelli, Alessandro Cariello, Luigi Falbo, Andrea Paone). It consists in a responsive park incorporating strategies and devices for microclimate regulation and energy production.

EXPERIENCE
digital & virtual space | behaviours | gaming
The experience session aims at exploring the possibilities of defining city perception and experience thanks to new technologies. Moreover it explores the influence of gaming on cities perception.
The paper "Measuring the unseen: the impact of urban qualities in the sensory experience of public space" (Stefano Andreani, Allen Sayegh) is a reflection on spatial cognition and presents a research

on the subjective perception of spaces. It was developed by a group of students from the Harvard University Graduate School of Design, who tested the reaction to different urban experiences, as travelling in the city or perceiving city colours, of a sample of people. It was developed using EEG wearable brain scanner to evaluate the response and emotive states of participants, that were classified as Meditation, Excitement, Frustration, and Engagement. The analysis of the readings resulted in a lexicon of urban spatial compositions and their deduced impact on the mind.
Also on the topic of spatial cognition, the paper "Adventures in neuroarchitecture" (Fiona E L Zisch) presents relevant neuroscientific knowledge showing the potency neuroarchitecture holds. It also presents three collaborative experiments that explore perception in relation to mobility within the city.
The last contribution of this session, "UMWELT GARDEN: a synthetic coexistence" (Vamsi Krishna Vemuri), proposes a reflection on virtual space and gaming, presenting a video game developed by the paper author, whose objective is the definition of Architectural objects.
.

LEARN
raising awareness | testbed for innovation | policies | data flows
This session focus on the development of diverse approaches to digital technologies use for public space enhancement, including work on new methodologies and protocols, new theoretical or conceptual models and the presentation of implemented projects targeted at awareness rising.
So far, interactive installations for public space have mostly been analysed in the framework of artistic or Human Computer Interaction research field. The paper "Co-Creating Responsive Urban Spaces: a two-year action research project utilising Arena Boulevard as a test bed" (Frank Suurenbroek , Martijn de Waal , Ivan Nio) explores the possibilities to integrate digital media installations in the praxis of urban design, in order to improve public places. Through the case study of Arena Boulevard in Amsterdam, the authors define a methodology to bring together different disciplines involved in digital-media projects implementation, bridging gaps between stakeholders. The methodology includes a quantitative and qualitative analysis protocol to aid in defining the area needs, an interdisciplinary vocabulary to assist stakeholders coming from different backgrounds to work together and a co-creation approach for involving citizens in the production of prototypes to be tested in the project area.
Tactical Urbanism (TU) as tool for knowledge production is analyzed in the paper "Planning professionals' use of tactical urbanism: A new knowledge production context in planning" (Mathieu Emond, Danielle Labbé, Juan Torres). TU advocates transformations at the local scale through incremental, rapid and inexpensive interventions that range from urban agriculture to the construction of public spaces. Strongly influenced by the do-it-yourself movement,

ment, TU is considered a form of spatial appropriation as well as direct participation by citizens in the design and development of their living environment. The paper explores the potentials of prototyping into the planning field, as a methodology for new conditions generation enabling knowledge production.
The use of urban data to generate interaction between urban infrastructure and citizens within the framework of an horizontal governance model is discussed in the paper "Cybernetics infrastructures of quantitative and qualitative data for distributed cities" (Tomas Vivanco Larrain), where strategies like the use of gaming, digital platforms and prototypes creation are analyzed.
Finally, a Do-it-Yourself initiative implemented in Vietnam, targeted at building low-cost playgrounds for kids, is described in the paper "From the Margins to the Urban Core:The Think Playgrounds DIY Initiative in Hanoi" (Gabriel Larue, Maxime Boutaghou-Courtemanche, Jules Laurent-Allard). The action is targeted at raising awareness with regards to the need of good quality public space in Hanoi and volunteers were involved thanks to social media campaigns.

In the last part of this volume projects of responsive public space are presented. They offers examples of practical application of topics discussed in the papers, as for example data visualization, microclimate regulation, city perception, real time city management, tourist experience enhancement and sustainable construction.

Castells, M. (2004). Informationalism, Networks, and the Network Society: a Theoretical Blueprinting, The network society: a Cross-Cultural Perspective. Northampton: Edward Elgar.

Foth, M., et al. (2011), From Social Butterfly to Engaged Citizen: Urban Informatics, Social Media, Ubiquitous Computing, and Mobile Technology to Support Citizen Engagement; Cambridge, MA: MIT Press.

de Waal, M. (2014), The City as Interface; Rotterdam; Nai010 Publishers.

DESIGN

URBAN ANALYTICS

PHYSICAL AND DIGITAL MERGE

FABRICATION PROTOCOLS

REAL-TIME DATA

WATERFRONT//: ARTIFICIAL LANDSCAPES OF DIAGRAMMATIC NARRATIVES

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Keywords: waterfront, boundary, emergency, computational design, city

Waterfront//: Artificial Landscapes of Diagrammatic Narratives attempts to renegotiate the border between sea and land, while unsettling the linearity and flatness of the waterfront of Thessaloniki, in the jetty of the Yacht Club, and the corresponding space to its east. A computer-aided complex machine is constructed in order to negotiate selected data and elements we find on the context while materiality along with concepts such as novelty, degradation and temporality emerge as fundamental issues throughout the research.

The project aims to analyze and discuss concepts and phenomena that climax the tensions between the politics of urban design and the logic of emergence. Moreover it insists in the complexity of the design process for the city as a fundamental procedure that generates new relations, narratives, potentialities and hybrid forms of [co]existence. This process is far more important than the final product, precisely because it starts from a few cells derived from the past [or the present] while most of the time it expands in a chaotic and unpredictable way, forming new beings and compositions like the city itself.

Acknowledgements

Waterfront//: Artificial Landscapes of Diagrammatic Narratives is our diploma thesis which was submitted in the School of Architecture in Aristotle University of Thessaloniki on March 2017.
The initial inspiration for this study came from our interest in post-structural theory of space – how it affects digital architecture, how it is observed in the habitation of public space.
First and foremost, we would like to thank our supervisor As. Prof. Stavros Vergopoulos for his great contribution and support as well as Asst. Prof. Nadia Kalara for our very helpful discussions.
Furthermore we would like to thank PhD candidate and artist Fotis Sagonas for his generous help and his critical advises that provided a stimulating context throughout this project.

1. Introduction

From experimental architecture and visionary urbanism to computational automation and artificial subjectivities, the hyper forms of the contemporary city point towards the linkage between narratives and structures, processes and matter, virtual and physical, fragments and assemblages [De Landa, 2000]. The synergies and clashes produced by these linkages verify the current condition of the inhabitation of space enhancing inevitable intersections between the past and the new, the natural and the artificial.

For Agamben "Those who are truly contemporary, who truly belong to their time, are those who neither perfectly coincide with it nor adjust themselves to its demands. […] But precisely because of this condition, precisely through this disconnection and this anachronism, they are more capable than others of perceiving and grasping their own time." [Agamben, 2011, pp.14]

In order to explore the abovementioned issues we choose a case study in the waterfront of Thessaloniki [image 1.] which describes a contemporary metropolitan experience with a specific focus on the relation between sea and land and especially on boundaries and polarities created by the way that spatial and non-spatial border lines are defined on site.

New Waterfront of Thessaloniki is a project for the waterfront of the city of Thessaloniki that was completed in 2014. As for many architects and visitors it is perceived as a successful and promising work, for others it is characterized as a problematic one, due to its emblematic linearity and purity, that shape an obvious boundary between the sea and the city, a 3km flat walking line without interruptions and alterations. Walking alongside this line one can observe, that there is a place which has not been included in the project: the jetty of the Yacht Club of Thessaloniki and the corresponding space to its east. As for us the connection of sea and land in Thessaloniki remains crucial we choose this pier as a case study to analyze

Figure 1. Location of the site
Courtesy of Dimitra Tsitsi

Figure 2. Stream diagram / Main concepts /
Courtesy of Zak-Markos Stefanou

the current condition of the waterfront in relation to the city and its neighborhood areas in order to suggest a design process that will disrupt the linearity and will shape a porous landscape, but not in a deterministic way rather than in a stochastic one.

First, we notice that the waterfront of Thessaloniki once was a lacy coast, while the relationship of the inhabitants to the sea was not merely visual as it is today. However, as we can observe, there is still a place, the pier that we are studying, which has retained some of the characteristics of the past, largely due to its use as a Yacht Club. It comprises the only place of the whole waterfront where the visitors have not only visual, but also physical relationship to the water. This is one of the main reasons for choosing this site as a case study to renegotiate a new way of inhabiting Thessaloniki's Waterfront.

2. Contextualizing the concept

This project searches the past of the city for discovering new relations between the existing and the new, while seeking to answer a [non]-certain query: "In the context that we are studying, why things are established the way they are?" The first questions, that we needed to answer, were related to the existence of the jetty of the Yacht Club of Thessaloniki: Why it is located there? When it was constructed?

By searching maps of the past decades, we discover, that the jetty existed before the development of the new waterfront of Thessaloniki in the 1960s, when it functioned as the end part of the largest stream of the city, Kus Deresi [image 2.]. It was a natural jetty which was covered with concrete in early '60s to host the installations of Thessaloniki's Yacht Club.

We can observe that, although the site is characterized by linearity, the abstract and physical elements that compose it are connected by non-linear relations shaping organic maps and complex environments. The juxtaposition of the actual [linearity] and the virtual [non-linearity] comprises a whole unpredictable terrain for further study. Concepts found in the construction and function of the stream such as repetition, flow and reverse branching will be used in our design protocols, not as a recall or nostalgia of the past, but as hybrid concepts, through which we analyze the current elements of the site, as well as our intentions for the design proposal. After all, what ultimately matters in a milieu is what is not visible: the virtual.

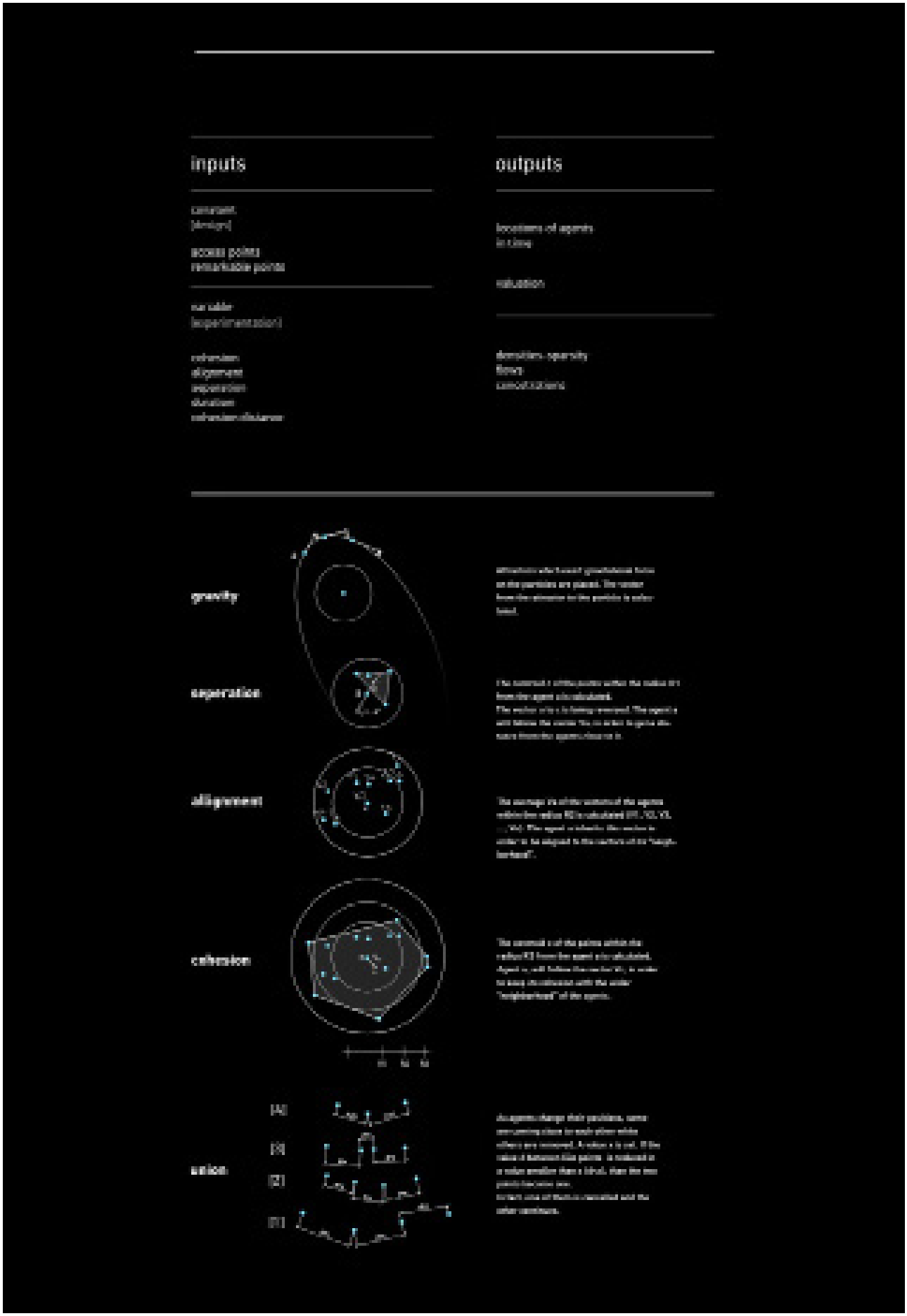


Figure 3. Principles of the machine
Courtesy of Zak-Markos Stefanou

3. Design Protocols – Process

In order to comprehend and to re-negotiate the linearity-non-linearity character of the site we develop a computer-aided design application, a complex abstract machine fed with data found on the site such as the network of flows of the visitors, the transit and the crossing points on the site, points of interest, and last but not least, the places where the water penetrates the land creating an inconspicuous boundary [image 3.].

Furthermore, notions found in the aforementioned Thessaloniki stream such as the loop, the flow, periodicity and reverse branching are combined with concepts borrowed from nature, such as swarm dynamics and gravity operating as variables in the machine. After we establish the external and internal rules, a set of experiments are carried out and diagrams of flows and condensations are produced.

At this point, it should be emphasized that the machine is neither a simulation model nor a design tool; it is produced and used as an analysis tool while its character is clearly a subjective and not a deterministic one. Moreover it is a context-defined instrument; the whole process of coding , including the restrictions, the intentions and the way agents encounter each other refers to this specific site embodied with metric and abstract relations. Therefore, the diagram is chosen as a tool of study and evaluation, but in the way that Deleuze perceives it; not as a means of representation, but as an abstract machine that produces condensations, flows, open meanings – meanings that develop in time, that are not born in it, but instead are embodied by it [Deleuze, 2003].

At a second phase, after a set of experiments are realized, we take a step back at our first intentions which were to "disrupt" the linearity of the boundary in Thessaloniki Waterfront and to create a variable penetrative landscape, that connects rather than separates land and sea. To do so, we make a selection of six diagrams [image 4.] that represent the most our intentions concerning the site with main selection criteria the location of densities, the penetrative zones [sea-land relation], orientation and complexity of the flows [paths]. In a further step, each point of the two dimensional diagram studies its neighborhood area and depending on the concentration/density of the points in this area it takes the corresponding 'z' value [image 5.]. In order to prevent chaotic and unlimited results from the one hand and the creation of a mega-structure on the other hand, we set a maximum 'z' value of nine [9] meters. After that, we repeat this process for the six surfaces that we have selected and the information of the three dimensional [XYZ] diagrams regarding density and flow is classified into superimposed surfaces [image 6].
The next protocol is overlay. The overlay of the abovementioned information [of the surfaces] is used as a tool for shaping the final terrain which we will study further in order to suggest a new design proposal, that will manifest the contradictory character of a city waterfront and will convert its linearity in a porous penetrative landscape [image 7.].

To further explore the results of the process so far, a crucial issue occurs: materiality. The ever-changing contemporary urban milieu highlights the need for temporality and variability. By shifting the focus from the Anthropocene to agrilogistics, Timothy Morton in his work Dark Ecology: For a Logic of Future Coexistence denies the existence of the three axioms of agrilogistics in a form of apostasy presenting a weird essentialism. Drawing on the work of French philosopher and feminist Luce Irigary, he argues: "while beings are what they are [essentialism] they are not constantly present" [Morton, 2016, pp.65]. Morton shows that constancy and consistency are the enemies of ecology [Morton, 2016, pp.73]. Under this scope, a need for a non-constant degradable material will trigger the next step of the project.

Studying the nature of buildings versus the nature of humans and other living entities, mycelium was chosen as the construction material. Mycelium is the vegetative part of a fungus, and can produce a biodegradable building material that has similar properties to concrete, but with a zero-energy footprint. It is rhizomatic, in threading texture, while as it grows, creates millions of small connections within its area. While it has been used in numerous small-scale projects especially from 2015, biologists in collaboration with architects and engineers are continuing to study its potentials manifesting an interdisciplinary approach for a zero-waste architecture. [Imhof, Gruber, 2015]

We take as an assumption that mycelium can be applied as a building material in a biodegradable plastic framework in large-scale as well. According to studies of research labs in the companies that currently produce building material from mycelium, there are a lot of possibilities that, in the near future, this assumption will be a reality. For constructing a building material from mycelium, organic waste placed in a mold is treated and impregnated with mycelium and then left three to five days in suitable conditions (28-30oC, 97-100% RH) [image 8.].

The site chosen is a quite suitable receptor for this material to grow, as during spring and summer period, the temperature in Thessaloniki is really high and it is accompanied with high humidity. Moreover, organic waste can be easily found everywhere and it also develops an opportunity for the citizens to collect their organic rubbish consciously and to "donate" it for the re-building of a public space. The participation of the citizens in the creation of public space, in any possible way, can lead to amazing results concerning the way they inhabit it, protect it and feel safe

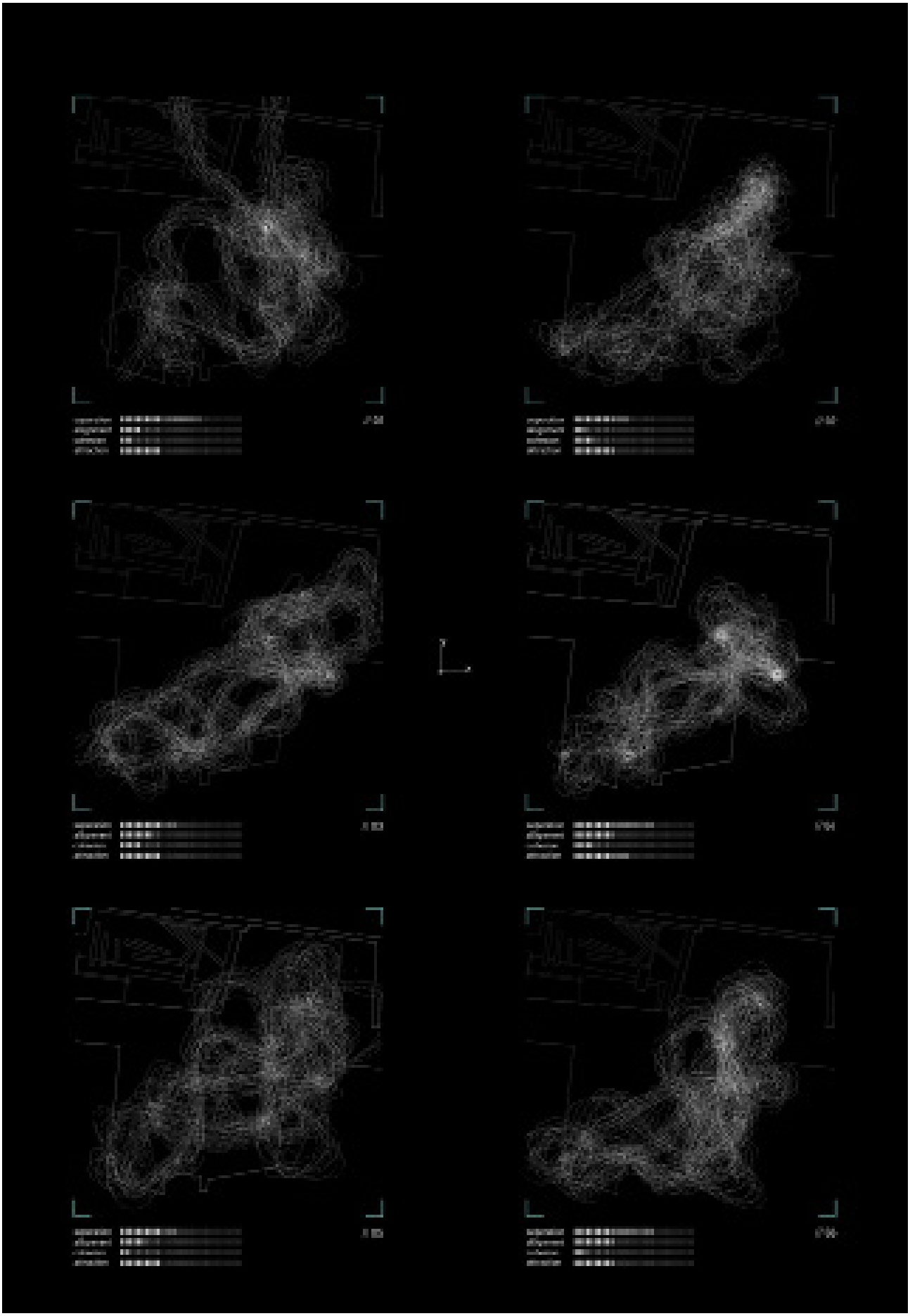


Figure 4. Selection of 6 diagrams
Courtesy of Dimitra Tsitsi

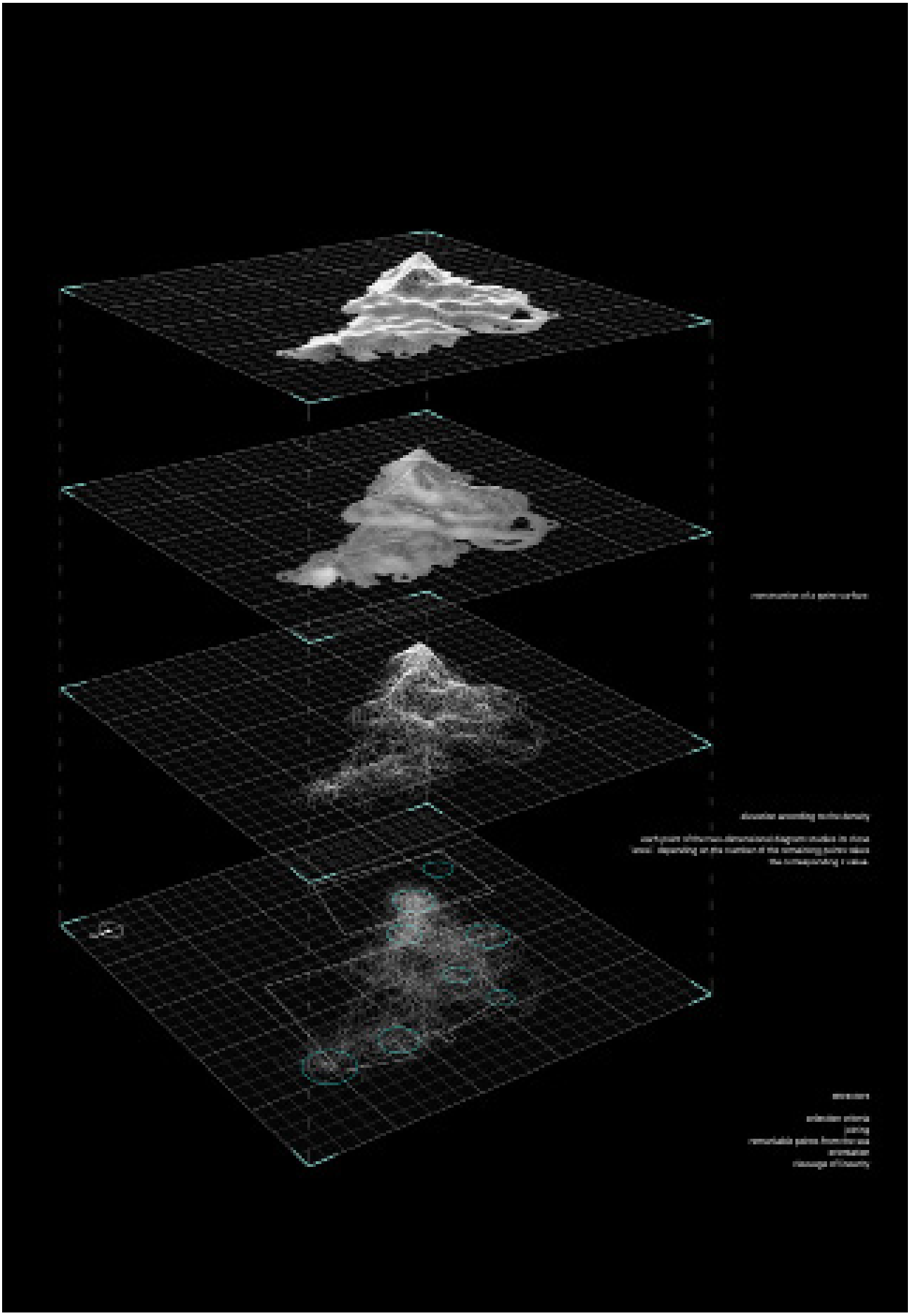


Figure 5. Evaluation of the information / 3D diagrams
Courtesy of Zak-Markos Stefanou

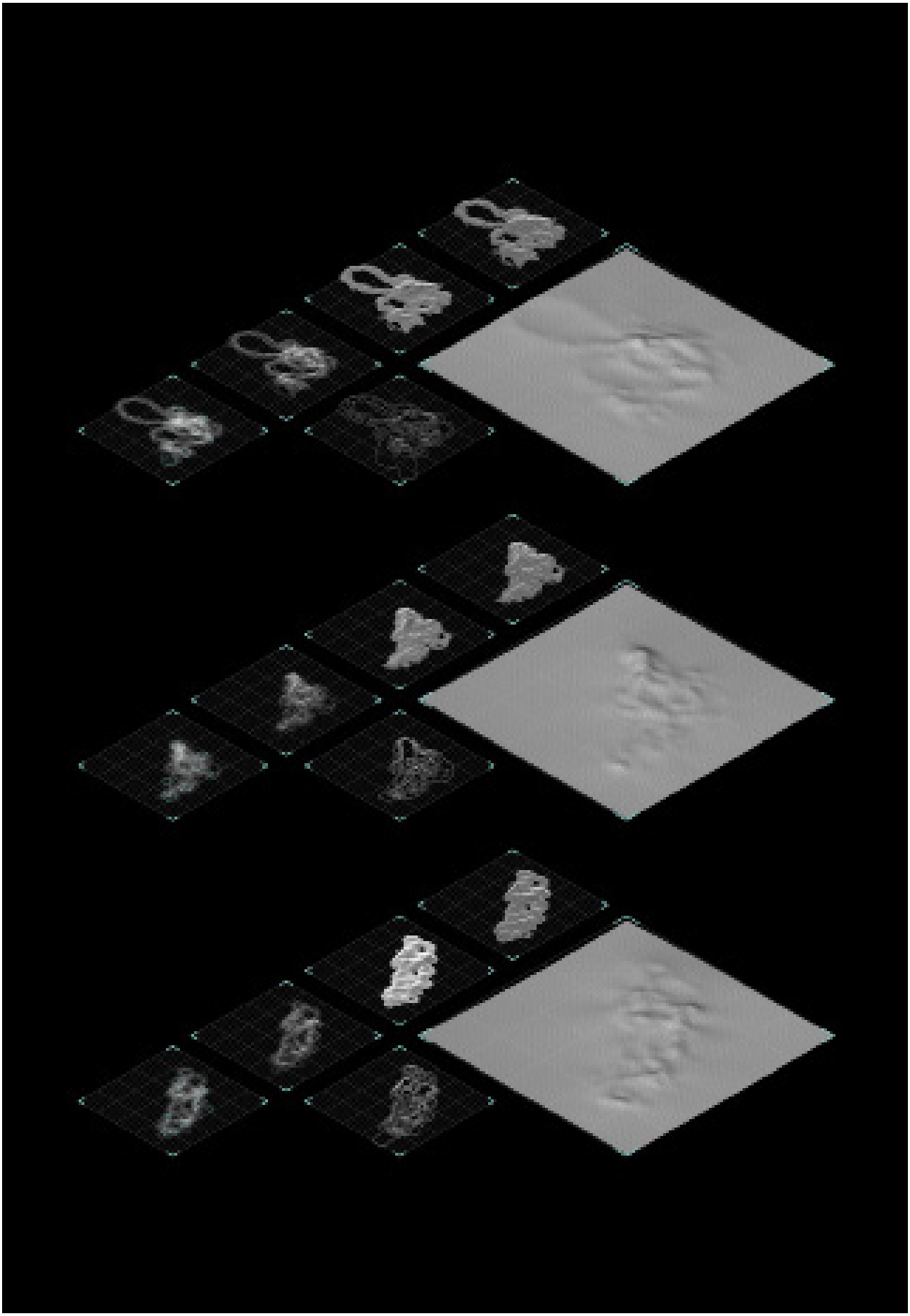


Figure 6. Classification into superimposed surfaces
Courtesy of Zak-Markos Stefanou

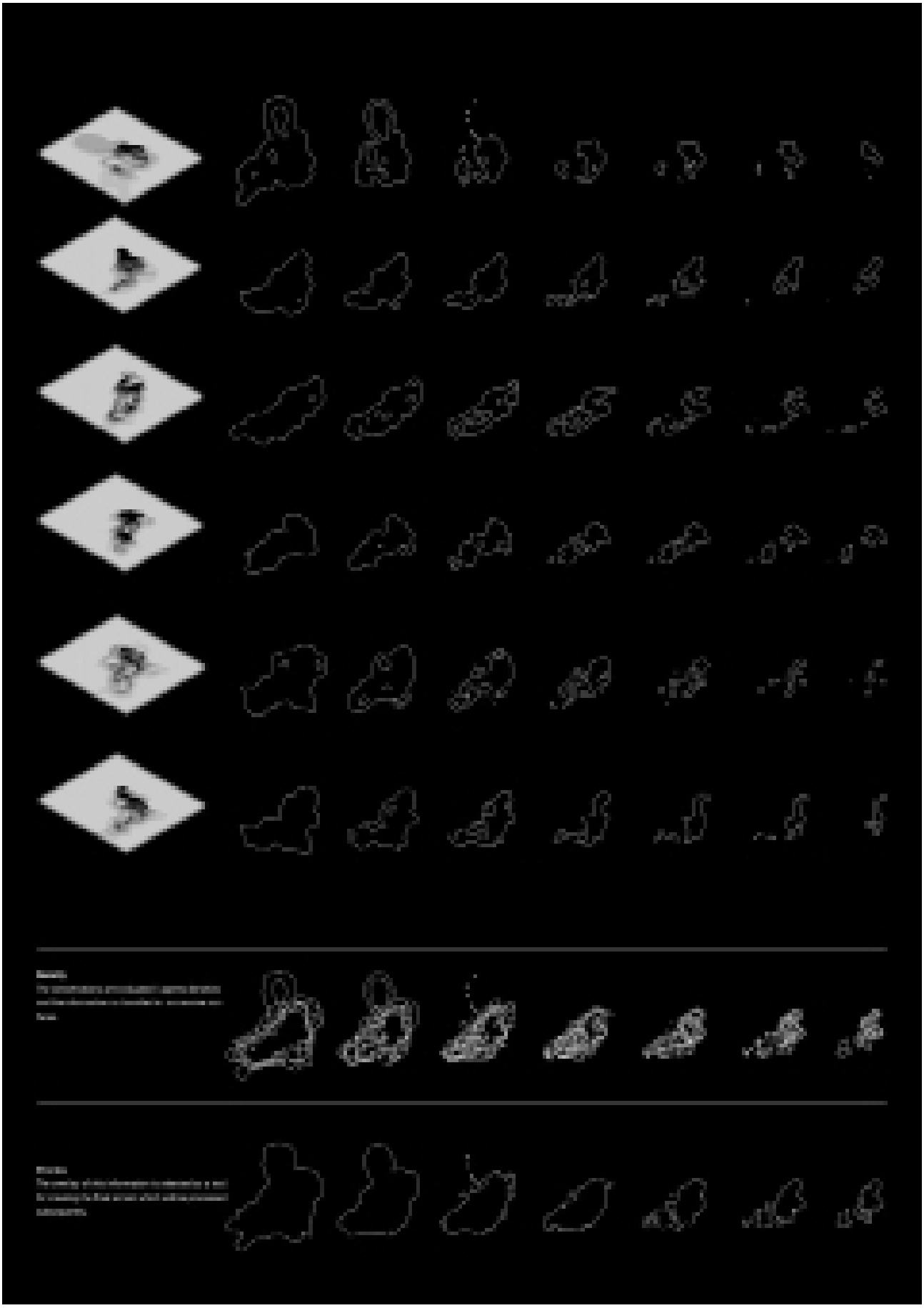


Figure 7. Density / Overlay
Courtesy of Dimitra Tsitsi

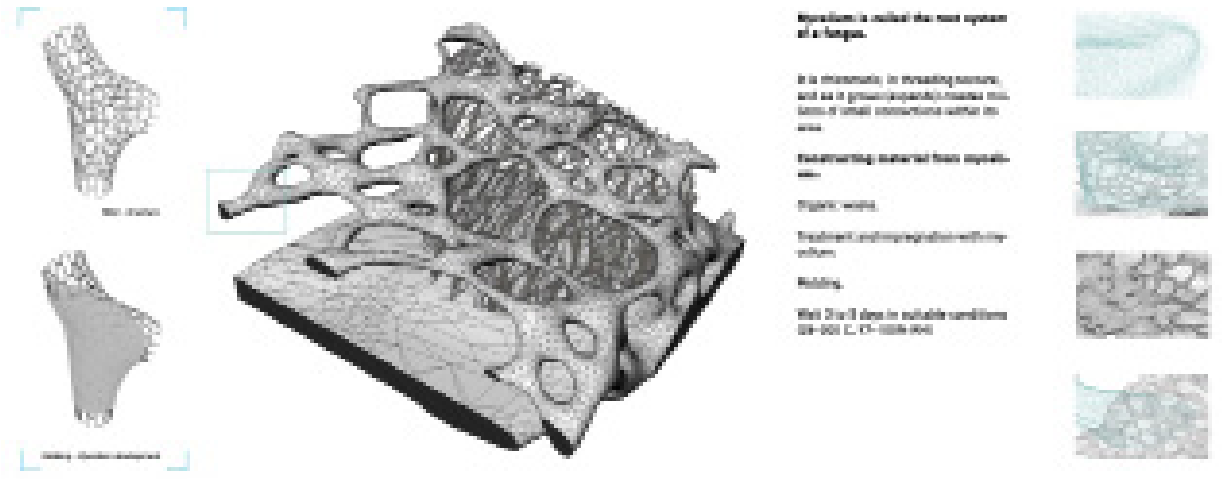


Figure 8. Making building material from mycelium //
Courtesy of Dimitra Tsitsi

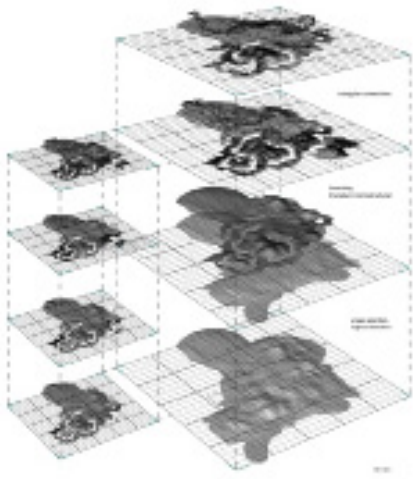


Figure 9. Branching / Triangulation
Courtesy of Dimitra Tsitsi, Zak-Markos Stefanou

in it [Harvey, 2012].
Every living thing should go through a lifecycle; should be born, grow, interact with its environment, weaken and then die. Waterfront// focuses on the bio-logic need in architecture, the logic for degradable non-static public spaces.

After the construction material is established, a new starting point for the design emerges.
When the basic shape of the terrain is constructed, the selection of the highest concentration areas takes place in order to "simplify" the base, in which we interfere to produce the new artificial landscape. As one of the main intentions is to create a porous dynamic space, branching ["rooting" of mycelium] combined with triangular connections is used as a final design protocol [image 9.]

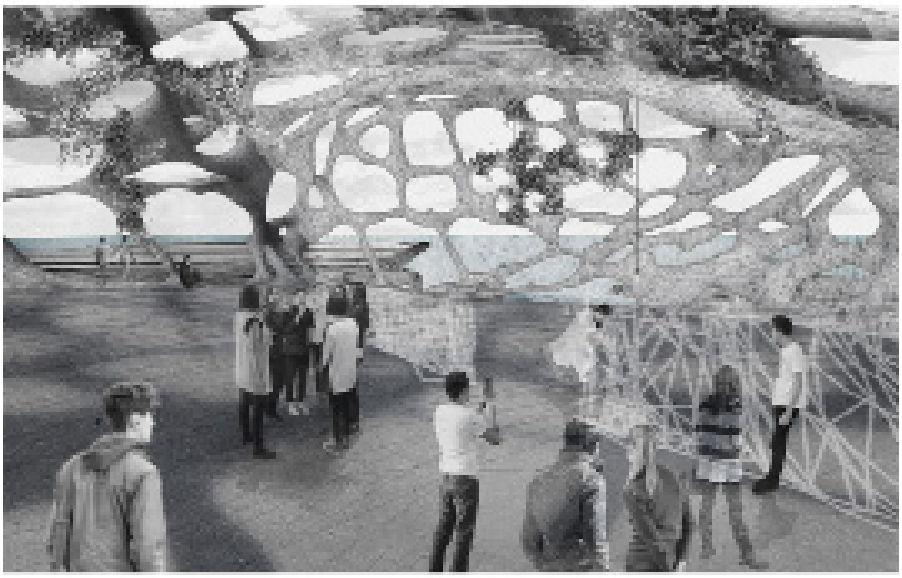
In Waterfront//: Artificial Landscapes of Diagrammatic Narratives, the design proposal, is not attempted as a static or established platform, but rather is based on different scenarios that transform the use of space according to the needs and the desires of the citizens. Due to its changing character and the flexible nature of the construction material, it performs as an adjusted structure that can be easily divided into opened, semi-opened and closed spaces [by adding layers from fibre, membranes or bubbles] hosting a diversity of events. [Image 10.]

It is worth to be mentioned, that the design phases analyzed above correspond with the timeline of the research procedure concerning the theoretical framework in which our design philosophy is based, the design process as a fundamental principle of any-"thing" site-specific and materiality which gives life into things, which allows us to perceive and/or to denature notions into beings [Images 11,12,13].

We could say that, currently, things are defined as temporal rather than spatial. For Paul Virilio time dominates over space, the colonization of space is transformed into the colonization of time [Virilio, 1998, pp. 178-187]. In this work, design is attempted as an open process, un-finished, it continues to develop in the passage of time, unpredictably, like the entity of the city itself.

4. [Instead of] an Epilogue

The hyper-dynamic context of today's metropolis inevitably leads to an architecture that raises queries and unavoidable intersections of polarities and dissimilarities. Mark Francis defines public space as



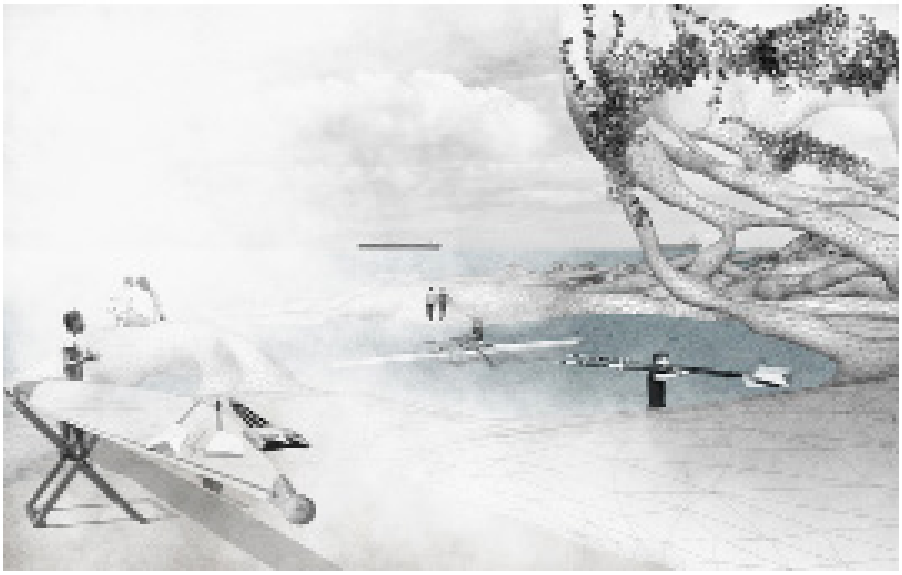


Image 10. Scenarios
Courtesy of Dimitra Tsitsi,
Zak-Markos Stefanou

a "participatory landscape" [Mark Francis, pp. 148]. In fact, in an urban landscape of territory expansion, the expression of urban living and collective activities transcends or finds more fertile grounds to changing/non-static platforms. Nevertheless in some cases, there are social relations, that mold the transformation of new spatial identities, while in other cases the spatiotemporal order encourage new ways of habitation of space.

In a more integrated definition given by Sennett, public space is received as a multi-layered field of ambiguity, exchange, informality and subjectivity where the individuals can play different roles, in the theater of the world6. [Richard Sennett, 2008, pp. 384-385.) Under the above point of view, the term of public, is not necessarily constructed within a fixed vision but is rather described as a flexible ever-changing platform where the traditional uses of space change and alternate according to social conditions and needs. As such, the aim of this project, is to suggest a public space which adapts the fragmented and changing character of the city itself, describing a world that is symbolically, spatially and temporally discontinuous. However, public space here is not designed as an interrupting layer but as a penetrated element between different layers [here: land and sea]. The interaction between these layers forms new models of space with different degrees of public uses, whose character alter depending on the needs.

Space is for Deleuze-Guattari a conceptual necessity that allows the dual deterritorialization / reterritorialization movement, the persistent terrain that allows the movement of flows [Hatzisavva, 2009, pp.272]. The cartography of the contemporary urban landscape is neither static nor fixed. Concerning the city and how it develops, there is not a beginning, nor an end; things are born in the in-between within an ever-changing living organism where public space is expressed as a transforming dynamic context, constantly reshaped, responding to its users' actions.

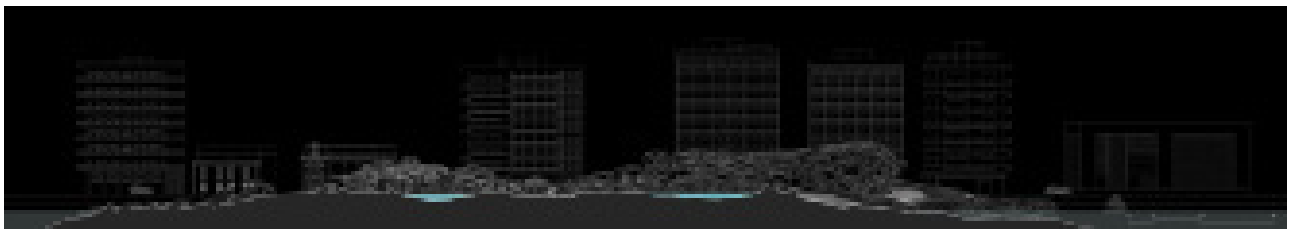


Figure 1. Section (1)
Courtesy of Dimitra Tsitsi, Zak-Markos Stefanou

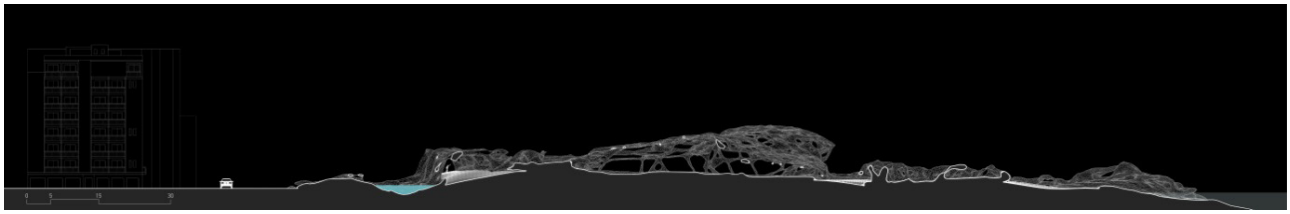


Figure 12. Section (2)
Courtesy of Dimitra Tsitsi, Zak-Markos Stefanou

Figure 13. Landscape
Courtesy of Dimitra Tsitsi, Zak-Markos Stefanou

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TOPOLOGICAL TIME-DISTANCE MODELING FOR URBAN TRANSPORTATION SYSTEMS

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Keywords: real-time-data, urban-analytics, transportation, data visualization, simulation

For over a century, time-based data has been introduced into urban transportation systems' modeling and mapping to better serve their users and as a means of research. These models, however, remain geographical in principle to which the time data is only added to, providing limited information that is difficult to harvest.

As an alternative, it is suggested that 'purer' time-based computational models in a topological environment will derive a powerful tool that could provide researchers with a better understanding of a system's functionality and may also be beneficial to end users. This approach is explored in this paper and discussed in the context of recent technological developments which are used for the generation of such models, such as live data sets. The methodology taken follows previous work by Gatrell (1983) and Carden (2005), and is exhibited in a case study software developed to highlight such system's potential advantages. The software is capable of presenting accurate and unique user-oriented mapping, also deriving a powerful simulation tool that may be used for urban research and planning. The work challenges conservative approaches to large scale transportation systems' design and analysis tasks by rethinking the design method itself.

1. Introduction

1.1 Background

The understanding that transportation systems rely equally on a time dimension as they do on a geographical one has led to the introduction of time based elements in their modeling and mapping. Time-based data is used to visualize non-geographical relationships for a given system's users, as well as to provide extended learning possibilities for urban and transportation researchers, contributing to their understanding of various systems' functionality and efficiency patterns.

Maps exhibiting time information for the use of travelers ('end users') can be traced as far back as the 19th century with Galton's (1881) isochrone global travel time descriptions from London. Similar exercises describing a single method of transportation have soon followed, such as the Melbourne isochrone train and tram travel-time map (MMTB 1910). Nowadays, numerous online services offer end users live navigation suggestions and isochrone information, taking into account the current transportation system's conditions. As the key purpose of these examples is to provide the user with easy to read information in a simple manner, time elements are by large treated as a secondary set to the geographical data, which remains the generating dimension for these maps.

Maps and models containing time elements also appear academic research. Related work has been carried out since the 1960's and can be categorized as 'time-space' mapping. Thoroughly surveyed by Ahmed & Miller (2007), this field of research has mainly been engaged with the description and analysis of geographic spaces' transformations induced by a given mode of transportation and its relative travel times. Despite using different techniques, the concept for most of the work done in this field is alike: they all demonstrate a mathematical method for the re-modeling of a geographical space as a consequence of an analyzed travel-time data set. Similarly to the 'end user' perspective described previously, the research concluded so far is as well situated within the geographic realm, although time is given a greater importance in the generation of the space's description.

Both the end-user and the research fronts described above imply a space-time approach derived mainly by geographic space. However, in respect of the urban and the contemporary technological context this paper wishes to discuss, such approach seems to carry several disadvantages. To begin with, the geographic space is not necessarily required for the description and analysis of transportation systems. Clark (1977) suggests that travel times are more important than the physical dimension in the learning of such systems and demonstrates a more topological approach to their understanding. A similar result has been reached from the end-user point of view. Harry Beck's (1933) London Underground map has demonstrated a topological representation of space, favoring connectivities (and therefore time relations) over geographic information for its users' ease-of-use. His topological approach for the description of transportation systems has been implemented in numerous other locations.

A geographical approach also derives many technical difficulties. Most of the research work done until now has been engaged with the difficulty of representing time-space relations, with many of them not ripening to concrete spatial conclusions. Ahmed & Miller (2007) suggest a similar explanation to the decrease in interest in this field since the 1980's. In a more technologically updated context, it is evident that GIS should be applied in time-space experimentations. This, however, is significantly more computationally expensive than slimmer and simplified transportation data interfaces (such as Google Maps API) that exist for many urban locations globally.

1.2 Alternative Modeling

As an alternative, it is suggested that the re-modeling of urban transportation systems on a time basis to begin with, and in a topological environment, could offer advantages that have been overlooked so far. Such an approach has been previously introduced by Gatrell (1983, 1991), as he criticizes geographers tendency to stick with Euclidean tools for the representation of space. Borrowing the term 'space-distance' from Clark (1977), Gatrell develops the idea of 'time-spaces' alongside other space types that can be used for depicting the physical realm. A similar line of thinking has also been developed outside the academia. Swedish designer Oskar Karlin (2005) has remapped the London Tube system on a time basis. Karlin's work was picked up by software designer Tom Carden (2005) who has adapted this idea into a software which generates various time based maps of the London's Tube system.

This paper argues that a time-based topological methodology may derive a powerful tool for the representation and analysis of transportation systems. Its main advantage is embodied in its simplicity, as what is considered to be unnecessary geographical information is removed from the data set. In this way, a simple to build model can be formed, relying on existing and relatively simple mathematical and algorithmic knowledge. Such a model can provide researchers with a visually simple and clear spatial analysis tool that could ultimately yield concrete and quantifiable data that is otherwise difficult to harvest. From the end-user perspective, a topological tool for the generation of complex yet relevant information is achieved, offering features that existing geographic maps struggle to deal with.

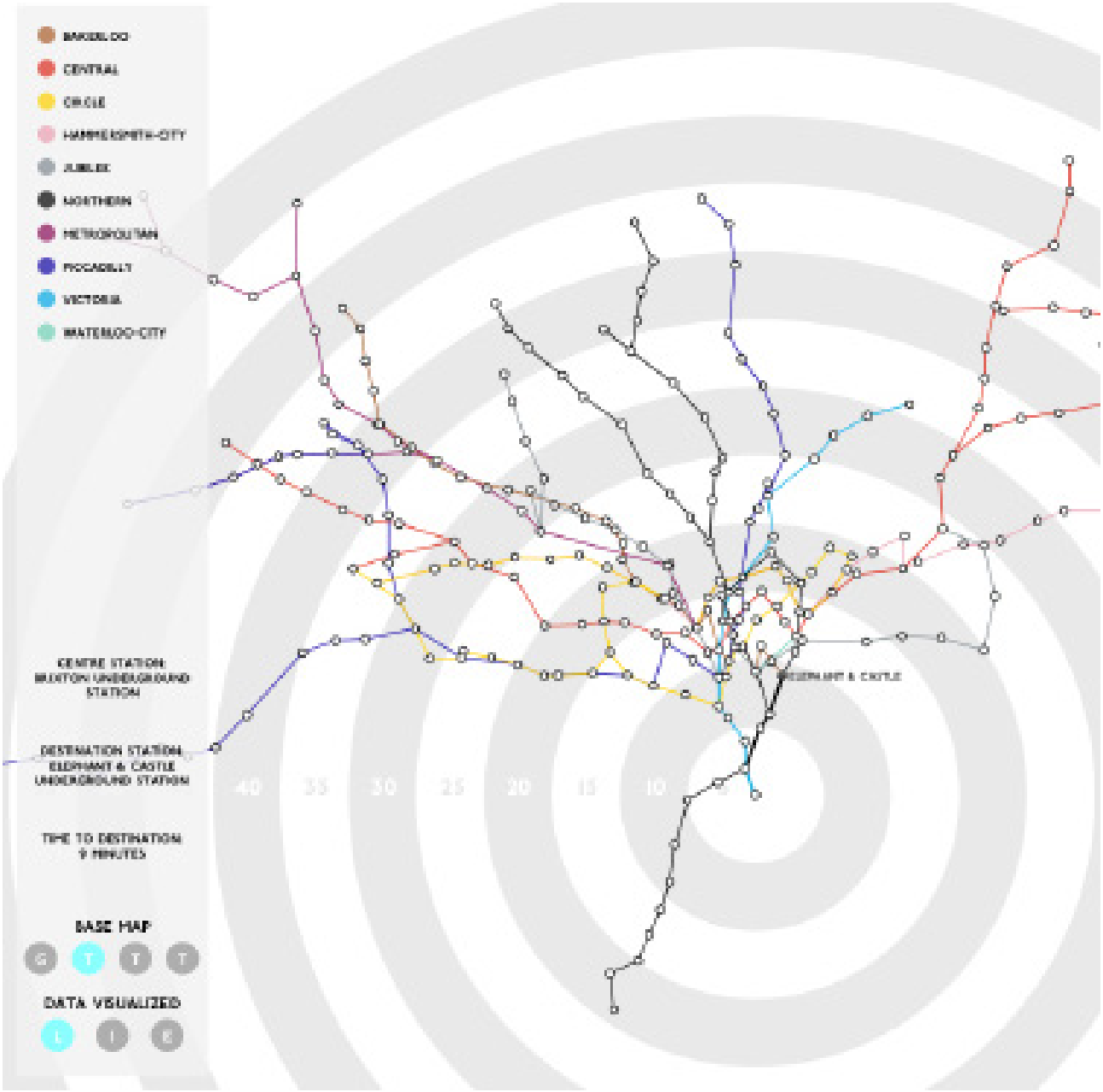
For the demonstration of this approach, a case study model for London's tube network is presented. Its implementation is explained and potential future work is outlined. It is hoped that the contribution of this paper would be in promoting the possible advantages for this type of modeling and define the benefits it may result for various user types.

2. Methodology

The purpose of this work is to offer an alternative model for the visualization and analysis of transportation systems based on time-distances taken from existing databases. The methodology follows Carden's (2005) work and attempts to re-envision it in respect of recent technology advancements, also suggesting several novel features. To do so, a time based topological model for London's tube network has been constructed and is presented in figure 1. As a starting point, the current system's conditions are modeled, describing the time-distance required to get from a user-chosen departure point to all other possible destinations. The overall time-distance between any two points is the sum of intervals between them when following the shortest (time) route. Although the model is a centric-relative one, forming an equilibrium description may be possible and is reflected on in the next part of this paper.

The most immediate advantageous feature the model offers is embodied in its ability to visualize accurate time data for multiple destination points at the same

Figure 1. A time-distance model for London Underground, focused on Brixton station



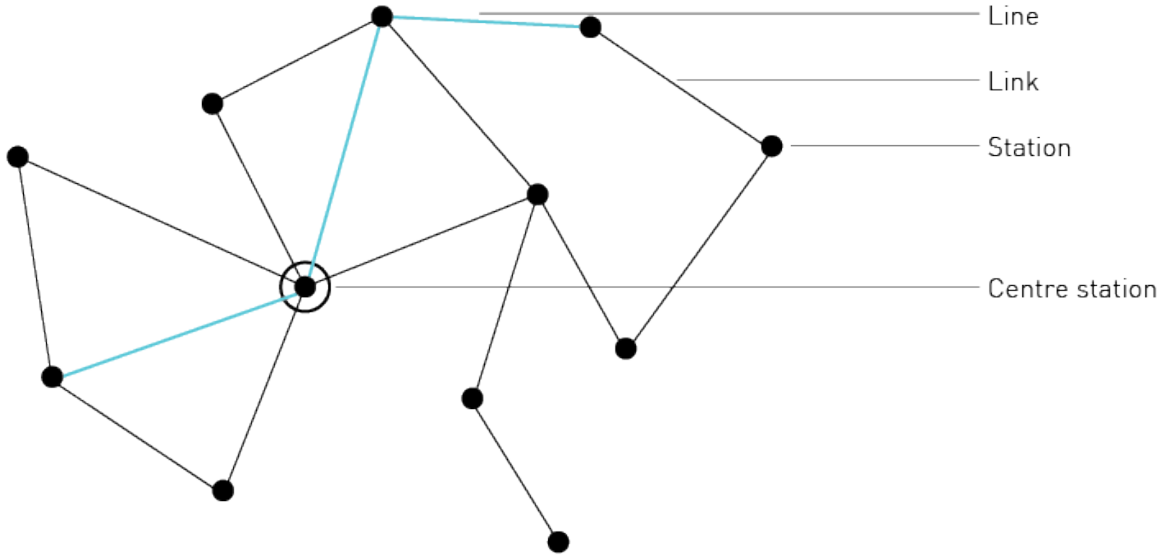


Figure 2. An abstract representation of the model's graph structure

time. The user does not need to calculate the time required to arrive at each destination individually, as all current possibilities are simultaneously presented to him in a graph-like structure. Immediate spatial-relations are drafted and heuristic conclusions can quickly be made. In the example presented in figure 1, Brixton Station is chosen as a departure point, demonstrating a very good level of integration within the general system, as the majority of central London stations are within 20 minutes ride. This data can easily be quantified and compared, and supposedly may contribute in understanding efficiency patterns and social phenomenon amongst other science.

To construct this model, a set of time-relations data has been re-organized in a graph structure (figure 2), in which all stations (nodes) are essentially connected one to another via 'transport links' (edges). Algorithmically, the model relies on two main classes: the Station class, containing connectivity data (what is connected to what) and the Link class, which contains the time intervals between each two nodes. To calculate the time between each two points, Dijkstra's (1956) algorithm has been implemented.

Other than the basic time-distance visualization discussed, several other features have been developed as potential future directions:
Live Data Set. The model relies entirely on a live data feed from the Transport For London (TFL) online API, implying a secondary time dimension implemented, as any change in the system's conditions (e.g. delays) immediately affects the displayed data. This feature results in a constantly updating live map fixed on the user's departure point, providing them with a comprehensive and live description of the system, potentially contributing to one's decision making.

Simulation Possibilities. The model allows the user to simulate the system when one (or more) of the transportation lines is not operating, reflecting the system's travel-time conditions for an imagined scenario. This feature, when extended, could provide designers with a tool to predict usage patterns for future events.
Introduction of Additional Data Sets. By referencing secondary data-sets into the model, an in-depth study of parallel systems' impact on the transportation network is possible. As an example, a set containing station entries data has been introduced into the model, applying a 'delaying' factor for a given station on its 'peak' times (figure 3). The outcome is interesting, as it depicts a dramatic change in the system's performance from one hour to the next. Another option implemented is a comparison between the system's description with and without the change times involved when changing between lines in a single journey. When factored into the model, this dataset brings to light a very different description of the overall system, explicitly revealing the falseness and naiveness of any non-time based model.
It is suggested that the new features described above could yield new and implicit information which would benefit both end users and researchers. This is discussed in the next part of this paper.

3. Reflections and Future Work

The potential benefits of a (certified) time based model for an urban transportation network is two-fold. First, the end users of such system will enjoy an accurate, comprehensive and real time description of the network's status, allowing them to take educated travel decisions on a daily basis. Other fields in which such tools may be applied in include property finding

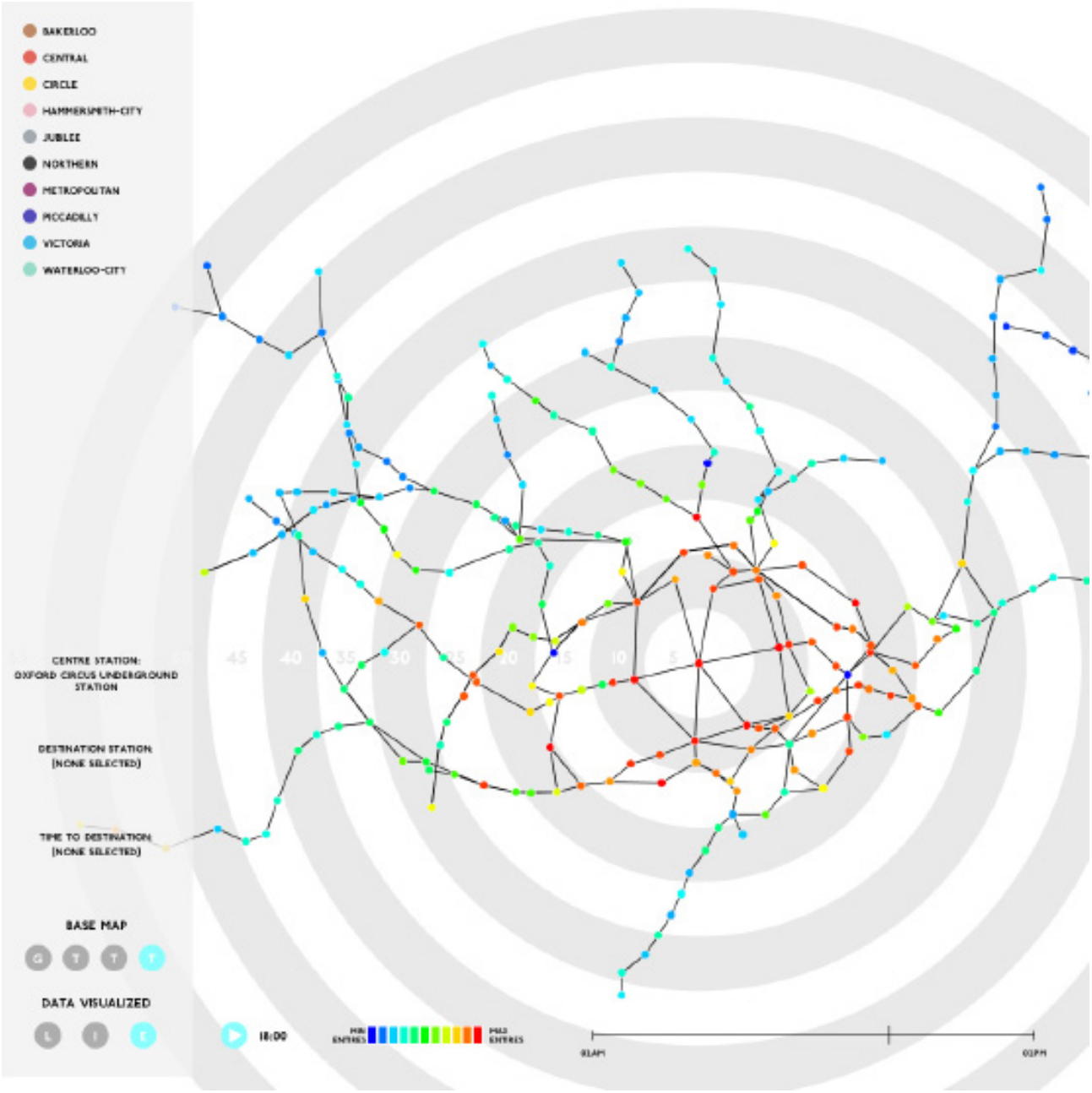


Figure 3. Time-distance mapping for Oxford Circus during rush hour (6PM)

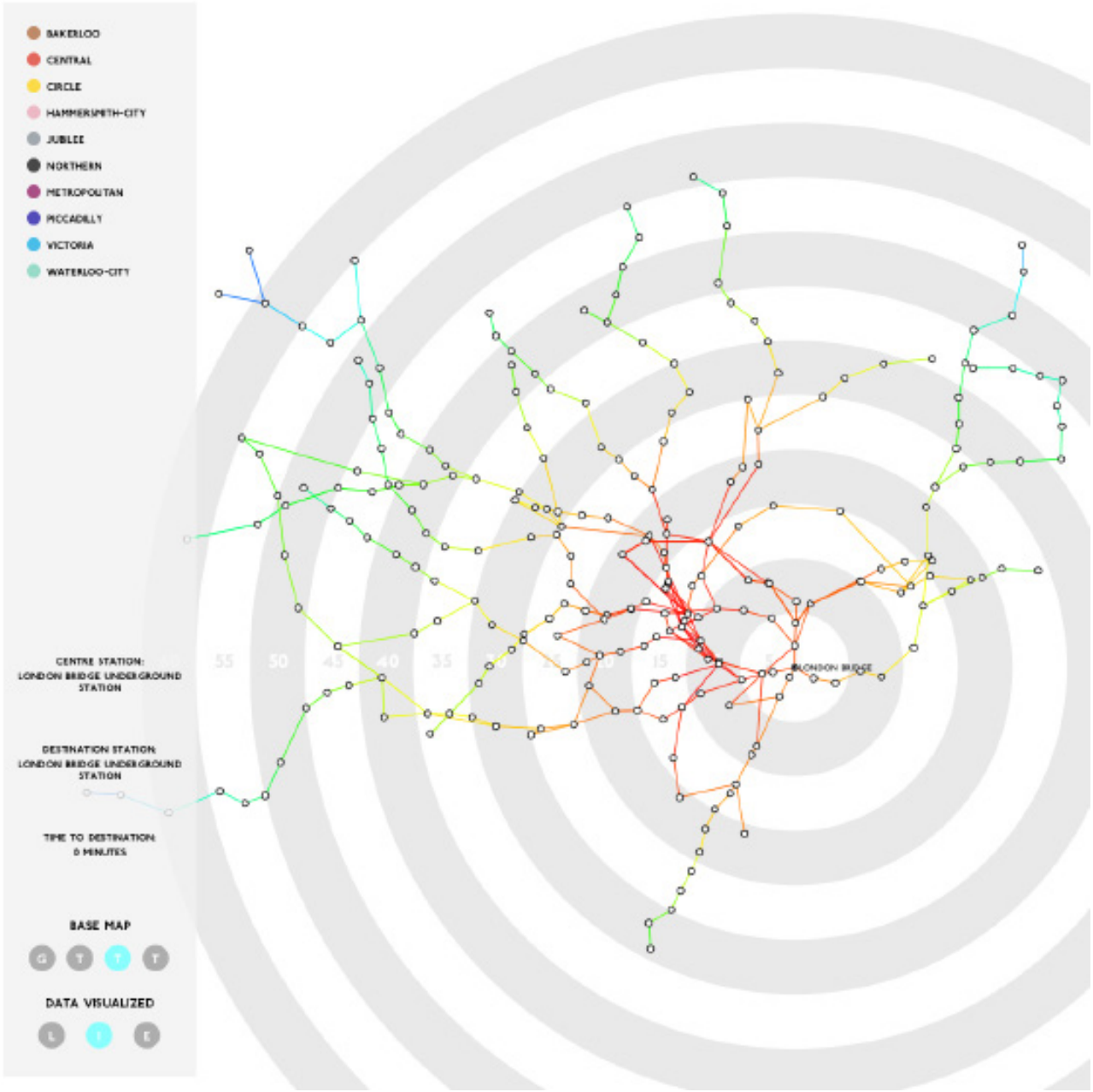
(e.g. where to place your office / home in respect of a desired urban habitat) or location services (e.g. finding an ideal location for a multi participant meeting, with users arriving from different locations). It seems that the main challenge here would be in providing a readable and easy-to-use interface to handle these dynamic and non-geographical results.

The second advantage a time based model would have addresses the researcher / designer position. This could result in a better understanding of accessibility within our cities, as well as the ability to predict service conditions via simulation as previously demonstrated. Furthermore, by superimposing time data-sets with other resources (as shown in the station entries example in part 2), we can begin and tie usage patterns to different efficiency levels within the network, which could ultimately lead to the development of concrete strategies for future events. Such feature may be achieved by implementing a machine learning algorithm which will later be used to predict service conditions for un-occurred events, potential expansions and strategic developments. The challenges for this group of developments are purely technological, and require the careful implementation and certification of various AI methods that could be confirmed through simple analogies with existing usage patterns statistics.

The research perspective may also be developed by applying existing analysis methodologies on such a time based model. To demonstrate this point, an option to display an 'Integration' analysis (Hillier 1996) for the system has been implemented (figure 4), allowing to numerically evaluate a system's various connectivity levels. In this mode, each link connecting two stations is treated as what would be space syntax's 'street segment', enabling the calculation of its relative integration level in respect of all other segments. This approach, however, has not yet been studied in the context of transportation systems and significant adaptations had to be made in respect of the original Space Syntax methodology and designation. It is therefore brought only to demonstrate the feasibility of such math and requires further study.

Another aspect which may be worth developing is an equilibrium condition for the system, or a holistic and un-centered time based model. Such an exercise may lead to a mapping which is very difficult to read for the untrained user, but may provide acute data for urban planners wishing to understand different connectivities in a complex environment.

Figure 4. An integration analysis visualization for London Underground's transportation model



4. Conclusions

Conservative approaches in which transportation systems are modeled on a geographical basis carry several disadvantages that limit their ability to offer easy-to-exploit and reliable information. As an alternative, such systems' modeling on a time basis and in a topological environment has been brought forward and argued being advantageous for both end users and researchers in various aspects. The case study software presented in part 2 of this paper demonstrates an accurate, user-based mapping which remains true to the system's operational conditions at all times. Its responsiveness embodies the constant change occurring in urban systems and reflects a user-centred, data driven approach. The alternative model proposed may imply 'bottom-up' spatial phenomenon as individuals receive personalized spatial analysis of the greater system for their own personal decision making process. This, in turn, could derive changes in the urban space consumption patterns and lead to the reconceptualization of urban adjacencies as a consequence of multiple dynamic variables.

Time based modeling of transportation systems may also be beneficial for researchers and designers, providing vast simulation possibilities which are exhibited in a functional user environment. It provides opportunities to easily infer and visualize multiple data sets which provide a more genuine description of a system's complexities. Specific phenomenon may be isolated and learned in detail, which could ultimately derive prediction abilities. Finally, the required future research and opportunities described in part 3 should be established in respect of contemporary technologies that would define such method's frontiers.

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TOUCHSTONE: A DISCUSSION OF A DIGITALLY INTEGRATED ARTWORK DESIGNED TO FACILITATE COMMUNITY ENGAGEMENT

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Keywords: interaction, sound design, technology, landscape, urban design

This paper provides the technical details of the installation of an innovative integrated public artwork in the South-Eastern suburb of Clyde North, Melbourne. In a previous paper the authors reported on the first phase of the research: the conceptual development of the work and its focus on the idea of memory. The previous paper described how the research team set about designing an artwork that could remember the history of the landscape in which it was embedded, and how the newly formed suburb might build its own new set of memories in relation to the artwork.

This paper will focus on the second phase of the research: the technical details of fabricating and installing the work, including the physical 'body' of the work: stone, steel and timber; and the 'expressive' qualities of the work: sound, light and vibration. The paper contains two parts. The first part describes the fabrication and installation of the work in relation to its four key modes of expressions: interaction design, low-frequency transduction, audio playback and lighting. The second part describes the 'behaviour' of the work in relation to its 'memory', which is spread across four sequences each 24-hour period: dawn, day, dusk and night.

The paper concludes with a discussion of the artwork's role as a sonic placemaking tool, which aims to foster ongoing community engagement by way of repopulating the artwork's memory with locally-procured sounds.

Figure 1.
The artwork contains two basalt rocks within a continuous surface, with digital and audio infrastructure situated below. The right image shows detail of the aluminum strips, inlaid into the stone's surface.
Courtesy of Jordan Lacey

1.Introduction

In an earlier paper (Lacey, 2018, forthcoming) the authors reported a conceptual design process in which an integrated digital artwork was produced. The paper described in detail a complexity of ideas that developed through co-ordinated meetings between an interdisciplinary university-local government team, which sought to integrate an artwork into the plaza of a new community center. Proposals ranged from singular objects to large scale distributed-networks (see Lacey, 2018, forthcoming, for examples), ultimately leading to the selection of a medium scale site (approximately 4x8m). Originally the site was going to be a raised timber deck and garden bed, but was lowered so as to provide a continuous surface and protect the artwork's digital and audio-visual infrastructure. The project demonstrates how technology can be creatively embedded into the everyday fabric of cities (Landry, 2012) to produce environments that are at once performative, community engaged and durational. The paper will describe the fabrication and installation of the work, and explorations of temporal themes in interaction design (Lundgren, 2009). It will end with a discussion of how such an artwork can be a sonic placemaking tool (Flemming, 2007; Carter, 2015; Lacey, 2016a) for community engagement. The paper has been specially designed to house multiple images, which will act as signifiers to clarify the text-based descriptions.

2. The artwork

Touchstone is a public art work commissioned by the City of Casey for a new Community Hub in the Selandra Rise housing estate, located in the suburb of Clyde North. Selandra Rise is one of the many new housing estates being built on the rapidly expanding south eastern urban periphery of Melbourne. The artwork, situated near the entrance to the Community Hub and integrated into the landscape of the building's forecourt, consists of two sculpted pieces of Victorian basalt that sit within or are seen to emerge from the plaza surface. The ground surface of the artwork is part timber deck and part metal plate. Slightly off-set from the central stone, and rising from beneath the deck is a single Crepe Myrtle tree. The central stone, called the sensing stone, is embedded with four aluminum strips and sensing electronics that convert the latent electrical charge (capacitance) emitted by our bodies into data (see Image 1). The data enters a software program that is able to translate interaction with the sensing stone into audio-visual outputs. The artwork contains its own memory, enabling it to collect, store, recall and recompose data in a different way each day, thereby avoiding the potential homogeneity that can be accompanied by repetitive experience (Lacey, 2016).

2.1 The Prototype

Prior to fabrication and installation, a prototype was built to test the artwork's proposed materials, software programs, and the sounds and lighting that would become the expressive elements of the artwork (see Image 2). The prototyping period was important as it allowed the artists and designers to focus on their work without being concerned about the complexity of contested public space (Stevens, 2007; Ouzounian, 2008). The prototype confirmed

Figure 2.
The prototype allowed university and council workers to test the materiality, digital and audio elements of the work before installation.
Courtesy of Chuan Khoo

a nominal behaviour of the artwork, with only on-site 'tuning' required once the work itself had been installed. The fabrication and installation of the work will be described by way of a description of the key interactive components: interaction, transduction, audio playback and lighting. There are four sequences, running over a period of 24 hours, that inform the daily behaviour of the artwork. Before describing these, the infrastructure of the artwork that allows the expressions to occur will be described.

2.2 Interaction

The heart of the work, where all the disparate elements intersect, is the aluminium strips and sensing electronics that react to tiny changes in electrical capacitance. A detailed design element of the work was getting the stones carved to specification by stonemasons, and delivered to a metal worker who secured the aluminium strips with a suitable silicone compound (Sikaflex 11FC) into four grooves. The design team carefully drew the four grooves onto the rock (see Image 3) to give the impression of curvature along a 3D surface. A surprising outcome after installation is that the metal strips did not have to be touched for the metal plates to vibrate. This suggests that the basalt possessed a mineral and structural porosity which led to good qualities in resistivity and electrical capacitance, allowing for sufficient electrical capacitive coupling to occur between stone and body. As such, the rock can be patted, touched, hugged, and variously caressed almost anywhere to produce a response. In addition, the artwork is responsive to environmental conditions, especially rain. The aluminum strip ends are connected with wires, which pass into a series of water-proofed circuitry boxes that feed the computer system with real-time touch data inside the community center. Details of the technical specificities of the interactive system will be discussed in a separate paper.

2.3 Low-frequency transduction

Low-frequency transducers are embedded with pistons that move backwards and forwards in relation to an incoming audio signal, much the same way diaphragms in a speaker move. This action causes physical materials to vibrate, which are connected to the transducers. In this case two 'buttkicker' transducers, which specialise in low frequencies (300 Hz and below) were connected to two 'transducer beams' that traversed the two metal plates (Image 4 – central plate). The metal frame legs were bolted to a concrete plinth set in the middle of the pit. The

Figure 3.
The research team worked closely with the stonemasons and metal workers to produce the sensing stone.
Courtesy of Chuan Khoo

Figure 4. The central image shows the two transducer beams stretching away from the sensing stone. A water–proofing solution for the transducers (right) was crated before being attached to the transducer beams. The left image shows the concentric contours of stone and plate, which allows for uplighting effects.
Courtesy of Jordan Lacey

plates were lowered and bolted onto the frames, and separated from the frame with industrial strength rubber. The rubber prevents vibrations being transmitted from the plate to the frames, ensuring a maximum of vibrations will pass through the human bodies that stand on the plates. The design of the metal plates was an act of meticulous crafting given the tapering edges of the plates and the requirement that the central void wrap around the contours of the sensing stone (Image 4 – left plate). How transducers would survive the elements was also a major concern, with the install potentially being in place for as long as 20 years. To resolve this, two water-repellent covers were produced and situated between each transducer and a protective shroud welded to the underside of the frames (see Image 4 – right plate). Silicone conformal coating was also applied to the speaker wire terminals to seal in the otherwise exposed connections. Six discrete compositions were produced for the plates, which are discussed below.

2.4 Audio playback

Beneath each of the timber surfaces a BOSE FreeSpace 51 environmental speaker was located,

Figure 5. Installing and securing the in-ground speakers.
Courtesy of Chuan Khoo

Figure 6. Diffracted light at dawn caused by the DMX lights passing through a perforated pattern in the metal plates. The dawn hues were considered in relation to the lighting design. Courtesy of Jordan Lacey

able to withstand very wet and humid conditions (see Image 5). The speakers played two roles. Firstly, they compositionally accompanied the vibrations of the metal plates with tone generators that emitted harmonic frequencies higher than the transducers' playback range, enabling the body to feel and the ears to hear. Secondly, they played back sonic ethnography samples each dusk. Sonic ethnography (Pink 2015), as described in the previous paper, was discovered by asking local residents via a facebook community page what sounds represent their community. Based on this a team of sound artists took to the streets with field recording gear. After editing and testing, a total of 144 field recordings were embedded in the playback system under seven categories (though not all survived the final onsite 'tuning' period). These included: environmental, rural, voices, youth park, machines, construction and performative.

2.5 Lighting

The final component of the artwork are two custom-built DMX512 lights embedded in the concrete plinth either side of the sensing stone. A perforated pattern in the metal plates surrounds the base of the rock, allowing for the uplighting to produce diffracted patterns on the surface of the rock (see image 6). Lighting is linked with the sonic ethnography in that, each dusk, the artwork chooses a lighting range that matches the selected sonic ethnography field recordings. A range of colour is selected based on the amount of interactions. These colours slowly emerge

Figure 7. The interaction system with its creator, Chuan Khoo. The left image shows the system in testing phase, and the right image its final home inside the community center. Inset is a list of mapped parameters.
Courtesy of Jordan Lacey

at dusk and set the possible pallet of colours that can occur at night. In this way the vibrations, the audio and the lighting are all linked by the software system, to create an interconnected multi-sensory experience. The paper now turns to a detailed description of the four durational sequences that inform the behaviour of the artwork.

3. The four sequences

The artwork is not only a solid piece of infrastructure with strong durational qualities (made of stone, metal and wood), it is also an intelligent data system able to read the environment including those who interact with it. Coupling the abstract user interface and the 24-hour temporal engine that modulates the memory of touches produces a 'slow technology' experience (Hallnäs, 2001), in which cumulative community interactions are resolved at the end of each day. A decision was also made by the design team to embed two soundmarks within the work (Schafer, 1977). This references the importance village bells played in more ancient communities (Schafer, 1977; Corbin, 1988). It was speculated by the design team that soundmarks might become meaningful to the community, if the sequencing of the artwork was built around this intention. However, once installed it was immediately apparent that something else was occurring. In fact, the soundmark was the constant presence of the vibrating, humming structure. And the dawn and dusk events, rather than acting as soundmarks, have become short durational performances.

3.1 Dawn

Civil twilight is the moment when the sun is 6° below the horizon, bringing about deep blue hues in the sky. At the precise point of sunrise – the moment right after civil dawn – the artwork plays back a hindi lullaby and environmental field recordings from nearby wetlands. The vibrations are a set composition that were designed to sound like a tabla that builds in intensity as the sky lightens, which also complements the hindi lullaby. These are the only non-interactive vibrations, the intention being to leave the work to greet the day in its own particular way. The hindi lullaby was selected due to the large hindu population in the surrounding area. The intention is to record many more songs and chants in local languages that are evident in the area, which is consistent with local efforts to "tailor social activities to residents' demographic profile [and] support a range of culturally diverse opportunities for social interaction" (Vichealth, 2016, p. 5). The lighting that had previously been active at night slowly disappears back to the hue it started with the evening before.

3.2 Day

After the five minutes of dawn the rock then settles into its day sequence, which is marked by four distinct vibrational compositions. One of the compositions is a gentle, ambient work. It plays about 70-80% of the day. The remaining three compositions, ranging from 2-5 minutes, pass more powerful pulses and vibra-

Figure 8:. The ethnography samples were stored, along with the vibration compositions, inside Ableton Live.
Courtesy of Chuan Khoo

tions through the body. During the day, the artwork is busy collecting data. Every interaction is stored in a five-minute buffer that will inform the dusk vibrations (see Image 7). Each composition has the four interaction types – hover, touch, tap and embrace – mapped to a variety of audio effects (Image 7 – see inset image). The embrace gesture requires the user to hug the rock or work with a friend to grasp it from both sides. Hover, touch and tap turn the rock into what might be considered a combined theremin – percussion-based object.

3.3 Dusk

At civil dusk, when the sun has receded 6° below the horizon, the artwork shifts into the dusk phase, lasting, like dawn, for five minutes. Each dusk, the artwork plays back two lots of sonic ethnography samples (see Image 8). The system is designed so that future council projects might encourage community members to add their own community sounds as the artwork ages. There is no limit to the number of sonic samples or categories that the stone can express. The artwork will pick an ethnography sound type and a colour range, determined by the degree of interaction recorded during the day. The second ethnography sample is chosen at random. This is to ensure that quiet days will nonetheless yield a non-repetitive set of ethnography samples. The metal plates play back a composition that references a condensed playback of the day's interactive events – a reminiscing of the day that accompanies each sunset with a deep, ground-borne sonority. The public can still interact with the rock to make some changes to the dusk composition.

3.4 Night

Finally, the work comes to a rest and enters the night sequence (see Image 9). The lights go out and the vibrations stop. However, the rock is responsive to interactions for the entire evening. If the rock is held, a resonating composition emerges from the transducers, but not the audio speakers so as to reduce the risk of noise annoyance. The lights (the range of which is selected at dusk) illuminate the rock at night, increasing in colour saturation the longer a touch is held on the sensing stone. If the stone is tapped, bright flashes of white light punctuate the feedback, and quickly recede, affording a dramatic counterpoint to its otherwise ambient presence. At night, the artwork's memory is expressed by the murmurs and flickers of a dream state. In this case, the memory of the artwork operates as a circular buffer, retaining the most recent 28 days of activity and letting go of its most distant memories. At dawn, the night sequence concludes, and the cycle starts again.

4. Main findings

- Integrating sculptural and landscape qualities with interactive and sensorial feedback systems creates an embedded spatial and placemaking experience.
- The construction of interactive systems as entities that possess memory offers the opportunity to connect community with their surroundings.
- Pre-installation prototyping ensures uninterrupted design. Post-installation 'tuning' enables adaptation to site-specific conditions.
- Basalt can possess qualities, which lead to electrical capacitative characteristics extending beyond metallic inlay contours.
- Coupled low-frequency vibrations and mid-high frequency tonal generators creates an immersive sound environment that affords a heightened affective field.

5. Conclusion

In the design team's previous paper (Lacey, 2018, forthcoming) the artwork was described as an 'Other' as a means to convey its perceived physicalities, characteristics and emergent behaviours. Now installed, the work may be better understood as an extended system of affective materialities; an unusual mix of solidity and ephemerality in which the user's interactions temporarily form an experiential interconnection between ground, self and sky. It is the embedded technologies that make this unusual interplay of solidity and ephemerality work.

The body of the artwork is steel, timber, stone and computer hard/software; the expression its sound, light and vibration. The touching of the undulating surface of the stone is met with varying vibrations, and the dawn and dusk events provide a performative field of sound and light that gives expression to the work's otherwise solid infrastructure. In addition, the artwork is expressive without user experience both directly (rain, birdlife) and indirectly (shifting fields of light and sound), which augments its material connections with the immediate environment. It is expected that the unusual form and behavior of the work should pique the curiosity of citizens, encouraging them to form a connection with the site. Indeed, anecdotal evidence (through recent onsite conversation) suggests that the work does produce a curiosity in those who interact with it, including the comment that the work 'breaks the monotony of the landscape'.

This view is consistent with the aims of the research team. In the next phase of the research, the design team plans to work with local government to create an ongoing program of community based projects in relation to the artwork. New sounds will populate the artwork's memory in an effort to encourage the

Figure 9. The artwork sits silently at night. Lights and vibrations emerge upon touch.
Courtesy of Chuan Khoo

community to take an active interest in its unfolding presence. These new sounds will be generated by the community in collaboration with artists. Sounds will include chants, singing and stories of different cultural groups in the immediate region, and new environmental field recordings. In so doing, it is expected that the site will become a gathering point during its dusk and dawn events when various combinations of these community-generated sounds can be heard. As such, this work aims to be a sonic placemaking tool, which produces interconnection with place via continuous acts of community participation. An analysis of these activities will form the next phase of research, which will be reported on in a future paper.

6. Acknowledgments

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CO-CREATING RESPONSIVE URBAN SPACES: A TWO-YEAR ACTION RESEARCH PROJECT UTILISING ARENA BOULEVARD AS A TEST BED

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Keywords: public domain, urban design, media installations, co-creation, responsive spaces

This paper explores how interactive installations could provide a new repertoire for urban design that activates the public space as a public domain. We use responsive urban space as a synthesising concept, defining it as a public place that can adjust in real-time to its users and to shifting conditions.

To realise responsive urban spaces, three gaps between urban design and the praxis of digital-media installations must be bridged; namely, those existing between: scientific disciplines, methodologies, and stakeholders. This paper demonstrates how we are attempting to overcome these gaps through our two-year action research project, Co-ReUs (Co-creating Responsive Urban Spaces), which takes ArenA Boulevard in Amsterdam as its case study.

The approach combines research-for-design and research-through-design. Firstly, a triangulation of quantitative and qualitative analysis is proposed to aid in defining the problem areas; secondly, an interdisciplinary vocabulary is introduced to assist the various disciplines working in urban and digital-media design in moving from the problem to a solution; and thirdly, co-creation sessions are conducted with a consortium of 20 stakeholders, producing prototypes to be tested on location. In this paper, we share our approach and conceptualisations and offer for debate our first findings.

1. Introduction

Public space makes cities work – not only functionally, as the necessary backbone for flows of goods and people, but especially on a deeper, more fundamental level, being the places where – speaking in sociological terms – the continuous production of society takes place (Carmona, 2010; Banerjee, 2001; Stanek, 2011). In order to do so, public places have to function as a public domain. Public domains are those places where an exchange between different social groups is possible and also actually occurs (Hajer & Reijndorp, 2002). In streets, squares, plazas, boulevards and parks, people meet, acknowledge one another, and interact. These interactions fuel the process of identity formation, a sense of belonging, and the production of collective values. However, many scholars emphasise the erosion of public space due to the trends of individualisation, commodification, commercialisation, safety measures, and the like (Lang & Marshall, 2017; Minton, 2009; Montgomery, 2013). Moreover, not every public space can afford to become a public domain.

The rise of digital-media technology plays a double role in these developments. On the one hand, it has been criticised for further individualising the urban experience, creating 'tele-cocoons' or 'private bubbles' in which individuals can retract while in the public space (Goldberger, 2003; Graham, 2005). On the other hand, many people allude to the ability of digital media to create urban publics in new ways (Brynskov et al., 2014; Foth, et al., 2011; De Waal, 2014; Pop et al., 2016; Häusler et al., 2017). Especially digital-media technologies that relate to the public space, such as the rapidly developing industry of sensors, IoT, and interactive installations, which provide a new and promising set of concepts and objects that activate the public space as a public domain.

Many experiments have been conducted and installations erected in recent years, represented in recent publications (Capelli, 2012; Cantrell & Holzman, 2016; Brownell, 2017) and displayed during events such as the worldwide Media Architecture Biennale, Playable City (Bristol), and the Connecting Cities programme at sites across Europe. So far, these installations have mostly been analysed and constructed from an artistic or HCI (Human Computer Interaction) perspective. What needs to be further developed in these approaches is a connection with debates on the spatial design of the physical fabric as well as an application in urban design practice. And reciprocally, professionals engaged in planning and urban design have yet to recognise digital media installations as being one of the building blocks in their repertoire.

Here we argue that new site-specific digital-media technology has the potential to become a producer of spatial quality. Particularly if it makes it into mainstream urban design – a profession responsible for the public domain – and could put this into practice. One might say that there is a gap between the practice of urban design and the more recent industry of interactive installations. Our two-year action research project, Co-ReUs, aims to explore the matter and bridge the gap. While we are currently in the midst of it, we would like to share and debate our approach and findings thus far.

2. The concept of responsive urban space

We have defined responsive urban space as a synthesising concept. In our research we describe it as a public space that can more readily adjust to its users and to shifting conditions in real time, pursuing the enhancement of conditions that create a public domain. In contrast, a common practice in urban design is the construction of a public space that is 'rather neutral' and is able to accommodate activities rather than to specifically condition them. This design convention was re-established after multiple design experiments in the 1990s with public squares that – in retrospect – were overdesigned, leaving little room for non-anticipated needs and uses (Lang & Marshall, 2017). The new possibilities for interactive installations and sensor technologies call for adjusting the place to its user needs in real time, creating a new layer of flexibility as well as time- and situation-framed spatial qualities. In terms of practice, the urban designer would be able to work beyond the traditional final stage of the final plan. Designing responsive urban spaces calls for faceted plans that target different moments in time and user needs, adding a 4th and 5th dimension to urban design.

Yet, the act of creating responsive urban spaces is still in the experimental phase, largely centred round events and art exhibitions or entailing a primarily tech-driven smart-city approach. Boiled down to our key research question, we want to explore how digital media installations can be transmitted to the praxis of urban design in order to improve the public domain affordances of public places. As we will discuss, this demands the bridging of three gaps: scientific, methodological, and stakeholderships. In this paper, we set out our approach and offer for debate our first findings.

3. Bridging fields of knowledge

On a scientific level, researching responsive urban spaces demands the linking of three disciplines and their corresponding expertise. Urban design research allows us to understand the relationship between the spatial fabric and the conditions it provides to create a public domain. We have built upon a rich body of literature that analyses urban design conventions in relation to the creation of well-functioning public places. Co-ReUs explores how interactive installations can serve a similar function by entering into urban design practice.

Urban design, however, tends to have a limited scope in regard to understanding the public domain as a social process in action. We therefore revert to a second discipline: urban sociological research, which frames the public domain as a place of social heterogeneity, openness, confrontation, and group interaction. This knowledge helps us research public spaces as well as understand how digital-media installations can contribute to strengthening the social dimension of the public domain.

Thirdly, we include media studies, so as to understand all the dimensions of digital-media installations. Various academic domains study the subject, the most prominent being HCI and humanities-based aesthetic perspectives. Concerning the latter, the installations are often understood as temporal events that can catalyse social relations or 'issue publics', or can contribute to the creation of a 'sense of place'. In this approach, the public realm is not so much understood as a spatial construct but as a temporal one; it comes into being through the interactions facilitated by the installations. The HCI approach mainly focuses on the design and usability of interfaces in these installations and on their various modes of representation. Although this field of study is not necessarily concerned with the notion of a public realm, its knowledge about the use-value or productivity of interfaces is crucial in understanding and shaping relations between media and people.

4. Triangulation of methodologies

On the level of methodologies, a triangulation of methods is proffered to explore importing digital media installations into the practice of urban design. In order to investigate in depth, Co-ReUs works around one case in point, Amsterdam's ArenA Boulevard. Figure 1 shows the combination of quantitative and qualitative situational analyses, with a third column covering literature review and desktop study of best practices and their key components and functionalities. The quantitative and qualitative analyses are conducted as research for design, aiming to diagnose the situational problem and trace the building blocks for the subsequent research through design phase of the project.

ArenA Boulevard represents a unique test bed in which lessons can be learned that apply to many other places. ArenA Boulevard is a large square 'kind of place' in the south-eastern part of Amsterdam, designed in the early 1990s. It's a leisure area, containing the Ajax football stadium, two concert halls, several superstores, and a furniture mall. In the direct vicinity are tall office buildings as well as multiple hotels. The square is unique for its pedestrian-only status and it is designed as a zero-friction space for the flow of the 100,000 visitors that pass through during peak hours. However, the rest of the time the space is much too large and monotonous to comfort and guide the current users. Comparable with many post-war public places, it lacks provisions for its users and does not contain a common gathering zone or 'vestibule'. Our research focuses on the off-peak hours. How could digital-media installations be employed during this period to enhance the qualities of the square as a public domain?

In order to understand the physical fabric of the square, we analysed its spatial concept, employing a combination of design research techniques (an urban design survey, a comparative morphological analysis, and a sectional analysis). Contrary to traditional boulevards and squares, the space lacks enclosure and there is no rhythm of side streets or visual and functional destinations at the western end. At nearly 5000 square metres, the space is enormous, four times larger than the traditional (historic) urban squares found in Dutch cities. Moreover, the buildings are not designed to form a streetscape but instead function as autonomous objects in space, with hard, unfriendly surfaces. A sectional analysis of the Boulevard emphasises how it can be understood as three fragmented subspaces, a division which is also visible in the light-intensity map. (Figure 2)

The quantitative research focuses on pedestrian patterns in relation to the ArenA Boulevard space. We used the roof of the 28-storey office building at the western end to record time-lapse footage spanning four evenings and an afternoon (all on weekdays and during the winter months). The evening footage covered the final hours of daylight into twilight and darkness, with the recording starting at the very end of rush hour. The software was programmed to transform the footage into heat maps, revealing pedestrian patterns. These maps also indicate where pedestrians reroute, scatter, and cluster. (Figure 3)

In order to understand the different users and their perspective with regard to the space, we combined three methods. The first was to understand how users perceive the space. We interviewed 165 people about their experiences and opinions of this boulevard. The results of their appreciation levels were mapped, demonstrating a clear differentiation between the eastern and western parts of the square. (Figure 4)

To research the interaction between users as well as their daily rhythms, we made systematic observations at different times of day, totalling 20 hours. We observed group and individual behaviours at eye level using qualitative urban sociological observation techniques. Finally, we commissioned two photographers to visualise and contextualise the five user groups: office workers, families, shoppers, leisure-facility visitors, and tourists. (Figure 5)

This triangulation of research methods reveals three subspaces with their own physical and social

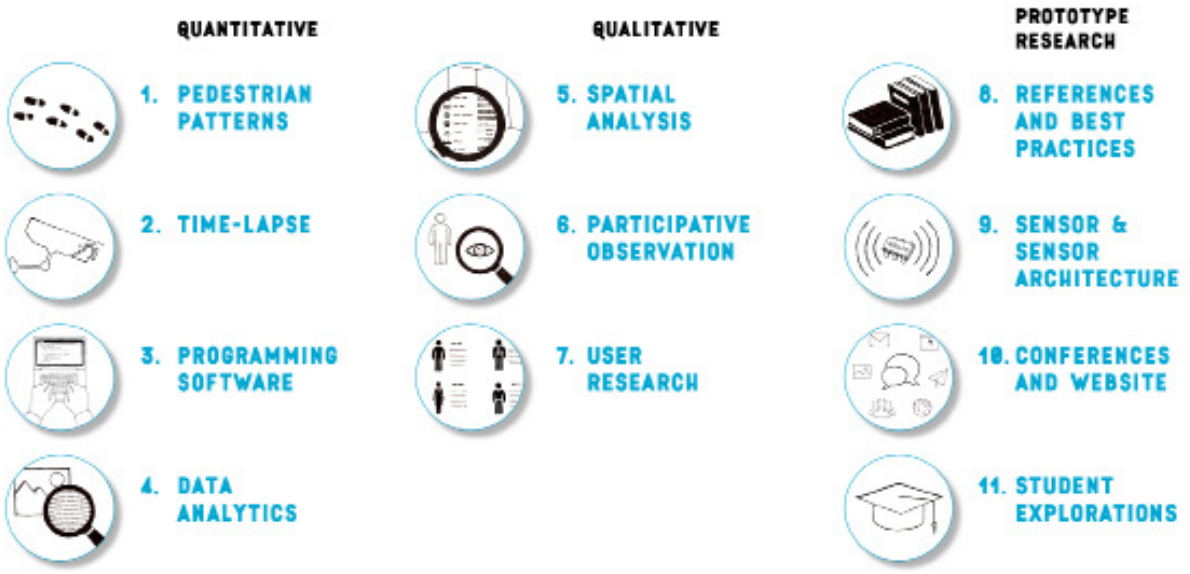

Figure 1.
Triangulation of methods along three lines of action

characteristics, users, and patterns. On the basis of our findings, we drafted an initial definition of the problem and a subsequent programme of demand for each subspace, to improve these locations as a public domain. The drafts form the starting point for the construction of prototypes to test digital-media installations as a spatial solution. For this purpose, we are working on co-creation with multiple companies.

5. Connecting stakeholders: co-creating responsive space

Responsive urban space demands the participation of various professionals and businesses. To this end, we have teamed up with 20 parties. (Figure 6)
The consortium consists of three urban design bureaus, seven interaction-design bureaus, and five local businesses, including Ajax Stadium and a large concert venue. This blend is complemented by three design startups, the Municipality of Amsterdam, and the Dutch branch organisation of urban design and architecture, as well as the University of Amsterdam and TU Delft (see: www.responsiveurbanspaces.amsterdam). The modus operandi of this research activity consists of regular co-creation sessions, leading to prototypes to be constructed and tested in the Boulevard at the end of 2017.

A main step in connecting this heterogeneous group was to build a common vocabulary and a culture of collaboration. How could we bring together the knowledge of the various stakeholders in such a way that it becomes instrumental to the collaborative effort to improve the public domain of ArenA Boulevard? Based on the literature review, desktop research, and a series of co-creation sessions with the consortium, we drew up a set of four 'functionalities' that digital-media installations could adopt:

- Sense of place (symbolic) refers to the affordance of digital-media installations to reveal layers of symbolic meaning, or to the collective rhythms of a particular place. These layers and rhythms could be made visible on urban screens or in soundscapes or through mobile media apps; they could be curated, responsive, or interactive.

- Personalisation & Appropriation (personal-use value) refers to the affordance of digital media to filter, personalise, or select particular aspects of a place according to personal or collective taste. Examples in this category help users of a place feel at home, offering 'shelter' or appropriate a 'place'. This can swing two ways. Apps or urban screens could expose aspects of a place that are relevant to the individual. The other way round, physical interventions could help visitors appropriate a place and create a sense of ownership within it, for instance by inviting the public to take photos for use on social media.

- Playful Interaction (relational) refers to the capacity of digital media to connect and forge relations between visitors of a particular site. These could be synchronous or asynchronous. They could be mediated in the installation itself or provoked by the installation, with the installation serving as a 'conversation piece' that brings about brief encounters between passers-by.

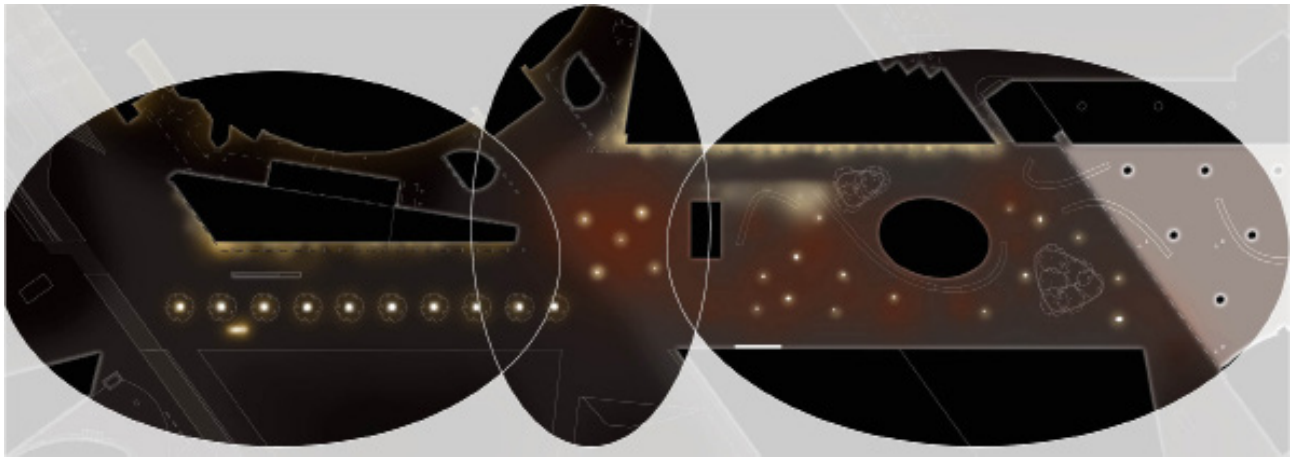

Figure 2: Light-intensity map, showing the three overlapping areas in ArenA Boulevard

- Routing & Legibility (spatial experience) refers to the functionality of media installations as elements that play a role in the way visitors grasp, experience, and understand a place. This category includes wayfinding, routings, imagebility, and walkability. In some respects, it taps into the scholarly work of researchers like Kevin Lynch (1979) and the research on walkability (Speck, 2012, etc.).

These functionalities are not exclusionary – they describe various dimensions of a digital-media installation that can be combined. For example, a routing system of coloured lights (a path helping users navigate a space) could be designed in such a way that its lighting pattern reflects the collective rhythm of the place. Playful interaction that encourages encounters between visitors can connect to symbolic meanings in a particular space and at the same time function as a physical boundary that defines it.

To further demarcate the problem space and devise

Figure 3: Illustration of a heat map showing pedestrian patterns

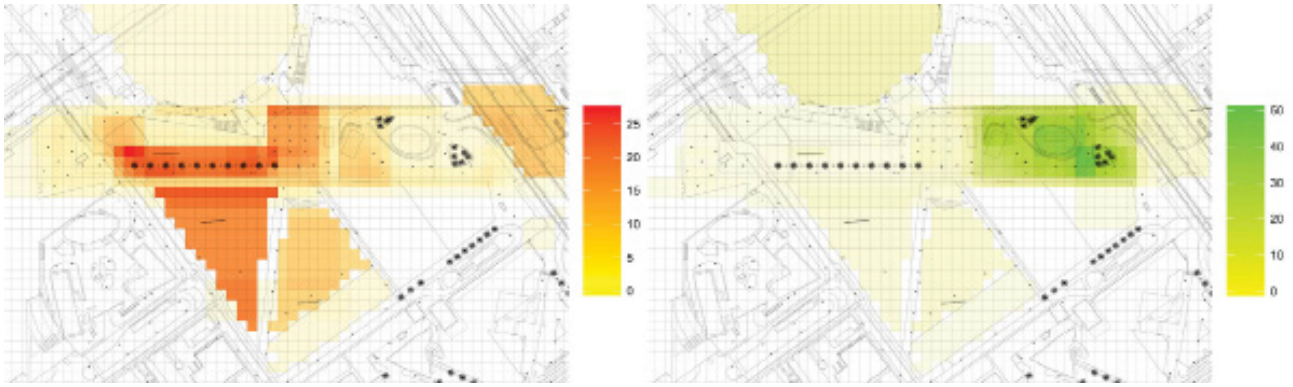

Figure 4: Geographically-plotted appreciation scores (n=165)

Figure 5: Boulevard users (photo: Geisje van der Linden)

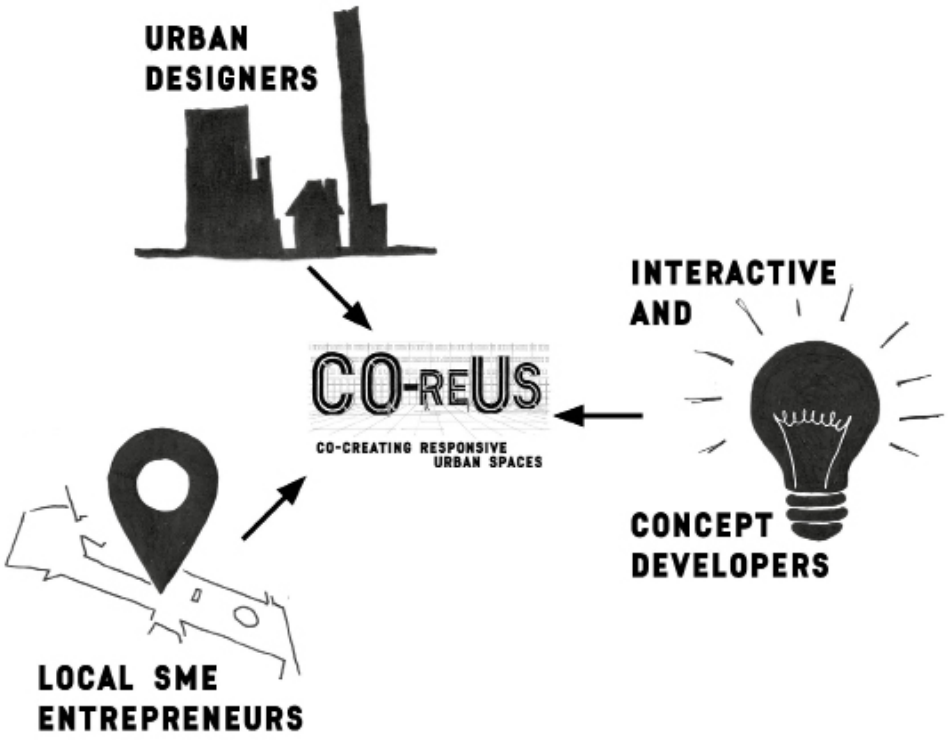

Figure 6: Three businesses join in to create responsive urban spaces

a solution, two co-creation sessions were created to produce ideas and then construct them. The participants were asked to make paper or cardboard miniatures of digital-media installations and to insert these into a simple scale-model of the Boulevard.

More specifically, the participants were asked to:

- address one or more of the three subdivisions of the Boulevard, starting with each programme of demand
- attach ideas to the four functionalities and their various dimensions: symbolic, personal, relational, and spatial qualities that digital-media installations could articulate
- focus on a specific off-peak moment and user group(s)

The sessions resulted in a wide range of possible concepts, and also further established the groundwork for the collaboration between stakeholders.

Figure 7: research through design co-creation sessions (photo's: HvA Co-ReUs)

6. Next step: building and testing prototypes

We are currently choosing concepts that will be built as prototypes to be tested in the Boulevard. The consortium is included in the selection process and is participating in the construction, pre-testing, and optimisation stages. The prototypes will be instated in November, December, and January. These tests will be treated as experiments, with a quantitative and qualitative pre-analysis conducted to include and rule-out specific conditions. A similar analysis will be made once the prototypes are in place. All together, we aim to use the outcomes of this research through design phase as proven practice that renders imaginable the transmission of interactive installations in the field of urban design. As an end product, we aim to provide a tried-and-tested overview of the application of interactive installations in the field of urban design, and to emphasise that the qualities of the public domain are able to be improved by treating and designing responsive spaces.

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- Figure 5: photo's Geisje van der Linden
- Figure 7: research through design co-creation sessions (photo's: HvA Co-ReUs)

SYMBIOTIC DATA PLATFORM

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Keywords: building information modeling (BIM), internet of things (IoT), citizen design science, interaction, real-time data

Rising up the concept of Responsive City, put the definition of Smart City in the urban terminology one step further, and added interactivity and participation to the context.

In this paper, the intention is to give a brief standpoint to address 'Responsive City' phenomena, by explaining the ongoing project 'Symbiotic Data Platform' on the way of introducing a receptive and responsive tool that focuses on the public space use, by approaching the European Project: 'Active Public Space'.
Symbiotic Data Platform is using individuals' local data (active and passive data collection) to serve the global organization, and also closing the cycle by returning the benefit to the user. As a result, combining two existing technologies (BIM and IoT) and creating an interactive-digital network, which will be operated by the citizens. Therefore, creating an interactive tool will increase citizen participation level in digital environment thanks to 'Citizen Design Science '.

Main focus of the paper is to make a reflection from the platforms outcome on public space usage by aligning with citizen participation methodology with digital mediums. Capturing data by taking advantage of IoT, and simplifying the existing data in urban gathering places, in main streets and plazas, and monitoring it through a BIM representation, will be the new solution for productivity, efficiency and sustainability in urban development.

1. Introduction

In the last decade, architecture became a compilation of computation and digitalism in architecture, structure and, at last but not the least; user interaction. 'Digitalism' is a term that is coined by Nicholas Negroponte , in his book 'Being Digital', (Negroponte, Being Digital, 1995) and following, he commented in an article, "Digital technology can be a natural force drawing people into greater world harmony… Being digital is different. We are not waiting on any invention. It is here. It is now. It is almost genetic in its nature, in that each generation will become more digital than the preceding one." (Negroponte, The Digital Revolution: Reasons for Optimism, 1995). Aligning with Negroponte's 'Being Digital'; we radically believe that the futuristic applications and solutions of architecture and urbanism lays on this way.

Nowadays, 'BIM' concept and 'IoT' applications came into prominence in the academic and professional projects, in relation with the current development on these fields. These terms are not only digital tools for design and making, but also prescient visions for urban development.

The built environment is incorporating more day by day with the digital manners to achieve a more connected society and a better network. Mitchell 's concept of "E-topia" which is also coined in1995; stating that; "'E-topia'is a new urban form in which we constantly interact, either deliberately or automatically, with online information systems, which increasingly will be in the wireless mode." (Mitchell, 1995). E-topia is introduced to literature when the digital era started to arise. It was one of the best forthcomings on the evolution of social structure of the new millennium. 20 years afterwards, Mitchells' concepts have evolved and recently became the key aspect of future foresight, which how smart cities will evolve.

This definition was an inception for the responsiveness of the cities, and over and above, 'E-topia' is obliviously a milestone on this research upon blending BIM with IoT for 'Symbiotic Data Platform'. Moreover; Batty mentioned the bottom-up evolution of defining the 'city' as, in the 50 years decade, the city was first defined as a 'system', then as a 'machine', and finally nowadays, the understanding change and it is defined as an 'organism'. (Batty, The Size, Scale, and Shape of Cities, 2008). Within this time batch, the expectation from the city evolved to be a responsive organization, rather than just being a space to live in. In the beginning, even the computers were simply basic tools for specific functions. However, in today's world, we are able to imagine the computers as the main element to create cities, to design futuristic projects and even perform arts. In present time, computers have AI and capacity to learn. That said, why not to think that the future of cities will be similar to the computers?

Recently, a question that is prospected is how to make the living environment interactive? Ratti and Claudel wrote; "Architecture should become an integral and responsive part of human life. Architecture must do more than just look like a living organism: it should perform as a living system." (Ratti & Claudel, 2016). Importance of the shift from the 'organism' to a living system is; to be able to create upgraded systems and set up more serviceable functions in the city structure. The concept of 'living system' is an upgraded value; yet more, it connects the contemporary era with the contemporary life of todays' world, and its demands with digital features, with a clear foresight. And also, this quote gives a reference for the researchers to think upon the 'Responsive Cities'. The contemporary city is not just a place to live in anymore: It is a place to interact with the system and with each other, while living together with upgraded values.

2. Smart City vs. Responsive City

The science of cities takes the root from the interaction. It can occur in two possibilities, such as in physical environment and in digital environment. Cities are constructed to create more proximity between people and obliviously to create active economies and increase productivity. They always attract people by their opportunities. At the present time, cities have been developed to be smart enough to sustain a well-managed urban system. Yet, one of the milestones of a livable city is to be interactive and responsive. According to Michael Batty "Cities … are about 'connecting people'. The various processes that bring people together to produce and exchange goods and ideas that take place in cities define a multitude of networks that enable populations to deliver materials and information to support such endeavours.

Physical and social networks tend to mutually reinforce one another as they develop." (Batty, 2011) 'Smart City' has reference to a sustainable urban organization, digitalized infrastructures, better functioning mobility, governance and healthcare systems. It is a new urban form that has ICT and OT adaptations for urban infrastructure. It gives social engagement opportunities to the citizen by the network and its' connectivity, as well as it empowers the citizen by creating awareness and enhancing productivity.

On the other hand, recently-emerging context; 'Responsive City', is taking the context of 'Smart City' one step further and adds up the interaction into city scale. It is a reciprocate system between the citizens and the living environment/neighborhood. 'Responsive City' is neither a formation, nor an infrastructure as 'Smart City' is; it cannot exist if there is no interaction. It requires the main gear; citizen; to activate its' entity. It is a decision-making catalyzer for citizens, as soon as the citizen interacts with the facilitated

systems and the technology, then it exists. It does not only collects data, but also it makes good use of it by the act of the citizen. It creates a holistic movement by data-driven technologies, so as to upgrade livability of the shared environment, and address the collective values. By transferring our cities from smart to responsive, the aim is to become more responsible and ethic as citizens (thanks to technology and feedback), as well as creating more respectful atmospheres (thanks to citizens' act).

Until the fascinating term 'Responsive City' has arisen, 'Smart Cities' broaden up the classical understanding of architecture and urbanism and introduced new terminologies to the contemporary approach. Recently, architecture became a compilation of computation, digitalism in architecture, structure and user interaction. By introducing these new features to the definition of architecture and urbanism, the context broaden up and became a holistic phenomenon which is a mutual adaptation of structures, infrastructures, systems, networks, interaction. Within the emerging need of tools to process the requirements, various innovative tools had been developed lately; such as BIM, and IoT. As a consequence of processing these digital tools, the interaction has 4 layers such as 'machine to machine', 'human to machine', 'machine to human' and 'human to human'.

According to these above-mentioned statements, the 'Responsive City' context is not only the latest urban phenomena but also the optimal approach for the urban development plans since it offers progress in several disciplines, urban resilience and mutually respectful – democratic and transparent environments.

3. Symbiotic Data Platform

The literature review done upon combining BIM with IoT, shows that, there is a missing gap in the field. This gap refers to the future use of BIM; which is the introduction of 'interaction' into BIM. Even so, BIM is the sustainable plan for architecture, construction, energy efficiency and economy, there is the conflict reveals on the last phase of the proposed BIM systems. The sustainability of the system is addressed until the building is constructed and maintained. However, there is no existing literature or proposal upon letting to interact the user of the built environment, with the BIM system in the real-time data, by proposing an urban operating tool, which is receptive and responsive.

The design thinking behind the project is the 'open gap' that have inspired this research to be done is that, in BIM, the process of the platform is designed until the operation phase, also known as the maintenance of the built environment & building; which is only processed by the designer or the engineer. The gap is, coming along with the following question: 'Since BIM is a platform that holds nearly all the data of the building, why it does not interact with the real user of the buildings' input?' Recently, there are concepts being used and developed everyday such as 'smart homes', 'smart phones', 'smart cities', which are being operated by the 'modern-day user'. Nevertheless, the actions that the users realize just could be used as 'produced data' in the existing technologies, neither as an incubation medium nor as a gear. Therefore, 'Symbiotic Data Platform' proposes all the means in this platform act as equal nodes of the system.

The importance of BIM in this research is, to be interdisciplinary and to achieve compatibility by serving the 'Responsive City' approach. There are two different possibilities to follow this compatibility. One is directly taking BIM as the building scale and proposing network between the smallest built elements, and the second possibility is to follow CIM, which corresponds to City Information Modeling that is introduced to the literature by Jorge Gil (Gil, 2013), that takes city as the scale, and analyze and model city via an urban-approach.

On the other hand, referring to the data and the information that will be presented on the BIM, will be using Internet of Things. IoT is a network that connects the devices and other articles that is being used, to each other. Basically, the system can collect data, analyze data, or even visualize the given data by complementary programs. The mediums of these interactive systems, which are generally sensors, control systems, actuators and the main computer, as well as Internet of Things. By the help of sensors, the applications and designs evolved to be interactive.

As a result of sensors accuracy, Wi-Fi and RFID connectivity, the collected data is not only a value, but also a fact that might be used for further cases and by the connectivity between the devices, the open-source data is processed and it can be used for other functions. Furthermore, the network of the devices

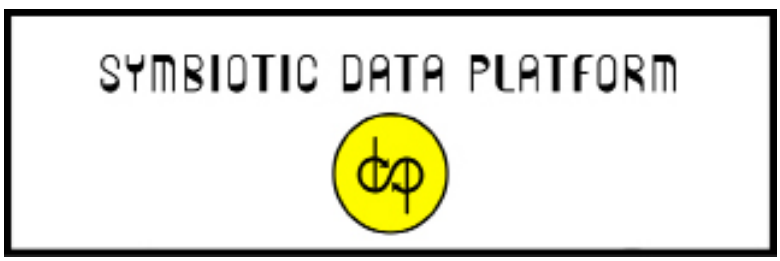


Figure 1. Symbiotic Data Platform

and other agents not only communicate with each other, also they can give some responses by the sensor technologies and motors. "Just as the Internet of things is connecting billions of devices worldwide, digitally integrated implants are creating a new interface with our physical anatomy. In addition to providing a machine-to-human interface, these implants may also enable machine-to-machine connection and analytics. Humans are becoming directly enmeshed with the network." (Ratti & Claudel, 2016).

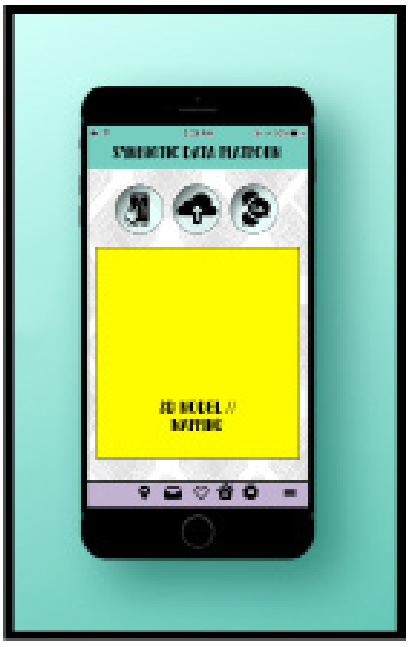
In brief, by the 'Symbiotic Data Platform' Project, it could be possible to introduce the reflection of the captured data, thanks to the Internet of Things, to a Building Information Modeling based representation. To do so, in the project of this research will ensue a new platform that overlaps two mediums in one platform. Technically, the platform aims to create a 'real-time information model', which also could be a network of 'real-time information models'. And as a result, the new tool for smart cities will introduce both a new technology to the existing system and also, will propose an innovative solution to the intelligent cities phenomena.

4. Methods of Application of 'Symbiotic Data Platform' to 'Active Public Space'

The specific theory in this research will be an interpretation on Building Information Modeling system according to the sensible & responsive urban emergence. The main objective is to introduce to the literature the interactive possibilities of the interoperable system. Real-time data and its' convenient uses benefits therefore Internet of Things and digital network is the main medium to propose the innovative project. This research aims to introduce a new approach on digital and responsive architecture & urbanism,

Figure 2. Symbiotic Data Platform Landing Page

Figure 3. Symbiotic Data Platform Interface Proposals ' design on- progress'



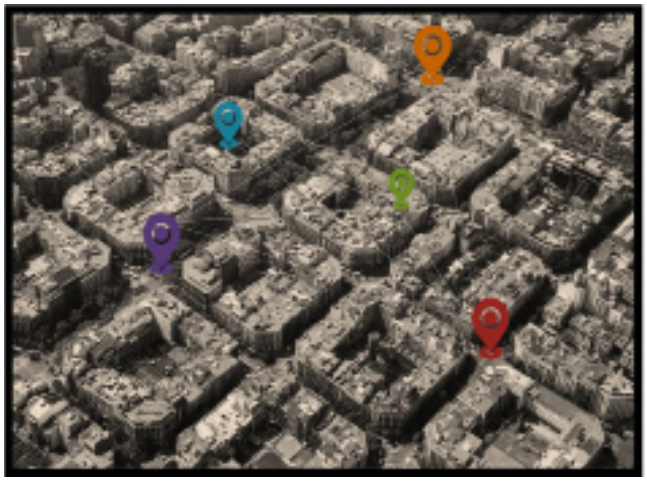


Figure 4. Symbiotic Data Platform Conceptual Representation

Figure 5. Symbiotic Data Platform Conceptual Representation for 'Active Public Space'

which simply combines these two concepts under one title. Building Information Modeling is considered as the future solution of the architecture and construction field and on the other hand, IoT is the key aspect for advanced architecture, and the forthcoming developments of the responsive techniques regarding the outcomes of controlling the data and information. By uniting these systems, the principal aim is not only regeneration our building to a smarter and more sustainable way, but also upgrading the end-users perception upon the 'things' and developing the socio-environmental qualities. As a result of this unity, the 'Symbiotic Data Platform' will be developed within the scope of this research. The platform is thought to be an 'analysis and visualization software', as well as a decision making criteria for collective values of future cities.

Symbiotic Data Platform addresses to upgrade citizens' participation, specifically related to the public space usage by engaging with "Citizen Design Science" methodology. "Citizen Design Science is a new strategy for cities to integrate citizens' design ideas and wishes in the urban planning and management process. Multiple opinions and thoughts by citizens should be combined with active design tools, enabled through information and communication technology. The active design contribution and feedback from a city's inhabitants is a still missing but essential step towards a responsive city." (Eidgenössische Technische Hochschule Zürich, 2017).

Additionally, this methodology is the combination of the three methodologies, that are; Citizen Science and Design Science and Design Science. Also, this methodology is a unity of local knowledge and observation, which gives feedback to the design decision-making. Also, apart from the planning and urban management, this methodology can provide links for individuals daily decision-making criteria by its statistics that are collected from the open-source data. "The approach is to combine the opportunity of crowdsourcing opinions and thoughts by citizens through modern information and communication technology (ICT) with active design tools. The active design feedback from a city's inhabitants is identified as a yet missing but essential way towards a responsive city." (Muellera, Hangxin, Chirkin, Klein, & Schmitt, 2018)

5. The 8 Pillars of 'Symbiotic Data Platform'

1 - Data Detection
2 - Data Collection and Analyze
3 - Perception and Visualization
4 - Cognition
5 - User Emotion
6 - Action
7 - Interaction
8 – Reflection

'Symbiotic Data Platform' usage in public space bases on 'passive' and 'active' data inputs-outputs. Passive data includes the values that are collected by the sensors automatically, and continuously, and these values will be uploaded to the platform constantly. On the other hand, active data is the interactive values of the user, which are the feedbacks, updates, pin-drops and the proposals. The statistics transparently show the real-time values of the public space. Additionally, the main feature of the platform, which is a 3D Model; that is BIM representation; facilitates a easy to use interface for every citizen. The 3d visualization of the place and the visualization of the real-time data on the model are giving the insight of the current situation of the local area and its relation with the global area. So that, the citizen creates cognition upon the current situation and also has reference for decision-making. The interaction with the place, and with the other users in the digital platform to share common knowledge and data creates synergy and emotional responsiveness as well.

6. Objectives

The objective of the proposed platform is to create intelligence in the society regarding urban values & empowering the citizen with collective values. The collective interface under the title of 'Symbiotic Data Platform'; aim to upgrade the smart cities to the responsive cities by including the citizen to the design, operation and maintenance processes of the cities. To do so; the 'Real-Time Data' is possibly the key aspect of the platform. By implying the recent technologies to the urban infrastructures, such as using the potentials of IoT by projecting the collected data on a 3D - BIM Model, will be operated by not only the technical users, but also the citizens that experience the place everyday. The new platform will bring the 'City Excellence' that refers to a good development plan, betterment strategies and upgraded life values. Secondly, by all the development plans, the aim is to achieve 'Alignment' between cities and cultures.

The participatory process via the digital tool, will create strong linkage to e-governance of the cities, as well as consolidating the transparency of the governance. Using the open-source data for the citizens own benefit is a catalyzer factor to encourage the user to engage with the system. The platform will provide co-creation possibilities, and it will create a more livable environment. Also, by providing a digital network to the citizens, the interaction level of the community will increase their engagement level to each other.

7. Added Value

As it was mentioned previously on this paper, the open gap of BIM, states one of the added values of my approach; which is to propose to introduce a new dynamic to BIM system as proposing the 7th phase: Interaction, right after the 6th phase, which is the operation stage. The 7th stage hasn't been discussed from BIM practitioners so far. By blending BIM with a real-time data collection and monitoring system, the following step will be possible to discuss. Since BIM is an interoperable system, an interaction with the user will be the added value of the existing dimension. Additionally, by creating the interaction level to a city operation tool, will also create the 'responsiveness' of the urban entity.

Apart from being a multi-ended and versatile project, the 'Symbiotic Data Platform's approach is proposing a new generation urban structure that deals with real time data and super-intelligence. As another point of view of added values of the project is the 'Dual-Development'. The 'Dual-Development Cycle', which means, using the users data to upgrade the communities life qualities, and as return, the upgraded life will empower the individuals in various ways, such as social, environmental, economic and political fields. Furthermore, the platform would be an interactive tool that will act as a 'receptive & responsive' agent, so that; the user will be the main server of this system. The tool is desired to stand as a medium in the decision making process in the smart cycle as well as, an interaction medium between the citizen and the smart cities. Eventually, apart from creating a new link between the user and smart features, using the digital facilities to constitute citizen participation to address sustainable urban development is expedient with the proposed platform. The tool is planned to have a two dimensional operation plan, since gathering data from the smallest scale will contribute with the greatest network-database of the city, and having the big data processed, digested, and monitored by the interface will serve the user back. It is a reflective plan that is sustaining itself by its own variables & values.
Significance of this ongoing project is to be interdisciplinary and to address both technologic / computational developments and social outputs for the society, as well as bringing the participation means eligible to the public areas, by offering the virtual tools to citizens. The main pillar of a 'Responsive City' is the citizen interaction and participation. Thanks to Symbiotic Data Platform, citizens will be included in the re-design, maintenance and organization of the public spaces.

8. Results & Conclusion

By 'Symbiotic Data Platform', the city is interpreted as within 3-layers. The 3-layered city equation consists, the digital infrastructure layer, the physical space layer and the virtual layer (which is the user action-feedback: 'data'). The added value of this new equation is the 'real-time data' under the digital infrastructure layer. The interaction that occurs by processing the real-time values that are facilitated by the platform and also, it is operated by the real activity driven input. As a consequence, the platform regulates a continuous receptive and responsive cycle. In 'Symbiotic Data Platform', the real-time data is implemented and projected on the existing BIM representarton, both in building scale and also within public scale.

By this, a 'Real –Time Information Model' will be achieved, and these 'Real-Time Information Models' will be linked to each other to create the interactive network. Addressing the pillars of Sustainable Urban Development, the project has two main aspects as goals: Social and Spatial (Organizational-Functional).

The 'Real-Time Information Models' that are outcomes of the 'Symbiotic Data Platform' would be social and spatial oriented solutions and will be defined and discussed interconnected to each other, and regarding the 'Active Public Space' project, the platform could perfectly adapt its' functionality to the public space interaction, community participation and co-creation via the 'Citizen

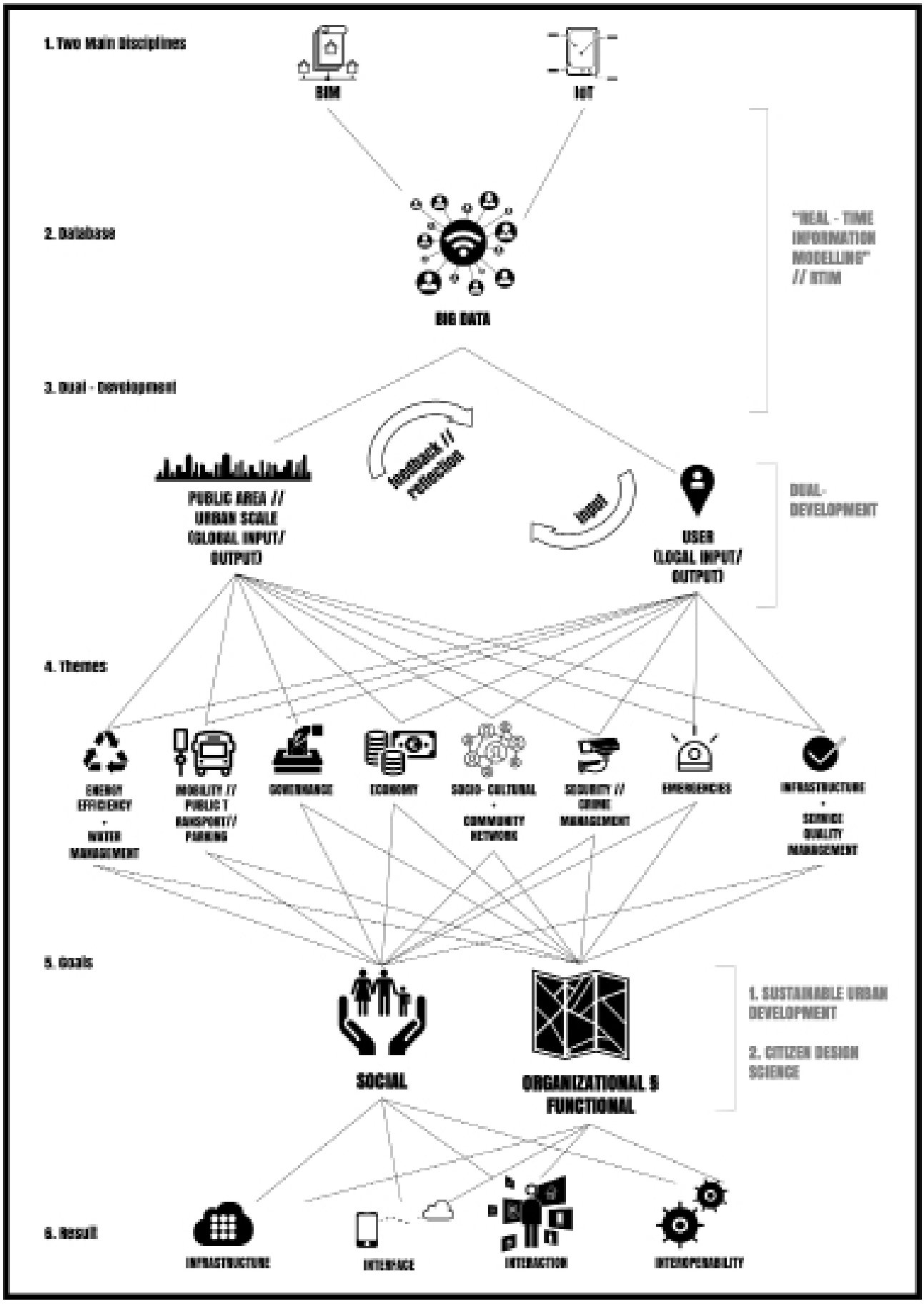


Figure 6. Symbiotic Data Platform General Scenario

Design Science' principles.
The 'Sensible' Data from the city and the 'Sensitive' Values of citizens from the smarter urban forms are the ultimate vision for the future. To achieve the goal is lying on the way of creating delicate tools for the user, by offering them better service with upgraded choices. By creating 'Symbiotic Data Platform', the main purpose is to open up the potentials of the community, and facilitate a network to connect to each other, and also with their surrounding, with their infrastructure, with their built environment. By developing the platform, the vision for the following work is to follow an 'Open Innovation' roadmap to provide capacity building for the community by participation. After all, the platforms' goal is to create 'Livable Cities With Collective Values'.

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COMMUNAL HACK BIG DATA AND COMMUNITY IN ARCHITECTURE

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Keywords: Architecture; Smart Cities; Big Data; Community Based Design; Adaptive Place Design.

Data collection offers a possibility to use citizens' behavioural patterns to understand common and individual needs. The digital footprint is a fundamental element to understanding the population's demands on an analytical basis. In order to react more precisely to contemporary challenges we face, such as the refugee crisis, this potential knowledge base needs to be integrated into architectural planning strategies.

Citizens are regarded as the primary source of information in a system that analyses data that their behaviour produces on a real-time basis. Besides the positive aspects of understanding – or even foreseeing – trends that could impact architectural requirements, data security has to be given profound consideration when assessing data due to potentially problematic breeches of privacy.

Society Lab serves as a case study project for data analysis in architecture. It is a platform that connects and merges the current request – offer situation of data and knowledge: Asylum seekers that are searching for housing are enabled to access a local information network by an application as a principal digital instrument. This app, which is focused on real-time output and easy handling, allows the asylum seekers to inform, exchange, look for and find contact, accommodation or work even before arriving at their destination.

1. Contextual framework

The beginning of the digital age brought about unprecedented possibilities for gathering, analysing and storing an exponentially growing and unstructured massive volume of data (Big Data) on a constant and real-time basis. By 2025 approximately 80 billion devices will be connected to the internet, according to IDC. To put that into context, at the beginning of 2016 there were nearly 11 billion devices connected. The expanding number of smart devices with GPS and internet connection, as well as spatial aerial sensors are instances of Big Data generators. IDC provides further predictions on the growth of digital data that results from the growing number of sensors and devices aforementioned. Until 2020 the total amount of digital data created worldwide is supposed to increase explosively up to 44 zettabytes. (Kanellos, 2016)

Evidently, Big Data is a developing source for evidence-based decision making, since it enables the evaluation of past and present circumstances. Computer science influence and Big Data collection have affected nearly all aspects of life. Put more tangible: Google engines are able to forecast flu trends based on what its users are searching on the internet.

Another level of given content from the user, generated through social media for example, is the socio-anthropological layer of information including emotional impact or feelings (i.e. like, love, dislike on facebook) related to a particular place, shop, idea, etc. In this sense, it is important to consider the term 'perception of physical spaces'. The term is referring to the perception of traditional living spaces and potentially inscribed meanings for the user. Such concepts can be discovered and understood through gathered data and information regarding the perception of private/public space and the individual versus the community.

Social media serves here as an instrument strengthening one of its very own principles: social interaction and exchange. It is of the Common's best interest that the means available are used in a collaborative fashion, consenting virtually everybody to generate and experience information and content. As Walter Isaacson suggests, the emergence of the digital age was promoted and sustained by governments in partnership with industry, military, and academic establishments. But simultaneously, the origin of the digital age sprung from within groups that would typically be sceptical of the consolidated power, as single operating hackers and community oriented individuals (2014).

That points out that the digital sphere inherently is about the communal experience, the sharing of knowledge and exchange beyond different backgrounds. Through the transfer into the physical world this unrestricted integrative exchange for and of everyone can improve our everyday lives if it is handled carefully. Considering security as well as privacy issues must be an integral part of the topic and will be discussed in a separate chapter hereafter.

2. Big Data and Security

The dualistic perception of the digitalization and the so-called Industry 4.0 reaches from the promise of salvation to demonisation of anything digital. Advocates of the digital age argue that through newly evolving technologies our lives will become easier, society is going to be more democratic, and participation of the individual is easier than it has ever been before. In contrast, the critics of the now emerging 4th digital-industrial revolution see jobs disappearing due to automation, the consolidation of existing power structures and the danger of the overall transparent citizen. (Littger, 2017)

Both perspectives need to be taken seriously, as the ensuing technological development is dependent on the society as well as on the societal framework that underpins it. It is vital, to be aware of the wider context of digitalization to understand the polarized views that surround the topic and the ways in which the socioeconomic and political landscape inform these opinions.

Arising questions, amongst many others, that need to be tackled and answered – not just in any project using Big Data, but in general to secure our future social cohabitation – are as follows: How can we secure the open and transparent handling of personal data? Who can access and analyse the data-sets of individuals? How can awareness of data, its traces and meanings, be established in the public mind? Just with an existing base of knowledge about how Data Mining works, how Algorithms influence one's perception (buzzword: Digital Bubble), and how much and what kind of data of an individual is gathered, one can reach 'digital maturity'. On one side this maturity is in the hands of the users – thus the data provider – and on the other, data collectors, data miners and decision makers need to make sure sensitive personal data is not compromised. Each user has its own privacy concerns, hence the privacy-preserving approaches adopted by one user are generally different from those adopted by others (Xu, 2014).

Recent events – mainly political – around the world show, that fears surrounding individual security are not limited to digital advancements: a globally represented legislative body is necessary to ensure that society has a common base to share and communicate in the digital world – as well as in the physical world. It is clear, that there is a universal need for respecting the right to privacy and free speech regardless of the place and form of expression.
The role that smart devices play in this discussion is

exemplarily shown with a recent political debate in Germany. The Federal Office for Migration and Refugees (Bamf) in cooperation with The Federal Ministry of the Interior (BMI) handed in a legislative proposal that is thought to enhance the enforcement of expulsion. According to estimations of the BMI 50%–60% of asylum seekers would have been considered for a data read-out of their smartphones in 2016 to facilitate identification. (Kampf and Leyendecker, 2017) The proposal is debated controversially and shows the complexity of the topic as well as the difficulties to localize borders.

If we see the role of the architect as part of the decision makers, the privacy-preserving objective is to make a correct judgement about the credibility of the data mining results he or she's got. To achieve this goal, one can utilize provenance techniques to trace back the history of the received information, or build classifier to discriminate true information from false information. (XU, 2014)

Big Data and its significance in architecture
With few exceptions – the architectural field seems not to be adhering to this very trend of integrating computer science know-how in the form of Big Data collection in its methods and processes. For the most part, Big Data collection has been instrumental in helping to solve problems that although might be relevant to the architectural discourse are not architectonic per se, such as traffic related issues, infrastructure networks, climate and pollution, etc. Computer science in the form of Big Data collection and Machine Learning offer an extensive ground for experimentation and improvement to the architectural field. Nonetheless, most architects are missing the chance to participate in the current discourse actively and thereby the opportunity to influence the direction the field goes.

The vast spread of 'intelligent assets' offers plenty of potential within the Architectural field, particularly when it comes to the citizen's ability to intervene in the planning and decision-making processes which need to be explored. Additionally, the Internet of Things (IoT) culture and its ability to decentralise information enables citizens to administer their impact better. As a result, one can argue that the IoT culture – that gives one the chance to express oneself, regardless social status or background – is an agent for equality among citizens when used in accordance with social, equality as well as privacy standards agreed on beforehand.

Mobile phone platforms are becoming key IoT enablers and hold great potential for unlocking circular economy value in this space [...] it is critical that an increasing number of people – users and developers of IoT – are involved in making big data and information public. In other words, big data should become open data to have a big impact on our lifestyle and cities. (Ratti, 2016)
Thus, to better understand the challenges of collaborative, participatory design approaches it is ultimately ineluctable to liberate the 'mythology of the architect visionary'. This cultural fascination of the authorial artist ignited in the XVI century by Vasari (Ratti, 2015) that has prevailed in the imagination of professional architects, architectural students and the public at large is no-longer-appropriate. Per contra, such a paradigm has proven to fall short in responding to the citizen's needs, particularly at the community level.

In summary, incorporating computer science in the form of Big Data collection, Machine Learning, as well as IoT, changes the architectural discourse fundamentally and brings changes in the way citizens relate to architecture as a discipline and as an outcome as soon as they are participating in design processes themselves. This demands a revision of the role of the architect, mainly concerning authorship. The architect appears more like an 'orchestrator' (Ratti, 2015) of the different parts involved, rather than the single mastermind behind a given project as he or she is perceived today.

3. Case Study | Society Lab. Outsmarting housing solutions – together

According to Helsinki Urban Facts and Hypo statistics, there are, currently, 300,000 vacant houses in Finland, which represents 8.2% of all built houses (http://www.hel.fi/www/tieke/en: Oct 2017). 28,000 of these properties are in the capital, Helsinki. Society Lab is a digital platform designed to connect and merge request and offer: asylum seekers with vacant houses. Considering the number of asylum seekers to arrive in Finland (35,000) and the number of vacant houses in Finland (300,000), the aim is to create a system that connects the two, optimizing and managing existing resources and thus avoiding new constructions, 'outsmarting' newly built housing solutions. Besides the intelligent use of resources, the focus lies on the social aspect: on one hand, refugees won't be housed in new quarters segregated from the rest of the society and thereby stigmatized, on the other hand, local citizens have the possibility to interact and get to know the asylum seekers step by step. Through the protected digital space of an application it gets easier for both sides to build a level of trust as well as to connect with people even before arriving. Both sides benefit through newly established social contacts and steadily grow a diverse social network.

The fastest as well as most efficient way to reach out to a lot of people nowadays is by utilizing social media; by creating an application that allows its users to collect and share information on a real-time basis. The majority of people use smartphones or other comparable devices to communicate. Asylum seek-

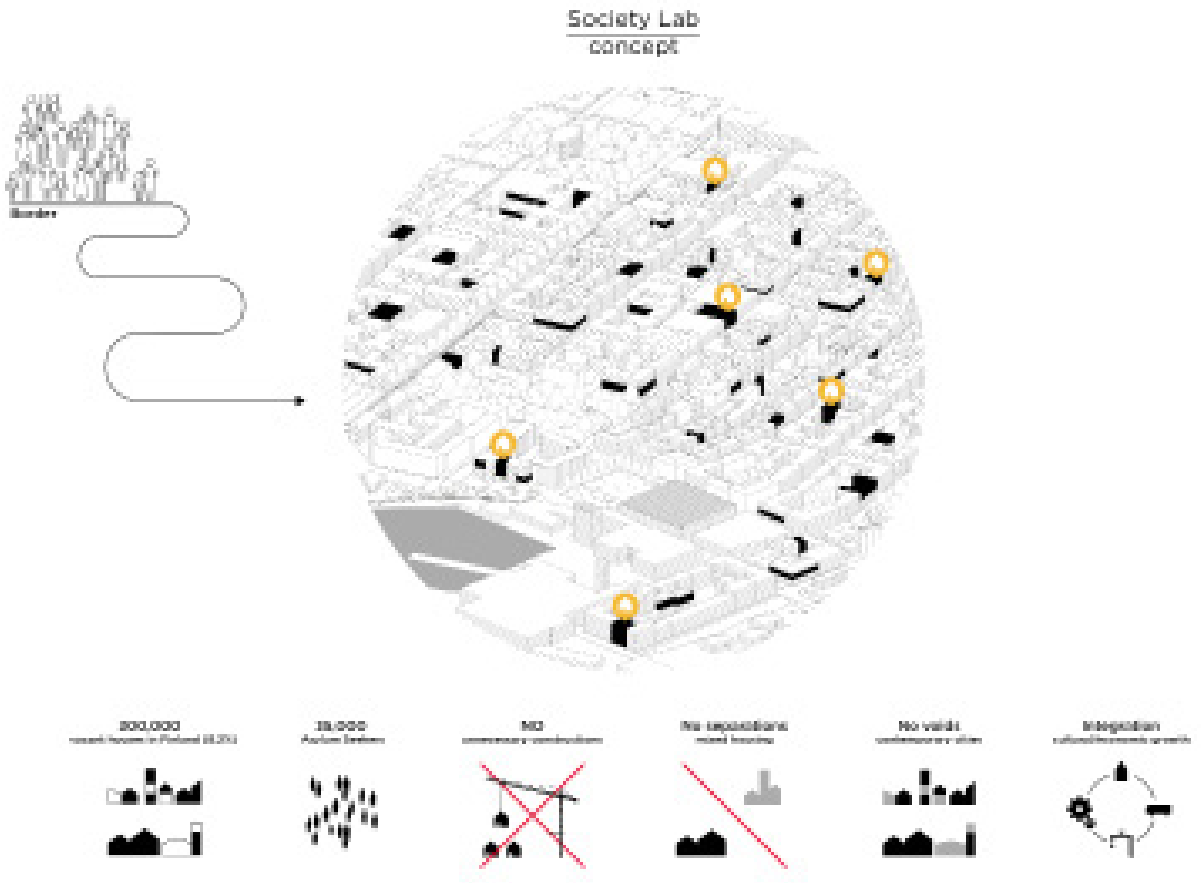

Figure 1. Example of a community-edited map with different layers of information

ers are no exception to that. In fact, various mobile applications help asylum seekers on their travelling route to reach their destination and are essential to become acquainted with the new surroundings. The broad dissemination of the application and thereby big number of users is a key point and works typically through word-of-mouth but should be supplemented by governmental as well as non-governmental organisations to reach full potential.

Society Lab connects the aforementioned aspects: Finnish people and asylum seekers create a real-time digital database in the form of community-edited maps that contain different parameters of information. The tool allows asylum seekers to be informed, to exchange knowledge, to search for and to find accommodation even before arriving in Finland via their mobile phones. The system is simple and intelligible. All users create a profile to become part of the Society Lab community. Local citizens upload information about vacant houses available for rent; asylum seekers can express their needs, regarding housing and announce their skills to the community on a real-time basis. All the data is immediately integrated into a city map interface, where intuitively one can understand what is available in the city.

4. Influence on the Public Sphere

The project is based on the assumption that integration in its complete form is the result of a shared effort. Therefore, the Society Lab database will include a range of further subcategories of seeking and offering: job, education, cultural exchange, etc. This dynamism will initiate the first encounter between local citizens and newcomers, which can be developed further into relationships in the physical space, creating cities that are dynamic, rich and plural.

For digital as well as non-digital users, specific gathering points will be set up in public space to enhance sharing and implementing of the database with all possible suppliers and seekers. These spaces will function as info-point, recreational and meeting places in the public sphere that can be even extended with layers of the gathered real-time data by Augmented Reality (i.e. showing all users present that want to start a language tandem, do offer an apartment etc.). Further, they add the aspect of a marketplace-like encounter in real life and help to minimise Filter Bubbles addressing people as well that might not use the app. In this way, a broad range of opinions can be considered and integrated into the database strengthening the plurality of insights that is fundamental for the advancement of the Society Lab

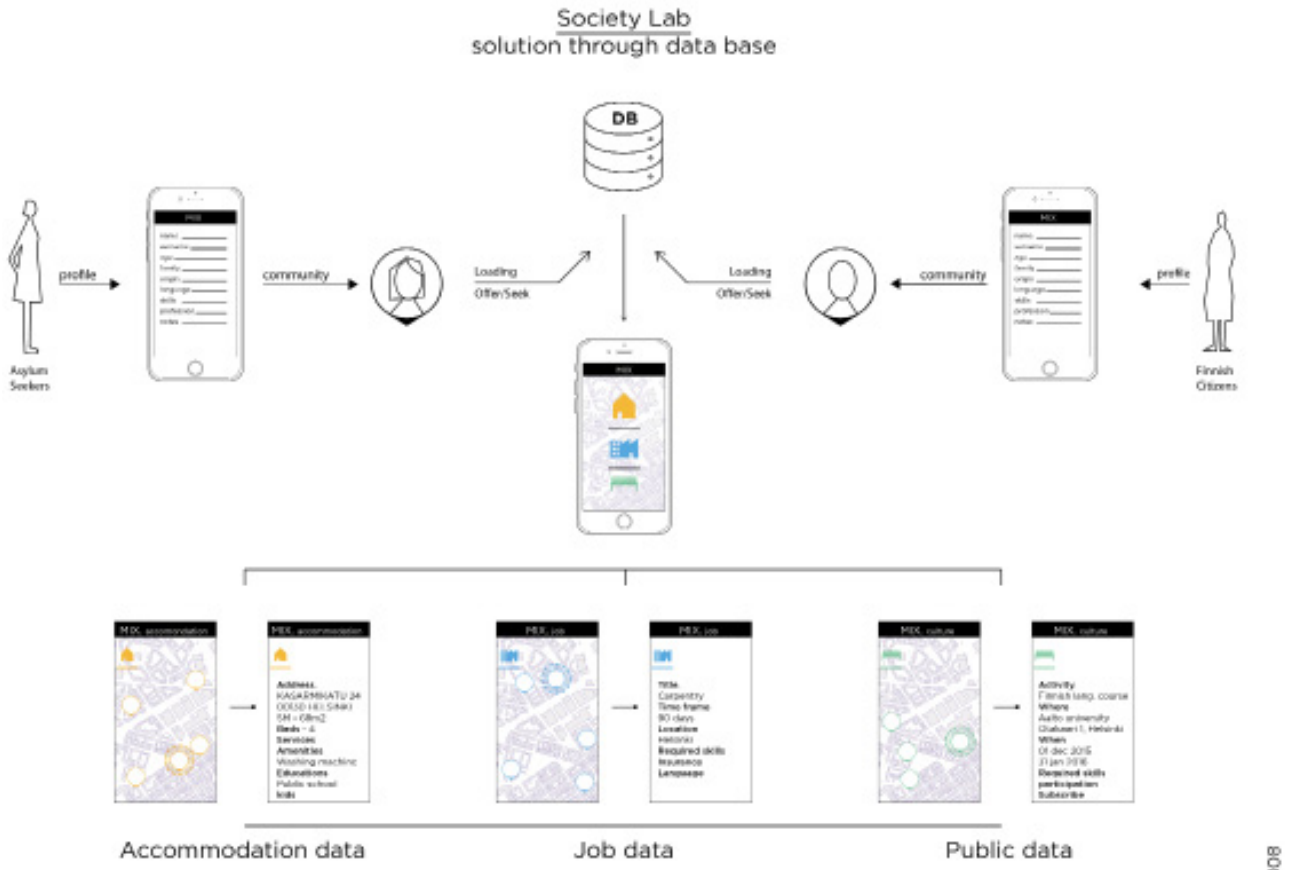

Figure 2. Housing solutions through data base

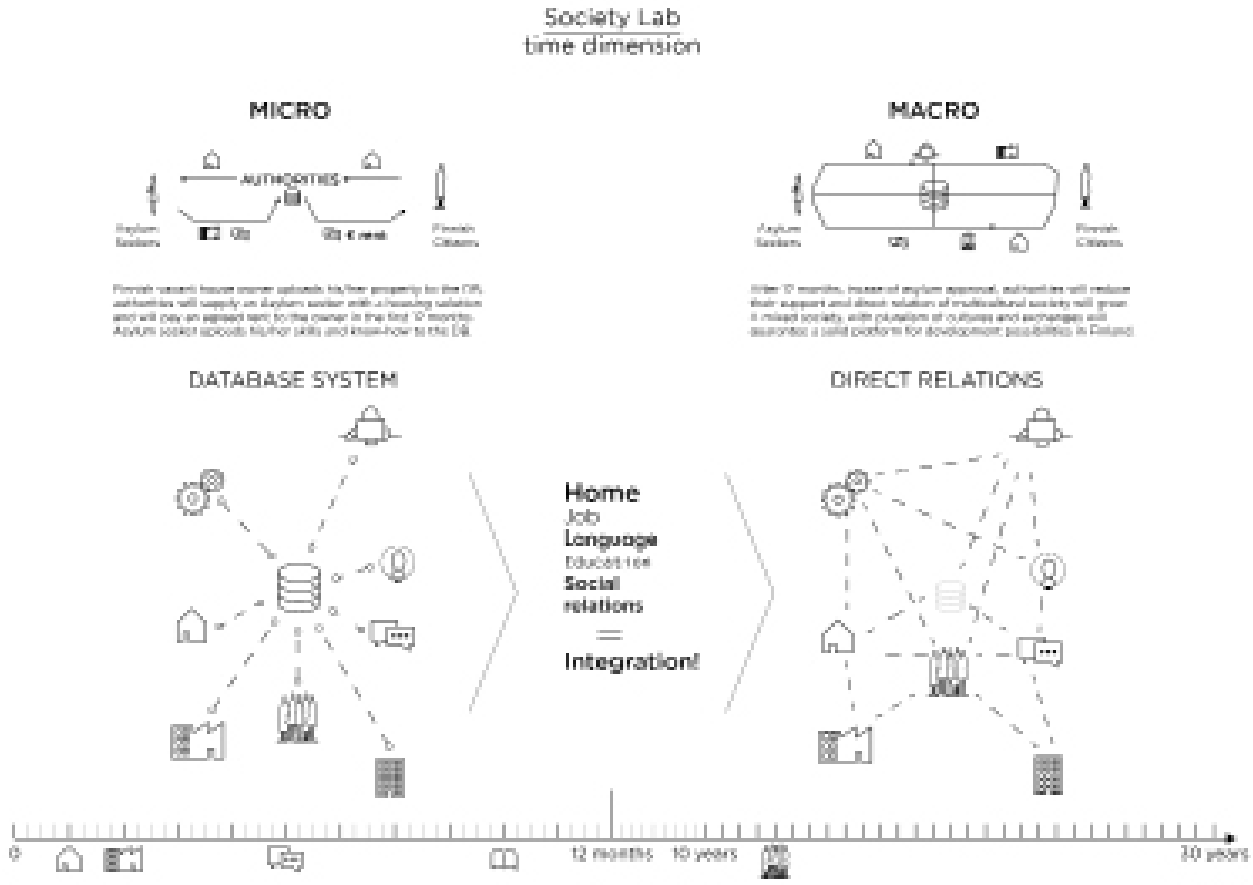

Figure 3. Micro and Macro time-frames

Project and prevents the segregation of society. A very figurative example that shows that the digital sphere can have tremendous impact on public space and the social realm of communities is the global phenomenon of Pokemon GO. Augmented Reality has hit the streets, and it's tough to deny that people are using public space more frequently because of it. Through a very playful approach the smartphone app created a wave of urban explorers that were encouraged to interact with each other based on a community-generated map.

The interface of Society Lab could look like similarly. The digital fuels physical interaction though its basic playful framework: External stimuli (i.e. the possibility to identify shared interests, supply and demand of a specific good or topic, etc.) visible on your personal screen provide a linkage between people and encourage strangers to talk to other strangers as if they knew each other. To offer public space interaction next to the digital platform is an essential step to integration. At the same time, it is a response to the changing needs and desires of communities, and this includes the evolution of technology and the resulting changes in social behaviors and trends as well in the physical sphere.

In sum there are three layers of interaction: As a base, the software application offers the opportunity to rent a house entirely through the platform. Successively, the app enables new interactions and dynamics between people through the active use of a digital platform in public space and, ultimately it will supply a data based overview of the communities' needs and wants (i.e. the need of space for community meetings, places where people can cook together, optimization of existing infrastructure etc.) that can be used by designers.

In the long term Adaptive Place Design can take place: through detecting the public sentiment of a place in an automatic and timely way, designers, architects, the municipality etc. get a database that provides them with detailed information about a certain area that can be adjusted precisely to current demands and developments. (You, 2016) Communities and local knowledge are an indispensable component to understanding the generated data, as they contribute to the identification of priorities within a certain country, city or block at a certain moment. The created data reaches far beyond empirical findings we are used to working with nowadays. The socio-anthropological aspect of the user group in

Figure 4. Example of a community-edited map with different layers of information. Potential of the project | long-term view

combination with infrastructural hard facts opens up a new field of (co-)design and direct participation for users as well as for creators.

Digital Placemaking through community based applications is still a new field. Authentic democratic participation depends on quality dialogue – both discussion and debate need to take place between all stakeholders involved. Decisions cannot be based on data alone.

5. Conclusion

The authors believe, that the role of the architect within the digital context of data analysis and implementation will change the architectural field and it's (self)perception elementarily. Data literacy – the ability to read, create and communicate data – might get the need-to-have ability for architects. If the field is not able to adapt and react to the newly emerging ways of integration and empowerment of the user, it may become obsolete. Currently, there are service providers across the board understand that they must place the user at the forefront of their practice. The public ultimately expect that in time their living spaces will also be more adaptable to changing living conditions informed by political and socio-economic shifts. Big Data tools offer architects the chance to forecast such expectations, so these values must be included in the methodologies.

The Case study gives an impression on how evidence-based design or rather, the prerequisite – the gathering of data and the interpretation of it – could be implemented. Evidently, the architect conducts the project as the head of organisation before the main design process begins. The fact that the end user participates in the design process does not mean that he/she designs the outcome. Instead, the user serves as an expert of the everyday – the architect becomes the mediator of the gathered needs and expectations and further, forms them into new spatial surroundings. The permanent exchange of knowledge from both side's fuels the discovery of the optimal result. The benefit from this is that compared to traditional workflows, the output of the 'design' is precisely oriented towards the needs of the end user and can be consequently adjusted. Even cultural specifications can be better understood (i.e. floor plan layouts customised to specific cultural needs) as the information from and for the particular individual is available. The before mentioned is only feasible if the building process itself becomes more flexible as well (i.e. the adaption/production of space through rapid prototyping and automation for example).

What is the role of the architect, regarding the new wave of industrialisation and the exponentially growing speed of the digital world? Leaving the question unanswered is a way to let the future architectural generation explore their position in the field. Amid data collectors, data miners and decision makers, the architect can be placed as an intermediary that knows how to accommodate peoples needs based on an understanding of architectural potential in data.

The digitalisation will continue at an ever increasing speed. One can not stop it; one can just design it. The digital development of our world might not make our lives simpler, but there is a potential that it may improve the overall quality of our lives when it is handled carefully. Success or failure is not a technological question but a socio-political one. It depends on us.

6. Acknowledgements

In October 2015, upon the 'European migrant crises' the Museum of Finnish Architecture (MFA), in collaboration with the Finnish Association of Architects (SAFA), launched the international architectural competition From Border to Home seeking housing solutions for the 35.000 asylum seekers expected to enter the country. Participants were challenged to present tangible solutions with a focus on the promotion of a positive social impact. The jury consisted of architects, experts from the Ministry of the Interior, the Finnish Red Cross, and the Finnish Refugee Council. The Society Lab Project by Omri Revesz, Cecilia Danieli and Mariana Riobom won the 1st prize, along with two other teams (http://www.mfa.fi/rajaltakotiin_eng: Nov 2017). The project is used as the conceptual backdrop of the paper and shows its topicality as well as the potential of hands-on applicability. Hereby we want to thank the authors that they provided us with all information needed.

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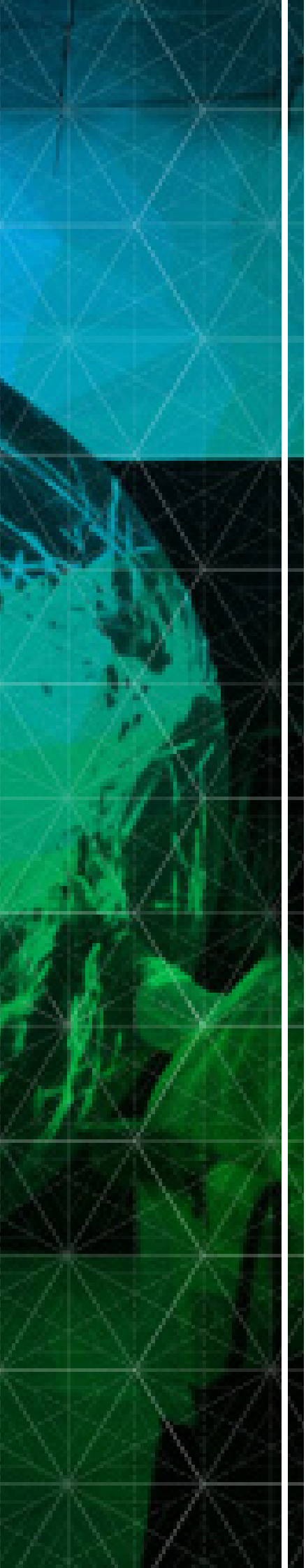


SHARE

CITIZEN PARTICIPATION

OWNERSHIP

ACCESSIBILITY

SHARING ECONOMIES

AFFECTIVATE : EXPERIENCING OTHER SENSES WITHIN PUBLIC ARTWORKS

Anaisa Franco
Anaisa Franco Studio

Keywords: Interactive, architecture, public art, sensitive, participative

In this talk, I will present an overview to the interactive public artworks I have been producing in my Studio, introducing my approach to technology as a creative tool to expand the sensorial experience between artworks and the spectator. My work is research-based, implying a constant experimentation process with new materials and digital fabrication to arrive at an "affective" situation where people expand their senses through the interaction with interfaces. The projects have been developed in teams of engineers, programmers, and architects through commissions, grants, and prizes in different programs and countries.

Using my work as a reference and several historical and contemporary case studies, I am analysing the field of Interactive Architecture (IA), also known as Responsive environments, which refers to constructions that make use of sensors, processors, and effectors embedded in its structure. The Participant sensitive works start to have direct relationships with the people by receiving input from spectators, which respond to it. Moreover, the constructions not only can respond to the environment but also be autonomous and intelligent by processing big data into it.

1. Introduction

We live in the era of the digital technology, hybrid, trans, parametricism, genetic advancements, transparency and network connection. Information is processed in every aspect of our life in society, the world is connected via the world wide web and reached in everyone's pocket. Daily life, financial structures and all sorts of communication are made using computers and its extensions, so do the public art, the public space, the built environment, and the transportation system.

Public art embraces all art realized in public spaces, accessible art that modifies the landscape permanently or temporarily, being the catalyst for urban renewal in the core of cities. Facing the expansion of the artwork in the public space, the viewer stops being a distant observer and becomes an integral part of the work.

The interactive public art refers to the branch of public art that deals with works that present the trio of sensors, processors, and effectors, incorporated as a fundamental part of its nature and functioning. Interactive public art encompasses building automation, but it goes further, including forms of interaction commitments and responses that can be in pure communication, as well as in the emotional and artistic domain, thus entering into the field of interactive art.

In the paper, I use 4 interactive public artworks from the artist Anaisa Franco as study cases to demonstrate artworks that start to have direct relationships with the people, the environment or been autonomous and intelligent by processing big data into it. The sensitive public artworks produced, make use of sensors that reads human data as pulse, distance, presence, and biometrics body measurements, both sensors related to the human body and its expansions.

With present technological advances, Public Art needs to incorporate re-adaptability and growth in order to pair with social evolution. The artworks propose the appropriation role of information processors, absorbing, processing and exchanging data in real time in order to perceive and expand our reality via artistic experimentation with technological new materials. Rethinking the role of art in our contemporary technological society means expanding the subjects we are daily confronted with and the spaces we inhabit.

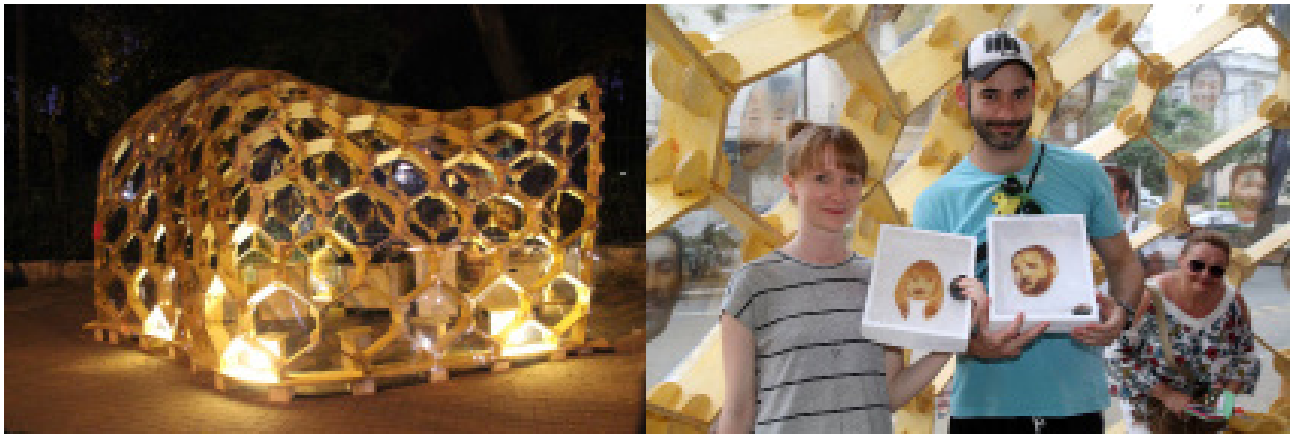
"Intelligent environments are defined as spaces in which computation is seamlessly used to enhance ordinary activity". (Fox and Kemp, 16)

1.1 Research background

I am searching for the expansion of human senses in the public artworks by building interfaces where I mix up materials, magic, creativity, and technology. I am looking for the materialization of the feelings that humans could not reach only with their own bodies and skills, but through the creations instead, understanding them as a starting point where to establish a dialogue by the use of interfaces.

Theoretically, I have been investigating the field of Interactive Architecture (IA), also known as Responsive environments, intelligent environments, and smart architecture, analyzing its history and contemporary constructions. Interactive Architecture refers to buildings that make use of sensors, processors, and effectors embedded in its structure. The buildings start to have direct relationships with the people, the environment or they can also be autonomous.
The participatory sensitive interactive architecture generally makes use of sensors that reads human data as pulse, distance, presence, and biometrics body measurements. It is related to the human body and its expansions. The study case for this section is

Figure 1. Sweet Reflexion is a participative public art installation, which functions as a digital kitchen in a form of parametric honeycomb pavilion where the audience interacts with their face mapped through photography and transformed into chocolate and pancakes using food 3D printers



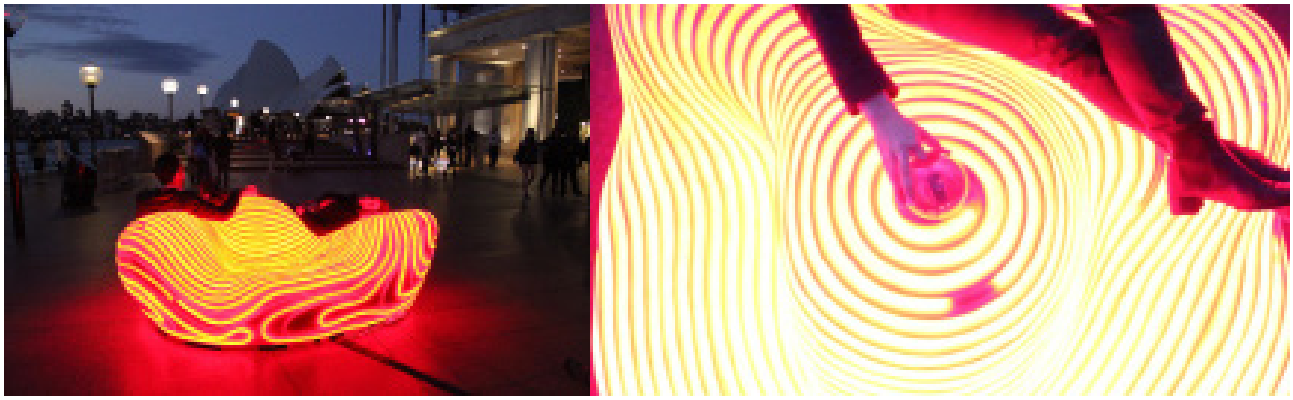


Figure2. The Heart of the City is an interactive public artwork that pulses light according to the heartbeat of the people.

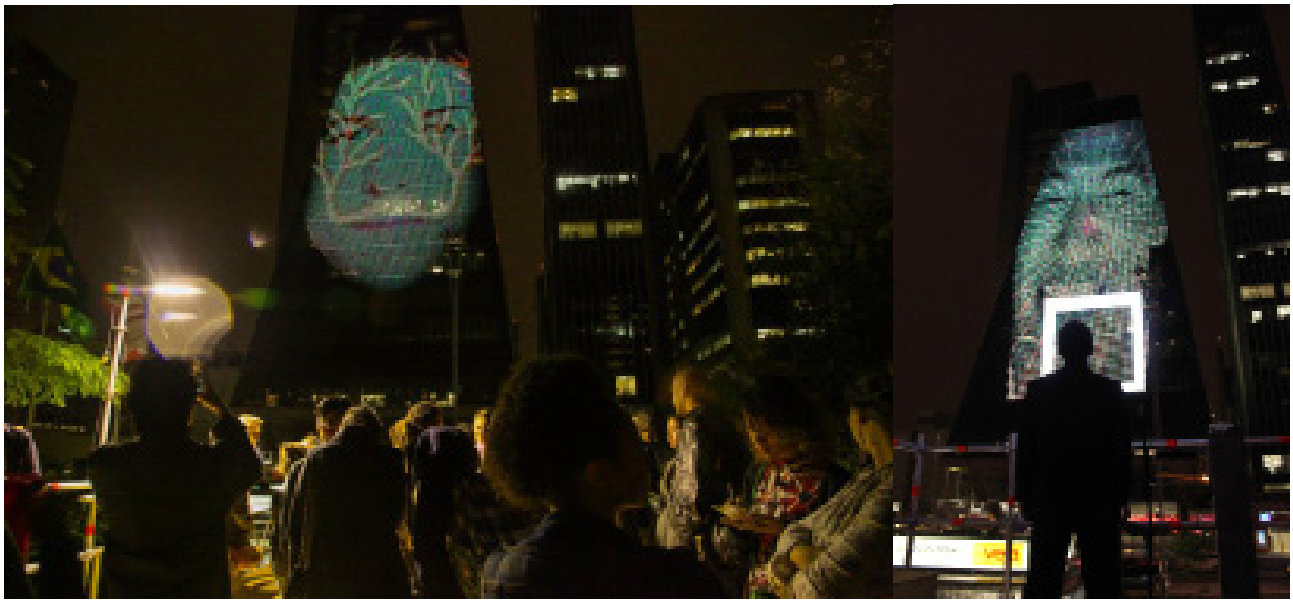


Figure 3. Onirical Reflections Facade is an Interactive Public Artwork interface that displays and adds animations over the faces of the user in real time on a digital facade or a projection in buildings. The work uses the people´s faces as an urban canvas experience inserted in an architectural landscape that awakes and augments facial sensorial experiences.

Figure 4. Wave of Rainbow is an interactive public artwork made for The Fourth Westlake International Invitational Sculpture Exhibition in Hangzhou, China. When someone enters inside the corridor, sensors activate the air pumps and all the tubes start bubbling. It is formed by 28 acrylic tubes filled with water, 2 air pumps, sensors and 7 colors led lights. The concept of project gaze between water and land by experiencing the force of the wave, which comes from the water and the force of rainbow colors, which arises from the land.

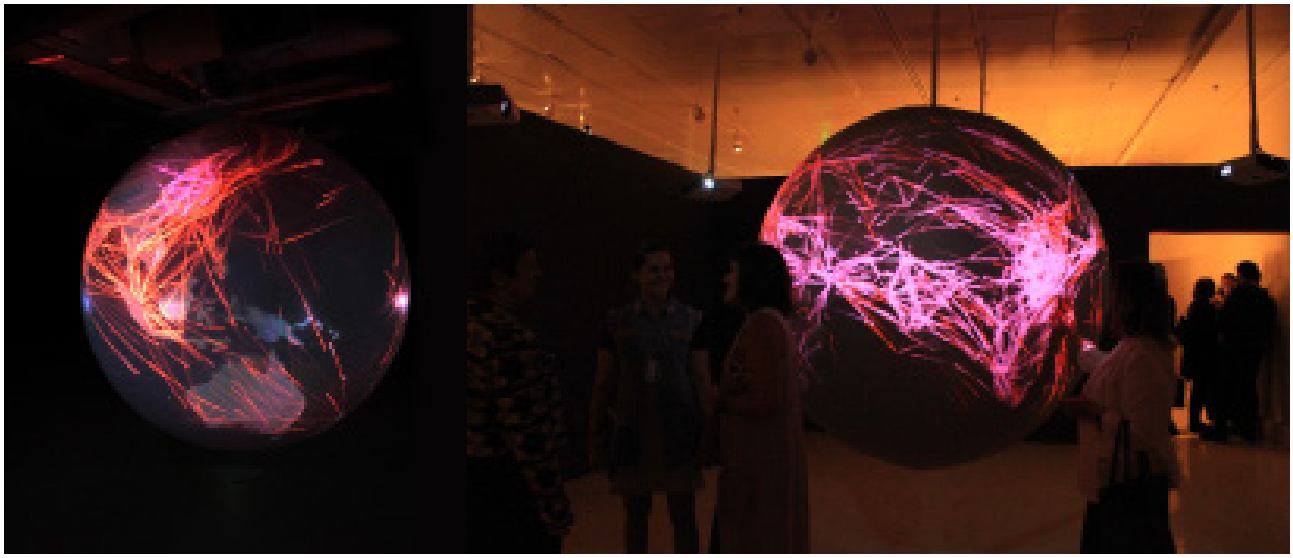


Figure 5. Circulatory system is an installation formed by a generative software that graphically visualizes the world's air traffic in an animation of moving lines drawing the takeoff and arrival points of all the planes of our planet. The software is projected in a ball of 2 m of diameter using 5 projectors, a mac computer and 2 TripleHeadtogo.

Sweet Reflection, Heart of the City, Onirical Reflections façade and Wave of Rainbow.
Interactive architecture can also read the environmental data as for example, pollution, weather, light, using this data to react and change chosen parameters in the building.
The building can also be autonomous, when it is processing data from a database, as for example airlines routes, grow and death of population, violence in the city, fluxes of public transportation, traffic, and many others. The buildings can process the "big data" and react to it. The study case for this section is Circulatory System.

"If Architects wants to create a responsive environment, they need to think like designers of operating systems". (Bullivant, 11)

1.2 Justification

The goal is to create a sensitive relationship between human and material, organic and synthetic, providing the user to expand themselves along with the public artworks. The aim is that the viewer amplifies his/her sensations in the body, through an experience with interfaces that simulate those feelings "elevating" the moment.
I intend to artistically elaborate a sensitive relationship between human senses and technological sensorial creations by developing outdoor sculptures to share feelings and emotions with people using sensors, new materials, and digital fabrications. In order to create new shapes, relationships, and experiences among the people, the artworks, and the technological material we have available in the market.

In order to justify the research, I am showing 5 works made by Anaisa Franco Studio and other works related to the field of Interactive architecture used as case studies.

1.3 relevance and objective(s)

The objective is to make an investigation and an analysis of what has already been developed within the interactive architecture sector in order to build participatory and sensitive public artworks that dialogue with contemporary issues.
"by definition spaces that interact with the people who use them, pass through them or by them - have in a short space of time become ubiquitous". (Lucy Bullivant, 1)

The work consists of practice led-research, comprising the development of new public art experiences that share senses between people and architectural spaces by using sensors, new materials, and digital fabrication techniques.
The creations generate a sensitive relationship between human senses and sensorial materials using digital fabrication and electronics to calibrate between virtual models and physical artifacts.
My work is research-based, implying a constant experimentation process with new materials and digital fabrication to arrive at an "affective" situation where people expand their senses through the interaction with the models. In these dynamics of interaction, my research is based on two theoretical and practical levels of stimulation and perceptual simulation:

A. Participant sensitive public artworks (Expanding

people's senses) :
Projects receives inputs from spectators, which responds to it.
- Sweet Reflection, 2016
- Heart of the City, 2015
- Onirical Reflections Facade, 2013
- Wave of Rainbow, 2012
B. Autonomous Public Artworks (Giving intelligence to public artworks by reading big data) : where technological interfaces imbue a certain type "intelligence" into them activated by big data flow.
- Circulatory System, 2017

1.4 Theoretical / conceptual framework / hypothesis

In the late 60s, Nicholas Negroponte introduced the term Responsive Architecture when cybernetics was applied into architecture in order to solve contemporary design issues. He described the abilities of computers to calculate programmable digital models integrated into the built environment and structures. During that time, works as Walking city (1964) by Ron Herron, which proposes the mobility of architectural structures, forming a "walking metropolises" was the dream of visionaries architects. In 1976, the Generator project by Cedric's Price produced a computer program to organize the layout of the site, suggesting that a single-chip microprocessor should be embedded in every component of the building, to make it the controlling processor, resulting in an "intelligent" building that controls its own organization in response to use.

In the late seventies, the called "Medialabs" started to pop up. First in 1979, was inaugurated Ars Electronica in Linz, Austria, and ZKM in Karlsruhe, Germany. In 1981, V2 Institute for the Unstable Media in The Netherlands was inaugurated. In 1997, NTT Telephone Corporation established the ICC (Intercommunication Center) In Tokyo.

Those centers were investing in artworks that merges art, science, and technology. A new media community were growing together with the internet phenomena, which gave rises to startups, open software, the shared economy and the internet of things. In 2005, Ars Electronica presented the first international conference on Media Art, Science and Technology and in sequence ISEA International Symposium on Electronic Art. Those events produced a canalization of people and brought new subjects producing the called new world of interactive media where scientists collaborate with artists and architects. "A responsive environment is a result of creative work by artists, architects, designers and other specialists, but frequently also scientists". (Bullivant 9)

The study cases selected to the research are:
1. Participant sensitive Architecture:
Projects receives inputs from spectators, which responds to it.
-dECOi (Aegis Hypo-Surface, 2003)
-NOX (The Freshwater Pavilion, 1997 and D-Tower, 2004)
-Michael Fox (Bubbles, 2006 and EX-COM Couch, 2007)
-John Snavely (WhoWhatWhenAIR, 2007)

2. Environmental reactive:
- Diller & Scofidio (Blur Building, 2002),
- Forster and Partner (Campus of Justice) (Adaptive Building), 2006-
-Wilkinson Eyre / Grant Associates (Super trees, 2014) Location: Singapure
- Santiago Calatrava (Museum of tomorrow, 2015)
3. Autonomous Architecture:
-Realities United (Bix communicative display, 2003),
-The living, (Hy-Fi, 2014) location:
-Interactive Architecture Lab (Furl: Soft Pneumatic Pavillion, 2014)
All selected works are classifiable as types of responsive architecture. They can be either participant sensitive, autonomous or they can monitors fluctuations in the environment and alters its form in response to these changes.

1.5 Methodology

The methodology has simultaneous steps:
A- Interfacing New Materials and Technology
Testing new materials and displays as soft robotics, media facades, Flexible LED displays, led curtains, E-paper, EL Wire, Solar power displays, holography-Holodesk, OmniTouch. Spherical displays as Panorama Ball Vision, I-ball, Led Sphere display, Multitouch 180 Mediasphere, biological materials, and devices.

1- Participant sensors: Measure movement, velocity, distance, heat, touch, visual and sound. Used to detect and monitor participant behavior.
Pulse: Pulse sensor
Biometrics: Iris scanners and fingerprint sensors
Movement: Capacitive displacement sensor, displacement receiver, motion detector, occupancy sensor.
Velocity: velocity receiver, Doppler radar, laser surface velocimeter.
Distance: Laser rangefinder, linear encoder, proximity sensor, photoelectric sensor
Heat: heat flux sensor
Touch: piezoelectric, tactile sensor.
Visual: Active pixel sensor, Tactile sensor
Sound: Fibre optic microphone

2 - Environment sensors: that measure air, ground, solar, water, weather, sound, nature and landform:
Air: Air flow meter, Anemometer, Barometer, Hygrometer, Gas detector, Quartz thermometer.
Ground: Frequency domain sensor, Laser dropper vibrometer, piezometer, seismometer.
Solar: Light meter, Optical position sensor, Passive

infrared sensor, pyranometer, pyrgeometer, ultraviolet sensor.
Water: Flow sensor, hydrophone, tide gauge, water meter.
Weather: Rain gauge, rain switch, snow gauge
Sound: fibre optic microphone
Nature: Auxanometer
B- Digital fabrication techniques and Design:
Investigation of the use of Computational Design and parametric architecture in Digital Fabrication technologies in order to apply in the works. Digital fabrications methods as laser cutting techniques, 3d printing, CNC sculpting.
C- Electronics and programming:
Investigate the relationship between digital/electronic sensors and human senses in an artistic context by testing in artworks and investigating audience experiences.
D - Public Art:

Apply the smart and biological materials and electronics investigations in the creation of interactive public art for indoor and outdoor spaces.

1.6 Conclusions with implications for planning education, practice and/or scholarship

To build my work is necessary to have an access to spaces, materials and fabrication machines in order to be able to investigate the confluences between parametric architecture and cutting-edge sensorial technology applied with my artistic aims to create affectivated and sensorial experiences to the public/spectator. It requires a Lab of industrial design equipped with laser cut, 3D printing machines, and CNCs.

2. Conclusions

As an artist, I want to communicate, be closer to people. I am interested in reaching out for situations that escape our control, new means of perceiving and expanding our reality via artistic experimentation with technological new materials. Rethinking the role of art in our contemporary technological society means to expand the objects we are daily confronted with and the spaces we inhabit, in order to expand and enrich our lives with an added aesthetic and creative dimension. I am interested in the realm of the collective, beyond the private dimension of art and enhancing the channel of communication with people: this is why I am particularly fascinated by the power of public art.

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DO NOT OWN, ENJOY! LIVING WITHOUT OWNERSHIP

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Keywords: On demand architecture, circularity, ownership, consumerism, service based society

We are on the verge of significant behavioural change. The production model in which people are working in order to buy and own, is about to end. We do not want to own, we want to access, use and enjoy products, information and services. Access to anything, anywhere at anytime. Everything on demand is the new trend. We want the pleasures, not the burdens: 'Do not own, enjoy!'

Could we imagine a service based society where ownership doesn't exist anymore? What does it mean for the production process if we no longer possess, but only use? How does it effect the way we build, in terms of (technological) innovation and economic growth?

The new Consumerism leads to a new city model where citizens can create their own personal environment in real-time; a city on demand, which visualises a perfect fit over time. Spaces, products and services can be ordered anywhere at anytime. After usage, the raw materials will go back to the manufacturers in order to revitalise. New emerging technologies are in constant development to provide real-time supply to the fast changing desires of human life.

1. Introduction

"As consumers reassess their priorities and increasingly ask themselves what they truly value, a host of major consumer trends have emerged: from the sharing economy to the preference given to experience over possessions, to frugal innovation and trading up and down. This shift towards new priorities,

which we have christened 'The New Consumerism', is impacting across a multitude of industry sectors and has the power to transform even the most established markets." (Boumphrey, 2016)

2. Research background: the new consumerism

We have created a society based on consumerism, in which human consume raw materials in a rapid time as everything is focused on property. In the past, products were created to offer people comfort and to solve a specific problem, in order to make life easier. The tools that were created last for a very long time. And there is the problem for the manufacturer: if he is making fantastic products that last forever, the market will soon be satisfied, and what will he do? He will use technology to create a problem. A problem that brings the customer back to the store where he has to buy a new product. Different trends and developments have stimulated this new Consumerism.

The Internet of Things has provided access to tools and information, anywhere at all time. It has created flexibility in terms of living and working. It has created new opportunities to share information and goods with others. Mass customization encourages uniqueness of products and goods. Trends like the sharing economy connect people and businesses in order to create an better balance between supply and demand.

3. Relevance: on demand

After defining ourselves for generations by possession, a new cultural shift is upcoming: an economy based on access to tools instead (Nanos, 2013). Using is the new owning. An economy based on (shared) services does already exist: think about buying a ticket for the theatre play or a seat in an airplane.

For the only time people use these facilities, it is better to rent and use, than to buy and own those properties.

The shift from owning products towards using products will liberate consumers from certain duties. People will just pay for the usage instead of paying for the raw materials, for the fuel that a product might need and for the replacement of a product once it is broken. Products and goods on the neoliberal market were designed to break or crash after the guarantee period would expire. In a system based on on demand services, the economy is based on high performance products that maintain as long as possible. This new way of thinking causes a different mindset in designing products; companies will generate high end products, make use of the best quality (raw) materials, easily demountable, which can be reused after a certain amount of time (Rau, 2015).

Many people listen to music provided by apps like Spotify (2016) on any of their electronic devices. There are many new initiatives such as Peerby where people can borrow or rent products from each other, where people can stay in someone else's home for example with AirBnB. Such apps liberate the user from many duties compared to the history of owning objects. The user has now access to music from all over the world and can listen to it anywhere and anytime. He doesn't need physical space to store cd's or lp's. He doesn't need to buy an album when he wants to listen to a specific song. The same is happening with books, movies, but also products with a higher economical value that are becoming available all time. More objects are to rent: nowadays cars and bikes can be rented. A car is on average over 90% of the time not in use (Nanos, 2013). Why do people still bother themselves with paying the mechanical checks, the parking lots in front of the houses when when they just need a ride once in a while? New initiatives such as Snappcar offer a solution to share the car with the neighbourhood.

4. Objectives: the city on demand

This New Consumerism based on different trends and developments leads to a new city model where citizens can create their own personal living environments in real-time. The city is shaped based on demand. Sharing personalised and customised goods and services is what is desired. The raw materials stay in a circular economic system. Ownership is not needed anymore as long as people can desire whatever they want on demand.

Living without ownership stimulates the 'city on demand': ordering spaces is fast, easy, user-friendly and comfortable. Every citizen will have access to an application where the user can design, adjust and order any space he wants. Algorithms in terms of artificial intelligence (AI) create suggestions to assist the citizen, based on the history of previous orders and considering data of what he likes, his activities, patterns and daily routines.

'Do not own, enjoy!' A significant behavioural change is on the verge; the production and consumption model has been completely changed. We do not want the burdens of owning, we want simply to access information, use services and enjoy. Accessibility to everything, anywhere at anytime is what is wanted.

Figure 1. Anything, anywhere, anytime

5. Analysis: the real-time city

The Real-time City is visualising a concept for a perfect fit over time. Following this idea, people can create their own personal architecture in Real-time. The Real-time City provides customization and personalization to every citizen. It is to be seen as an improvement towards the current building system (based on standardization as well as fixation) and is adapting to the newest technology.

5.1 Changing (life) situations

Our desires, are in constant change, over time: people's living situations are constantly changing: families are expanding, shrinking, people are moving. People at different age have different needs and desires. Important to mention is that those desires, are not clearly predictable. By 2050, most of the people will live in urban areas. (United Nations, 2014) In most cities, space is scarce. The urge to create standardized houses is the efficiency in terms of planning, construction and economics as a part of mass production. Even if some parts will be altered, it is a rigid customization for a frozen moment in time. Those houses come with standardized floor plans, as the result of the architect's research on the standardizing measurements. The space is optimized for needs in a static way. A standardized environment could not suit to fulfil the task of constantly changing interior life. The hypothesis concludes
that the built environment is too much based on standardization. There is no space for dynamic adaptation.
The Real-time City proposes a tailor-made environment adapting constantly.

5.2 The real-time city = personalized

Personalized means that the Real-time City fulfills desires on demand. Architecture becomes a service. You can just imagine having a Real-time City app where you can place orders in real-time. Personalized also means that your environment becomes tailor-made. Just imagine having a set of Virtual Reality goggles or the Hololens adding an extra layer of personalized content.

5.3 The real-time city = freeform

The second point is the implementation of freeform. Basically it can be any form you want. The logic is inspired by nature. A natural process of emergence. It is the process of life. It is unforced, it is natural.

5.4 The real-time city = adaptive

The logic is inspired by nature. A natural process of emergence. It is the process of life. It is unforced, it is natural.The third point describes the adaptiveness of the concept. As in nature the proposed architecture will bloom and wither, depending on the user's desires. It is a closed circular model, call it a loop, between creating, using and returning. There is no waste, nature is left untouched.

5.4 The real-time city = automated

The fourth point of automated matter is proposing the use of real-time data analysis for immediate

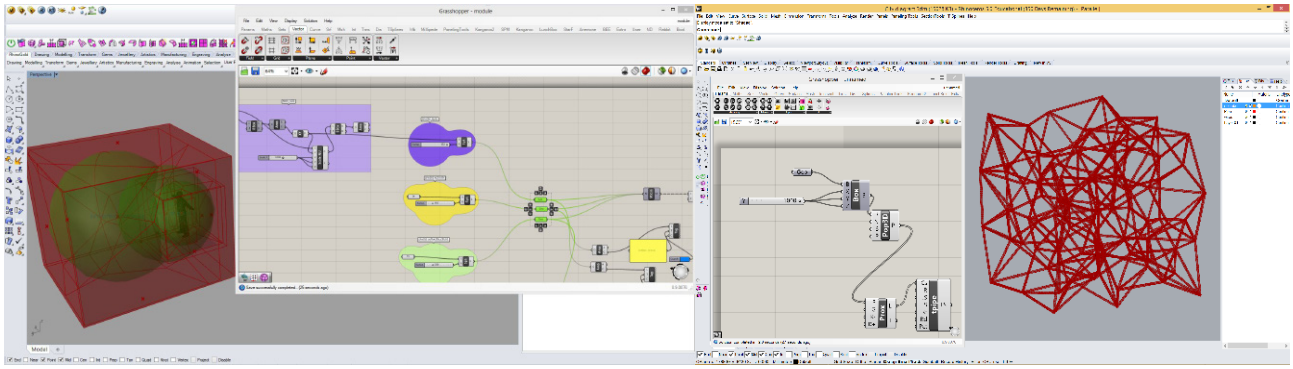

Figure 2. The Real-time City takes the body as a validation of proportions

adaptation and optimization. Currently there are different researches going on, for example at the MIT were professor Carlo Ratti is researching how data gained from users in real-time can improve our living environment for the better (Ratti, 2016): traffic apps for example that try to avoid busy streets.
In terms of automatization we would also talk about an autonomous building process. These are not ideas taken from science fiction movies, but they actually do already happen, For example the autonomously
created bridge by industrial robots of Joris Laarman (MX3D, 2014), or the drone assembly
of bricks by Gramazio Kohler (Gramazio & Kohler, 2012).

5.5 The real-time App

Imagine having a family expansion upcoming. New spaces are desired where others have to be changed within the near future. The new space is to be ordered by one simple application on your mobile
device. The new living room will perfectly fulfill your current desires. The parameters can be adjusted to your desires, functionality can be added. A delivery date will be scheduled and the new adaptions to the house will be done. The on demand spaces are fully integrated spaces that include all furniture and technical features. The design takes your own human body as a validation of proportions.

Figure 3. Different archetypes can be seamlessly combined

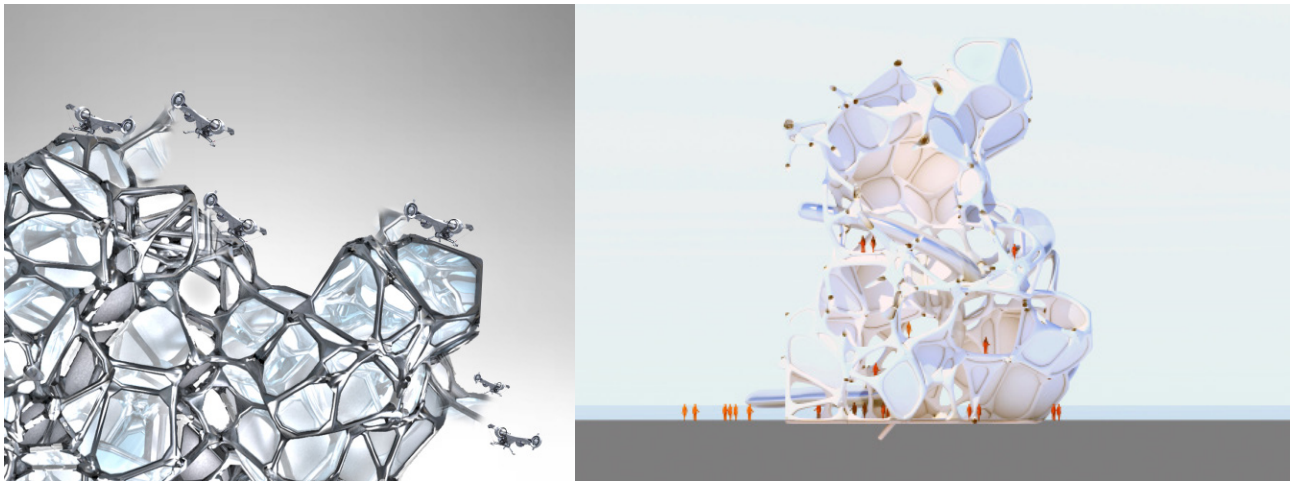

Figure 4. Real-time fabrication methods

Let's bring this idea towards a bigger scale: a real-time district. Different people, order their new living volumes. Accessibility is added automatically following algorithms, facilities are being created in the same manner in order to provide life support conditions; like heating, cooling, fresh water, waste disposal etc. Over time, living volumes are disappearing, whereby the structure can remain. When new volumes are being created, the structure will be modified and added at the same time. The structure, the backbone of the entire build-up district, can be optimized for static efficiency, with specialized software.

Zooming out on the scale of the city, additional public and shared services are added. To simulate the described behaviour of the Real-time City, custom scripts were used to generate a fictive geometry.

But as freeform is one of the main key values, the form of design can basically be anything, Imagine a pitched roof house in combination with a blob and a type of Mies van der Rohe pavilion. Different archetypes can be seamlessly combined. Life in the Real-time City is also about sharing spaces as it provides spatial and economical benefits in common areas. Public facilities are organized by the need of events.

5.7 Materialization and real-time fabrication

Due to their advanced properties, the use of biodegradable plastics, biopolymers, algae and bacteria are proposed, each with their own superior character. The urge for new advanced materials is clearly visible at some of the world's renown institutions like the MIT whereby researchers prototype with

Figure 5. Implementation of The Real-time City in existing city

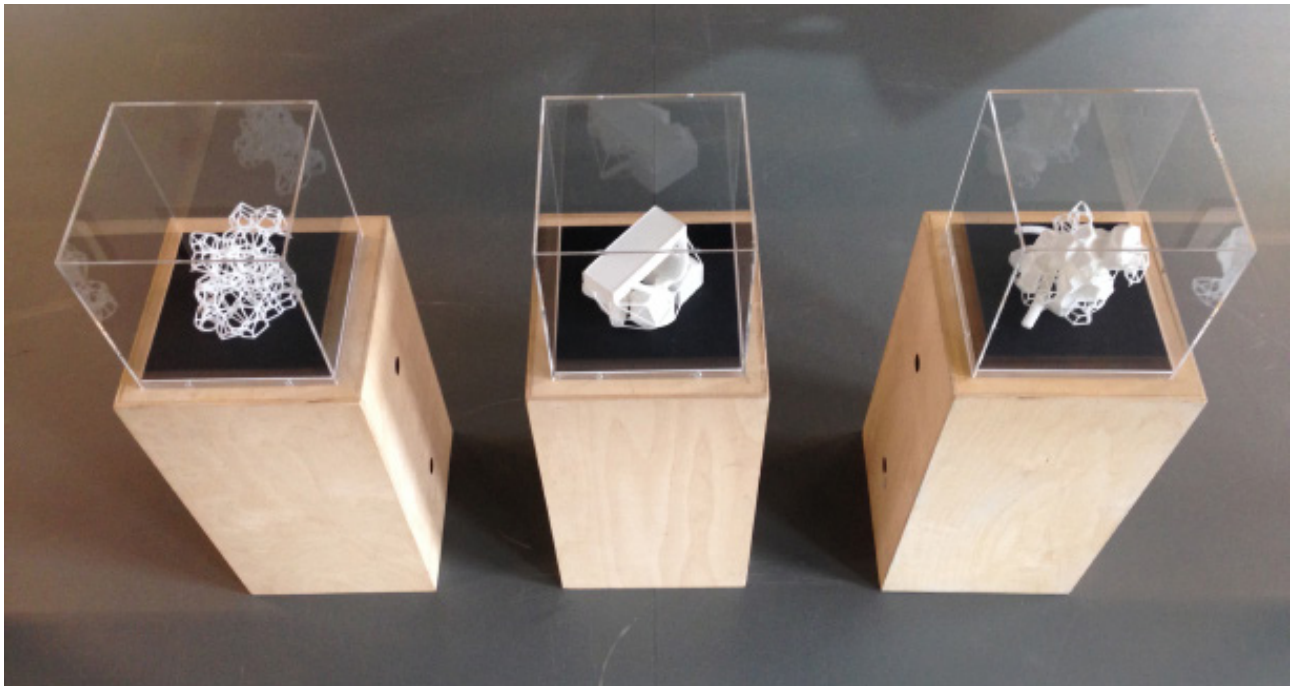

Figure 6. 3D printed models of The Real-time City, at expo TU Delft

new materials, like the biopolymer structures based on additive manufacturing, created by the mediated matter lab of Neri Oxman (Oxman, 2015). Oxman's biopolymers originate in nature, and are made of abundant natural materials by shellfish and insects. The material, in this case chitosan, can be easily 3D printed and it serves as a perfect bottom-up base material enabling further addition of properties.

Instead of assembling different materials with their own properties, all those properties can be combined into a single custom-made material with a gradient property distribution. Like the human skin. The human skin varies from a thicker skin with small pores on the back, to a much thinner with larger pores on the face. One functions mainly as barrier, the other mainly as filter. Guided by the wisdom of nature, and the recent developments in nanotechnology, new supermaterials can be constructed without being tied to only known materials.

Real-time fabrication methods consist of 3D/4D printing, drone assembly, just-in-time manufacturing and closed recycling loops. Concepts of 3D printing drones are no longer fiction anymore. The recent project at the AA is already testing drones for autonomous construction processes (Smith, 2016).

5.8 The experience age: virtual realities

The architecture of the contemporary city is no longer simply about the physical space of buildings and landscape. More and more it is about the synthetic spaces: created by the digital information that we collect, consume and organise.The Real-time City is exploring these immersive environments where the public can meet, perform, interact, indulge and play. Architecture and the built environment are augmented, interactive and will celebrate the virtual. It is about a world where realms blend with other realms. Experience is destination.

6. Discussion of results / conclusions with implications for planning activated public space in responsive cities

Instead of speculation, real-time data will be used to shape the content of the city. The organization of the city structure is based on emergence; it is a self-organizing mechanism created by the input of realtime metadata of the inhabitants. Networks and flows of infrastructure, water, waste and energy will be optimized and function as nodes which interconnect the city. The Real-time City is based on a bottomup approach where every citizen can participate to shape the city's content in order to create a responsive, tailor-made and sustainable environment.

Real-time data of inhabitants are also supporting local democracies and communities. Data and patterns will be analyzed and anticipated upon in order to adapt to fast changing desires as well to avoid conflicts.The city will evolve due to changing situations, desires and activities over time. Emerging technologies and real-time fabrication methods, such as 3d printing drones, just-in-time manufacturing, drone assembly and nanotechnology enable the realisation of these fast-changing city's content.

The Real-time City is a city of 'blooming' and 'withering' where any space can pop up anywhere at anytime. The city is no longer based on ownership,

but citizens can lease materials and resources in order to create their own tailor-made spaces. Architecture becomes an on demand service. The citizen can order any type of space he wants, at any place, whenever he wants. The on demand architecture is not owned by the user, but the service will be rented as long as it is needed. Materials and space are no longer possessed by the human but they belong to the earth. In The Real-time City one can rent and use a space for a lifetime. The city just provides an extra service to provide flexibility by not having the disadvantages of ownership. The on demand service creates a certain flexibility for the citizen to move, change and explore wherever he wants. The human being is not anymore fixed to a specific place, in a standardized typology but is free to move and express his personality. Make reality of your imagination!

The public space is redefined among social, environmental and economic agents as it concerns a playground for experiences. Responsiveness of public life will be activated by the organisation of events; inhabitants can participate, organize and attend public activities. Public space goes beyond the physical boundaries. The concept of the public buildings such as the theater, school and cinema are redefined as events will take place in physical, augmented or virtual space. The public place is a place to interact, play, perform and indulge. Sharing spaces stimulates social interaction between people and creates great benefits in environmental and economical aspects.

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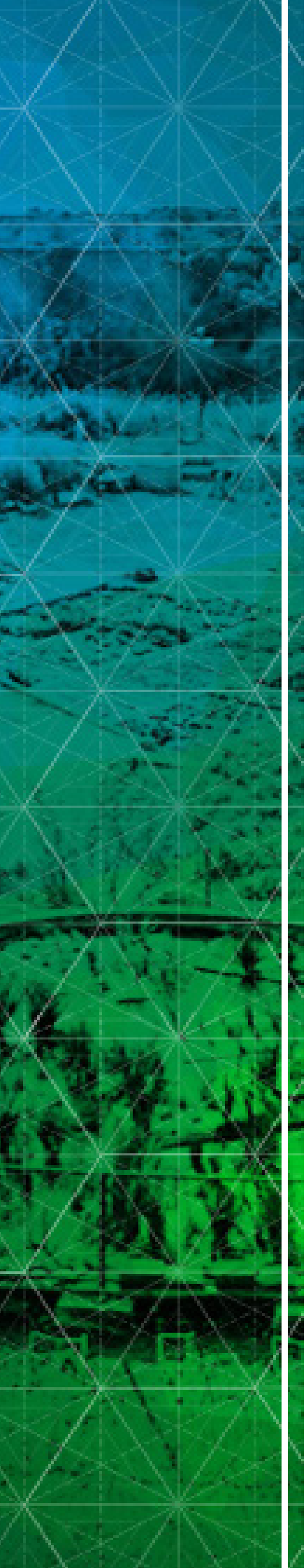

ADAPT

RESILIENCE

NEW MATERIALS

DYNAMIC CYCLES

ENVIRONMENT

CYBERNETICS INFRASTRUCTURES OF QUANTITATIVE AND QUALITATIVE DATA FOR DISTRIBUTED CITIES.

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Keywords : distributed city, cybernetics, qualitative data, non-object, recursion, distribution

The association of technological development with cities leads to the construction of new urban habitats imaginaries.

This paper raises the idea of using qualitative and quantitative citizen data to build recursive and distributed cities.

1. Introduction

Global urban topological networks shaped the way how cities are conformed and relationships between them, in both centralized and decentralized networks have been reduced to a specific group of specialists who determine which, how and where urban infrastructure is developed. In past years, lateral citizen power has been emerging to inform and shape our urban habitats.

First and Second Industrial Revolutions conformed the develop of cities based in a centralized and decentralized topological networks respectively. Centralize network generates a unidirectional communication between the central and peripheral nodes, if a connexion is lost a node will immediately be insulated. Decentralize network constitutes a topology based in a group of peripheral nodes connected to a main one and each one of them to a central node. This topology stablished a change from a unidirectional to a bidirectional communication and from an oligarchic to hierarchical system, reducing its possibility of failure.

Nowadays, communication infrastructures and transport systems shorten distances and reduce time, creating a distributed topology, supporting and connecting cities in a point where liquidity appears as a new type of possible shape. The complexity of modifying cities morphologies supports the construction of new urban imaginaries, urban utopias and dystopias images are built to project desirable and undesirable objectives for social progress. Those target images distance themselves of Friedman`s realizable utopias who defines that to transform a utopia in a realizable utopia (Friedman, 1971), first a social and collective dissatisfaction must be detected, second must a media or technology must be available and as last, there must exist consensus that through the available media or technology the dissatisfaction can be satisfied.

The ideas of idealistic and future of cities relies mainly in a new technological discovery and in the credibility that through that discovery we can solve contemporary urban problems. When Iannis Xenakis proposes 14 axioms to create his Cosmic City he did it by criticizing the decentralization and orthogonal morphology as urban 'dramas´ (Choay, 1965), both understood as collective dissatisfaction, and by proposing technical solutions to solve the proposed axioms he validated the idea, even it was non-viable.

Hyperconectivity and its impact on personal lives (Cheok, 2015), has been situated as medium of mediums for the socialization and communications of dissatisfactions and ideas, but not as a valid technology to solve, by itself, urban issues. As Xenakis explains, it is impossible for urban planners and architects to solve much more urban complex issues, as designing infrastructure can solve, in fact, there is no need to build massive urban project to achieve urban impact, the idea of distributed cities is related with the dematerialization of physical infrastructures for the creation of new type of information and communicational systems.

2. Data for the commons

Technology have changed the way how we interact between us, shortening geographical, institutional and political distances making almost every person accessible, breaking the typical hierarchical organization levels, bringing us into the same base level generating an heterarchical organizational structure. If for TIC's we are all equal, personal and particular situations could be not considered in any equation if the process of collecting and visualizing data are threated without regard to common people.

Pouring a liquid content into a solid container, particles will distribute through the physical context adapting to the object`s shape. The same phenomena happen with digital communications that underpins analogue infrastructures by adapting to its shape not only from a topological perspective but also from its performance which depends on specific and local iterations related with openings, uses, materials and time. The way how data flows, generate structures and its representation is defined by a pre-established logic that defines trends, strengthens situations and consequently weakens others. Data visualization platforms acts in the same way as a container where information is structured, organized and shown depending of the back-end structure.

Putting together both front and back end of the platform, makes users to interact in an extended way with technology. One way is to generate participation through gamification strategies, making technology accessible to common people who unconsciously participates from a bigger, and sometimes occult, objectives. The case of Sesame Credit, for example, promoted by the Chinese government, measures citizen's obedience, giving and taking away credits and benefits depending if the social behaviour is aligned with the regime doctrine, generating a distortion between interactions and objectives. In the opposite Block'hood (Plethora, 2014) propose a new type of interaction, where participants create they own emerging patterns and build environment through ecological balance.

In these two main dimensions where information performs, generally, official institutions focuses on quantitative statistic data, making specific visualizations for they own purpose. Unofficial institutions, mostly relays on distributed and crowdsensing method to collect data focusing on collective and individual experiences (Picone, 2015). This creates a new opportunity by combining personal emotions with objective

data through georeferenced digital infrastructures by identifying a right participatory system.

3. Linear (centered) and cybernetic data (distributed)

In complex systems, information must be legible using defined digital or analogue methods to decode it. Human relationships and interactions can be readable as well, by understanding the messages and the access of communicational platforms we can understand how society behave (Weiner, 1958). If we can measure are the facts that normally are used to define, design and implement urban projects, so the measurement instruments are key to collect precise and multisensory data that can give us am understanding of a new type of social messages. Data is the quantification of specific metrics that are generally collected through Geographic Informational Systems (GIS) and by field observation, both taken as a one-time picture from a top-bottom approach using conventional measuring systems that creates static images which can be overlapped and clipped by the viewer creating a new data and content.

This process requires that the field of analysis should be precise and limited, subject to individual events, using one type of data and a mono-platform for processing multiple information simplifies the observation field, making it linear and oriented to reach a specific objective, without allowing spontaneous and informal human activity inform the process. The role of the observer who process and control the system, by selecting, filtering and concluding from his personal subjectivity. As the thermodynamics second law defines, entropy can increase over time for an insulated system, the observer insulates de systems depriving it form interactions and from equilibrium. By insulating systems, the lack of interconnectivity between official and unofficial information of conventional topographic analysis in cities contributes the creation of a partial understanding of our urban environments (Sassen, 2011), by separating social, economic, physical and experiences geolocalized orders.

The role of the observer is similar of what James Clerk Maxwell defined by as his demon (Maxwell, 1867), a creature who had the ability to act in a molecular scale to move particles and control a global system to decrease entropy, to achieve that, he must have the knowledge and understanding of local and global scales at the same time. The first one allows him to know exactly which particle he must select and the second one give him the context and information of where that particle must be located in space, endowing him with a certain intelligence by empowering him to be an active element of the system.

The continuous linear flow of information from an origin situated directing from one side to other, processing inputs into outputs it's a closed system where the controller plays an important role but it has no integration with the system itself. Regulating information makes the system alive by incorporating feedback as a hermeneutic and regenerative process, breaking the not reciprocal linearity.

Viable System Model (VSM), developed by the British cybernetic Stafford Beer (1972), is a self-reproducing model capable to include the environmental changes in a recursive way to continuously adapt through time in a cause-effect action, considering actuality, capability and potentiality. The appearance of this model complemented the way how Norbert Wiener defined cybernetics, including the systems as part of the environment, so the result of the system can inform the next iteration and so forth, generating recursion. In the same line of the VSM, second order cybernetics integrated the observer into de system (von Forester, 1979), involving people and, by consequence, society. By allowing the observer to get inside the system and choose his own purpose, giving him autonomy, changing the linear way of thinking in the occidental culture (Delanda, 2010),

Installed as a feasible media for decrease social entropy cybernetics improves the communication between humans, humans and machines and machines with machines (Wiener, 1958), enabling the opening of new formal imaginaries, incorporating the idea of generative, recursive and cybernetic systems in the dimensions of art, public governance, architecture and urban design.

4. Hybrid cybernetic infrastructures

In the design practice is common to design within a context and space, they give scale and gravity, providing precision to local interactions in specific time. Conditioning the result to a specific time, giving stability by freezing any chance of further growth (Vivanco, 2016). Life is a dissipative metastable process (Schenider, Sagan, 2008), where things are in continuous transformation through the exchange of energy based on thermodynamics' laws. By stopping individual evolutionary processes from objects, the bigger ecosystem is affected increasing entropy.

What is not so normal in the design practice is to design openly by incorporating these evolutionary principles, considering the fourth dimension (Fry, 2009), that means to extend the borders of design and make things open and public so they can be extendedly owned by people (Delanda, 2010), focusing the power and potentiality of objects in the extension of its unfolding capacities (Domínguez Rubio, 2015). That requires to change the idea of finished objects, understood as products, for the concept of prototypes, understood as interventions. To achieve the change, it is important to stablish the difference between a prototype and prototyping.
Prototypes are formal representations of the projections of what the object will become, they commu-

nicate an extended idea based on technological, interactive and economical aspects. By focusing the process in the interactions and dynamic that the objet generates, the idea of finished product disappears emerging its capacities and implications. The language and communication become a process that enables a complex extended-self creation of the idea.

By the end on 1960's, computational science community started to reflect about the potential impact of technology applied to society, the concern was not focused in products technology, was in the new utopias that the democratization of military, industrial and big scale spatial computational systems opens (Boguslaw, 1965). The idea of applying computational principles to create urban and spatial infrastructures was explored by the British group Archigram, in 1965 Denis Crompton designed the Computer City a vision of a cybernetic city for control and communicate through feedback of the metropolitan area traffic (Sadler, 2005). Following the same recursive and self-organized system logic, Cedric Price's Fun Palace (1961-1972) opens completely the way of how to perceive physical structures by defining them as planned obsolescence (Veloso, 2014), projecting a homeostatic building that vary to internal activities and external environmental conditions.

Figure 1. Distributed Neighbours by Fab Lab Santiago. 2017
http://fablabsantiago.org/experiencias/n/barrios-distribuidos/

Shape and prototype cybernetic physical infrastructures in cities requires the previous definition of a specific community and within that community to define certain initial key `pains´, what bring us to define a location in the urban context and by last the design of the physical shape. Experience Totems (Image 1), as part of the Distributed Neighbours project (Fab Lab Santiago, 2017) by mixing quantitative environmental data and qualitative experience and urban perception digital data, establish as a social metabolic system for the detection and definition of new urban relationships.

The results of those measurements, where openly viewed and analyzed by the community and authorities in order to define specific needs and determine which, where and how public spaces solutions can be developed. After a participatory process leaded by Fab Lab Santiago, citizens from the community designed, prototyped and installed they own solutions. The result of this cybernetic data collecting and participatory design and implementation process where far from being a temporal exercise, where after 6 months, the infrastructure was improved and proliferated towards other points of the neighborhood.

Cybernetics infrastructures requires to merge both physical and digital systems, allowing connections without any central governance locating them in an extended and distributed network. This new topology decreases the possibility of failure and without any predefined structural logic, creates a heterarchical structure, giving all agents the same level of participation, augmenting resilient capacities in territories. This new type of infrastructure becomes then a valid media to achieve urban challenges by connecting people, data, experiences and governance.

5. Measuring quantitative and qualitative data for distributed and recursive cities

As was pointed before, physical infrastructures and objects temporize social flaws blocking any chance of feedback and by consequence, adaptability. Communication in a distributed network requires dematerializing physical elements into data, making then open, public and democratic (Tironi, 2016) a shift from designing within an Object Oriented Design (OOD) logic to a Non-Object Oriented Design (NOOD) must be defined (Vivanco, 2017) in the principles of the implementation of participation through cybernetics in the urban environment.

As we seen before, there were server al attempts to design and implement hybrid infrastructural projects based on cybernetic principles, nevertheless no one of them was implemented. The complexity of connect people, infrastructure and political strategies within a territory was successfully developed in 1971 in Chile by an interdisciplinary team composed by designers and engineers led by Stafford Beer and

Gui Bonsiepe. Cybersyn was an integral system that articulates the global economy of the country from an organic and cybernetic perspective, tuning in with contemporary cities concepts, something complete unthought in that time. The Viable System Model (VSM) was the core technology where Cybernet, an internet based on telex machines, Cyberstride, an information filter connected to CHECO (Chilean Economy). All these technologies were controlled in the Opsroom, a futuristic room where seven people- observers- take informed decisions based on real time data extracted from all the public industries equipped with telex machines. Allowing workers in industries spread all over the country to be part of the main economical project by informing the system in real time, with quantitative data of production, like the number of produced shoes in one day or the price of the dollar, with worker's observation and personal experiences, creating a distributed governance.

Quantitative data are the facts that stablish main rules, borders and common places, generating information readable by experts that's create a central governance based on main statistics without considering granular individual data. Individual experiences and qualitative data gives a spontaneous dimension to urban systems basing its principle under the unknown. The complexity relies then in the design and implementation of specific and integrated hardware for data collection from everyday activities.

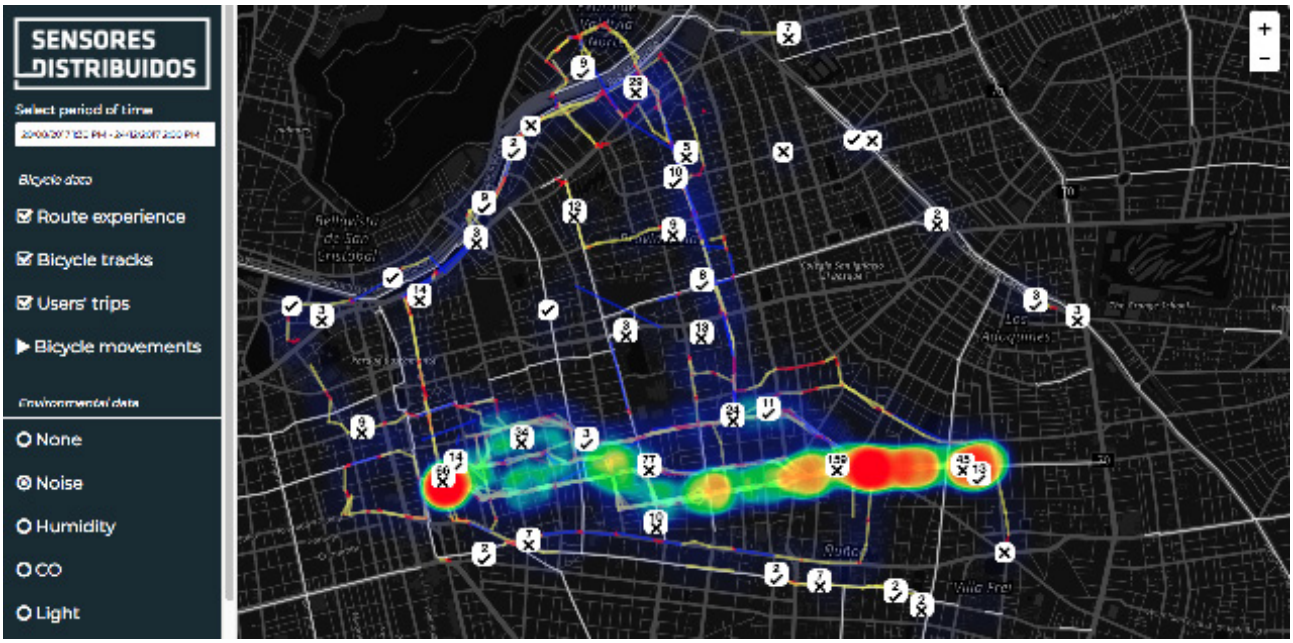
One good example is the Cyclist Experience Platform (Image 2), developed by Fab Lab Santiago. By installing in public and private bicycles a basic distributed hardware composed by two buttons, one associated to a good experience and the other to a bad one. By the extended use of technology, cyclists contribute to a public and open visualization platform generating a recursive interaction between urban infrastructure, citizen experiences and distributed governance.

In both cases, by measuring and process qualitative and quantitative data, design, as practice, can integrate in the same system new variables creating human ecologies by satisfying them, preventing formal and contextual mismatches, as Christopher Alexander raises referring to Herbert Simon `the design problem it is not an optimization problem' (Alexander, 1966).
The implications of cybernetics infrastructures lead us to a better understanding of the urban ecosystem in order to define and build common infrastructures in public spaces, making cities more adaptable and recursive.

6. Conclusions

Each person interacts in singular ways with the city, collect and understand this behaviour is crucial to develop a distributed topology, mixing quantitative data with qualitative data extracted from citizens, combining physical and digital infrastructures. Digital technologies can be a catalyst of social empowerment and governance to articulate local needs, transforming them into design opportunities, increasing local territories resilience.
By integrating cybernetic and computational principles in daily life, subjectivity can be iterated until it will reach objectivity in equal conditions. The challenge lies in the definition and implementation of distributed and open physical interfaces for data collection with the qualities of being intervenable and improvable by common people for the construction of a distributed city.

Image 2. Cyclist Experience Platform by Fab Lab Santiago
www.smartcitizen.cl



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WATER MANAGEMENT AND COMMUNITY IN PUBLIC SPACE. RECOVERING THE THERMAL GARDENS OF CALDES DE MONTBUI

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Keywords: social metabolism, public space, water cycle, community, productive landscape

This experience aims to recover a space of historical irrigated gardens located in the metropolitan area of Barcelona, Spain. From understanding the traditional water management as cultural heritage, the project has a double goal: on the one hand, to promote sustainable urban design and, on the other hand, to boost a new community consciousness connected to the territory.

Through several phases, the project solves a double environmental conflict linked to the irrigation system: on one side, the lack of enough water availability and, on the other side, the health risk due to the spill of urban polluted waters in the main irrigation canal of this space. Consequently, the main proposal is based on the gathering of thermal clean water surplus of spas and public washing places -that are not reused in the gardens presently- to provide enough quality water for the irrigation.

By means of an action-research process it's possible to recover the active ability of urban citizens as producer agents, as well as the quotidian practices related to water self-management as the imaginary of place identity, that is to say, the intangible heritage of the water management as a reference model towards the sustainability.

1. Introduction

The project is located in Caldes de Montbui, a town in the Plana del Vallès region of the Barcelona metropolitan area. Specifically, this town gives its name to one of the tributary rivers of the Besós River, the Caldes stream. Caldes receives water from the Pre-Litoral mountain range basin and from a very special resource: the upwelling of thermal springs. Crossed by a tectonic fracture from west to east, the town has numerous upwellings of thermal springs with the hottest water in the whole Iberian Peninsula (74ºC). From Roman times, when the city was founded under the name of Aquae Calidae, much of the lands of the Caldes stream basin have been used to cultivate food. The surplus of thermal water made regular irrigation possible even during times of drought.

1. Triggers: Conflicts=Opportunities

Water is life, and the landscapes generated by its social and productive management are their spatial expression over time. In the traditional city, water carried out most of the urban and peri-urban activities, allowing the city to be understood in relation to its territory. Referring to E.A. Wrigley (1987), this relationship was based on an organic productive model where the citizens had an active role as users of water through everyday life practices of self-management and production, adapting the use of this resource to its availability in its territory. Water used to be a public good and citizens knew how to deal with it since it was a social resource, a cultural asset.

The scientists Naredo and Valero stated in 1999 that the growth of urban systems and their disconnection with their territory has conditioned our relationship with water since the industrial revolution. Its management has changed from a model where the communities were using it directly, to a public municipal model risking becoming a private commodity. This caused a disconnection between water and users that, together with economic development, led the users to adopt a passive role that turned the management model into a demand-based system. Thus, traditional infrastructures became obsolete, falling into a process of oblivion. Water has been "stolen" from the community, a community deprived of agency and affected by the loss of sense of community (Hardy and Ward, 1984).

However, if we understand water management from a systemic and integrated point of view, it is possible to read traditional management as an intangible heritage and this is our guiding principle when intervening at the orchards in Caldes de Montbui.

Figure 1. Organic village model providing the resources for self-sufficiency. Date not accurate (XVII century). Source: Pere Maspons i Cadafalch.

Figure 2. Non-organic village model separated from the surroundings. Aerial photo of the village at the beginning of the XXI century. Source: Institut Cartogràfic de Catalunya.

The site belongs to a peripheral fringe called Hortes de Baix (which means "low orchards" in Catalan). Hortes de Baix is an historical space of irrigation consisting of 3.7Ha attached to the main core of the village. This space has suffered the gradual environmental and social degradation of its landscape. This particular process of peripheral landscapes of the twentieth century is here mainly caused by the water pollution of a local stream that supplies the irrigation system, a lack of security regarding accessibility to the space and the breakdown of the irrigation community (due to a lack of cohesion and transference of intergenerational know-how).

Therefore, the main conflict to solve was the continuous flow of polluted water from the entire city centre into the main irrigation ditch that supplies water to the orchards and to the Caldes stream. A complaint to the national health department from a local group of ecologists sounded the alarm about the risks of eating vegetables watered with sewage. Complaints from the gardeners about the unhealthy quality of clean water and its scarcity helped to visualize the flow of polluted water to the orchards, which are part of the area's heritage. This fact, together with the frequent accidents caused by the poor access conditions to the orchards (walking over the drought wall) and the death of a gardener due to this accessibility problem raised awareness in the town hall of the need to work on the orchards to improve the water supply and its management and access.

2. The background of the project

The main background that activated this project is the Mostra Internacional de Art Urbà (International Urban Art Exhibition) that took place in Caldes de Montbui. For 8 years, and organized by a local institution (Museu Thermalia), this event spotlighted the potential of urban public space linked to thermal water in the old town. Decontextualizing and making those spaces open to artistic ephemeral performance helped to emphasize their singularity, redefine their use and claim the public condition of urban public spaces (more information at www.miau-termal.cat). In addition, the research that took place on the site with the students from the master's degree in Sustainability at UPC-BarcelonaTech helped in organizing debates between the agents related to thermal water (spas, gardeners, institution and citizens) to allow a new model of production and management, proposing a new participatory action to integrate the intangible heritage into the cultural agenda of the city.

Those investigations were partly coordinated by ourselves from 2008 and were a way to establish contact with the community of gardeners and to make a petition to the local government. The town hall took the petition to the municipal Board for Public Spaces, which gives voice to local initiatives to improve the city's urban space. Consequently, the City Council commissioned the assignment to solve the need for more clean water for irrigation, to channel the open

flow of wastewater and to facilitate accessibility from the city center.

Therefore, departing from our specific approach and three complementary strategies, we proposed the following: to recover the private horticultural landscape as a new public space that encourages food self-sufficiency; to co-design the process with the irrigation community and stakeholders; and to recognize the key value of traditional water management as a tangible and intangible heritage.

3. Strategies

As if they were a conceptual lens, we borrow the approaches of our main references in landscape ecology and urban metabolism. Their theories and experience allow us to develop four specific strategies that will determine and guide the goals, methodology and outcomes of the project.

3.1 Specific approach: Urban metabolism

The Economic historian Enric Tello (2006) recognizes the potential of a specific landscape unit: the traditional agro-forestry landscape mosaics of the Vallès region, the territory where our project is located. Tello states that these mosaics are a good way of increasing the biodiversity and continuity of this type of ecosystem that combines production and conservation as a fringe between the forest and the urban fabric. He also explains that the landscape is the territorial expression of the metabolism that any society sets up with the natural systems that sustains it and this is our point of departure to understand our context.

Since our orchards are located within this agro-forestry landscape mosaic, we will work to close all the material circles in its metabolism (mainly the water cycle, organic matter cycle and energy cycle). Not long time ago, these orchards self-supplied the city centre in the same way that fields supplied the entire city. Work towards the self-sufficiency of this system is one of the main goals of the project.

3.2. The water cycle in its territorial dimension

Taking the urban vision of the anarchist geographer Élisee Reclus, we recognize the need to identify the cultural practices around water derived from the territorial scale. His book Histoire d'une ruisseau (1869) shows all the different stages in which water plays a key role for society's activities.

In consequence, we need to research beyond the context of the orchards themselves, exploring the watershed as the real scale of intervention,and its potential as a supply. Identifying the functional water cycle through streams, ditches, old mills, existing laundries and rafts along the course of the river that irrigates those orchards.

3.3. The historical value of water

We establish a very clear link with the concept of "oasis" that UNESCO architecture advisor Pietro Laureano has developed in his work La piramide rovesciata, il modello dell'oasi per il pianeta Terra (1995). He helps us to understand water management from a systemic and integrated point of view; it is possible to read traditional management as an intangible heritage.

Thus, we recognize the material dimension of the orchards as a heritage where traditional knowledge and its physical, cultural, social and economic representation enable resources to be managed organically. This means that the orchards can be understood as if they were an oasis, a key model to transform our current urban social metabolism.

3.4. The civic survey and the role of the community

The last reference is the biologist Patrick Geddes who developed the concept of the civic survey, an observational technique to analyse the environment from a social perspective. Furthermore, he explored what he called conservative surgery, a very sensitive way to intervene by trying to respect the context.

This is why we have carried out participatory observation research in order to diagnose threads and opportunities within the social context of the water system of these orchards. According to the Geddesian surgery, our interventions turn out to be very specific and interconnected.

4. Goals

The strategies described led to the development of a general goal for the project and two further specific ones. The main goal of the project is to promote a new perception of the use of thermal water for irrigation. We propose recognizing the key value of traditional water management as a tangible and intangible heritage, recovering community daily practices to allow the reinterpretation of this social heritage as a way towards the sustainable transformation of the space (WCED, 1987). From the compression of the landscape as the shape of a sociocultural perception of the territory (Roger, 2000), the way resources are managed and the traditional water management practices recovered, it is possible to transform the perceptual frameworks necessary to develop a new ecological urbanism. In this project, this transformation aims to become a key instrument towards the new sustainable paradigm and that is materialized in two specific goals.

The first specific goal of the project is to propose a plan to reactivate the community of gardeners in or-

der to consolidate their structure, representation and commitment to efficiently manage the thermal water resource. In this sense, the community of irrigators has been empowered by creating an association to collectively manage the resources and the physical space of the orchards and their infrastructures. The second specific goal is to promote a productive urban landscape based on sustainable urban design, from the understanding of the traditional management of resources by using the knowledge on thermal water and the current technical possibilities of using it for irrigation. Reusing the surplus of thermal water from spas, using gravity to move water and separating different water qualities to allow different uses became the main action lines of the project. We also focus on organic material to produce food and the absorption of waste (like compost) to respond to social and environmental challenges while mobilizing the urban social metabolism.

5. Methodology: participatory action research

We support a long-term participatory process since we are convinced they enable awareness for the transformation of perceptual frameworks of the landscape (Lakoff, 2007). Thus, we propose tools that facilitate this change of perspective towards thermal water. Throughout almost two years of collaboration and co-design with the gardeners, we detected an inadequate management of the water surplus from private thermal spas released into the stream. Therefore, we proposed to reuse it for irrigation as well as the surplus water from thermal washing places. Together, we discovered that the lack of thermal water in the orchards did not respond to a shortage in the thermal water supply but to the inadequate management of this resource. At the time the project began, two-thirds of the 1,000m3 of water that naturally outwelled every day were discharged into the river once they had been used by the private spas, without spaces for retention, compensation or cooling before reaching the river.
Throughout this process, the irrigation community was recovered and empowered to agree on some interventions without altering the existing irrigation system or its social management. The project was executed with a very low budget and a Municipal Employment Plan. The maintenance is taken over by the irrigation community and eventual problems are managed by the municipality.

6. The proposal: an action plan of micro-interventions

The result of the participatory process is an action plan based on different interdependent micro-interventions.

The interventions have been developed over two stages:
-The sustainable management of the irrigation system
-The walkway to improve accessibility

As part of the community-driven process, the surplus of water from thermal spas was recovered to irrigate orchards, ensuring a supply of water. For that, a new public pool was built to accumulate and cool thermal water. From there, we keep and recycle the existing irrigation system to deliver flooding turns operated by gravity only, avoiding introducing any new mechanized device and non-renewable energy consumption. Wastewater is channelled to the sewage collector allowing the existing main canal to be recovered, with a new walkway to improve access to the area. This is supported inside the stone walls to avoid any alteration to the appearance of the canal traces.

The presence of elements from the self-construction of horticultural identity is enhanced: granite stones, handmade ceramic bricks, manual floodgates, wire meshes and fences. We reintroduce live willow, formerly used to make willow baskets heated by thermal water.

Finally, an innovative pilot system is developed: phytotreatment with macrophytes planted on floating gardens, to absorb residual organic material without altering the pool's oscillation condition.

Figure 3. Participatory process with the community of irrigation during the project.
Author: Jose Romero ©Tostoneone

Figure 4. Public pool to accumulate and cool thermal water (above). The walkway to improve accessibility (below). Author: ©Adrià Goula

7. Conclusions: Benefits of the project

The results of the project allow the project to be evaluated on three levels:
First, the political level: The Government has committed itself returning the dignity to this place and to the long and intense participation process that culminates with the creation of a hitherto non-existent gardeners' association. A board with commissions is created to ensure self-management of the irrigated space, the establishment of internal rules, communication with the city council, the visibility of its historical heritage and the necessary intergenerational transfer of local knowledge.

Second, the productive level: Obtaining clean water allows the practice of organic farming and increases flooding turns. In the long term, visitors will be able to consume the cultivated products. In a way, these orchards may become a food pantry for the village, a grocery for those committed to consuming organic vegetables, including the local stakeholders such as primary schools and consumer cooperative stores.

Third, the civic level: The vegetable gardens become an open public space, promoting the recognition, inclusion and education of the agrarian space. The location of the orchards in relation to the city centre generates a kind of "balcony" over the orchards that are visible to citizens. The new orchards become a

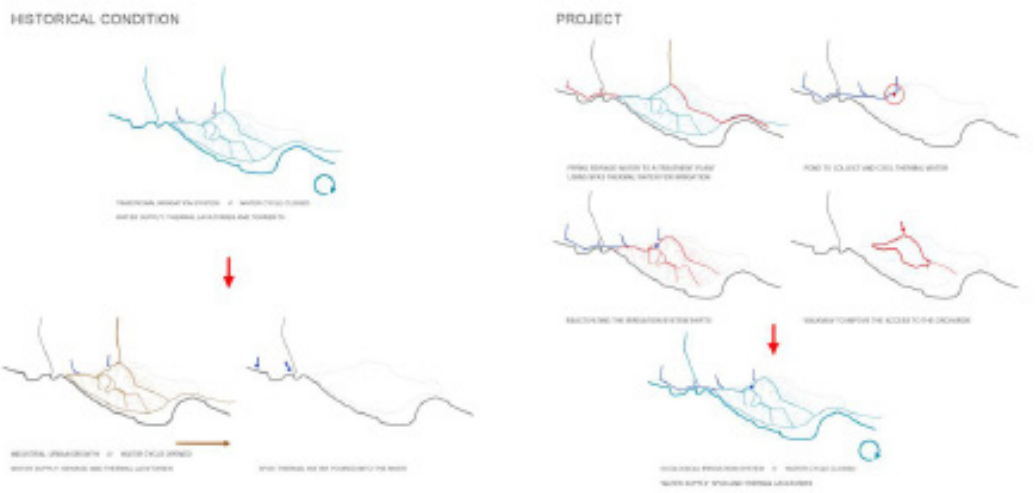

Figure 5. Scheme of the irrigation system. Authors: Ciclica & CAVAA.

new productive garden for the town and a new route is created by the new walkway reconnecting the town with its territory.

8. Learnings and lines of continuity

The new community and ecological approach also challenged our architecture team to assume the role of mediators and observers, by adopting innovative conceptual references from complementary fields and integrating external collaborators. This has allowed us to develop new decision-making tools and communicate the technical aspects of the project. Nowadays, we continue to collaborate with the town hall and the new gardeners' association to establish agreements in two different ways: on one hand, we are collaborating with a techno-agroalimentary research institute to facilitate technical support to the new generation of gardeners that have to introduce new means of fertilization once the sewage water irrigation ended. On the other hand, we are collaborating with a university master's course in landscaping that will be able to set new long-term proposals for the space.

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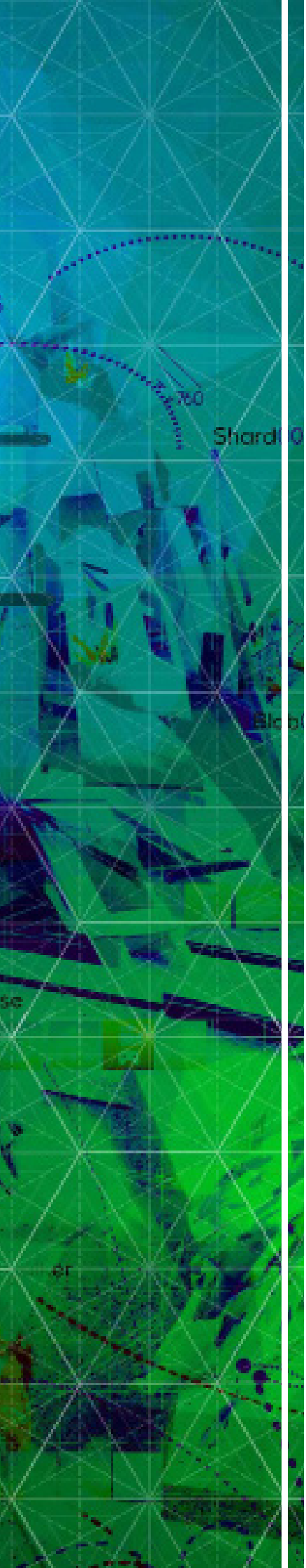
Figure 6. Community of irrigation, gardener in the orchard and the new walkway. Authors: Ciclica & CAVAA (left and right) and Jose Romero ©Tostoneone (center).



EXPERIENCE

DIGITAL & VIRTUAL SPACE

BEHAVIOURS

GAMING

HERE: AN INTERACTIVE DEVICE FOR COLLABORATIVE PUBLIC SPACE

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Keywords: engage, interactive, multidisciplinary, open-source, urban device.

Nowadays new technologies are becoming quickly cheap and popular in the urban environment, and cities along with their main stakeholders need something more than apps and sensors to deal with the issues of the public spaces.

The design of an urban interactive device - HERE, a physical and digital interface – is pushing forward the way we think at an urban device by addressing different approaches and subjects toward the next collaborative leap in urban design innovation.

HERE aims to respond to the contemporary quests for a more sustainable and efficient city, while generating new all-purpose public space and fostering convergence of atoms and bits to engage people.

The knowledge we are able to both gather and manage merged with the ability to generate performing hubs of public space experience are the leading drivers for a temporary, sustainable and open-source innovation through serendipity.

1. Introduction

It's a two decades old evidence: urbanism is struggling to answer to the needs of the contemporary city and as far as new technologies are increasingly leading the ways we physically interact and get emotionally involved in the real world, new approaches are being developed outside the competences of urbanism and architecture. Usually founded on paradigms such as participation, open source and algorithm-aided processes, these approaches are supporting new theories and practices. As a result of this shifting, the traditional ways of dealing with the urban environment have started to be questioned.

Since the early 2000s, some of the largest ICT companies - e.g. IBM, Cisco, Samsung - become the main actors in the decision-making process related to city management. This trend begun as soon as the term 'smart' started becoming the driving paradigm of the XXI century city's transformation plans. They are not the only new protagonists: the diffusion of internet-connected devices has brought to people new ways of gathering in as well as acting for the urban space. As highlighted by Renier De Graaf, cities are now ruled by someone "who usually build chips and software, driving the urban transformation from the spontaneity of the interaction in the urban life to the utopia of full control and forecast of events" (De Graaf, 2016).

Micheal Batty enlarges the topic, arguing that "these new technologies are changing our focus on the city from that based largely on space to one based on time. In our past, our concern for cities has been n relatively long-time scales, as much because what happens in a city on a daily or hourly basis has been beyond our systemic observation and control. (...) Moreover, data and information in any considered way has not been available and hence our understanding of cities on very short time scale has been rudimentary, individualistic and largely subjective" (Batty, 2013, p.10).

Today we are dealing with the chance to merge both bottom-up and proactive actions with computer intelligence to support effectiveness and spreading while contrasting indifference and self-destruction.

To avoid big ICT companies' biased vision of top-down approach and data- driven changes, the multidisciplinary team of actors that nowadays should be in charge of envisioning urban changes have to merge respectively know-hows, methods and tools. In the last five years every one of us had experienced the at least two of the most outstanding technologies that are about to change the setting of public space: autonomous vehicles and augmented reality. While the first one promise to clean up messy and congested roads in few years, the second one broke into the physical world mainly as just a game – Pokémon Go – but it paved the road for what is looks to be its evolution: Magic Leap's 'mixed reality'.

It is quite an evidence how the new technologies are rapidly affecting the essential functions of the public space while citizens and professionals are struggling in following suit to understand the potential and to participate.

So, how can we foster the coexistence between the new technologies and the city's user in the public space? How public space will engage us in order to more comprehensive, active and responsive?

2. Thesis

The paper explores a feasible solution by briefly introducing HERE, a physical and digital interface that is able to engage a wide range of people while offering a multitude of services to the surrounding space. Basically, a performing installation that works as an interactive catalyst for multidisciplinary approaches and open source public-space making strategies. The design of such an urban device is pushing beyond the IoT and app-based solution we have seen so far and aims to gather and address different approaches and subjects toward the next collaborative leap in urban design innovation: the next generation of urban experience. HERE hence aims to respond to the contemporary quests for a more sustainable, efficient and active public space inside the city's fabric by fostering convergence of atoms and bits to engage people.

3. Conceptual Framework

Beside the geographical scale and aim, HERE shares some of Archigram and Archizoom paradigms – like modularity -, embodies some principle and vision developed by Cedric Price in some of his most visionary projects – like 'the Generator' and the 'Fun Palace' projects - but it largely matches Yona Friedman's spatial, digital and social program envisioned from 1958 with his Ville Spatiale. At first, Yona Friedman saw his utopia as an instrument of social change, enabling people to decide how their dwellings should look like and to succeed in self-planning; thanks to two simples as well as radical concepts, Friedman aimed to achieve these goals. He designed a spatial infrastructure made of a fixed element – a multi-storey space- frame grid" lift form the city lever by stilts – and mobile elements consist of walls, base-surface and dividing walls, which represent the filling for the infrastructure.

But mainly, Friedman developed "a program of methods of choice to enable people to create and position the living space they wanted" which was published in 'Manuals'. He then invented a "model for communication to get a balanced combination that would serve to avoid conflict; it was thought as

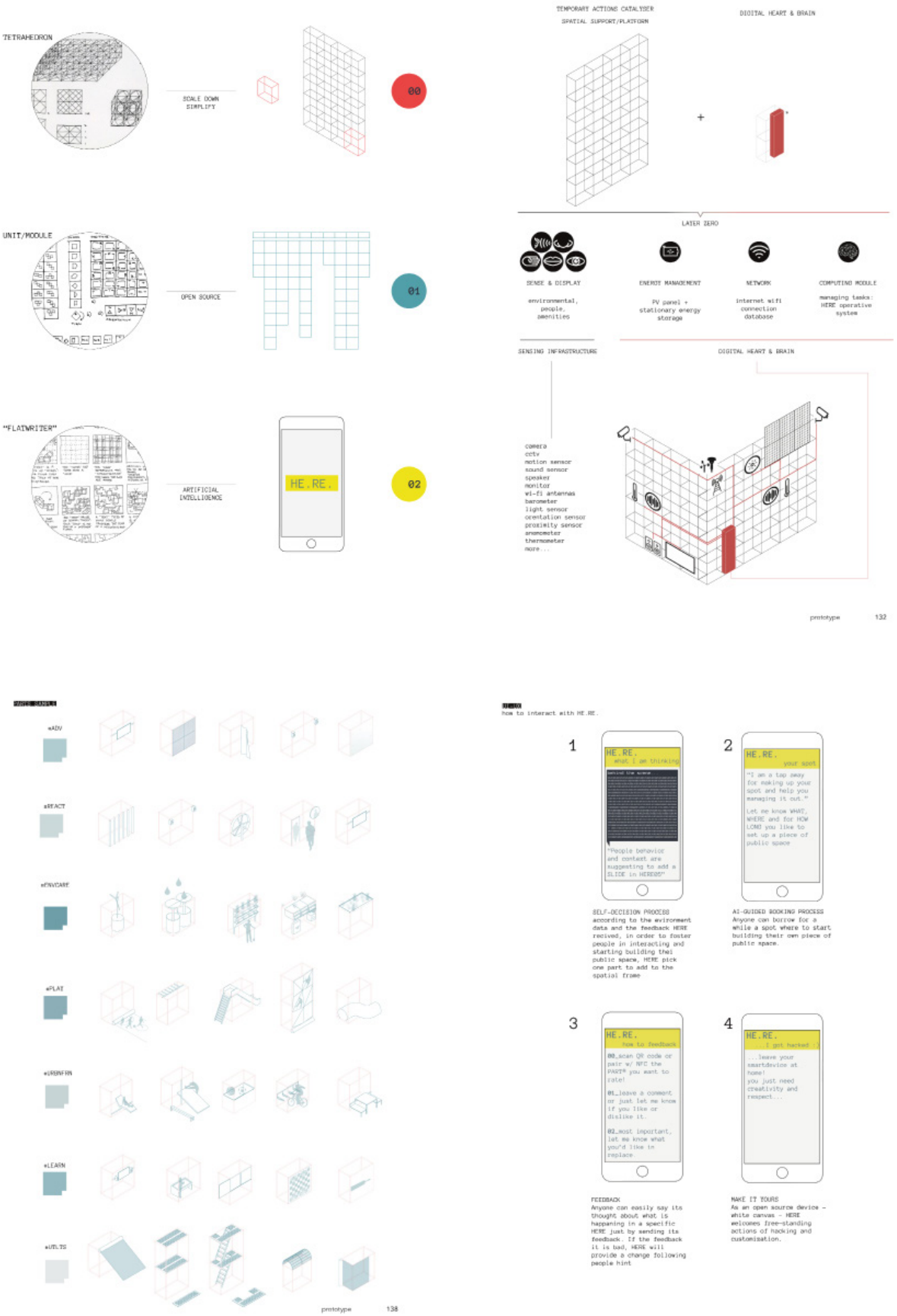

Figure 1. From Friedman's element to HERE's (Benetti, 2017).

a computer program, called 'Flatwriter', to integrate the Manuals and it is meant "not only to explain how to build, how to decide, or organize, they also explain for instance mechanisms in behavior, economics and principles he sees fit for people to improve their live" (YonaFriedman, 2016).

HERE learns Friedman's three principles and it accurately makes them suitable for the needs of the contemporary city; HERE is designed with a strong urban identity able to communicate and spread the values and principles that led HERE's mission.

HERE is basically made of two macro levels: in fact, the first, it is the result of a balanced but rather adjustable coexistence of physical and digital elements: the parametric scaffold is set as the frame of the device and represents the Friedman's fixed element while the 'mobile' elements are all those physical objects listed in the open-source kit of parts that represent the customizing gears. The second is represented by the digital level that is made of a customizable ICT infrastructure and displays - where to visualize data – as well as Virtual reality gears. The physical as well the digital interface are designed following specific rules and parameter in order to guarantee the most disruptive and engaging user experience (Figure 1).

The simplicity and inexpensiveness which lead the design process of the framework worked as well in the definition of the terms of use of HERE, that can be seen as a 'blank-canvas' at urban scale which anyone can paint on.

HERE is designed as a temporary urban stage where anybody can interact with, play with and even more important can customize it; it is nothing else than an active, pro-active and multi-tasking piece of public space designed to embrace the fast changing in lifestyle and culture in an urban environment.

The kit of parts consist in an open-source market, in form of a digital platform – app as well as a website or in-site 'vending machine' – in which anyone can pick up its accessories to add a temporary feature in his/her favorite HERE; so basically it come out the box with a basic set of parts, accessories, add-on anyone can borrow or rent along with a possibility to let anyone built its own by offering few and simple "blank model" on which to start developing new accessories – just like a FAB-LAB.

Furthermore, the most revealing principle introduced by Friedman was for sure the 'Flatwriter', the software designed to let people built their own house, as simpler way as possible. Today that approach is evolved in what commonly and generically we call Artificial Intelligence. HERE, as a hybrid urban device, merges into her 'system code' the ability of not just sensing but to compute processes and to learn and support decisions. To complete definition, HERE is then a 'blank-acting canvas'.

Indeed, HERE evolves to be a just a performing device by being a complete catalyst for public space life: the living pulse of the citizen and their actions are analyses-to-be-known by the data they generate, allowing the AI to support decision-making process while raising awareness about new technologies and the city (Figure 2).

HERE finally is designed to embody and push forward two main strategies-driver concepts: hacking the urban public space and open-source approach. Ratti and Claudel introduce the mentality and approach of hacking to the physical world, affirming that "if hacking is about understanding a system, appropriating it, and using it for alternate purposes, then the core of a truly successful hack in urban space involves, first, what the site means; second, how the hack appropriates the site; and third, how the hack transforms the site to communicate a message to a broad public" (Claudel, Ratti, 2016, p.142). Further, they bring forward the topic toward the awareness of the risks public space - as space made of the convergence of atoms and bits - will face and embody since it will increasingly become hacker's playground, if it will worth it.

The parametric scaffold has been designed as a perfect incubator and catalyst for the temporary urbanism paradigms; temporariness, inexpensiveness, open-source place-making, pop-up-activities platform are the main principles that HERE embodies by default.

In their book 'The temporary city', Bishop and Williams reflect on case studies and enquiry – as they say – on this topic; the temporariness contrasts with "the dream of permanence" (Bishop, Williams, 2012, p.11) which have led humanity belief in its all history and it is becoming an out-of-date vision when today we talk about it as a perpetual problem-solver, in particular if it deals with urban dynamics.

HERE shifts the focus on the open-source and short-term action which in first place empower citizens in the process of reactivation while sending in the background/put in hold civic authorities and their tools; by fostering citizen and civic association to hack this urban leftover, HERE allows to add temporary features to the urban environments in which it is placed.

4. Findings and Vision

HERE focuses on the quest for something more than just IoT infrastructure in our contemporary urban space. As IoT is becoming quickly cheap and popular in the urban environment, citizens along with cities' main stakeholders need something more than apps and sensors to deal with their issues, from mobility to social matter. Furthermore, as many disciplines have

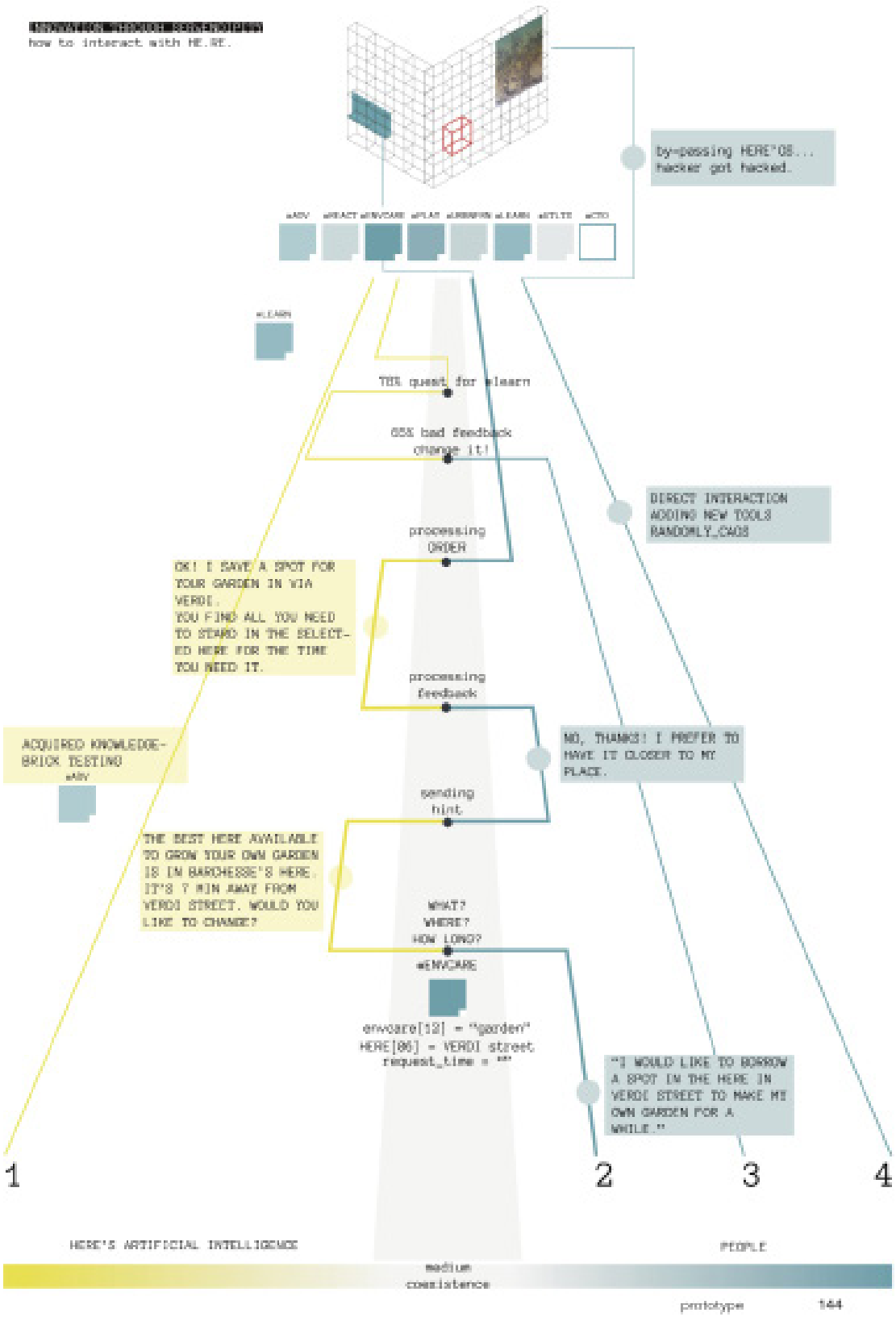

Figure 2. Innovation through serendipity: how to interact with HERE (Benetti, 2017)

become very confident with data-driven approaches and methods, HERE is pushing forward to address different approaches and subjects toward a singular and collaborative physical and digital platform. Hence, HERE is built as an interface with which all the main city' stakeholders can collaboratively learn, talk and share everything - from knowledge to solution to any urban issue.

HERE is an upgradable all-in-one urban device which gather heterogeneous approaches and actions into a physical interface with digital intelligence. This intrinsic ability allows anyone to tailor HERE to suit better the public space conditions and needs.

The interface is basically a series of physical tools that gear the scaffolding to make it interactive - monitors, boards, urban furniture, notification panel, etc - to foster anyone to stop and engage with HERE. The physical interaction is supported by a digital platform - e.g., web/app dashboard and Augmented and Virtual Reality gears- that enhance the overall users experience. Therefore, HERE is a new way of envisioning the next-generation of city's Urban Centre which is able to create urban physical interaction while fostering collaborative sharing of ideas and research.

As a low-cost, modular, sensing and interacting scaffolding, it is designed to be constantly update - through an open source process - to create a new place within the city most interesting spot to enhance existing public space. HERE aims to foster convergence of data-specialists, urban designers, citizens, governance authorities and companies for a collaborative urban managing process while enhancing existing public space. Indeed, underneath the framework of public spaces renewal policies, citizens and governs needs, more than ever, physical interaction spot to discuss and address the main choices for the transformation of their cities. Each HERE, by being an installation and a social collector, allows to drive the regeneration process of the area. Due to its adjustable design parameter, HERE allows different continually changing configurations to better suit the variety of characteristics of the public space and the new functions are asked to host, foster or support. Each HERE can host vertical farm in a network of farms spread in the most efficient spot around the city or can be geared with PV panels crating a smart grid. Or both, while having the ground level sets for interaction and public functions.

In this term, HERE fully suits the definition of what is called cyber-physical systems (CPSs), that from smart grids and autonomous vehicles, experience a deep level of interaction between the physical space and the computational elements (Figure 3).

5. Conclusion

In conclusion, HERE is a prototype that merges a data-driven design, able to push resiliency and participation while being a pro-acting entity inside the public space with the final goal of raising awareness and foster innovation. It can be defined as a geared evolution of HWKN's air-cleaning project WENDY or a more empathetic and user-friendly version of Sidewalk Lab's LINK NYC; beyond the comparison, the fact is that HERE would represent a positive disruption as a catalyst for innovation in our public space. The concept and the strategies that HERE embodies are well combined as a coherent whole in the words of Carlo Ratti and Dirk Helbing: "Decentralized decision-making can create synergies between human and machine intelligence through processes of natural and artificial co-evolution. Distributed intelligence might sometimes reduce efficiency in the short term, but it will ultimately lead to a more creative, diverse, and resilient society. The price of anarchy is a price well worth paying if we want to preserve innovation through serendipity" (Helbing, Ratti, 2016)

6. Acknowledgements

This paper is both an adaptation and a closer examination of the topic I developed for my master thesis "HE.RE.: from big data-driven mapping of urban neglect to sustainable and resilient reactivation" with the supervision of prof. Mosè Ricci and Marcella del Signore, during the academic year 2015-2016 at the University of Trento (Italy).

The master thesis has been awarded the IEEE Smart Cities Initiative Student Grant Program 2016/2017 - Trento Smart City.

Figure 3. Needs-changing scenarios (Benetti, 2017)

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UMWELT GARDEN: A SYNTHETIC COEXISTENCE

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Keywords: game design, ecological cycle, AI, augmented reality, behaviors

This paper outlines the goals and conception of a videogame based simulation Umwelt Garden, an interactive collective of digital Architectural objects resonating in the virtual and the augmented real. The paper presents the analysis of game based AI and behaviors deployed in live simulations and contemporary games to establish a design framework.

By understanding the video game medium as a synthetic ecological life cycle apparatus, the game aims to establish a dialog between the users and the synthetic, defined by the contextual disposition. This apparatus also aims to produce a divergent engagement and affiliations with its digital peers forming aggregations and occasional disruptions with the human users in the Augmented real. The game does not convey an overarching narrative, but rather distinct personal narratives as experienced by the users.

This paper draws on multiple disciplines such as video games, digital urbanism, synthetic biology, ecology, mixed reality, new media theories and material cultures.

1. Introduction.

1.2 UMWELT

The research revolves around the biological term Umwelt. The term umwelt gives us an access to understanding the constitution of an ecosystem. Umwelt as theorized and exposited by Jakob von Uexküll and Thomas A.Sabeok, is the semiotic world of an organism and the organism functioning as the subject1. Umwelt unites all the semiotic processes of an organism into a whole. He also states that the umwelts of different organisms different, which gives us an understanding of how the perceptual world constructs of different organisms operate at different scales and yet are linked together to form a gigantic musical score.

The functional components of an umwelt have a meaning for an organism; it maybe food, shelter, threats, enemies, or simply way finders for movement and navigation. An organism actively engages itself in creating its umwelt through its repeated interactions with the environment and other neighboring organisms. This abstract functional relationship between an object and an organism in its world is termed as "functional circles"2 or the feedback loops (In biosemiotics) again given by Uexküll.

1.2. Speculative history of form finding and video games

The broad lineage of Architectural form finding has inherited discursive inspirations from the embryogenesis and morphogenesis in the 1990s. This understanding was substantiated by the work of philosophers like Henri Bergson and Gilles Deleuze, who broadened the vocabulary of process-driven architectures. Bergson's "duration"3 (Bergson 2002) and Deleuze's "becoming"4 (Deleuze 1987) are at the epicenter of generative design agendas3.

The form was always an end result or an artefact that emerges out of a dynamic process of change. Greg Lynn characterizes three fundamental properties of the digital medium as topology, time and parameters as opposed to an inert medium of paper5. Lynn's micro-landscape of blobs (isomorphic polysurfaces) that mutually inflect into one other forming composite assemblages. animate field opens up a more intricate contextual relationship between the field and form than its previous possibilities.

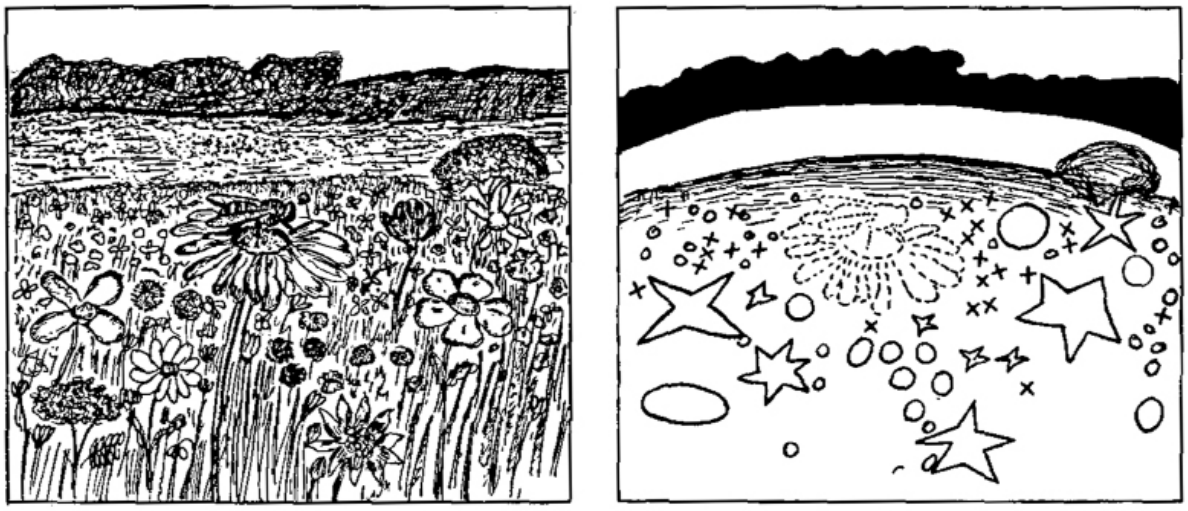

Figure 1. Environment and Umwelt of Scallop, Jakob von Uexkull

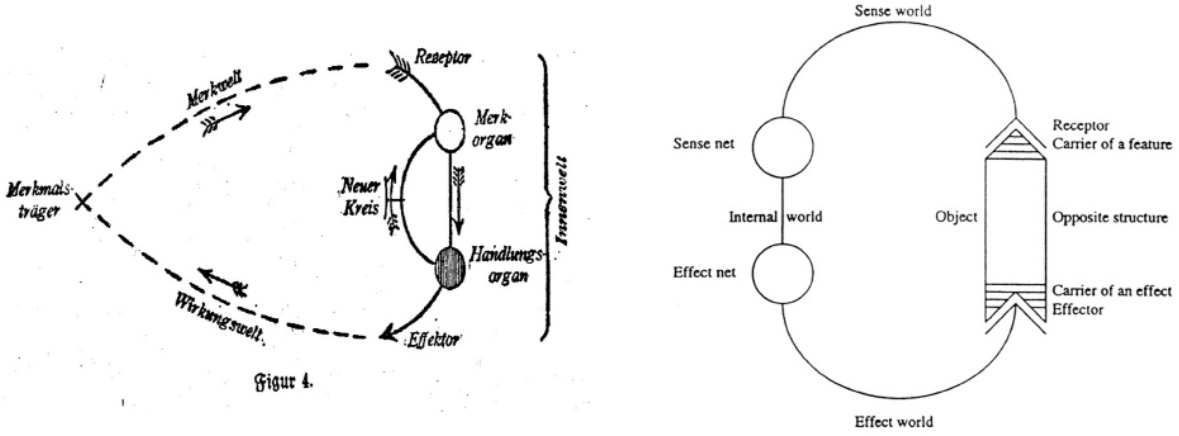

Figure 2. Functional Circle by Jakob Von Uexkull

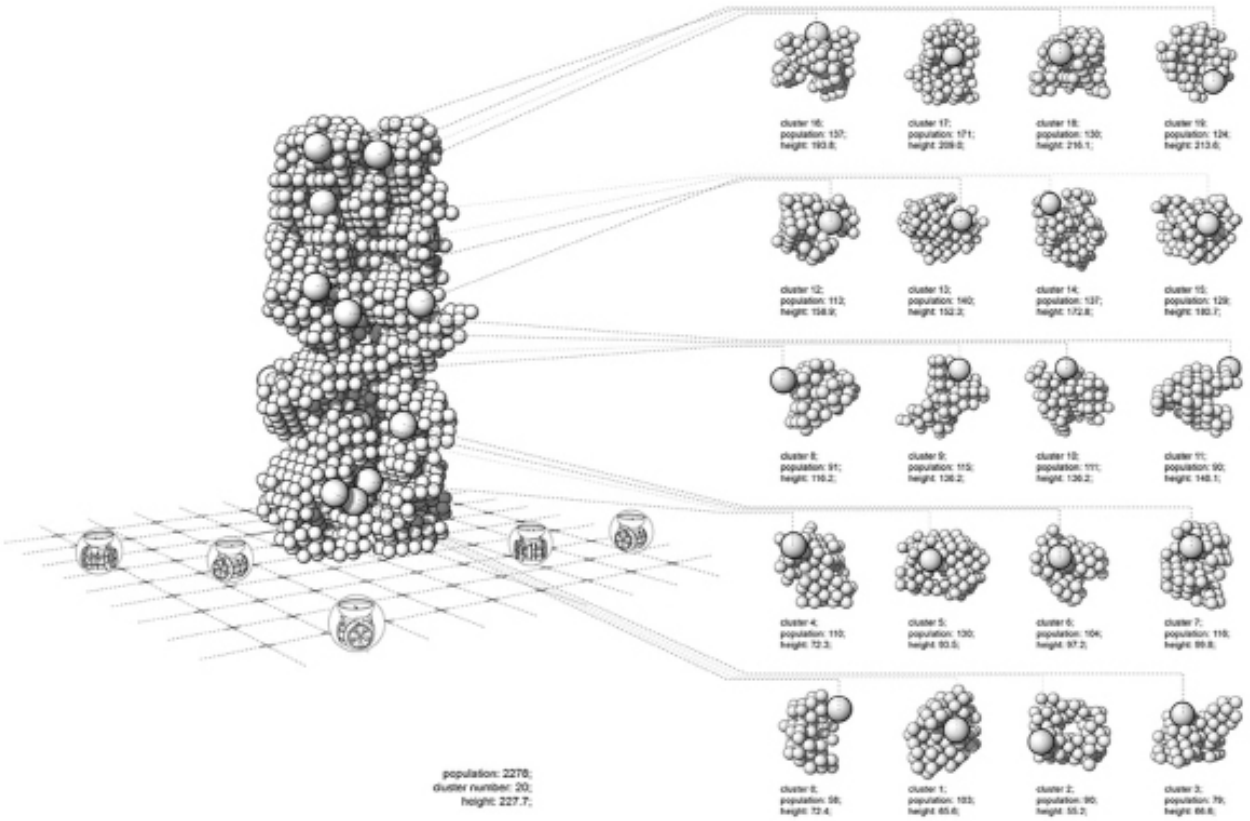

Figure 3 - Emotive City is a framework to explore a mobile and self-organizing model for the contemporary city. (Minima Forms)

Fast forwarding in time, the era of swarm intelligence and genetic algorithms, and the biological inspired computer aided processes led to the strive for Artificial life – also known as behavior oriented Artificial intelligence (as given by Eggenberger, 2005) that includes cognitive systems developed through adaptation and evolution; self-regulated assemblies of self-similar agents, through collective emergent behaviors, based on flocking, swarms, climbing formworks as seen through the work of Theodore Spyropoulous, Minima forms6. This model is again being constructed through local interactive behaviors, of modular units that rotate/move/climb and form homogeneous self-similar configurations. Each of these agents function within their Umwelt and their functional circle in order to perform their tasks.

"Today abstraction is no longer that of the map, the double, the mirror, or the concept. Simulation is no longer that of a territory, a referential being, or a substance. It is the generation by models of a real without origin or reality: a hyperreal." / Jean Baudrillard 3
On a parallel timeline, the video games universe has been on the fore front in unravelling immense narrative based simulated fictions since its inception.
The rich expansive environments set in contemporary games unfold unfamiliar spatiality of Immersive interaction for the users. This opens a field for a relatively larger ecology of diversified sets of movements, behaviors and interactions within its synthetic ecosystem and disrupted by the cognitive user. In Video games, artificial intelligence (AI) is used in non-playable characters (NPCs), to exhibit interactive and responsive characteristics. This AI usually refers to a broad set of algorithms that include techniques from Computer graphics, control theory, robotics and animation. The game AI developments extends to procedural content generation and data mining than merely being a set of rules. This enables each NPC to establish their own umwelt (Navigation mesh) and their functionalities. This paradigm presents itself with a much more unfamiliar and complex derivation of results.

The Computation and form finding techniques over the past years relied heavily on manipulations of form, converging on similar 'solutions' that are coherent and monotonous. The former parametric continuity constantly relied on the notion of self-organization within computational design. This self-organization of similar entities that grow, flock or mutate as seen in a popular algorithmic model by Craig Reynold's BOIDS (Reynolds, 1987). They attempt to simulate the natural biological processes and produce Architectural forms. The process was often times autonomous and component of interactivity was feebly present.
The paper emphasizes more on the latter (videogames), being primarily interactive and real-time, the formal disruptions are non-linear, unanticipated and

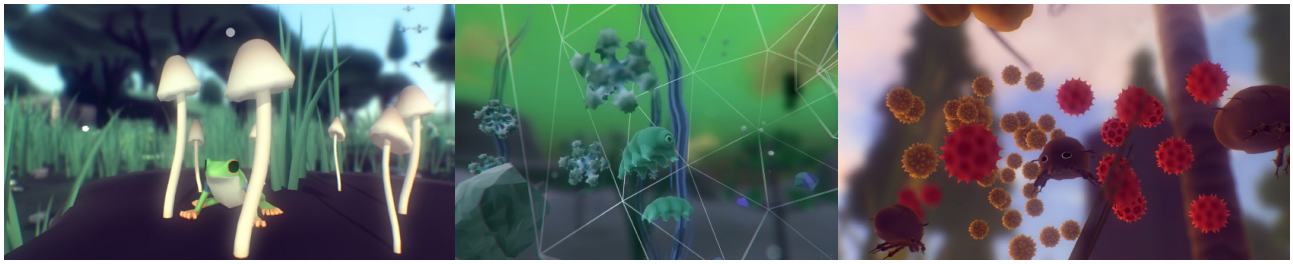

Figure 4. Everything game by David O'Reilly

constitute a larger part of how communal engagement can operate on the field.

2. Research background. Video games, UMWELT and interactivity

Design today must find ways to approximate … ecological forces and structures. To tap, approximate, burrow, and transform morphogenetic processes from all aspects of wild nature, to invent artificial means of creating living artificial environments. -Sanford Kwinter7

The recent game by artist O'Reilly – Everything8 showcases an interesting holistically advocates the concept of being, in which all the entities in the cosmos (the ecology in the largest sense) are fundamentally interconnected and compatible. This broad ecosystem (based on Alan Watt's Holism) provides access for the users to embody anything in the ecosystem.

Everything serves as a paradoxical salve to the anthropomorphism that it relies on. The rocks and amoeba and all other entities have expressed similar behaviors or interactions. They also draw attention the fact that in a carefully constructed digital ecosystem, rocks and amoeba can't possibly have the same characteristic, at least not like humans. In her book Vibrant Matter, the political scientist Jane Bennett provides us with a summary of this unexpected escape route from human self-centeredness:
"Maybe it's worth running the risks associated with anthropomorphizing … because it, oddly enough, works against anthropocentrism: a chord is struck between person and thing, and I am no longer above or outside a nonhuman 'environment.'" - Jane Bennett9

This ecosystem encapsulates the idea of immersion by being any object in the realm, and operating within its umwelt and disrupting the collective umwelten, establishing broader connections, although with a familiarized similar behavior at different scales and beings. The architectural fiction becomes an immersive environment that lets the cognitive user engage in the expanse and disrupting the ecology not as an observer but rather as a creature/object within the

Figure 5. Screenshot from Minecraft, Voxel based videogame.

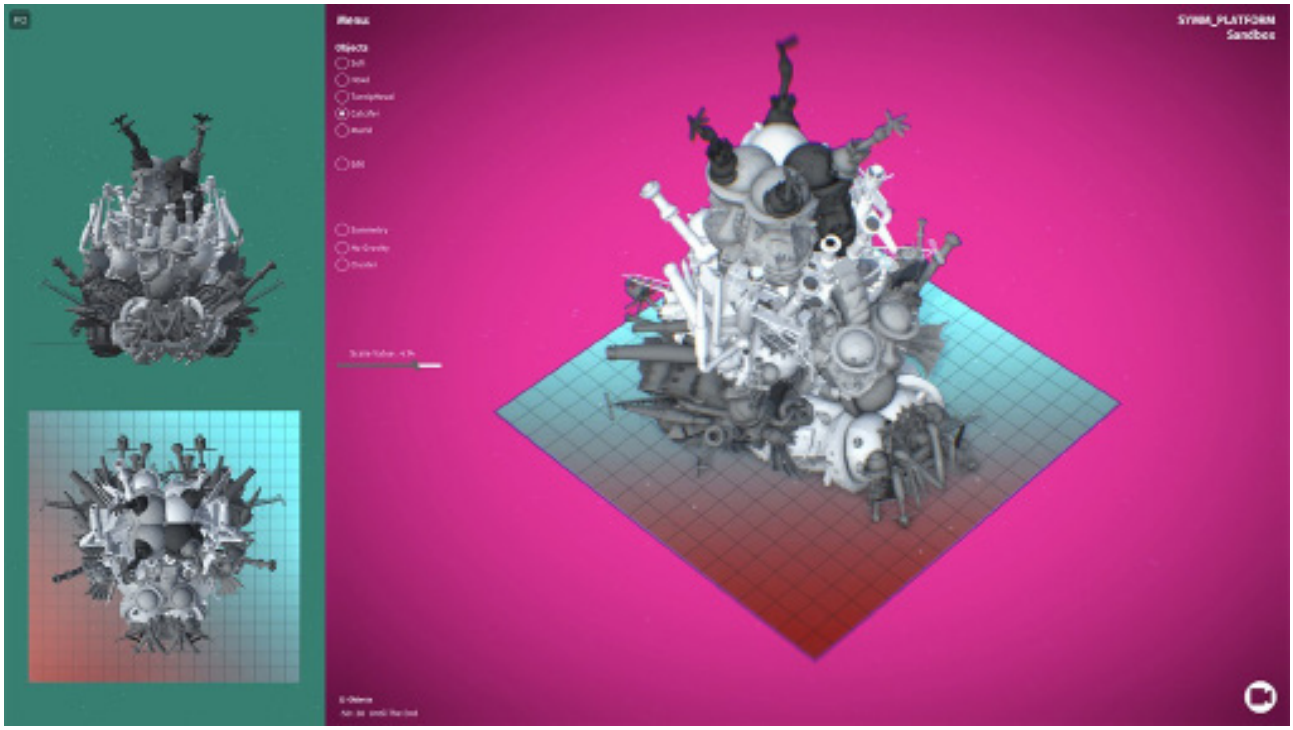

Figure 6. Platform Sandbox v.1, developed by Damjan Jovanovic, customised by IT.Blanco

game. The user becomes a part of the process with his own behaviors to stimuli and this begins to raise the question of how an autonomous simulation is mediated by this localized disruption and how the spatial dynamics is altered invariably.

The conventional narrative format of video games of storytelling is disregarded as an unexciting as Ian Bogost10 suggests that games are not new interactive medium of stories, but rather the aesthetic form of cultural everyday objects. As observed in the case of Everything, the concept of environmental story telling (a game narrative format) when adopted to Architectural discipline radically alters the way the user discovers and reconstructs a strict regimented spatial organization through the environment itself.

In May 2009, Minecraft11 was released by Markus Persson, an open world sandbox game built using a 3-dimensional grid, where individual cube holds different materiality. The game was devoid of any specific objects and rather focused on survival and creation. The open-ended structure of the game provided the players with an opportunity to create an infinite array of world building possibilities, making the game a huge success. However, the game still operates on discrete self-similar voxel based units that operate on the conventional framework of creating aggregations.

On the other hand, Damjan Jovanovic's platform sandbox game12 serves an ideal example for form making, achieved primarily through conceptualizing the design tools and insisting on producing custom-made, imprecise and messy software based on computer games' logic. The results are ambiguous, complex and are based on a kit of parts that are designed, preloaded and stacked and arranged in arbitrary fashion, and generate iterations using the collaborative component of human-computer symbiosis. He also states that the rich and immersive spatiality of computer games alter the design methodology of architects as he introduced the notion of play as a methodology of design and not the notion of playfulness.

These two examples perform with a similar intent, while the former being an open world platform with infinite possibilities, and the latter is established on a Diorama game format, the realm established in this paper. It constitutes the domain of an umwelt in its intimate setting and the Architectural fiction constructed in and around this setting. The interest lies in the functioning of this ecosystem and the respective behavioral characteristics within this system. Contrary to the large open world expansive environments (panoramic) the ideal fiction of play based form making environment is by establishing a Diorama format. Diorama game format13 lends itself to the traditional Japanese Bonsai or Bonkei, dating back to the sixteenth century, practices of growing miniature landscapes. This model establishes a deeper and closer analysis of each ecosystem and its behaviors.

As an extension to the above-mentioned argument, the flood of immersive and interactive simulation based games actuated by behavior based objects and assemblies in the continuum of Virtual reality and augmented reality reiterates the design process

Figure 7. Pokemon Go, by Niantic (played in a public park)

by embodiment of an object or a character within the ecosystem (as seen earlier in 'Everything'). The engagement with the other characters (also known as NPCs or non-playable characters) implies sensorial or seemingly intelligent responsiveness that dynamically begins to produce the spatial effects.

This no longer leads to conceiving of form at an idealized stasis, rather as objects or assembly of objects that share affiliations between themselves and the user becomes a part of the many characters and participates in the process of being or becoming.

In other words, the behavior based monopoly of digital ecosystems, reminds us of the nostalgic ELIZA effect14, the tendency to unconsciously assume computer behaviors as analogous to that of humans; as given by Douglas Hofstadter. It starts to become far more evident in the discipline of architecture through game based objects constructing cultural fictions.

3. Conceptual Framework.
The virtual and the augmented real

The above discussed games and apparatus further extend into the realm of Virtual and Augmented reality paradigms, enabling the users to customize and engage in their personal spaces and public spaces. The finest example from the recent years, that has created an augmented public space is the game Pokemon Go15 by Niantic. The Public space is actuated and engaged in a digital and real dynamics where the users engage and interact with these virtual creatures across the globe. The city becomes the playground for the users to participate, search and increase the foot traffic.

This game attempts to establish the canvas for the Umwelt Garden – an Architectural game based apparatus, that produces aggregations in the Virtual and the augmented real.

4. Methodology and analysis.
UMWELT garder - the collapse of the digital and the real.

Umwelt Garden16 – Is a Drawing apparatus, devised in the form of a Videogame, which operates on a time and life cycle based quasi interactive gamescape; that stops and restarts upon the digital death (envisaged through Stasis of the deployed Creatures/ Objects). It is comprised of a Digital ecosystem with its components being:

A. World/Environment - A Platform diorama environment
B. Digital Objects/Creatures (A kit of parts)
C. Behaviors and Interactions

The platform based videogame lends itself to three different architectural typologies of objects coexisting together on the world platform and constantly forming aggregations based on a series of nested relationships. These aggregations are dynamic and they constitute approximations of Architectural forms and entities that perform as kinetic semi open pavilions in space. The objective of making aggregations reinstate the game truly Architectural. The game in the Virtual space works with a user embodying one of the object and participating in the construction or the

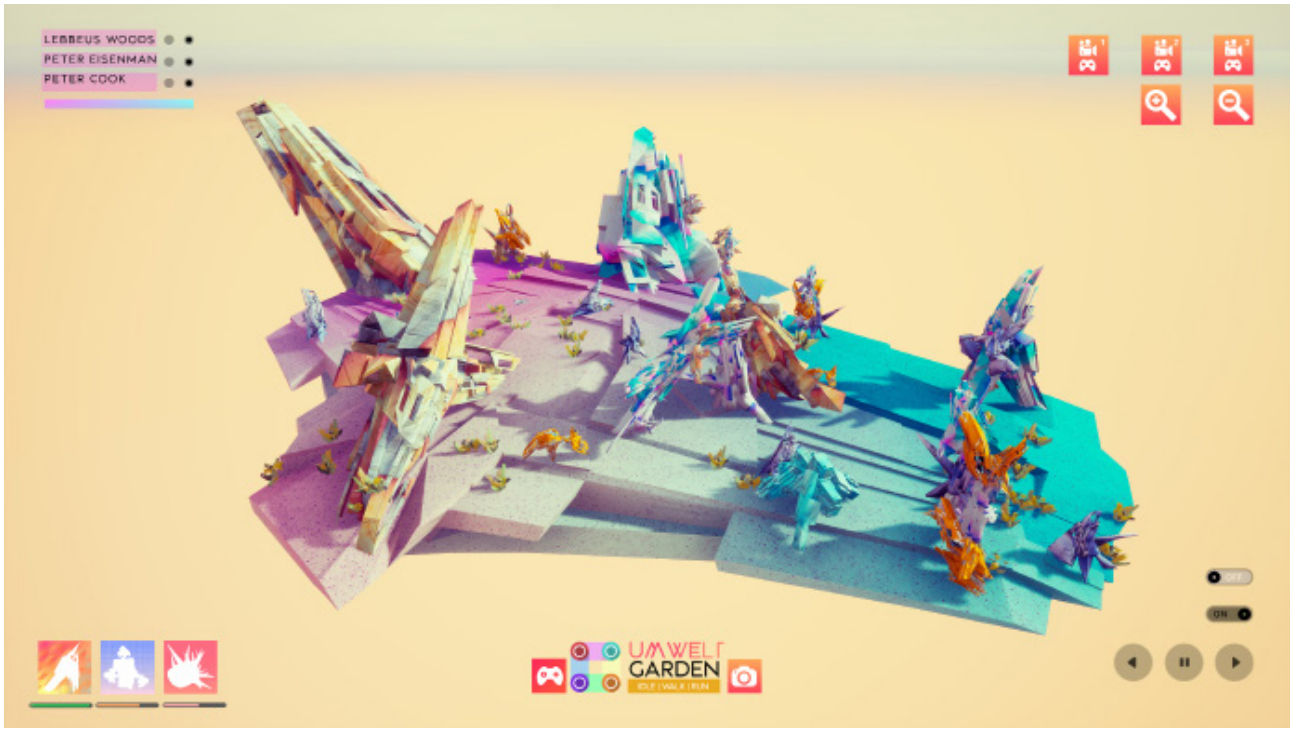

Figure 8. Screenshot from Umwelt Garden, by Vamsi Krishna Vemuri

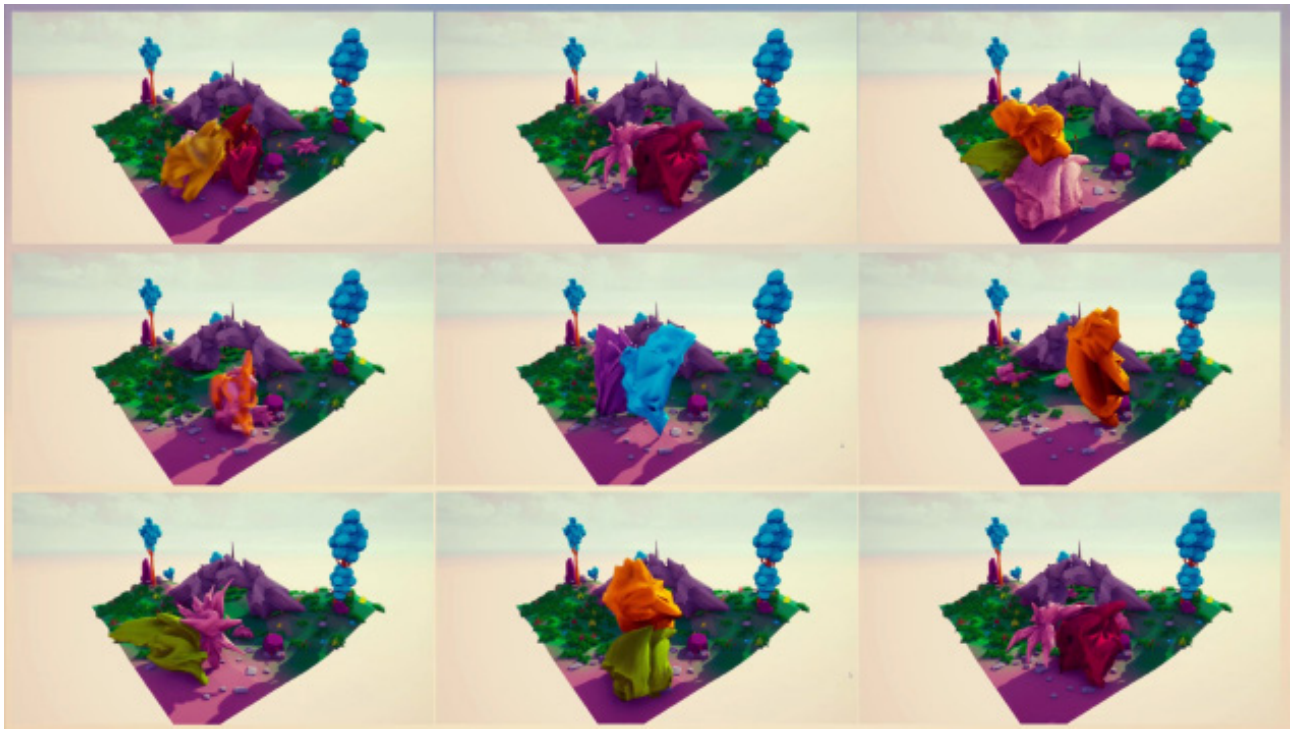

Figure 9. Behavioral studies, screenshots from Umwelt Garden

disruption of the aggregation enabled by the NPCs. The player object engages the other objects based on different logics of attractions and repulsions; triggers and behavioral patterns. The digital series of interactions and relationships are encompassed under a term Digital Ethology. Contrary to the dictionary definition of Ethology being the science of animal behaviors, the digital ethology forays into the behaviors and effects of digital entities.

Digital Ethology in this case is elucidated into ABC – a three-term contingency as given by B.F. Skinner, an American Psychologist, Behaviorist and Philosopher. The Antecedents being:

Figure 11. Antecedents

Figure 10. Gameplay Screenshot, Umwelt Garden

The initial events or triggers within the Umwelten (Collective umwelts) begin the interactions based on which the different entities coalesce or repel and begin their life cycle. Each entity is coded with a different life span as elaborated in the Behavioral diagram of Umwelt Garden.
Their corresponding behaviors and fixed action patterns follow as a sequential continuity of the triggers and the objects exhibit a wide array of interactions and behaviors based on the proximity, hierarchy and the overarching laws of attraction. The fixed action pattern (FAP), or modal action pattern, is sometimes used in ethology to denote an instinctive behavioral sequence that is relatively invariant within the species and almost inevitably runs to completion.

The schematics illustrates the life spans of each of the different entities (showcased in the life bar as in case of a videogame), and the different annotations and iconography referring to the proximity, view cone of each entity and how one digital object relates within its functional circle with the other and also how they react and perform in time and space. These triggers result in behavioral consequences where they perform as choreographic objects in motion. As quoted by William Forsythe, A choreographic object is not a substitute for the body, but rather an alternative site for the understanding of potential instigation and organization of action to reside. Ideally, choreographic ideas in this form would draw an attentive, diverse readership that would eventually understand

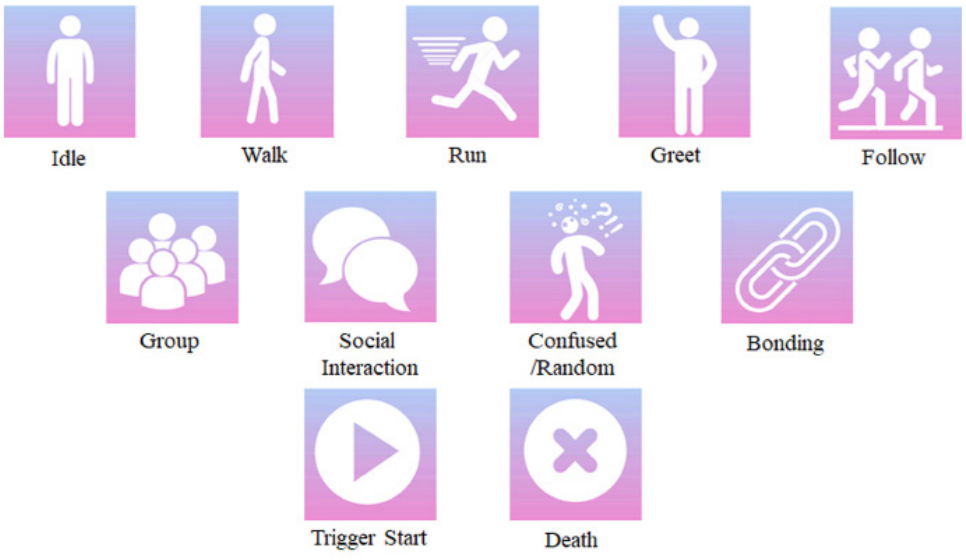

Figure 12. Behaviors

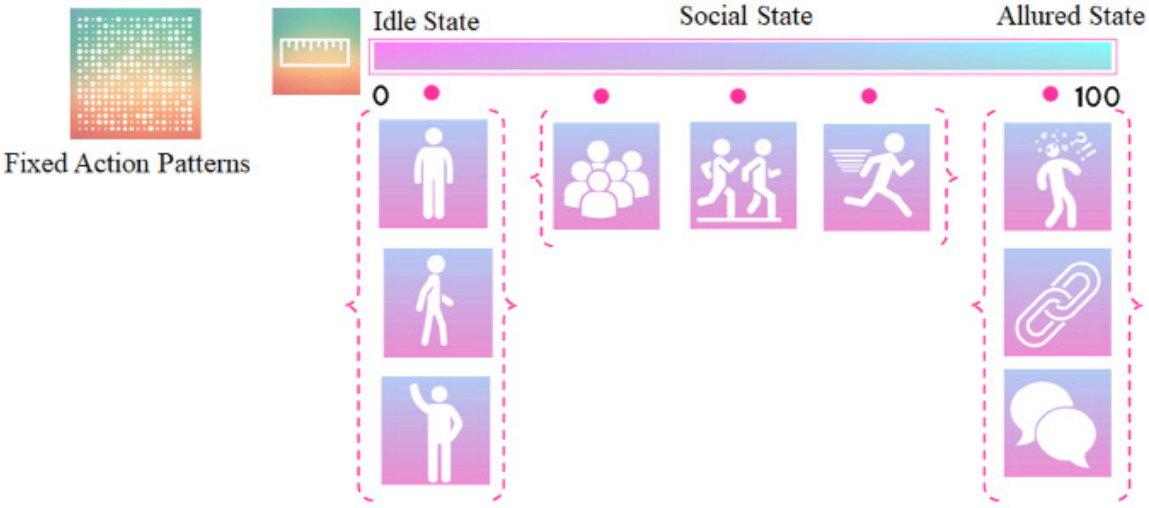

Figure 13. Fixed Action Patterns

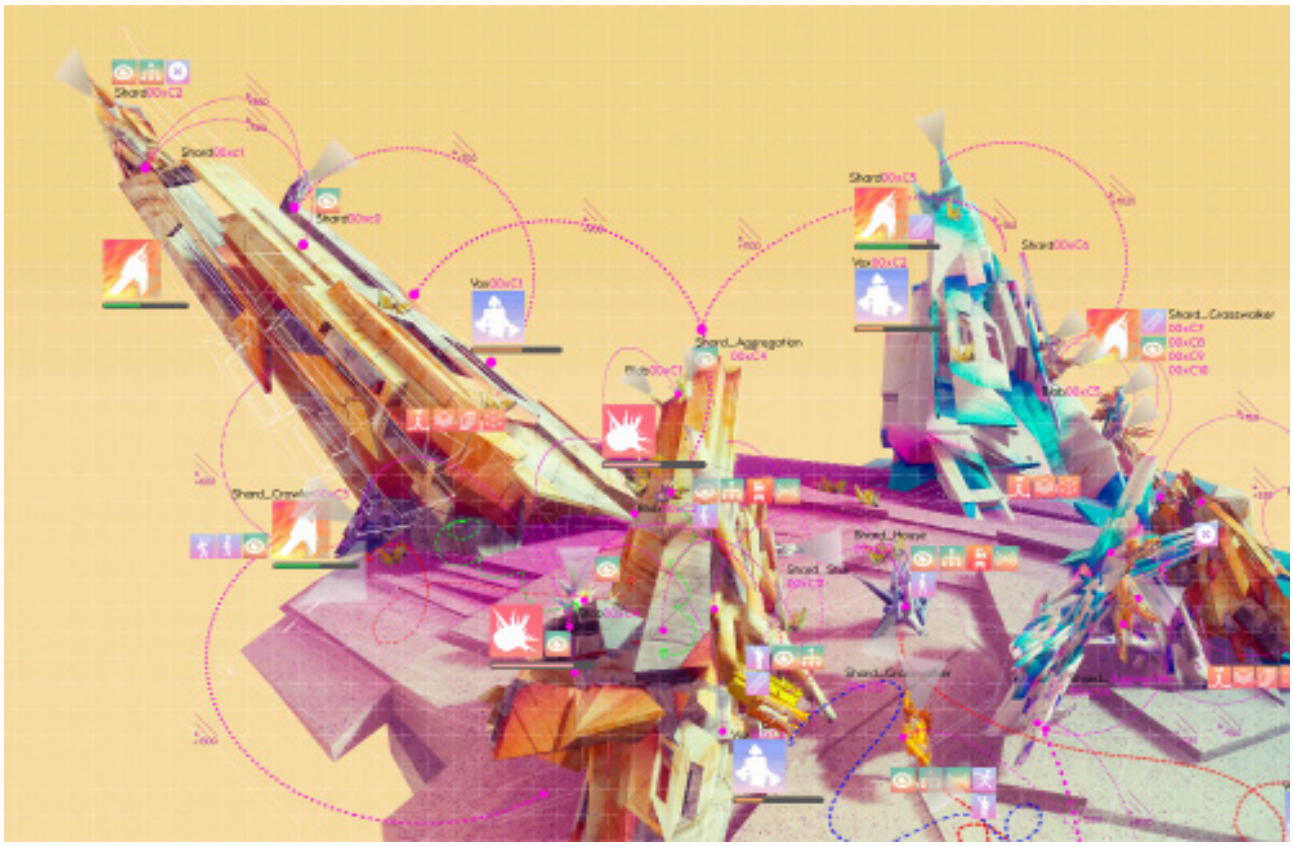

Figure 14. Gameplay Schematics, Umwelt Garden

and, hopefully, champion the innumerable manifestations, old and new, of choreographic thinking.
Choreographic Objects by William Forsythe

These choreographic objects are performative in nature, and the cognitive user also becomes a performer in forming these aggregations or architectural approximations. The gamescape doesn't limit itself to the Virtual space but rather is deployed on an expanded canvas of an Augmented platform of the Public city space actuated via mobile phones or Microsoft Hololens (Augmented reality goggles).

5. Results and findings

The expanded canvas offers estranged interactions and obstructions upon the confrontation of the Digital realm and the physical realm. This ecological life cycle responds and develops newer affiliations when deployed in the physical space and begins to establish unfamiliar associations that resonate in the pseudo digital and the real. The cognitive users are par-

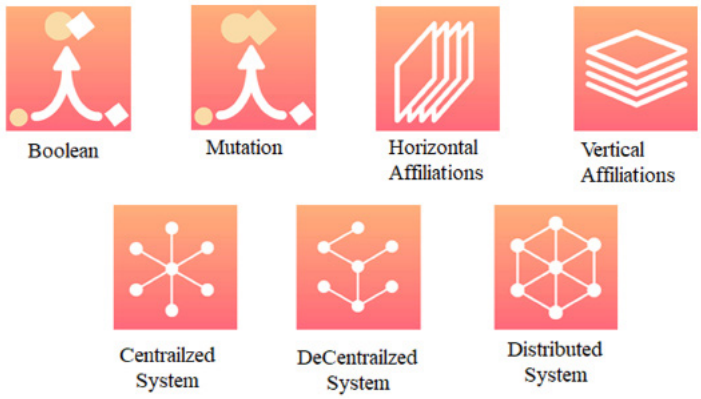

Figure 15. Consequences

Figure 16. Aggregations, from Umwelt Garden

ticipants that engage with these objects as they stroll across the public squares or pedestrian pathways.

6. Conclusions.

6.1Behavior based form-finding

Umwelt Garden opens up a framework of synthetic choreographic performance based form finding, that often results as an enclosed space or physical architectural approximations of columns, pavilions, or wall/roof structures (figures 17,19 & 21). This process does not limit itself to producing iterations, but rather unfolds the possibilities of dynamic temporary structures, that are reiterated into new forms upon their life cycles.
Life cycles and ecological roleplay situates the apparatus to a seemingly biological cycle, yet highly synthetic and digital, that actuates the public space with a fineness and curiosity.

6.2 Politics ofthe users

The strange continuum of the Virtual and the real as imposed by the Umwelt Garden encompasses a condition where the cognitive human users are confronted with the digital users of space. The politics revolves around how the newer relationships and affiliations are established. Will the humans embrace this digital coexistence or they develop a hostility towards this intervention? The habitable public space is occupied by these entities that live, associate, behave, but aren't tactile. They emotionally induce anomalous tendencies to the users.

6.3 Politics of public space / architectural space

The politics of the user presents itself with a debatable scenario, while the politics of the Architectural space raises further more interesting questions. Vandalism, historically holding a socio-political relationship in crafting the history of Architecture, the augmented architectural media presents itself with multiple questions. The image fundamentally questions the idea of a scaffold. What constitutes the façade and the scaffold? The scaffold is present to commemorate the façade panelization or to lure these Augmented life forms. Is the façade a principal building front or it becomes a hive for data mining? The public space is no longer passive and activated in its own right. The panels are momentarily confronted with these behavioral entities, until they complete their ecological cycle and respawn at different locations within the City.
We are emerging into an age where citizens and physical infrastructure are not merely the occupants, but the intangible digital begins to leak into the Augmented real.

Figure 17. Augmented Aggregation, Street corner

Figure 18. Augmented Aggregation, Between buildings

Figure 19. Augmented Aggregation, Riverfront

Figure 20. Augmented Aggregation, Street corner

Figure 21. Augmented Aggregation, Façade and scaffolding

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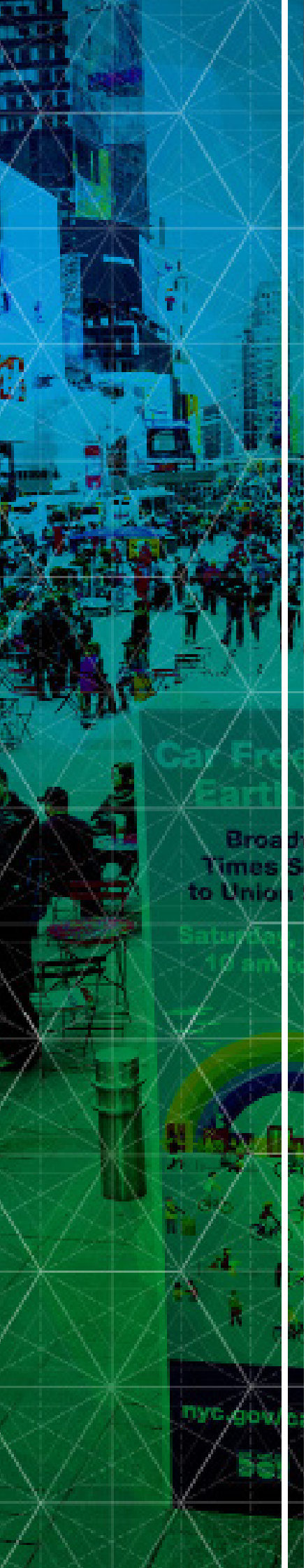

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BIOSENSING URBAN INTERACTIONS

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Keywords: Smart City; Urban planning; Social Development; Bio-sensor; Internet of Things

The growth of urban settlements is a phenomenon without an end. To be able to tackle and embrace i tsconsequences, we need alternative tools that help us to sense and response these phenomena.

On this framework, this proposal aims to explore how the information can be gathered and used to equilibrate urban systems in terms of sensing and reacting the interactive distribution of the actors in the urban mantle. To achieve this goal, the exchange of data through an organic system of biochemical interaction network is proposed.

The possibility that the user can interact with this system, from an interface which responds to the Biochemical, is a key aspect for the visualization of the network interactions.

1. Introduction

This project is an alternative proposal about what is already developed and understood in the intersection of Technology and Urban settlements. A resilient alternative for the vision that Eremia, Toma and Sanduleac (2017) propose in "The Smart City Concept in the 21st Century". We find interesting in this frame, that the integration of Information and Communication technology and Internet of Things technology to use and develop Urban Informatics. Nevertheless, the developers and interpreters of the Data that these technology gather, generate and use, are, with a few exceptions, outsiders of the geographic urban circumstances where they have influence. This creates a point of dependency in the interactions of the Urban Growth which can mutate into bigger problems like; excessive costs, out of the context solutions and misunderstanding of the real needs of the network. Besides the political frictions it might spark. Another interesting factor is the way the energy and the materials are used to develop these tools. Our alternative proposes an integrative solution with a comprehensive approach to the agents and stakeholders that will benefit of this implementation.

BioRizom is a sustainable strategy for taking advantage of the Inter-plant communication (Gorzelak, Asay, Pickles, Simard, 2015) and the bio-chemistry processes related to it. According to this, the main intention is to design a system which works like a massive load cell to sense the changes in the surface of the ground. Due to the diversity of the plant-fungus network (Toju, Guimarães, Olesen, Thompson, 2014), we define our active interactive agent as a plant. Its characteristics of growth will give us the feedback of the state in the network. This data interchange can be used to build intelligent solutions contributing to the transformation of the way humans interact with Urban space.

Such interactive system (sense and acting) can be integrated with existing technology networks of data like: IoT, Information and communication technology, urban planning and urban growth. Our second intention is to use Growth as a tool to harness, embrace and interact with the Space. To knit a Human-Built landscape scaffolded in technology rails, embedded as it is, in closed tie with the environment. This is a project of Social Development carried out with applied technology in the verge of biotechnology and Internet of Things.

2. Research background

This research applies an integrative design strategy, which is related with the urban planning and the relationship between the humankind with their environment within the complexity of the City.
A design process approach, which goes in the direction of deepening on the interrelations among the agents that constitute the urban environment. In this sense, this proposal tries to open a new inflection on th e responsibility o f space, from settlers to the City. The role of the humankind as co-creator will be resignified. In other means, how the relationship between men and his habitat are articulated in a complex system.

How design can be a way of relationship with the environment creating synergie? This approach give the possibility of freedom, in the sense that the man will have a relationship form the process of planning and building through growth and development related with the Space that is constantly transforming.

Justification What could be a traditional way of sensing a city? How to define an interface of something that is not finite and it has no end? Does design has a chance to define an optimal intersection among the agents that conform the geographical circumstance of a urban inhabitat? We propose the exploration of the communication stream that takes place in the habitat, within the silent living beings that coexist with us in the environment. The underground information that exists before and after the established settlement.This is knew in a more specific way as soil .
The Smart City theory and all the digitized media works as scaffolds and the articulate the scene for using a more complex technical gear. ICT and IoT, reduce the user ability for managing and gathering data, which prevent the knowledge about the information of the environment. Its agency, is technologically marginalized, in the appreciation of how action could change the reality. Its activity is disposed as a niche where to harvest data and a final focus of a commercial projection.

This demonstrates the importance of incorporating the social needs from a technology which consider human interaction space. Also, another aim is the integration of the actors that have a more passive role in the Network is missing. What information these living being are exchanging and that can be loaded in our mantle to knit a more integrative approach of how the social assembling happens in the cities.
We consider that there is a need of an integration of all the agents that have a role in the knitted space.

Displaying another sensing. Giving another sense to the way the data and the interpretation can be loaded, perceived and released. This is our opening point of inflections, where the users and agents can interact and intersect so the dialogue can become plural.

3. Sensing With Sense

Objectives
To design a system which take into account new point of interaction within the assembled pace to improve the urban systems.

- To develop different information inputs and out-

puts exchanges, sensing and to acting in a different dynamics and speeds.
- To read the information between the organic system, the urban and the environment with a sustainable inflection point for the users.

4. Theoretical framework

Currently, the research about the Myco-rhizome chemical exchange and the Soil microecosystems, is done focusing on the physiology of the Soil and the chemical connectivity between the agents such as plants and fungi. It is done with more emphasis in: Bioremediation of soils, Pharmaceuticals, Biofuels and Bioreactors.

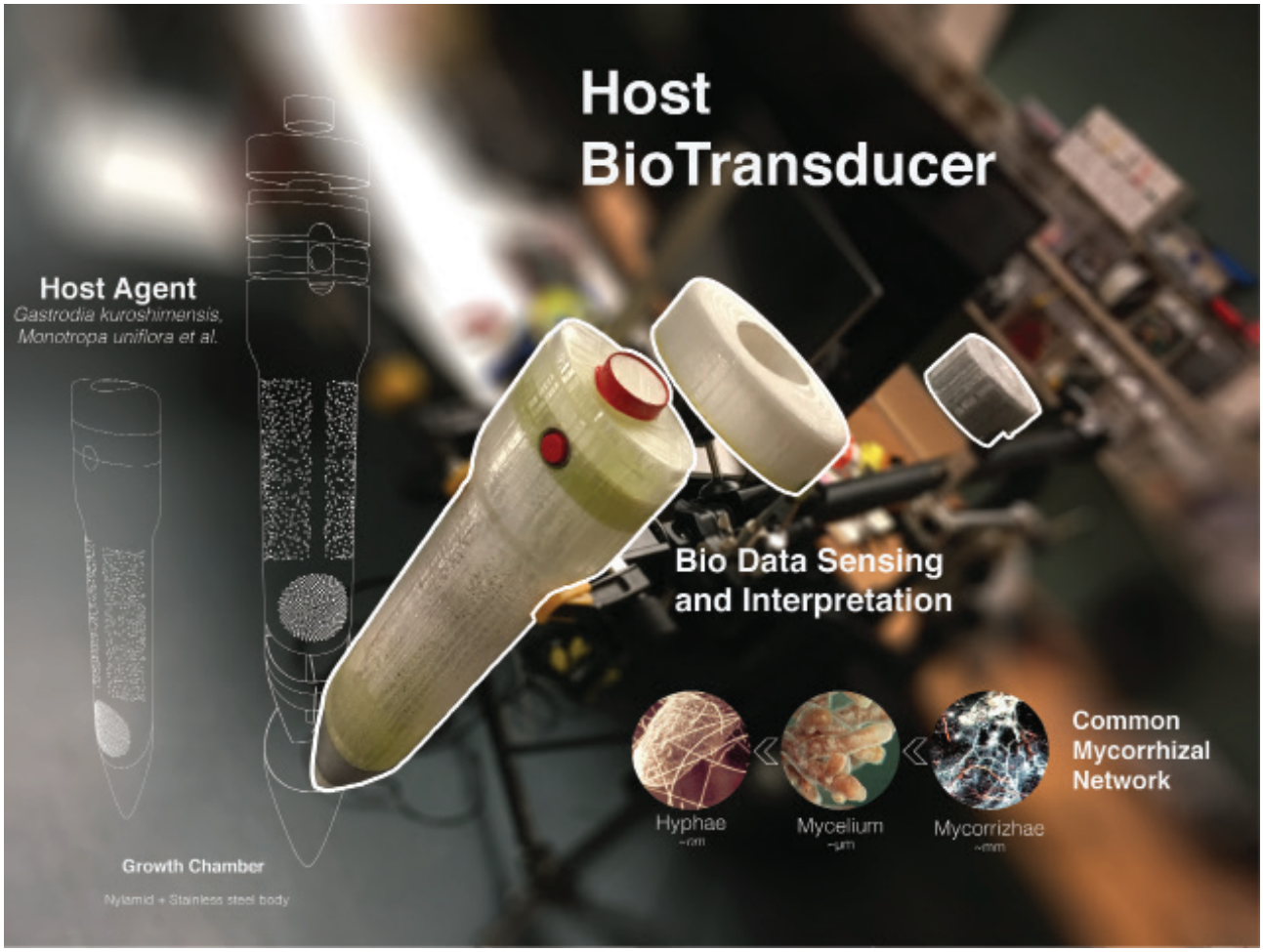
Our approach to use the fungal network behavior as a communication channel is not new, but our aim in use that network exchange with or without human interaction is it. This give us an alternative data input for practical uses and applications. Specially in the field of urban planning. Our research responses to the question: How innovation through design can integrate the agents of life to improve the information exchange between humankind and the Urban systems?

5.Methodology

The problem is related with the connectivity in a digital network and the possibility of interconnect an analog biological network to sense changes and transmit the Data to other information networks. The BioRizom system works like a load cell which has sensors for detecting the bio-signals. This information received from the environment will be transmitted to an interface that transforms it into digital data. Once digital, this data will work to reinforce the IoT, Communication and digital information data and a reinterpretation for useful information could be depicted. The whole system is divided in three main parts: BioWire Grid Architecture by natural Growth, BioSensing and Big Data threshold.

We defined different knowledge fields as a departure point from where to start the development of

Figure 01. Structure of the Biotransducer and Technical Details. © Hugo Larqué.
The image shows and artistic representation and technical information of the device. The cap of the device, is the data interpreter from the bio-network to a Digital output that will be merged with the other information to give another way to rearrange the assembly of the social space.



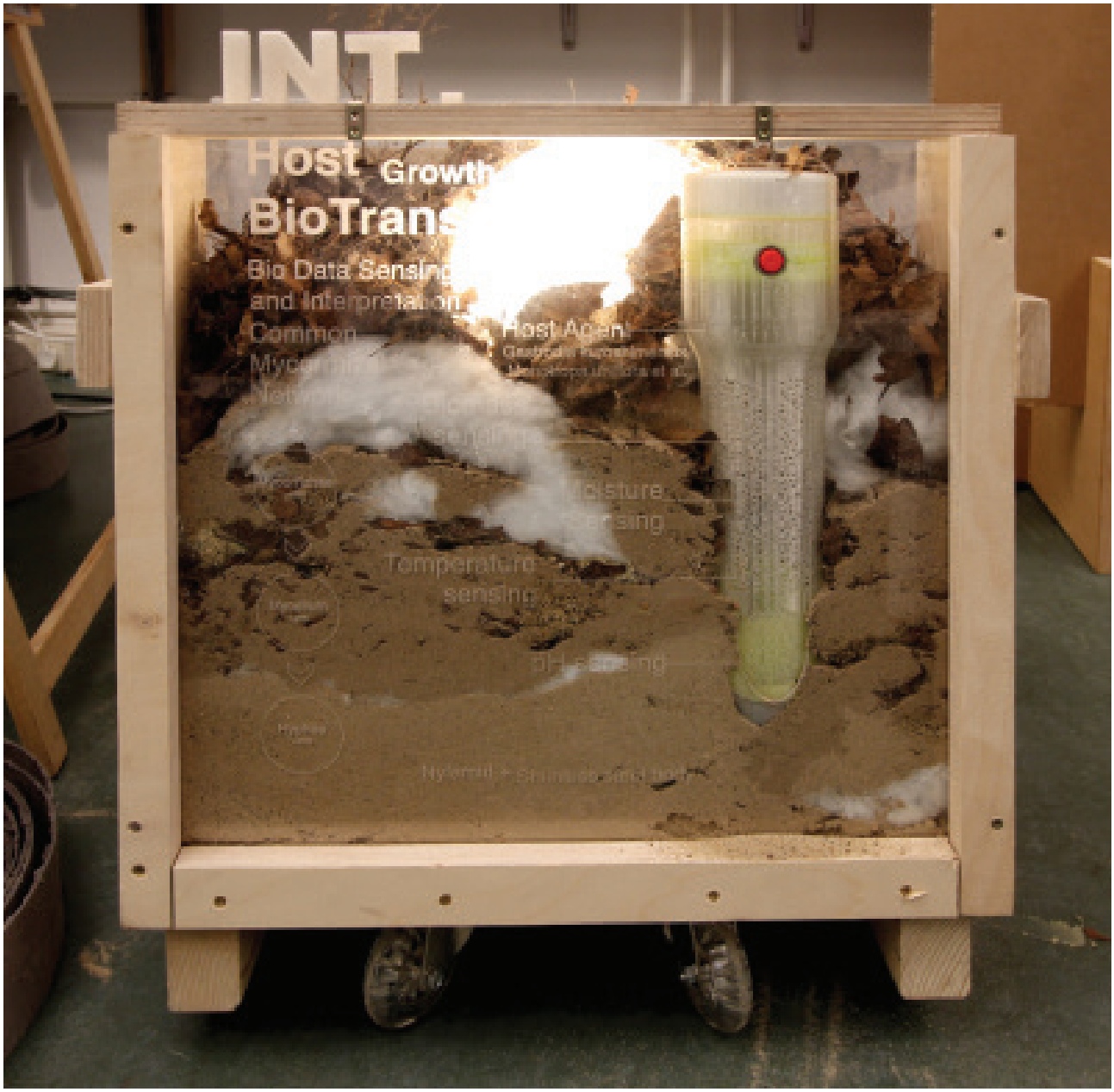


Figure 02 Conceptual Set up. © Hugo Larqué.
Shows the conceptual set-up of the device which was done to find and define the boundaries and limits of the experiment needed to develop the proof of concept before getting into the next stage of the project.

the solution and the interconnections between the research in those fields. Through an interdisciplinary research, and according to the knowledge areas, experience and individual interests inherent to the team, we adopted these fields: Material Science, Biology, Urbanism, Architecture and Industrial Design.

Based on these different disciplinary fields, we propose three stages: (1) Collection of data in each area - material / information science possible materials for the project, biology / living agents, urbanism / dynamics in the public space, architecture / relationships space and project, industrial design / scaling-outline. (2) Set parameters and design criteria according to the scans performed. At this stage, the interconnections between the system variables are identified and defined. (3) Design of the system according to previously established criteria.

6. Analysis and discussion of results

This research could establish an openness for the scaling up of biotechnology and its application to urban territories. However this would require the accuracy of certain information, as well as the clarity between the relationships of the elements of the system. For the purposes of this research, we focus on the design of the device system that will allow the

connections between the two streams of information.

Through the use of a host agent (Figure 1), the threshold between the technical and the bioagent was vanished through the same device. Its host agent, is a plant. Who is feeded by the mycorrhizal network, therefore it will give the feedback of the information exchange that happens in the soil due to the changes in its body. The cap of the device, is the data interpreter from the bio-network to a Digital output that will be merged with the other information to give another way to rearrange the assembly of the social space.

The conceptual set-up of the device (Figure 2) was done to find and define the boundaries and limits of the experiment to develop the proof of concept before an extended set of prototypes and optimization of the equipment could be engineered for an industrial scale.

7.Conclusions

The inquiry about natural networks within the soil lead us to the possibility of biosensors development. This approach sought to address this relationship for practical and industrial applications. However, it is still necessary to check the interactions between the system variables, especially those related to bioagents.

On the other hand, the fact that this proposal can be scaled progressively, allows to identify the versatility of the use according to the data that will be obtained. The perception of the space gives a notion of the existence. More awareness about the space, more awareness about the whole. The more independent the interaction of this information exchange, the more awareness will spark.

We like to envision the use of devices like this and the network information it reads, as a tool for inferring different phenomena. Like the tectonic movements and how them are sensed. Earthquakes.

The displacement of those forces leave a trail that has a reflection in the rhizome and can be measured through the changes on it. We look forward for the different uses it will evolve.

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MEASURING THE UNSEEN: THE IMPACT OF URBAN QUALITIES IN THE SENSORY EXPERIENCE OF PUBLIC SPACE

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Keywords: sensory experience, urban qualities, augmented environments, urban sensing, wearable technologies

This paper argues that the complexity of today's digitally-enhanced urban environments requires alternative methods of understanding – perhaps even more than designing – our relationship with the public space.

To that end, the paper presents a hybrid approach to the sensory experience of the built environment by employing experimental design research strategies that leverage wearable augmenting and sensing technologies. By operating in between research rigour and design creativity, the paper discusses two experiments that explore the impact of varying typologies and qualities of public spaces in the states of mind of test subjects while (1) navigating the built environment through different transportation modes or (2) responding to color stimuli in urban settings.

These studies demonstrate that, by adopting a multisensory and multidisciplinary approach, it is possible to obtain a novel perspective to the subjective experience of the built environment for supporting technologically-enhanced design processes toward more engaging, pleasant, and responsive public spaces.

1. Introduction

Our surrounding space is a complex entanglement of physical matter, energy flows, immaterial qualities, and increasingly digital environments. Indeed, multiple facets and variations can be associated with the concept of space. As Georges Perec wrote in his Species of Spaces and Other Pieces: "There isn't one space, a beautiful space round about, a beautiful space all around us, there's a whole lot of small bits of space, and one of these bits is a Métro corridor, and another of them is a public park. [...] In short, spaces have multiplied, been broken up and have diversified. There are spaces today of every kind and every size, for every use and every function. To live is to pass from one space to another, while doing your best not to bump yourself" (Perec, 1997, pp.5-6). Perec particularly unfolds this character of multiplicity by elaborating a list of space typologies, conditions, or properties (Figure 1). Highlighting the influence of the Digital and Information Age we live in, today we might very well update this 1970s list adding concepts such "virtual" space, "augmented" space, or "networked" space. But we could also, and perhaps most importantly, complete this taxonomy with an element that the digital itself too often tends to obfuscate: the human space.

In fact, the individual is deeply intertwined with the space she occupies, and the two affect each other in deep and yet kaleidoscopic forms. In that sense, Martin Heidegger argued of the indivisible link between space and the human condition: "When we speak of man and space, it sounds as though man stood on one side, space on the other. Yet space is not something that faces man. It is neither an external object nor an inner experience. It is not that there are men, and over and above them space" (Heidegger, 1977, p.334). This human/space relationship entails three aspects of the notion of our surrounding environment: firstly, environment is actually a relative term, in the sense that it acquires meaning in relation to our own subjective understanding of the external world; the second point addresses the evolutionary aspect of the environment, as an entity in constant development and change; and finally, the third observation emphasizes the influence of our presence in the world and the impact that we have on the environment, and vice versa (Ingold, 2000, p.20).

Today, the increasingly ubiquitous presence of information systems in cities transforms the public space, blurring the distinction between physical and digital environments. The very concept of space is therefore questioned, for hybrid realms emergence as the result of either clashing or mutually reinforcing processes of interaction between tangible spaces and virtual environments. The rise of new forms of augmentation facilitated by mobile and wearable devices, in particular, opens up unprecedented possibilities for the ways in which we experience and interact in cities.

This digital/physical dichotomy certainly disrupts conventional architectural and urban design processes. As predicted by William Mitchell, "Traditional urban patterns cannot exist with cyberspace. But long

Figure 1. Taxonomy of spaces listed in George Perec's Species of Spaces and Other Pieces

	SPACE	
OPEN	SPACE	
ENCLOSED	SPACE	
OUTER	SPACE	
	SPACE	SUIT
	SPACE	AGE
LIVING	SPACE	
PROTECTIVE	SPACE	
	SPACE	CAPSULE
LACK OF	SPACE	
	SPACE	BAND
	SPACE	HEATER
DEEP	SPACE	
	SPACE	ODYSSEY
	SPACE	SALESMAN
EUCLIDEAN	SPACE	
	SPACE	CADET
	SPACE	STATION
BLANK	SPACE	
	SPACE	OUT
PARKING	SPACE	
	SPACE	INVADERS
	SPACE	WALK
	SPACE	TIME CONTINUUM
	SPACE	BAR
LOST IN	SPACE	

STARING INTO	SPACE	
WATCH THIS	SPACE	
	SPACE	CURVE
	SPACE	LATTICE
	SPACE	OPERA
CATCHER	SPACE	
	SPACE	SICKNESS
BUNCHER	SPACE	
THREE-DIMENSIONAL	SPACE	
HAIR	SPACE	
	SPACE	RACE
NULL	SPACE	
LEAVE A	SPACE	
	SPACE	OF A MOMENT
INTERCOSTAL	SPACE	
AVAILABLE	SPACE	
	SPACE	NEEDLE
POSITION IN	SPACE	
EDGES OF	SPACE	
	SPACE	WRITER
WIDE OPEN	SPACE	
LACK OK	SPACE	
	SPACE	SAVING
ENCLOSED	SPACE	
	SPACE	FILLER
WASTED	SPACE	

live the new, network-mediated metropolis of the digital era. [...] To pursue this agenda effectively, we must extend the definitions of architecture and urban design to encompass virtual places as well as physical ones, software as well as hardware" (Mitchell, 1999, pp.3,8). Emerging technologies not only extend our possibilities to manipulate and affect our surrounding environment, but also deeply transform our very perception and relationship with the public space. This results in the opportunity of "totally rethinking urban form in a way unbounded by traditional compositional logic" (Picon, 2015, p.115).

This paper attempts to balance out multiple tensions: Deleuze's "intensive" vs. "extensive" qualities of cities (DeLanda, 2005); material components vs. immaterial information (Leach, 2015); and the "space of flows" vs. the "space of places" (Castells, 2008). By exploring the characteristics of urban contexts in relation to how we perceive and interact with our surrounding environment, the paper particularly elaborates on what makes spaces and places unique through 'hidden' and yet revealing qualities of public spaces.

We argue that, to capture these less-known urban aspects is a matter of both quantitative knowledge of the tangible facets of cities and individual perception of their immaterial properties. In the field of architecture and urban design the tendency has always been to emphasize this distinction: scientific methods are typically employed in relation to the technical, physical and material aspects of architecture, whereas the individual perceptions, emotions and responses conveyed and provoked by architecture is usually a matter of design intuition (Pallasmaa, 2013). This article attempts to bridge research rigor and design creativity by presenting a few hybrid experiments developed at the Harvard Responsive Environments and Artifacts Lab (REAL). The assumption is that, by developing an alternative lexicon of experimented situations, we can eventually provide a reference for studying different typologies of public spaces through the lens of the creative use of sensing and augmenting technologies.

2. Research Background

The use of technology to measure and quantify urban qualities that account for city activities can be traced back to the cybernetic movement of the 1950-70s. The emergence of the first computing machines in conjunction with systems theory (Reinhold, 2003), in fact, offered new possibilities for urban planners, architects, and scientists to explore correlations between urban parameters and user dynamics. In these cybernetic experiments, "the computer could further enhance connectivity while allowing a highly customizable management of ambience parameters" (Picon, 2010, p.32). Luigi Moretti, for instance, in the 1950s and '60s developed a few highly experimental machines (Moretti, 1971), including an "electronic calculator for the operational research." Built in collaboration with IBM, the prototype's objective was to analyze urban conditions based on "rational, coherent and constantly-updated" statistics and information. In this research, the Italian architect also introduced the concept of "human engineering" in urban spaces, to raise awareness on the importance of designing the "secondary elements" of an architectural or urban structure to respond to the "human user" (Moretti, 1960).

Around the same time, the first attempts to better define the role that urban morphologies, spatial arrangements, and public places design play in conveying certain sensations to people can be referred to the Psychogeography movement. Defined by Guy Debord as "the study of the precise laws and specific effects of the geographical environment, consciously organized or not, on the emotions and behavior of individuals" (Debord, 1958), the research conducted by the related Situationist International was indeed looking at the arrangement of the elements of the urban setting in close relation with the emotional effects they provoke. By wandering, letting oneself float or drift (dériver), the psychogeographer in her walking could capture the varied ambiances of the urban environment (Sadler, 1998). With the intention of exploring how the mind recollects the urban experience and how psychology intervenes in the understanding of the built environment, the well-known "Psychogeographic guide of Paris" can be considered one of the most effective experimental attempts to capture and represent the "atmospheric" qualities of public spaces.

Those qualities certainly exist in close relation with the individual perception of space. In that sense, the concept of proxemics introduced by Edward Hall in his The Hidden Dimension expands the observations and theories on man's use of space (Hall, 1966). Just as certain hypotheses of linguistic relativity claim that language shapes our perception of reality, so do space conditions in proxemics theory. Using our sensorial receptors to gauge the distance between ourselves and the surrounding space, Hall particularly classified the proxemic zones as intimate, personal, social, or public. The role of public space in affecting people's behaviour was then further studied in the 1970s and '80s by William Whyte. The American urbanist particularly showed that through the power of simple observation and recording, and subsequent quantitative analysis one can carefully map out social activities and user dynamics in public spaces (Whyte, 1980).

Today, these qualitative ways to assess the sensorial experience of the built environment can be supported by a more scientific understanding of the individual perception of places with recent technological developments on cognitive science and psychology. Through neuroimaging technologies, for instance,

"we can now begin to study human responses to various materials (steel, glass, concrete, wood), the dynamics of personal and peripersonal space, our biological responses to certain spatial settings, human responses to particular forms, colors, proportions, textures, light, and vegetation – in short the many inactive variables that compose the built environment" (Mallgrave, 2015). Without discussing the details of the psychological and biological aspects of human perception, cognitive science thus argues that in planning the environments in which we live, architectural design does affect our brain functioning and therefore our actions (Arbib, 2015).

3. Methodology

The employed method attempts to combine a 'scientific approach' with 'design creativity.' In fact, design and science can borrow from each other ways of pursuing their work, as Herbert Simon already suggested in his classic The Sciences of the Artificial (Simon, 1969). Addressing the "messy, problematic situations" the design process has to deal with (Schön, 1983), a series of hybrids between the natural and the artificial can actually emerge (Latour, 1986). As Antoine Picon writes, "the most fascinating aspect of contemporary sciences probably lies in the fact that they promise the unveiling of a both complex and enticing new reality" (Picon, 2008). Embracing novel technological opportunities, in many circumstances today designers can thus make use of the very same tools as scientists, no matter if often applied in different contexts and for different purposes.

The availability of new technologies – from data analytics to artificial intelligence, from contextual sensing systems to augmented reality tools – in fact offers a whole new way of understanding the world. However, we should be aware of the danger of thinking that these emerging ways of measuring and inferring will spontaneously generate new knowledge. As our ability to quantify the built environment increases, so does the risk of developing and acting on limited data sets and making conclusions and design decisions that ignore crucial variables that could not fit into available quantitative models. In this sense, Paul Virilio had already criticized the heavy use of technology in modern science, for its process of "progressively become techno-science – the product of fatal confusion between the operational instrument and the exploratory research – has slipped its philosophical moorings and lost its way" (Virilio, 2000, p.1).

Putting the human being at the center and forefront and shifting our role from typical central-planning designers to "participants within the systems we exist in" (Ito, 2016), this paper aims to demonstrate that, by leveraging on subjective response it is possible to achieve a more holistic, and perhaps novel understanding of the built environment and of our presence within it. The measurement of subjective experiences translates into capturing the impact of urban qualities while navigating urban spaces. Being exposed to the multisensory stimulation of the environment, typically in these experiments the test subjects provide responses to their emotional states through interviews, surveys, or mobile information (Schreuder, 2016; Ma, 2015). More recently, biosensensing devices have been also employed for a number of applications, intersecting with fields such as human behavior, psychology, human computer interaction, or neuroscience. Open source platforms then facilitate the customization of biosensing and neurofeedback hardware and software for brain-computer interfacing. Wearable sensing tools such as EEG scanners are being particularly experimented while navigating the built environment (Cernea, 2011; Mavros, 2012; Collins, 2014).

The paper particularly focuses on two design research experiments carried out at the Harvard REAL Lab, investigating (1) the impact of different typologies of public spaces while navigating the environment through different modes of transportation; and (2) the role of the perceived color values of spaces in the emotive states of people. The devised methodology includes the process of 'hacking' and customizing the employed off-the-shelf sensing and augmenting instruments, such as proximity sensors and EEG wearable devices, taking them outside typical lab setting. Rather than relying on big data analysis, we therefore extrapolate information by shifting the more conventional top-down approach to a bottom-up, human-centered perspective.

4. Results

4.1. Urban proxemics and sensory experience

This experiment studies the mind's response to the individual experience within varying typologies of urban environments, intersecting the proxemics zones with different modes of transportation. The study specifically allows for a better understanding of the subjective perception of spaces through different dimension of mobility in the city of Boston, MA. The selected route downtown is reliant on multiple transport options, with plenty of cycling and driving, and heavy reliance on the subway system and walking (Figure 2). This dynamic urban experience is also affected by the flow of others in relation to the spatiality of the environment.

In the study, proxemics was investigated using a set of proximity sensors directed at the four corners to create a circumscribing illustration of the intrusions into the personal space. In order to study the relationship to the mind, an Emotiv EPOC EEG brain scanner was employed in the field to track brain activity throughout the experiment and against proximity (Figure 3). The results of the EEG scanner readings were categorized as Meditation, Excitement, Frus-

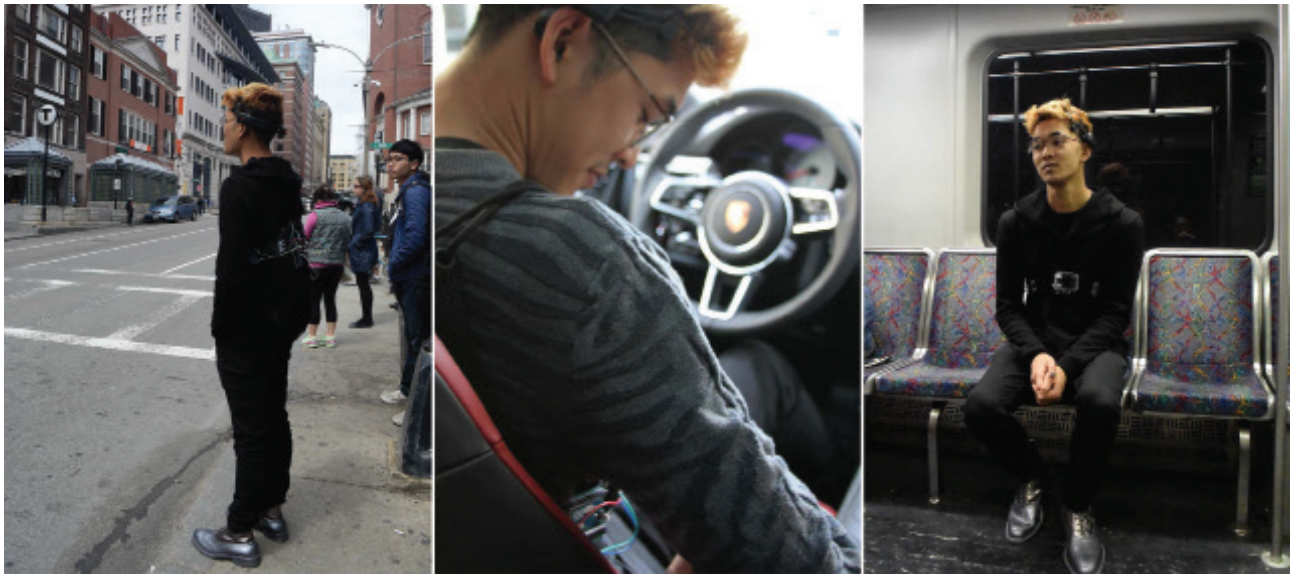

Figure 2. Measurement of the test subject's sensory experience during walking, driving, and riding the subway

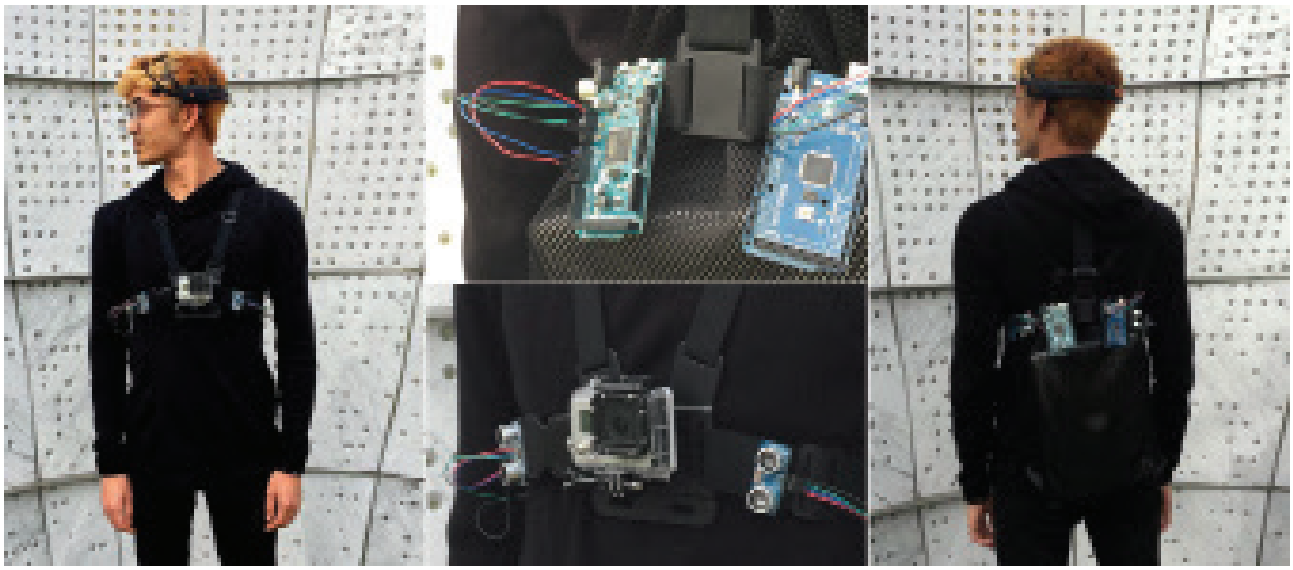

Figure 3. Details of the test subject's setup with a proximity sensor and an EEG scanner

tration, and Engagement. These data were then displayed in alignment with the readings from the proximity sensors, in relation to first-person footage collected from the experiment (Figure 4). The analysis of the readings and spatial scenarios resulted in a lexicon of urban spatial compositions and their deduced impact on the mind.

The urban taxonomy juxtaposes spatial condition, proximity, and state of mind to generate 99 cases observed in the study of spaces (Figure 5). Some cases introduce the impact of people which are by proxy a result of the architecture of the setting, while others are purely based on proportion and surrounding. In particular, each state of mind is most commonly induced by a particular spatial situation.

Highest levels of meditation are achieved in calm and quiet areas but with a certain static object to help orientation and create a sense of scale. Engagement is most commonly associated with people, or the lowest chance of expectancy, thus forcing the subject to be alert and engaged in whichever transit activity is being undertaken. Excitement relates, most often, to unexpected or agitated spatial circumstances. Finally, frustration is most common where other modes of transport are in close proximity, or more accurately when people or objects traveling at different velocities are nearby, making maneuvering more challenging to the subject.

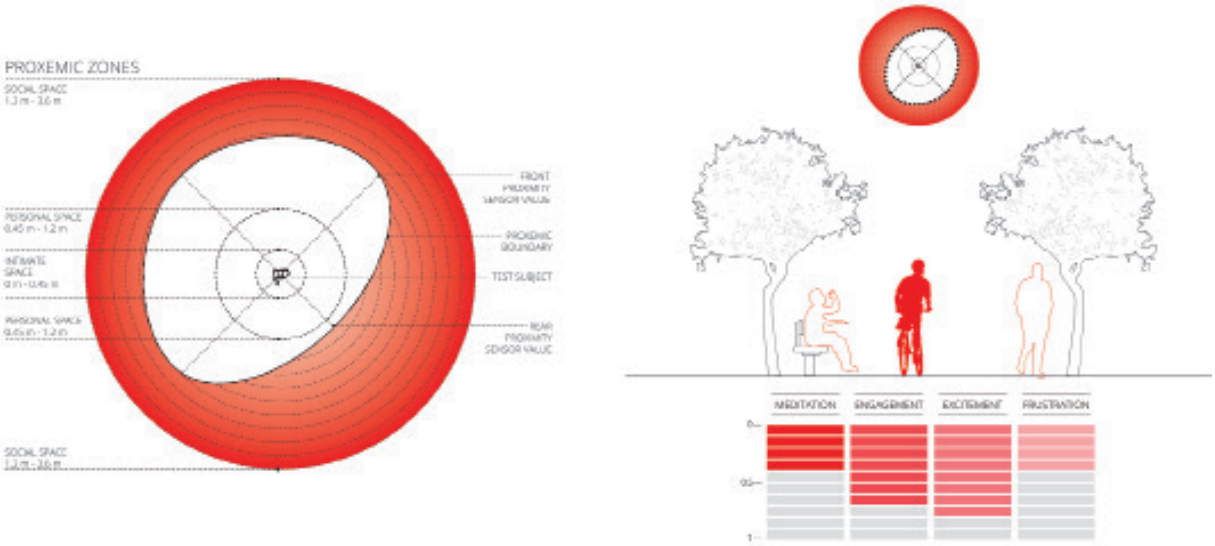

Figure 4. Proxemics analysis and EEG scanner readings

While all the results speak to a certain impact of closeness on the mind, and seemingly relate to people more often than not, it is in fact the built environment that creates the spatial conditions which put people in closer contact. Moreover, the outcome suggests an inherent relation to flow, whereby the temporal transformation of space is created by people and impact the state of mind instantly. Although the accuracy and consistency of the results are limited due to various uncontrollable factors in the brain readings, these data and interpretations lead to a better and more complex understanding of the fabric of Boston, at once suggesting an enhanced knowledge of the public space and a critical perspective of transit modes.

4.2 Urban color and emotive states

Although color is a visual quality, when we observe the built environment we do not respond to just one color at a time, but rather to multiple dynamic combinations. These colors under different seasons and lighting conditions give a space its own look and feel. In fact, color, hue, light, shadow, texture, and pattern, combined with different lighting conditions allow each city to have its unique character. Paris has a color, which is different from London's, which is yet different from Boston's. It is this unseen average or general color of a place that is the particular subject of this investigation. The project specifically addresses the relationships between the feel of a public space, perceived through combined color values, and the emotive states of the study participants. Different colors are perceived to mean different things. For example, tones of red lead to feelings of excitement while blue tones are often associated with feelings of relaxation. Both of these emotions are pleasant, so therefore, the colors themselves procure positive feelings in advertisements (Aslam, 2006; Labrecque, 2011). Usually, the effect of perceiving color in different environments and the related mood states are assessed through emotional questionnaires (Sroykham, 2014).

The presented work expands these approaches by

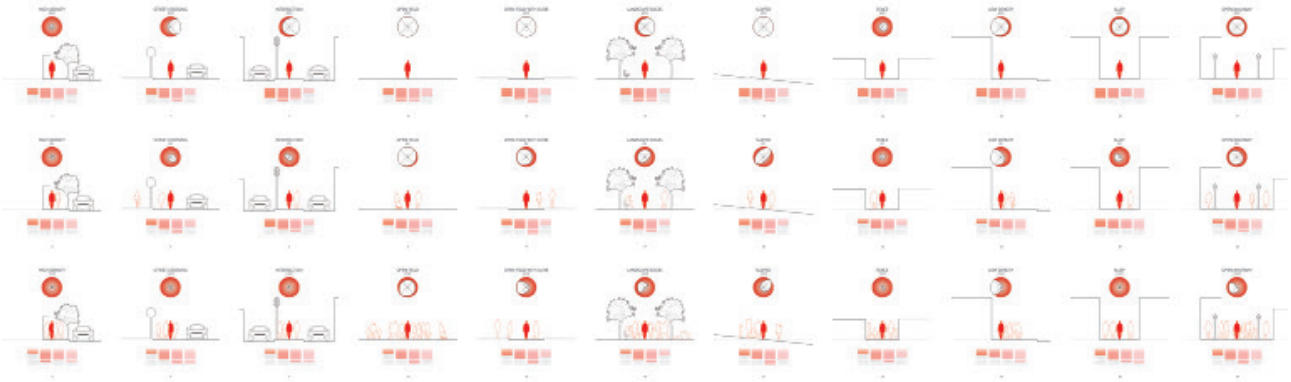

Figure 5. Taxonomy of urban conditions in relation to sensory experiences

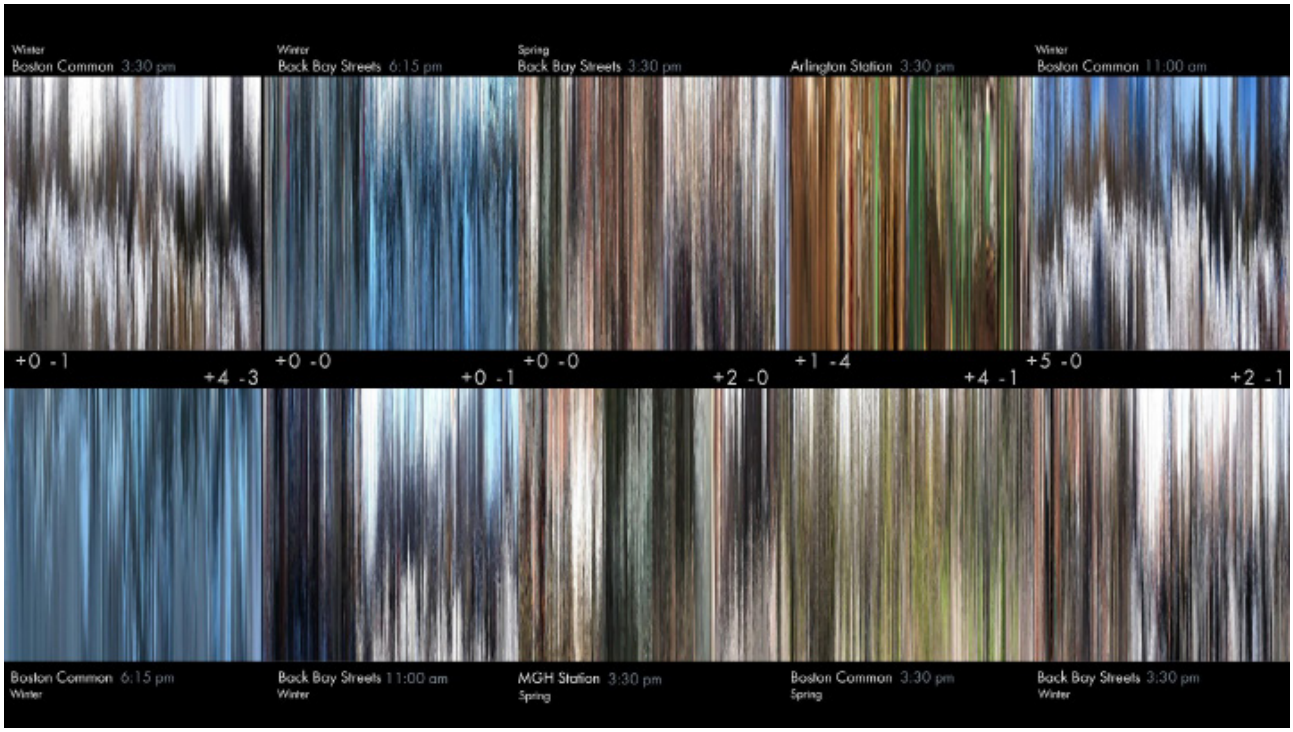

Figure 6. Series of color barcodes of urban spaces at different times of the day

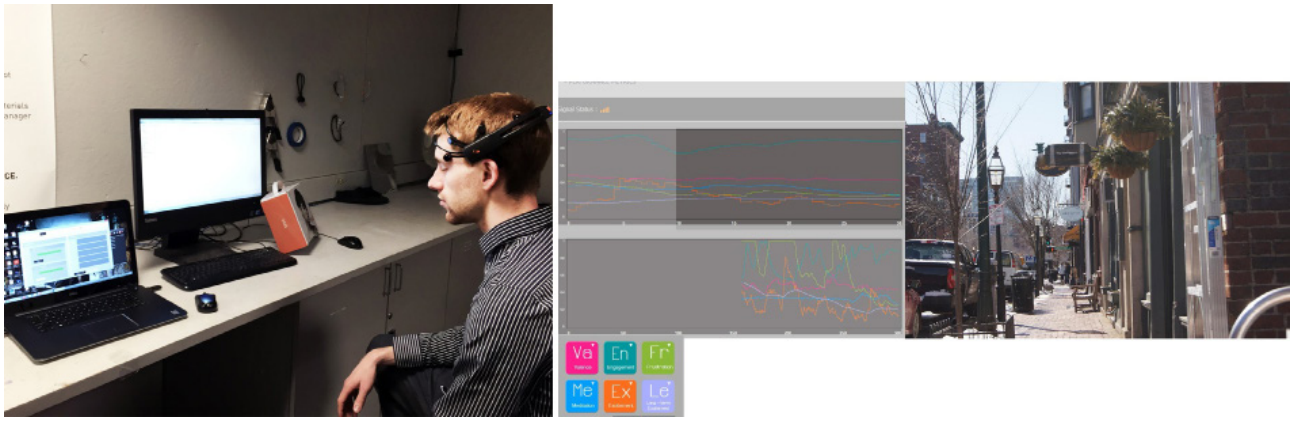

Figure 7. Study participant testing the EEG headset (left) and readings of real-time emotive states (right)

employing an EEG wearable brain scanner in the color-centered experience of the built environment. The site of investigation is the Back Bay area of Boston, characterized by four types of spaces that have distinctive visual qualities. The research team captured video footage while walking through the selected path in different seasons and lighting conditions. These footages were then abstracted into a form that allows colors to dominate over other qualities. Using a "barcode" method, each frame was taken out from the video footages and resized to create one-pixel-wide strips. By stitching these strips next to each other sequentially, the variation of the space is reduced down to a barcode that shows the progression of the walk highlighting the most predominant colors in that route (Figure 6).

A series of barcodes representing the four urban environments at different times of the day were then assembled, and randomly rearranged to create a video that scrolls through them one by one. These abstractions were subsequently shown to experiment participants in a darkened room to monitor their emotional reaction. The study was conducted indoors through abstraction of the environment rather than outdoors at the actual site in order to remove distracting factors that are not related to the objective of the experiment. As in the previous experiment, the EEG headset was used to evaluate the emotive states of participants (Figure 7). The procedure also included a questionnaire for rating the emotional feelings and responses to the visual stimuli.

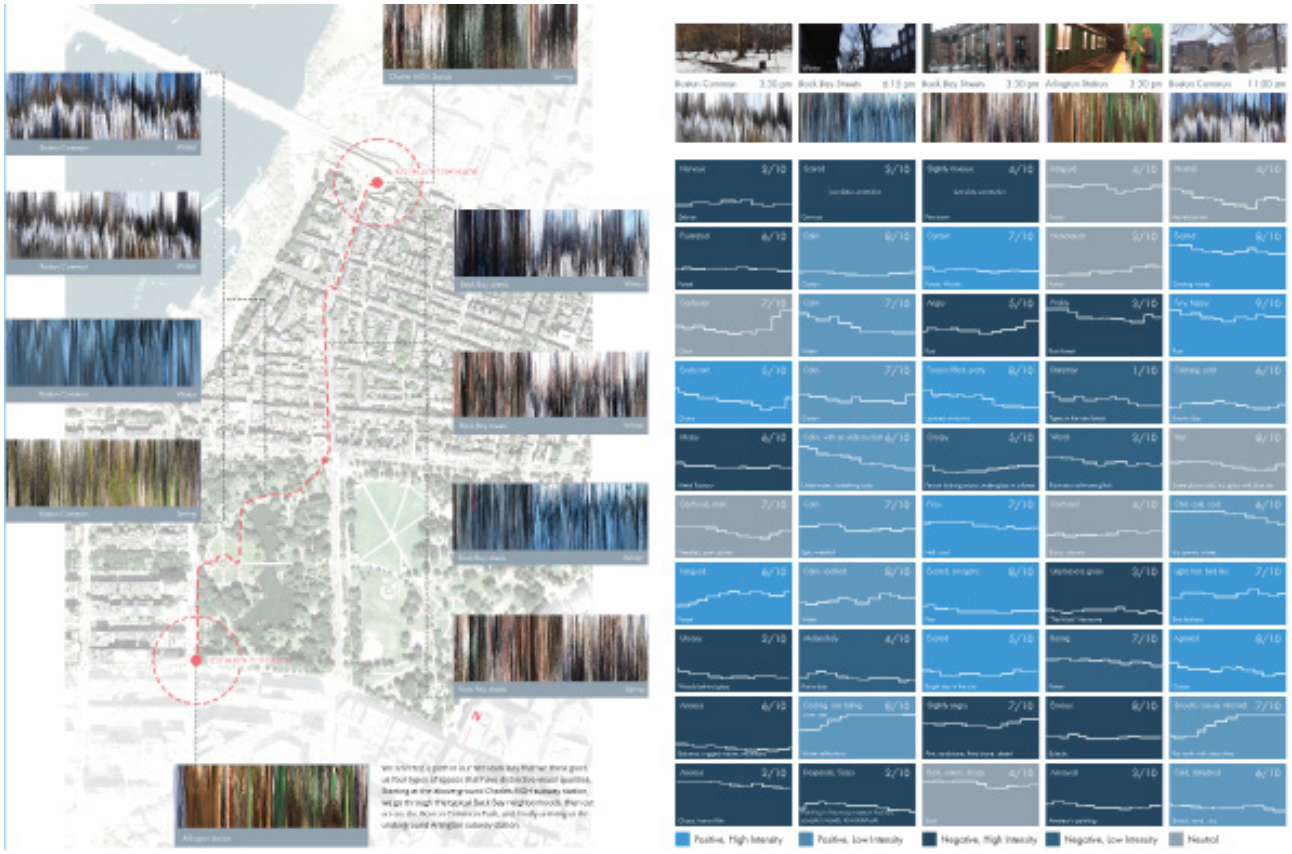

Figure 8. Matrix showing the results of the Boston-focused experiment

The results of the EEG data were then graphed to obtain a large matrix of environmental situations (Figure 8). Each cell has the score given by participants to the barcode, and also their verbal descriptions. The cells are color coded into five categories based on the emotive state: (1) Positive – High Intensity (i.e., exuberant, excited); (2) Positive – Low Intensity (i.e., calm, soothing); (3) Negative – High Intensity (i.e., angry, anxious); (4) Negative – Low Intensity (i.e., melancholy, bored); and (5) Neutral. The matrix of results were finally correlated with the findings of the questionnaire, offering an alternative perspective on the role played by the color pallets of urban spaces in conveying and provoking emotional responses.

5. Conclusions

This paper presented a multidisciplinary and multisensory approach that creatively employs augmenting and sensing technologies for a better understanding of the embodiment of immaterial elements in the subjective experience of the public space. The contaminations between different fields and approaches are leveraged to create an alternative design research method and open up for potential implications in architecture and urban design. The experiments described in the paper particularly shed new light on the impact of digitally-enabled design in affecting our relationship with and within cities, not only in terms of mental response but also actual behavior. By operating in between the scientific domain and the design realm, these studies ultimately demonstrate that it is possible to obtain a novel perspective of the individual experience of the built environment, eventually fostering hybrid design processes for more engaging, interactive, and responsive technologically-enhanced public spaces.

6. Acknowledgements

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FROM THE MARGINS TO THE URBAN CORE: THE THINK PLAYGROUNDS DIY INITIATIVE IN HANOI

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Keywords: Do-it-yourself Urbanism, Hanoi, Civil Society, Playgrounds

This paper presents the results of a research project that brought together 10 Canadian students from the University of Montreal and Hanoi's National University of Civil Engineering to document a unique Do-it-Yourself urbanism initiative in Vietnam. The study focused on a group of young volunteers (called Think Playgrounds) who are designing and building low-cost playgrounds for kids in public spaces of the Vietnamese capital city.

Despite being unprecedented in the communist socio-political context of Vietnam, this bottom-up initiative has produced a significant number of new playgrounds in Hanoi while also redefining the nature of urban public spaces. Building on data gathered in Hanoi during the summer of 2016, we argue that two strategies deployed by Think Playgrounds explain its success: a focus on raising awareness among the local population and authorities on the substantial opportunities of an innovative and low-cost solution ; and their dynamic use of social medias in organizing and funding their projects, disseminating their objectives and intentions, and recruiting volunteers.

Together, these two strategies have played an important role in allowing the organization to develop a broader public space design expertise and to become a serious actor in the transformation of Hanoi.

1. Introduction

Open public spaces such as squares, parks, and playgrounds have historically been very scarce in Vietnamese cities and especially in Hanoi (Drummond, 2000). The pressure on the few existing spaces has nevertheless increased over the last decades in the Vietnamese capital city. This is due, in part, to the country's rapid urbanization which witnessed a rise of its urban population from 18.3% to 33.5% over the last 40 years (United Nations, 2016; GSO, 2017). In addition, during the late 1980s, Vietnam embarked on major socio-economic reforms, which left a much larger place to the market economy. Following these reforms, public spaces started to get commodified while, at the same time,
new consumer spaces and privatized and paid leisure spaces emerged in cities (e.g., theme parks, video game parlour, etc.). Resulting from these various phenomena, today's inner-city districts in Hanoi suffer from a serious shortage of free, safe, clean and well-designed open public spaces in general, and lack playgrounds for kids in particular (Boudreau et al., 2016). In parallel, the rising
popularity of videogames and mobile devices impact youths and children's leisure activities, which have become more solitary and tend to be practiced indoors.

1.1 Situation in the literature and conceptual framework

It is in this context that two young Hanoians decided, in 2014, to found an organization which they called "Think Playgrounds" that adopted a "Do-It-Yourself (hereafter DIY) urbanism" approach to produce new playgrounds for children. For a few years now, the planning literature has characterized DIY urbanism as a mean through which urbanites can think and act on their living environments. Stemming from groups with limited resources, DIY's micro-interventions have been found to allow innovative and cheap solutions to problems that remain undealt with by urban administrations. By broadening the scope of citizen participation in the urban space production process, DIY initiatives further challenge the conventional planning paradigm of consensus, political management, and urban governance (Finn, 2014). The projects implemented by DIY proponents
indeed expose spatial conflicts over territorial use and infrastructure, thus revealing new potentialities for planning and bringing to the fore groups willing to voluntarily engage their human capital in the creation of better cities (Iveson, 2013).
Contrasting with the Global North experience, the notion and practice of DIY urbanism is completely new in Vietnam. In this hierarchical and relatively authoritarian context, the very idea that groups of individuals, with no formal training in urban design nor position in the urban administrative apparatus, might take it into their own hands to transform the city is inherently transgressive. Despite this political challenges, Think Playgrounds has succeeded to apply key-principles of DIY urbanism in Hanoi. Building on very limited human and financial resources, the organization has designed and built 49 playgrounds in Vietnam over the last three years, most of which made of recycled materials
and assembled by young volunteers. Think Playgrounds is regularly celebrated in the (state-controlled) media for this impressive contribution to the city's public space network. Recently, the organization further enlarged its mission. Beyond the production of playgrounds, the organization is actively structuring a network of actors working to improve the access of children, the poor, and the
urban population as a whole to safe and good quality outdoor recreational spaces. Think Playgrounds is also regularly called upon to assist local governments in creating public spaces for children in Hanoi (an area previously neglected by Vietnamese planners).

1.2 Research questions and argument

How did this small volunteer organization manage to move from being a marginal group that relied on what, at first glance, seems like a transgressive bottom-up mechanism led by civil society actors to become a producer of public spaces and, to booth, an adviser of public planners? How has this organization not only managed to gather considerable popular and media support, but to also
attract the attention of public authorities on another way of producing and interacting with the city's built environment? In what follows, we argue that two strategies deployed by Think Playgrounds explain its success : i) a focus on raising awareness among the local population and local authorities on the substantial opportunities of an innovative and low-cost solution ; ii) their dynamic use of social medias in organizing and funding their projects, disseminating their objectives and intentions, and recruiting volunteers. Together, these two strategies have played an important role in allowing the organization to develop a broader public space design expertise and to become a serious actor in the
transformation of Hanoi.

1.3 Methodology

Our analysis relies on a variety of research methods. To understand the origins, evolution and functioning of the organization, we conducted about 52 semi-directed interviews with its founders, staff members, volunteers and citizens. We also interviewed representatives of NGO partnering with Think Playgrounds and local government officials in areas of the city where the organization has been active. This was complemented by case-studies of 5 sites across Hanoi where Think Playgrounds has intervened over the last three years (see map at Figure 1). Site selection was based, first on their location (we included both peripheral and inner-city sites) and on their tempo-

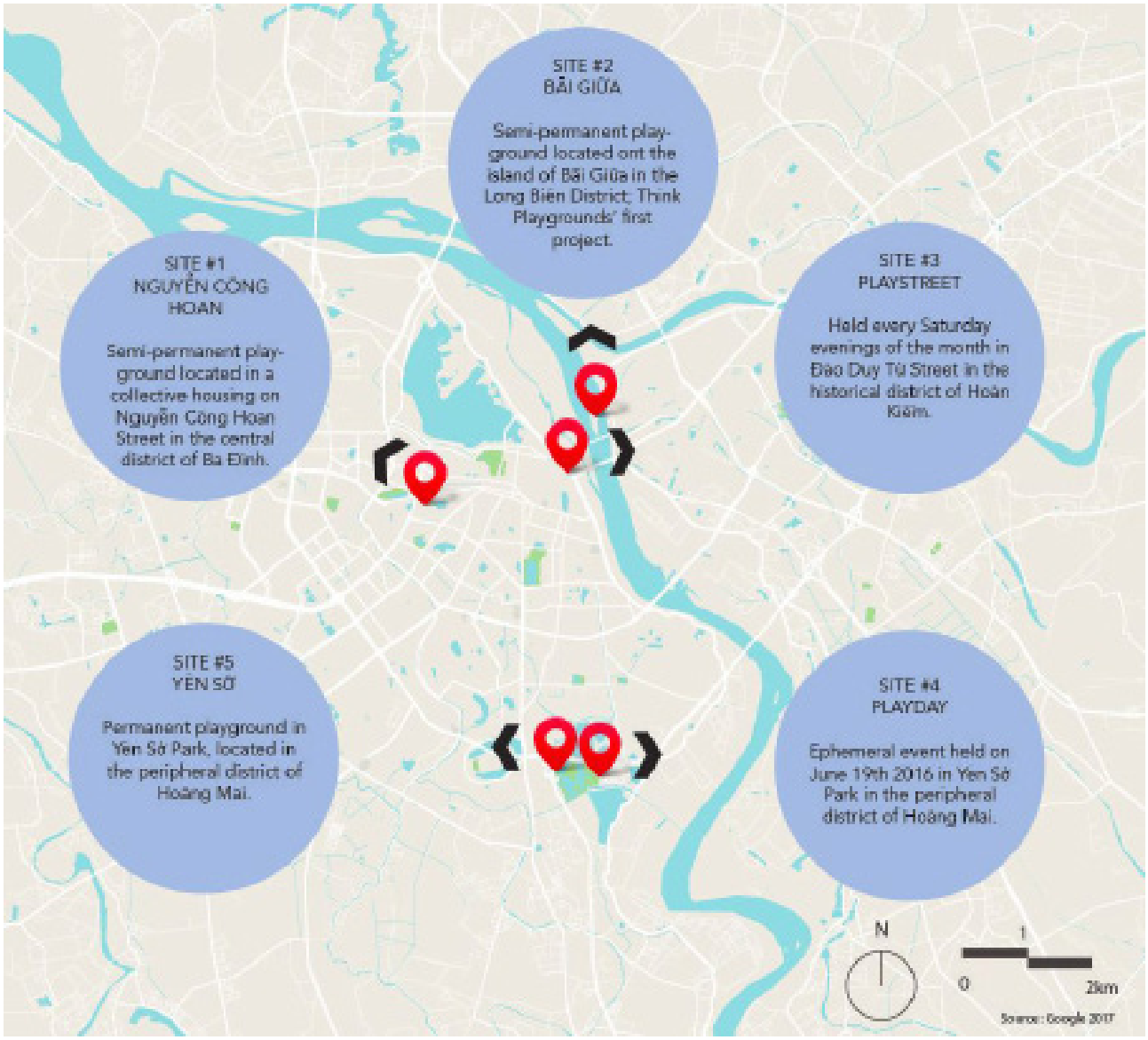

Figure 1: Location and description of the five case-study sites, Hanoi (Vietnam)

rality (we included event-based and semi-permanent interventions). At each site, we conducted systematic observation and conducted a short survey and interviews with users and surrounding residents. These various data sources allowed us to explore the relationship between Think Playgrounds and the city's local authorities, the development of a network of local and international actors around the DIY organization, the organization's internal management and ways in which its projects are received by citizens.

2. Learning from Hanoi: Making DIY Urbanism Possible in a Socialist Environment

The very first intervention of Think Playgrounds took place in 2014 in a disadvantaged community of undocumented migrants. This community lives on floating houses on an island adjacent to the city's historical center, an area that stands outside of municipal authority's regulatory purview (site #2 in Figure 1). There, Think Playgrounds' volunteers built a small playground (figure 2), testing their method of quick, low cost interventions carried out by a limited workforce and emphasizing dialogue with and integration of local residents. The local community's positive response validated this approach and demonstrated that reclaiming unused or privately occupied spaces for free, open recreational purposes is possible in Hanoi. This first project also captured the interest of the press and media coverage that kept growing, and gave the project visibility. This also caught the attention of City officials who recognized the project's benefits. This success further showed that social network can play a vital role in attracting human and financial resources, the dissemination of Think Playgrounds' objectives and activities, and exchanges about DIY practices.

Figure 2: Think Playgrounds' first project on the island of Bãi Gi□a
Source: Gabriel Larue

2.1 Raising Awareness

Following this first initiative, Think Playgrounds multiplied its activities. The organization has since constructed dozens of low-cost playgrounds in formal public parks and on under-used private plots in residential zones. It also implemented a recurring event held every Saturday night on an inner-city street closed to traffic which they called "Playstreet" (Site #3 in Figure 1). By building these installations in the capital's dense and saturated areas, Think Playgrounds succeeded to raise awareness among local communities and local authorities on the possibilities of reclaimed unused or privately occupied spaces to create playgrounds for children. The political support received from the Management Board of the Old Quarter following the success of "Playstreet" provided political capital to the organization. The creation of tangible links with the rigid administrative apparatus has enabled Think Playgrounds to develop a larger network of partners and create strategic links with key decision makers. Simultaneously, the relevance of the claimant's message had been understood by a representative of a residential complex (Site #1 in Figure 1) who subsequently approached Think Playgrounds for the construction of a playground in the Ba Đình central district. In these areas of high density, open spaces are often grounds for constant competition between uses and users. This contention for space forced a prior negotiation between the residents of the Nguyen Công Hoan collective housing for the division of the space. According to various authors, the acceptability of DIY projects would depend on the pre-existing nature of the requalified space, or on the modified uses.

The legitimacy of an intervention is thus questioned in a disputed place, where different groups of users claim their right to use (Pagano, 2013). Our interviews revealed some dissatisfaction over the decrease available area of free space, the significant increase in unpleasant noises, or the degradation of cleanliness. Regardless, and generally speaking, respondents had a positive perception of the new installation, which allows more than 50 children of the surrounding area to engage daily in outdoors activities and interact with other children.

On June 19 2016, Think Playgrounds hosted a "Playday" (Site #4 in Figure 1) that we attended and stud-

ied. While the first event of this kind held in November 2014 attracted nearly 1000 children and parents as well as a few journalists, this third edition reached more than 5,000 participants and six different local and national journalists (HealthBridge Vietnam, 2015; Think Playgrounds, 2017). It is worth mentioning that the media coverage Think Playgrounds benefits from is a key element of their rapid expansion. The aim of Playday is to raise public awareness on the lack of playgrounds, but above all to proclaim in the public debate the child's right to play. Through these projects, Think Playgrounds raises the question of the right to the city from a particular perspective - the children's perspective. If the organization claims a right to intervene in public spaces, it does so on the basis of its projects' relevance for a specific, omnipresent, and often overlooked public. In a context where the political ideology limits a full affirmation of human rights, the topic of children's rights helps legitimize citizen's claims by depoliticizing them, thus making them less sensitive. Our interview with the founders of Think Playgrounds illustrates their focus put on the children's right to play : "The right to play is a the human right, but that's sensitive language in Vietnam. When you focus on human rights, [it] means you're touching on a political subject. Not much people focus on some kind of keyword like this to run a social project".

These types of event-based and temporary activities, as well as the presence of semi-permanent facilities in the public realm, also draw the attention of the public and government authorities on the feasibility of an affordable and ecological solution. For instance, the Bãi Giua (Site #2 in Figure 1) playground has only cost 15 million Vietnamese Dong (about 750 USD); mainly coming from a crowdfunding campaign, private contributions and businesses. Think Playgrounds proves that an innovative way of making public space at a low cost is an accessible - and achievable - mode of action for the population. Furthermore, by building low-cost facilities in several areas of the city, the organization tends to achieve a reduction in socio-economic inequalities and a socio-spatial imbalance between dense central neighborhoods and modern urban models in the periphery. The evidence of a sustained and repeated use of playgrounds located in the center showed in our research confirms the relevance of such interventions. The use of recycled materials not only offers an affordable solution to the important lack of playgrounds, but also contributes to environmental protection, a significant input in a metropolis facing some of the world's worst pollution level.

The intervention of Think Playgrounds is also innovative in its integration of citizens in the production of public spaces, a significant advance in a context where the public administration has a monopoly on urban planning. If the rigidity of the communist structure avoids all forms of consultation, Think Playgrounds' projects allow residents to have a voice and participate in the modification of their neighborhood. Therefore, we are witnessing a change in Hanoi's urban planification as it shifts away from an omnipotent unidirectional model. Today, it can be argued that Think Playgrounds, through their participatory projects, transforms the way inclusive and playful public spaces are perceived and built in Hanoi.

2.2 Use of Technology

The use of web platforms is another significant aspect of the Think Playgrounds case study.
Their Facebook page, as well as their website, are privileged mediums to work and share the message of the organization. Subscriptions to their Facebook page climbed to more than 1,000 followers in the two months of construction of the first playground in Bãi Giua (Site #2 in Figure 1) (Nguyen, 2015).
To date, nearly 16,000 people subscribe to their Facebook page (Think Playgrounds, 2017). This platform is used by the organization to constantly monitor its activities, share newspaper articles mentioning them and publish photos and videos of their projects. It is also a platform to collect donations from an aware public. The multiplicity, ease of access and ubiquity of these exchange platforms enable the mobilization of both the public and resources (Wortham-Galvin, 2013).

According to data gathered during the 2016 Playday (Site #4 in Figure 1), 65% of respondents claim to know the group via social networks, and 62% subscribe to their Facebook page, unmistakably illustrating the relevance and effectiveness of this social network.
Think Playgrounds is also a member of the international Global Play Alliance network. Set up by the Australian partner Playground Ideas, the platform allows the exchange of good practices and strategies with other similar organizations. Playground Ideas actively supports groups aiming to construct playgrounds either with "how-to" guides or by supporting them through the different stages of realization of their project. In addition to producing materials that helps highlight the importance of play, Playground Ideas has also developed an online catalog of playground equipments from which Think Playgrounds draws some of their inspirations.

3. Conclusions

In a context where cities see parts of their territories being privatized and commercialized, the commodification of leisure spaces is a pressing issue. The case of Think Playgrounds, which redefines and transforms the way Hanoi is planned as a responsive city, showcases viable and innovative solutions for public spaces. The young organization is thus representative of the rising DIY urbanism movement in the Global

South from which multiple lessons can be learned. Its interventions are especially interesting as they take place in a high density city combined with scarcity of public space, in a communist State with a liberalizing economy.

We have shown how Think Playgrounds has shed light upon the possibility to reclaim unused or privately occupied spaces, the fundamental importance of the children's right to play in our modern cities, the affordable and ecological alternatives to solve tangible urban problems, and the possible ways to involve citizens in the fabrication of their public space. It has done so through an active use of web platforms : dissemination of their message; mobilization of human and financial resources; exchange of strategies with similar organizations. For Think Playgrounds, the new technologies became the most efficient way to largely publicise small and context-specific interventions.

By doing so, the organization started a conversation on the legitimacy and the repeatability of DIY practices in their city. The flexibility of the web brought together not only the creators and the users of the playgrounds, but also outsiders from the political sphere or the civil society. These were the future stakeholders of what is now a broad network. Think Playgrounds demonstrated the legitimate place of DIY in Hanoi, and throughout Vietnam. DIY proponents must now find ways to foster this creative capacity amongst the other urbanites. As a specific tool, one could think of an interactive mapping of residual or underutilized spaces throughout the dense cities of Vietnam. This platform would be a mean to highlight overlooked needs and encourage spontaneous interventions. Building on these re-discovered areas, an online co-design tool would strengthen the collaborative and participatory production process DIY advocates for. In short, this growing movement must continue to tap into new technologies to definitively secure its legitimacy in the creation of the city. Think Playgrounds is an inspiring example for emerging DIY organizations in similar political and economical contexts.

However, one must remember that if social medias can play a definitive role in the creative process, the management and the mobilization of a citizen-led organization, it is all happening under active surveillance by the state.

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PUBLIC SPACE AS AN INFRASTRUCTURE FOR LIVING: THE EXPERIMENT OF LARGO 2 GIUGNO IN VALENZANO (BARI, ITALY)

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Keywords: hi-tech, low-tech, public space, infrastructure, experimental

The essay asserts the upsurge of an infrastructural nature of contemporary public space, describes the theoretical roots of its interpretation, that go deep into the evolution of information society, and postulates therefore some necessary indicators of contemporary urban publicness.

The theoretical statement, also output of a PhD research, has the chance of being applied into an experimental case study in Southern Italy, in the occasion of a square refurbishment in Valenzano (Bari), soon to be realized, with the emergence of sensible design as well as social issues.

1. Introduction

This short essay comes from the outputs of a 4-year-long research that have been condensed in one of the authors' PhD thesis, discussed at Milan Polythecnic University in 2016, and from the fortunate occasion, offered by the refurbishment of a neglected square in Valenzano (Bari, Italy), to apply some of the theoretical principles of that research into an experimental project by the authors' architecture office (SMALL – Soft Metropolitan Architecture & Landscape Lab, based in Bari and Milan), the construction of which will start in summer 2018.

The modern and contemporary history of the western urban civilization is permeated with a background conflict between the evolution of cities and the growth of their infrastructural logics.

Since the failures and consequent decline of the CIAM-like aspirations for urbanism, as well as with the rise of the ecological question of development in the 70's, the relationship between infrastructures and their surrounding environment (being it both natural or built) has turned increasingly turbulent, self-conscious and dialectic, letting few space for any understanding of infrastructures other than that of producers of discontinuities, frictions, fractures and conflicts [Graham, Marvin, 2001].

It is only very recently that the narrative of infrastructure has entered a process of gradual rehabilitation and growing interest, thanks to both some very well-known projects of infrastructure recycling and reuse as public spaces, but also for sure mostly thanks to the spread of information technologies, along with their fascination with the immateriality of the new, pervasive, global idea of networks. The globalization of flows of people, goods, money and information has made the infrastructural nodes increasingly important in the urban life dynamics, turning them into «the ultimate public space» that «expands the public realm beyond the boundaries of a single space» and «articulates the aspirations and dignity of contemporary society» [Smets, 2009].

As today it is then possible to think to the relationship between environment and networks as progressively solving, and therefore to infrastructures as public-space-generators, our aim here is to assert that also the reverse process is ongoing.

Both deeply permeated with networking technologies, or simply being the main theatre of a public life that has been profoundly transformed by the upsurge of the information society, public space now belongs to a new, intermediate sphere, a mediatory position between the "hard" infrastructures of the past and the "soft" dimension of immaterial networks.

2. Infrastructural public spaces

2.1 From information to space and back

One of the main and perhaps most interesting sides of the question is the increasing convergence between two apparently opposite processes, that we can call spatialization of information and informatization of space.

On the one side, the 2000's have been the years where the old, cyberpunk-like physical/digital opposition has started to be discussed thanks to the spread into the civil sector of satellite technologies, with the consequent possibility of free data geolocation and the simultaneous mass diffusion of portable tracking devices, known as locative media. Since then, the internet has increasingly become a location-aware environment, so that its immaterial dimension has started to be developed as a spatialized information field, changing mutually the experience of the physical space involved in the process.

Since then, a very broad, disciplinary contaminated and often harshly politicized set of experiences were born, mainly in the fields of software and new media art, to discuss the impacts of spatialized information onto the urban level, and most of them inevitably focus on topics like geopolitics, citizenship, borders, surveillance1. Among the most interesting themes of experimentation is certainly geofencing, namely the possibility of setting up intangible fences, georeferenced around physical locations. With the continuous advancement of satellite technology and the resulting increase in accuracy of localization tools commonly available on the market, a variety of applications enable interaction with urban areas that in fact call into question the concept of threshold with important consequences related to bio-political issues of access, freedom of movement and the risks linked to the opening of new channels of aggression by private interests, in the uses of the urban public sphere2.

On the other hand, or from the point of view of the production of spatial design integrated with information, the state of the art is still extremely magmatic, because of the substantial mismatch between the evolution speed of technology and of architecture. For this reason, in a phase of unstoppable run towards the maturation of the relationship between physical space and digital information – as it is the one that characterizes the last decade of trials –, many project cannot push the research boundary much far beyond the integration of typical interactive screens into the design of facilities, whether the most interesting results are usually achieved within temporary structures, and inevitably end moving designers towards the choice of playfulness, gamification and, in any case, transiency. Even if sometimes it leads to extremely experimental and stimulating results,

attributing such a "performative" character to public space, in a way, relegates these projects to a "state of exception", not generating a real possible impact on the rise of standards of public space design on a wider, general scale.

1 It is for example the case of the "Transborder Immigrant Tool", made by the Spanish collective Hackitectura.net in 2004, that uses the eye of the gps, applied to mobile phones – even to very early and low-cost smartphones –, to allow the interpretation of the desert territory forming the border between Mexico and South California to irregular migrants, in order to avoid the many deaths from thirst during the clandestine trespassing.

2 See the case of "MapAttack" gamification app for a team game, based on the use of geofences, to be played in the urban context: https://geoloqi.com/blog/2011/09/building-a-real-time-location-based-urban-geofencing-game-with-socket-io-redis-node-js-and-sinatra-synchrony/

2.2 Accessibility, accessivity and accedency

What instead could be seen as a set of new, specific characteristics of an informatized space is the extension of the domain of "access" far beyond the traditional boundaries that have been defined it one of the fundamental warranty principles of publicness [Madanipour, 2010] in the last decades.

In fact, as the knowledge economy spreads in every field of production, and as the access to an exponentially growing capital of free data is everyday wider on a global basis, the right to access the totality of any available public information is going quickly towards becoming one of the new inalienable human rights. In this scenario, public space begins to be seen as a hub, a hotspot, or as a field in which a new right of its citizens should be guaranteed: therefore, an indicator of "publicness" would not just be the capacity of preserving free access from outside into the space itself, but also providing access from the space itself to the whole of global knowledge. Elsewhere, we have been naming this indicator with the neologism "accessivity" [Cariello, Ferorelli, 2013].

Once more, and with regards with the specific experience we will present in this case, we propose that the domain of access in the publicness of urban space can be furtherly stretched, including that public spaces should also be the contexts where the basic principles of sharing economy are fully enabled. In this scenario, another specific feature would be necessary, which we choose here to name "accedency", or the capacity of allowing citizens to share (or, in other words, let other citizens access) some of their own otherwise private belongings, information or thoughts.

In this case, public space would act as an enabling platform, or device, to build new kinds of social ties, exchanges and relationships among citizens: something that, in our opinion, deeply relates to its most ancient nature.

2.3 Meteorological architecture

Another important possibility provided by the current advancements in technology is clearly the action onto the comfort environmental condition of temperature, humidity, light, sound, and more.

Philippe Rahm's work is mainly focused on this specific aspect of research. In his words, «slipping from the solid to the void, from the visible to the invisible, from metric composition to thermal composition, architecture as meteorology opens up additional, more sensual, more variable dimensions in which limits fade

Figure 1. A lateral view of Largo 2 Giugno refurbishment project, where the thin metal structure extension is compared with the density of the urban context.

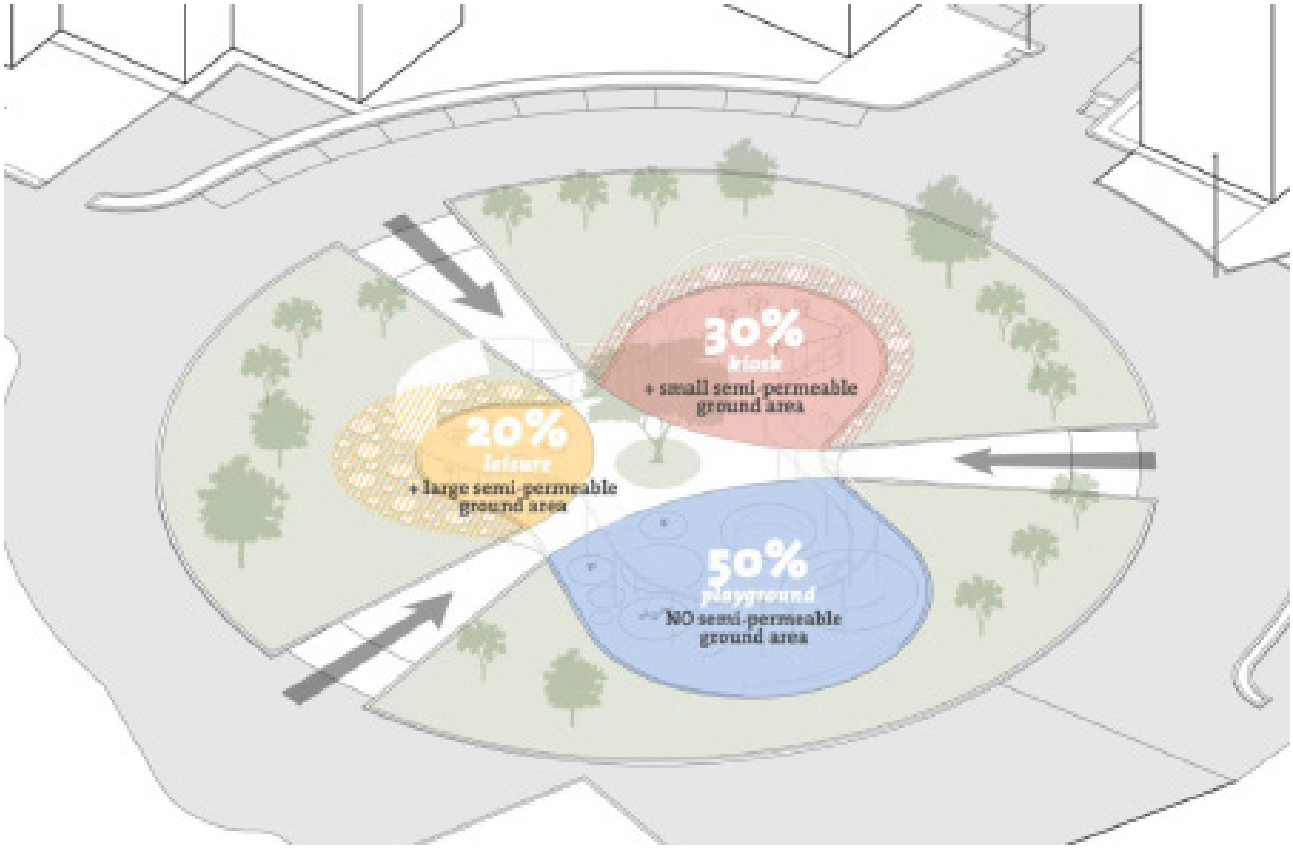


Figure 2. Axonometric view showing functional division of the areas along with semi-permeable ground ratio.

Figure 3. Axonometric general view of Largo 2 Giugno refurbishment project.

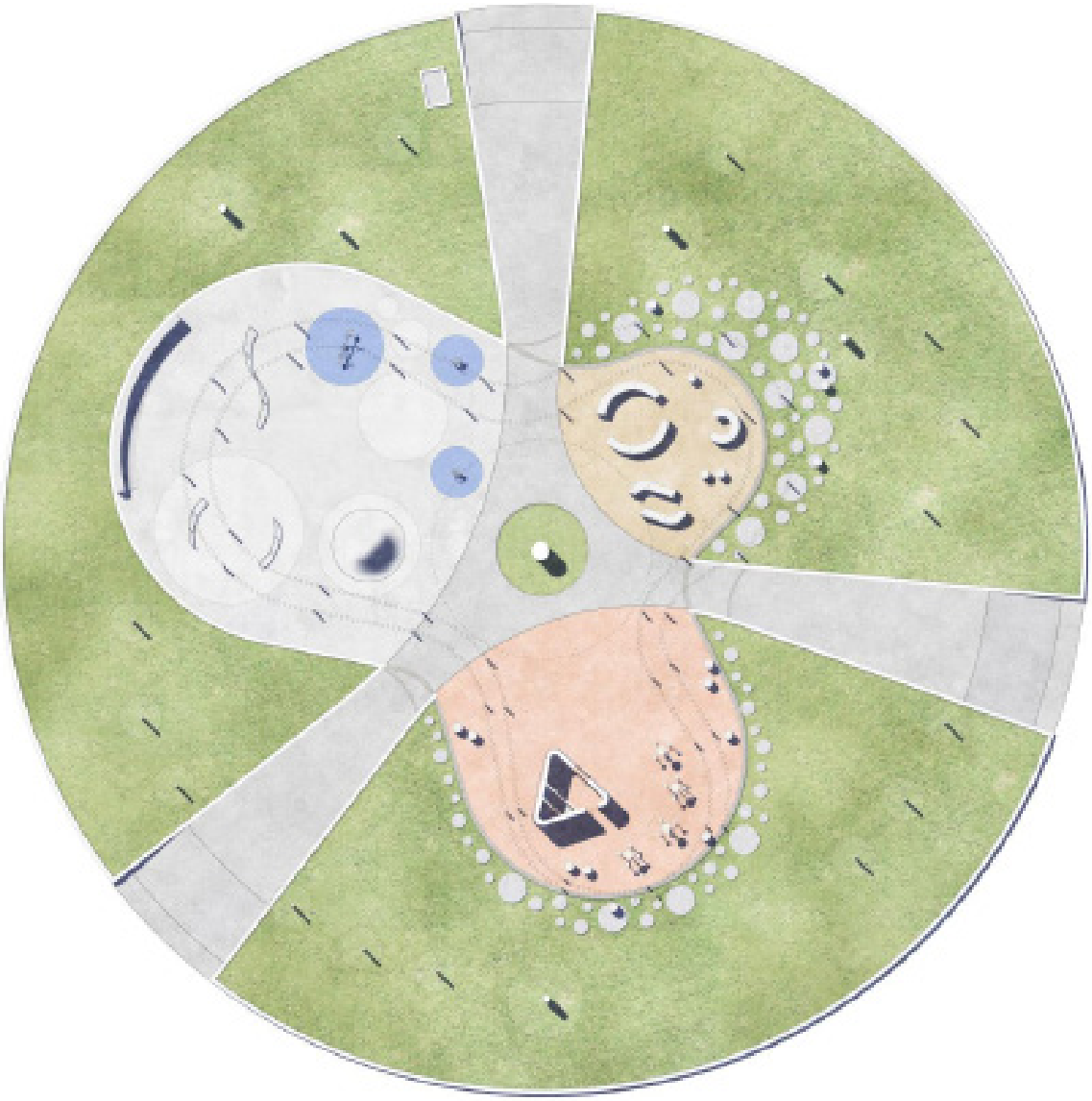


Figure 4. General floor plan, floor level.

away and solids evaporate» [2009].

Beyond the fascination for a whole new geography of urban landscapes where architecture progressively disappears and transcends to a purely experiential and sensorial [Barbara, 2011] dimension, a meteorological approach to public space architecture could be an additional element to provide all the access rights mentioned above, particularly at latitudes where the climatic condition don't averagely allow a vibrant public open-air urban life, or simply in case of specific contingencies and demands.

3. The experiment of Largo 2 Giugno in Valenzano (Bari, Italy)

A very welcome occasion to apply the principles mentioned above – and also for a deeper understanding of some of their shades – has come from the refurbishment of a square in Valenzano, a small town close to Bari (Apulia, Southern Italy).

The square, a roundabout of approximately 75 meters diameter, is located in a peripheral area in Valenzano, where part of the housing fabric is still under completion.

The starting condition of the square was not blank. In fact, the area had been formerly designed and realized with rigid formal principles (symmetries and strong divisions), unspecific furniture, no regards for the accessibility by disabled people, and had been soon abandoned by the citizens and fallen into deterioration.

With the will to realize a prototypal public space with the widest possible application of the publicness principles postulated for a new-generation urban space, Largo 2 Giugno was enterely re-designed as an "infrastructure for living", where a linear, suspend-

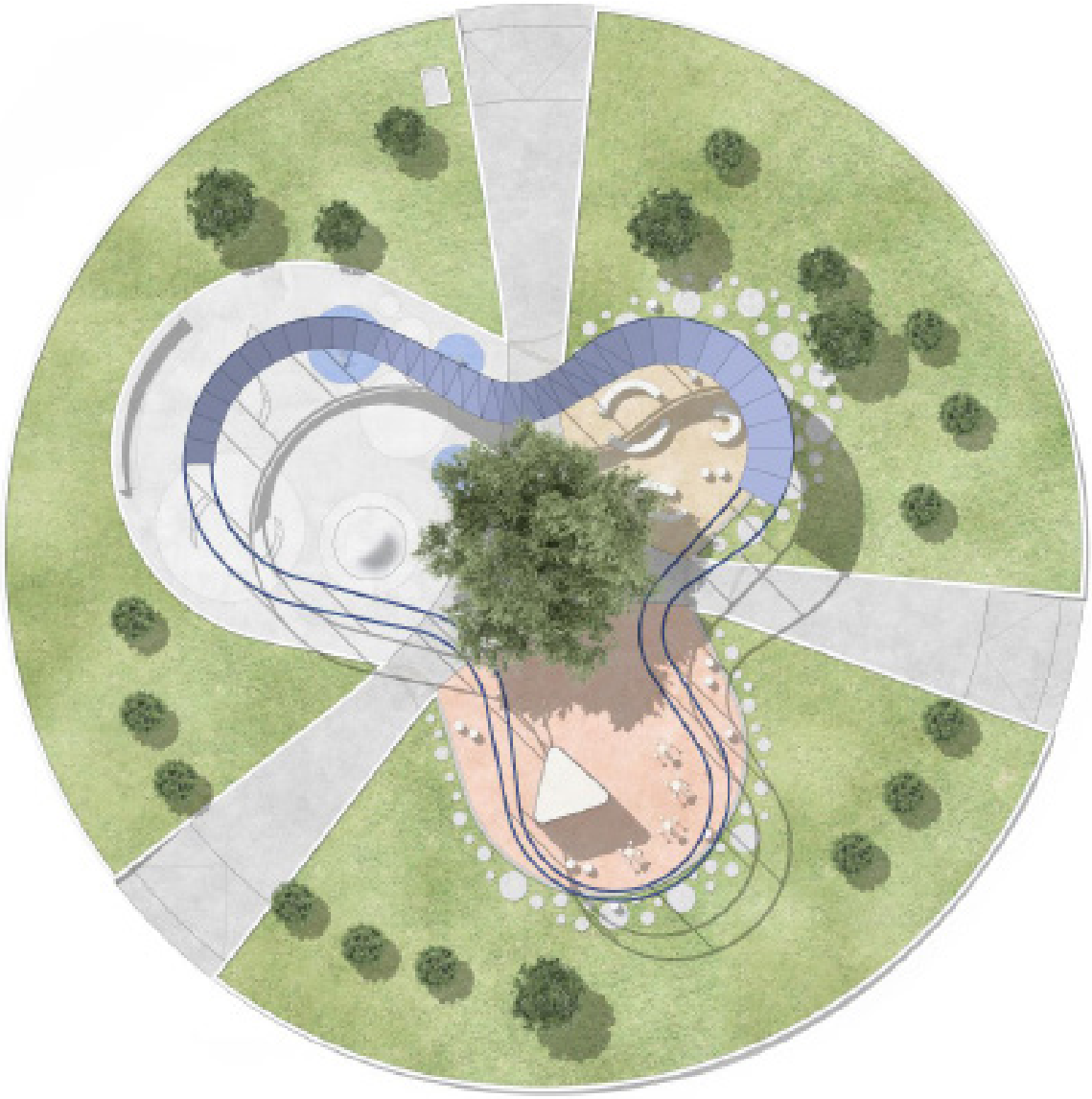


Figure 5. General floor plan as from above the structure.

ed structure composed by two concentric curved metal pipes, going through the whole space, provides different kinds of services, at different times of the day and the year, to three areas designed specifically to host different atmospheres and functions.

3.1 Functional program

The three areas have been designed and dimensioned in their relation between permeable and impermeable soil to welcome three different main uses:

- AREA 1: a playground for children with also facilities for beginning skaters and bikers (namely, small hills and grind rails). This is the zone with the widest impermeabilization of the ground and percentage of empty space, to allow the best possible mobility among the furniture;

- AREA 2: a leisure area, to relax, contemplate and just stay together. This is the zone with the lowest impermeabilization of the ground, as the leisure routine can also be largely be enjoyed on the grass;

- AREA 3: a "chiosco" (small kiosk or cafeteria) with fixed tables and stools. This area has a half-way impermeable ground, as it is possible (but less probable) to eat and drink on the green area.

All the following performances have been then directly dimensioned and placed in relation with the functional program.

3.2 Lighting and shadowing

The night lighting is equally distributed linearly all

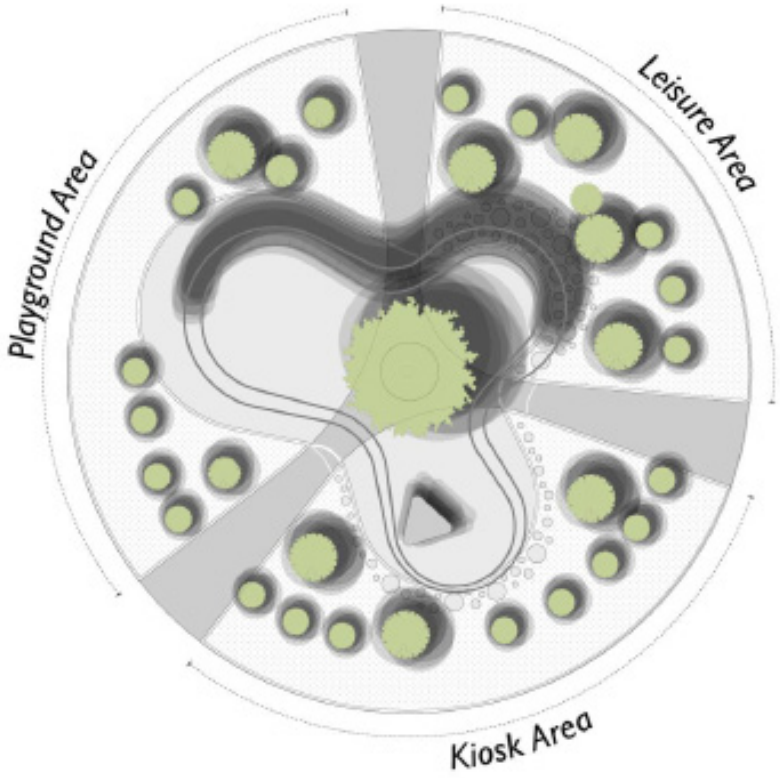


Figure 6. Diagram of shadowing conditions.

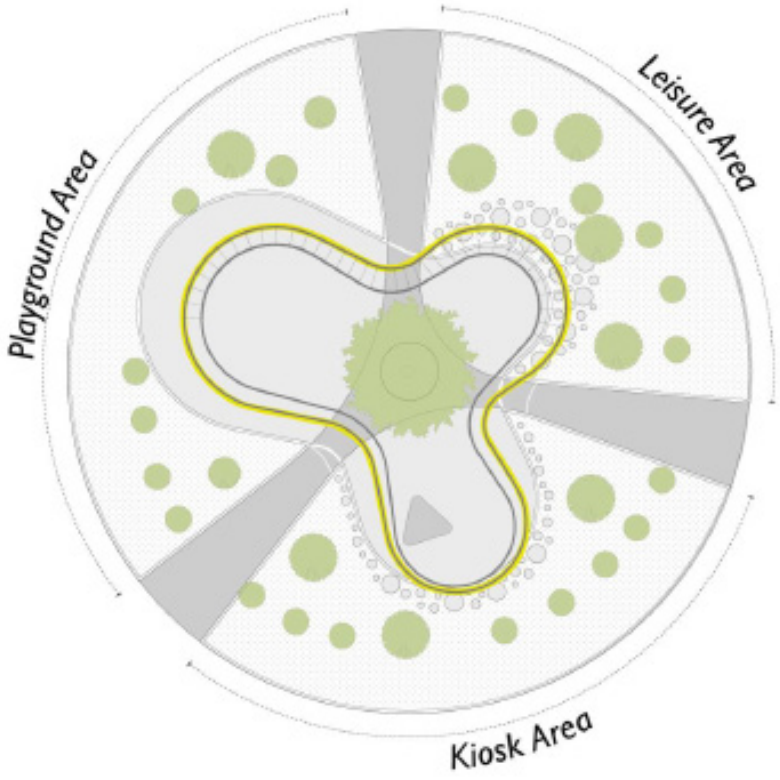
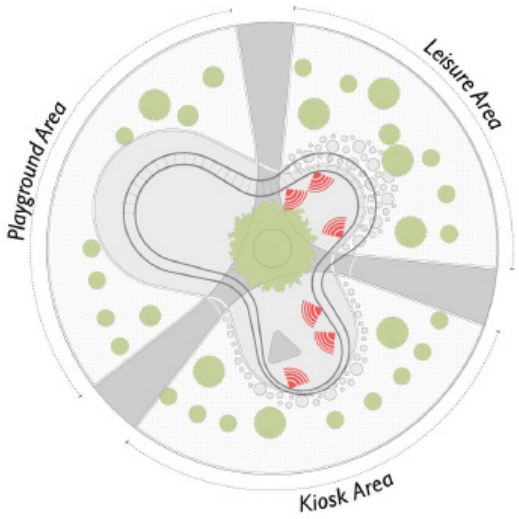
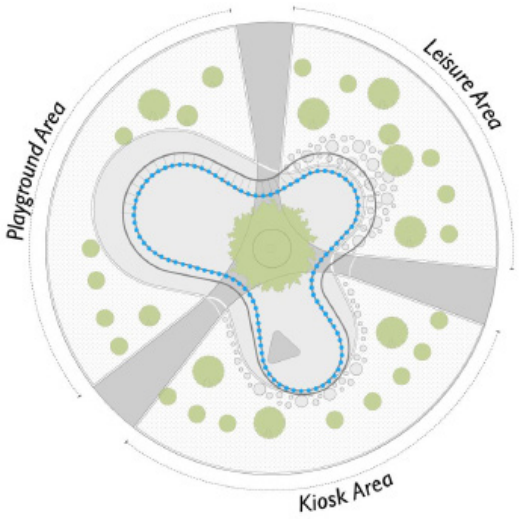


Figure 7. Night lighting extension, on the external ring, for an even illumination effect.



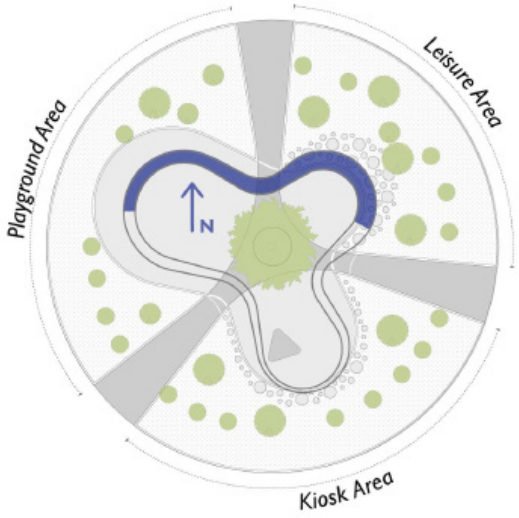
WINTER WARMING

Figure 8. Diagram of heating system, placed on the internal ring near the leisure and kiosk areas, where the activities are slower and need prevention of heat loss during wintertime.



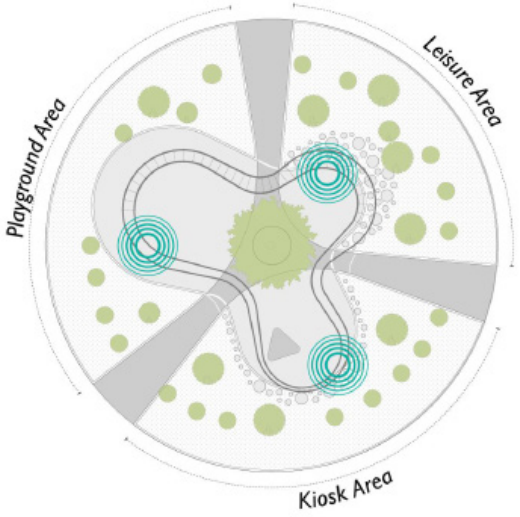
WATERMIST

Figure 9. The placing of water mist system, on the internal ring, all over the system, given the average high summer temperatures of the region



PHOTOVOLTAIC PLANT

Figure 10. Photovoltaic system extension.



WIFI HOTSPOTS

Figure 11. Placement of wi-fi hotspots for a full coverage of the area.

along the structure, to provide a uniformly comfortable environment, other than a strong nightly image of the place, regardless the different functional areas. The day shadowing is instead mainly ensured by the covering realized by a surface, going through more than one third of the structure and providing as well photovoltaic energy production and optimized for both the uses. The shadowing is also implemented by the existing vegetation and is maximized over the leisure area.

3.3 Heating and cooling

In the night and wintertime, and depending by the actual users (whose presence is calculated by optical counters inserted in the pillars) warming infrared lamps act on the leisure and on the cafeteria area, while the playground, given the intensity of physical activity hosted in it, has been left uncovered by the warming system.

The summer/daytime cooling is instead realized by a water mist plant that, given the Mediterranean cli-

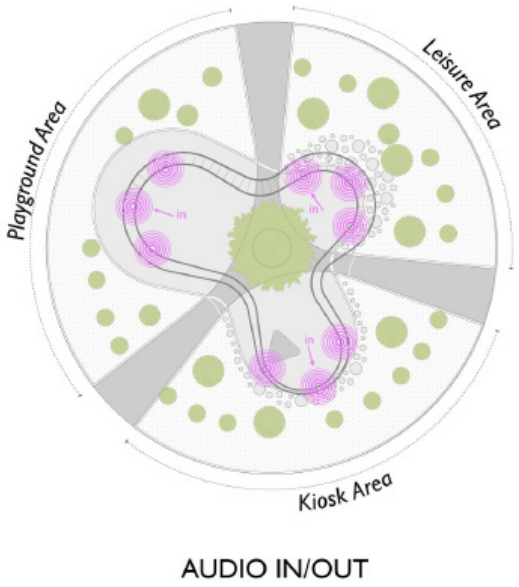


Figure 12. Soundscape system, with indication of inputs location (USB ports) as well as output audio sources.

mate, particularly hot in summer, is present along the whole structure.

3.4 Energy production and supply

A wide energy production (estimated 5820 kWh/year) is possible thanks to the extension of a photovoltaic surface on more than one third of the structure. The amount of produced energy will cover approximately the 35% of the yearly consumption of the area.
One in two vertical pillars hosts an electric plug, for mobile device charging.

3.5 Hotspots and surveillance

The whole structure also works as a big wi-fi internet hotspot, with 3 routers equally distributed along it, as well as 5 cctv cameras, as requested by the Municipality.

The hotspots, today, are then clearly a central feature of accessive public spaces. Although here we state that today only few design projects have started to face the problem of a specific design demand rising along the demand for accessive spaces, we have chosen to provide anyone of the three areas with its own hotspot, as if the need for this kind of access was not program-sensitive, and therefore not design-sensitive.

This project is in fact highly experimental, and therefore is also meant to test the effects of such a technological insertion inside public facilities on different kind of communities, and to measure their reaction of appraisal or refusal.

3.6 Extra: sharing soundscapes

Finally, one of the most experimental features of the project is its "accedency" device. The structure has in fact been equipped with an audio system for the reproduction of any audio format file. The three areas are served by a separate, independent line, and every line is connected with an input device (jack, usb and wireless) where any user could connect and share an audio recording or a playlist, for a limited time slot. This specific feature has been chosen to enable, at the same time, a regular use by the cafeteria, and a playful, unpredictable sharing and enjoying behavior by the citizens. Music is a universal language and a powerful way of communication across ages, ethnicities and census, and it is not uncommon, in Southern Italy, to see it used (even by playing it loudly in the streets throughout cars or windows) by urban communities and tribes as a symbol of identification and belonging.

The use of music in this project is then aimed at creating a dimension of equality in the practice of the urban infrastructure for sharing, and, at the same time, an occasion to experiment untried dynamics of social cohesion.

4. Conclusions

The rise of new network technologies give us the possibility to deeply rethink the sense of publicness as a both an intrinsic urban condition as well as a set of new strategies for common living in the cities, demanding increased standards for public spaces to provide to the communities, in relation with new fundamental rights upsurging.

The new urban "infrastructural condition" is offering a whole new range of design demands, that are still unfortunately not always caught and turned into occasions.

Public spaces can and should be turned into infrastructures for a happier living, but this doesn't necessarily mean that their architecture cannot but be hi-tech. Low-tech and low budget design, as in the case of Largo 2 Giugno in Valenzano, if oriented to contemporary issues and a deep understanding of the information society, can lead to interesting social and architectural innovation.

Urban space today can assume any scale, shape, and technology level, but it will only be successfully public as far as it is design to be, and stay, accessible, accessive and accedent.

Figure 13. Rendered view of the square from the kiosk area towads the center and the playground area.

Figure 14. Bird eye view of the project.

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PLANNING PROFESSIONALS' USE OF TACTICAL URBANISM: A NEW KNOWLEDGE PRODUCTION CONTEXT IN PLANNING

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Keywords: tactical urbanism, knowledge, learning by doing, planning, action

Stemming from civil society, tactical urbanism advocates local scale transformations through incremental, rapid and inexpensive interventions. Inspired by the flexibility of the approach, professionals in several cities have recently started to experiment with tactical urbanism as a new design protocol to produce public spaces.

By bringing the concept of prototyping into the planning field, tactical urbanism generates new conditions – real world, real-time and real scale – to explore how knowledge is produced in the planning process. The analysis relies on Friedmann's (1987) flexible conception of planning as going beyond linear design, where knowledge precedes action, and Schon's (1983) redefinition of action as knowledge-producing. These ideas support a theoretical reflection on the ways in which planners' use of tactical urbanism as a design protocol in the production of public spaces contributes to knowledge production.

This exploration sheds light on the ongoing transformations in the relationship between knowledge and action in planning. Ultimately, it is expected to inform reflection on planning education programs and to improve the design protocol of tactical urbanism to ensure the production of resilient public spaces, better adapted to their environment and the needs of citizens.

1. Introduction

Tactical Urbanism (hereafter TU) is a recent movement that is progressively becoming mainstream (O'Connell, 2013) while, at the same time, emerging as an object of study in the planning and urban studies literature (Lydon and Garcia, 2015). Originally used by activists, practising forms of urban guerrilla to reclaim their right to the city (Lefebvre, 1968), TU advocates transformations at the local scale through incremental, rapid and inexpensive interventions (Lydon and Garcia, 2015). These interventions range from urban agriculture to the construction of public squares. Strongly influenced by the do-it-yourself movement (Talen, 2015), this type of action is nowadays a form of spatial appropriation as well as direct participation by citizens in the design and development of their living environment.

While the TU movement originally stemmed from civil society, it recently started to be integrated in the toolkit of professional planners. Inspired by the speed and flexibility of TU, professionals in several cities have been experimenting with the methods and codes of this approach to initiate urban public space projects (Davidson, 2013; Pfeifer, 2013). The scope of this phenomenon, in terms both of the number and geographical spread of projects, has lead us to explore planning practitioners' use of TU as a new design protocol to produce public spaces.

Although several studies have examined the civic manifestations of TU (e.g., Douglas, 2014; Talen, 2015), the appropriation of this practice by professionals remains little studied. Some authors have explored the role of the planner in this type of project (Crombez, 2014; Pfeifer, 2013), others have stressed the ideological tensions stemming from transformation of a militant demonstration into a planning tool (Iveson, 2013; Mould, 2014), but little attention has been paid to ways in which professionals' use of TU transforms knowledge production in planning.

This paper begins to fill this gap by developing a theoretical reflection on this question. The goal is to explore how professionals' use of TU as a design protocol to produce public spaces fits into planning practices and how it impacts the relationship between knowledge and action in the planning process. This reflection builds on a critical review of the scholarships on TU and on the production of knowledge in planning.

2. Tactical urbanism as a design protocol used by planning professionals

A turning point in the institutionalization of TU occurred in 2010 when the City of San Francisco adopted the Pavement to Parks program, inspired by PARK(ing) Day (a world event wherein participants are invited to occupy and transform an on-street parking space for one day) (Bradley, 2015; Davidson, 2013). The Pavement to Parks program also encouraged the reclaiming of public right-of-ways in the city but for longer periods (figure 1). Citizens and organizations were invited to submit projects to occupy part of a street with the aim of creating new meeting places, encouraging active travel and revitalizing commercial

Figure . Street life on the 3876 Noriega Street Parklet

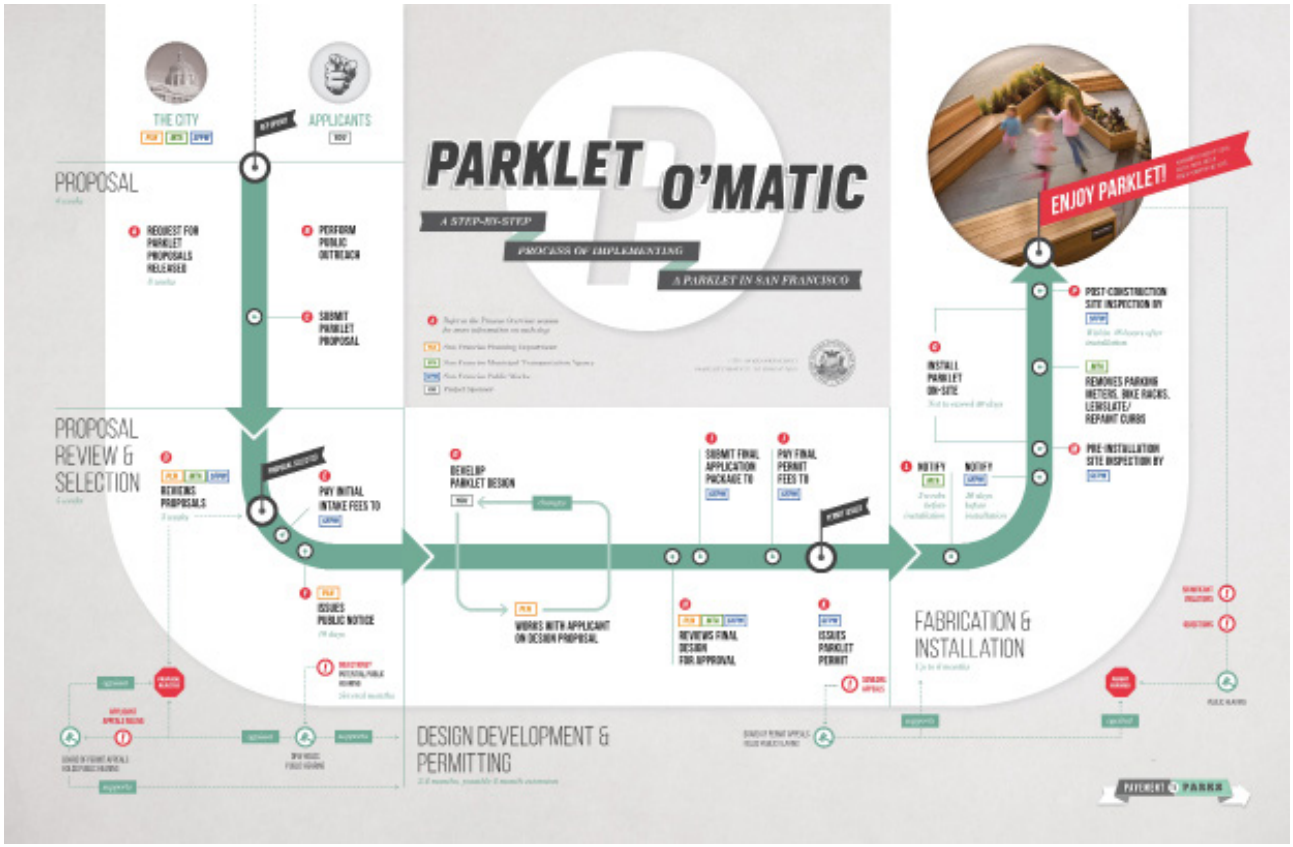

Figure 2. The "Parklet-O-Matic": an overview of the parklet permitting, design & construction process

streets. Applicants of selected projects where thereafter accompanied by the administration during the implementation process (City of San Francisco, 2015) (figure 2). According to Bradley (2015, p. 103), "the institutionalisation of the parklet is a good example of how a guerrilla action became a social movement, which in turn became incorporated into official public planning."

Based on early experiments of this type, professionals rapidly acknowledged TU's potential as a design protocol. Echoing prototyping approaches, TU is founded on an experimental logic of trial and error. This incremental process – proceeding through successive modifications – is valued for the quick adjustments of public spaces' less successful aspects it allows (Lydon and Garcia, 2015). In practice, TU offers the possibility of carrying out low-cost pilot projects, to test their impacts in 'real life' circumstances and to optimize designs without permanently altering the environment. TU protocols further provide feedback from actors (managers, citizens, stakeholders) throughout the implementation process, thus generating knowledge for professionals. Such knowledge allows professionals to carry out resilient projects better tailored to users' needs.

Over the last few years, such a protocol underpinned the redevelopment of the Place de la Nation in Paris (Douay and Prévot, 2016), the introduction of a bike-sharing system in Denver (Marshall et al., 2016) and the pedestrianization of Times Square in New York (Sadik-Khan and Solomonow, 2016), to name only a few projects. During the (re)design of each of these public spaces, planning professionals relied on TU to generate data – usage, perceptions, opinions – and then used this information to facilitate decision-making. In the three cases, the data helped validate the projects' relevance and later justified their permanent implementation.

3. Tactical urbanism as a new context for knowledge production in planning

As suggested by Alexander (2005), to explore what types or forms of knowledge are relevant to planning, we first need to define what planning is. In what follows, we adopt Friedmann and Hudson's (1974, p. 2) view of planning as an "activity centrally concerned with the linkage between knowledge and organized action" (authors' emphasis). While very broad and applicable to other disciplines (c.f. Alexander 2005), this definition offers a useful starting point because it highlights and links three elements that are reshuffled by the TU approach: planning, knowledge, and action. Let us turn to each of them.

3.1 Planning

While deliberately vague, Friedmann's (1987) definition widens understandings of what planning is and, in so doing, position the disciplines into broader intellectual traditions, including Social Learning. Apprehending planning from such a perspective moves beyond a linear conception wherein knowledge precedes action. By instead suggesting that planning "begins and end with action" (ibid, p. 181), this interpretation provides an insightful lens to explore the links between knowledge and action in TU contexts.

Social Learning finds its roots in Dewey's pragmatism, which advocates learning by doing: "its central assumption is that all effective learning comes from the experience of changing reality" (ibid, pp. 216–217). This vision is further based on the empirical sciences in which learnings derive as much from failures as from successes. Friedmann sums up this view by explaining that "through experience, we come not only to understand the world but also transform it. As in a spiral movement, from practice to plan and back again to practice, it is the way we learn" (ibid, p. 189). Such an open understanding of planning calls, in turn, for a redefinition of what knowledge is and of the role it plays in the planning process.

3.2 Knowledge

With the "breakdown of the modernism consensus" (Rydin, 2007, p. 52) and the erosion of the rational planning paradigm in the 1960s (Alexander, 1984) came the realization that knowledge is never neutral but is instead used by individuals and groups to serve specific agendas. An alternative view of knowledge thus emerged in the late 20th century, breaking with "the positivist claim of modernism that examination of the facts will reveal the truth" (Rydin, 2007, p. 54, authors' emphasis). Stemming from the interpretative or hermeneutical tradition, this new view argued that knowledge is socially constructed and contingent on history, politics and the surrounding culture.

From that perspective, it is impossible to establish a unifying category of knowledge. On the contrary, "knowledge now has a variety of sources and takes a variety of different forms" (Rydin, 2007, p. 54). Viewed through this epistemology of multiplicity (Sandercock, 1998), everyday experience is reconsidered as able to guide more conventional expert knowledge (Rydin, 2007). This goes hand in hand with collaborative arguments about the need to include of a wide-variety of stakeholders' voices and commitments in planning processes.

While this new, post-modern understanding of knowledge gained traction in the social sciences, planning remained engaged in an evidentialist paradigm that continues to favor knowledge based on evidence (Davoudi, 2015). The problem is that evidences are often synonymous with facts, leaving aside immaterial or un-factual knowledge. According to Davoudi (2015), this centers planning on cognitive and theoretical knowledge (what she calls "knowing what"). In reconceptualizing planning as a "practice of knowing", Davoudi suggests to broaden the types of knowledge on which planners draw to embrace "knowing how (skills/technical knowledge), knowing to what end (moral choices) and doing (action/practice). Together, these multiple forms of knowing provide the foundation for the art of practical judgement (wisdom)" (ibid., pp. 317–318, authors' emphasis). Rather than seeing knowledge as instrumental to planning, this view reframes planning as a learning process; a recursive and iterative process between knowledge and action.

This reconceptualization of knowledge complicates the planning process by asking how different types of knowledge should be obtained, and then compared to each other. Rydin (2007, p. 58) proposes to use a more pragmatic approach that gives space for expressing knowledge claims ("opening-up"), but also for testing and validating ("closing-down"). In this context, the planners' role is not only to give a voice to those who have knowledge claims to share but also to evaluate these claims. This double action recognizes that knowledge is both socially constructed, but also emerges "from an active engagement with material reality" (ibid, p. 58) which, according to Alexander (2008, p. 208), is "an aspect that much theorizing in planning has downplayed at best or at worst ignored".

3.3 Action

The essential step of testing knowledge claims is recognized by Zeisel (2006) for whom design is deployed a three stage process: imaging, presenting and testing. Using the metaphor of the spiral, Zeisel explains that the design exercise involves backtracking to revise and adjust the proposal in the light of newly obtained information. This cyclic and iterative aspect of design involves repeating the same steps several times. Since the designer does not have all the required knowledge from the outset, he accumulates and generates knowledge at every step during the design process. As Zeisel puts it, "the process feeds itself both by drawing on outside information and by generating additional insight and information from within" (ibid, p. 31).

Schon (1983) made similar observations when examining professional's activities. According to him, rather than merely focusing on problem-solving, professionals give considerable attention to problem-setting, an activity that places them in a learning position. Through their actions, if they pay attention to the constant negotiation between the initial situation and the reframing of the problem, they can become reflective practitioners. Also using the spiral metaphor, Schon (ibid, p. 132) goes on to emphasize that "the practi-

Figure 3. Times Square in September 2009 during the testing phase

tioner's effort to solve the reframed problem yields new discoveries which call for new reflection-in-action. […] The unique and uncertain situation comes to be understood through the attempt to change it, and changes through the attempt to understand it". Action thus plays a central role in the professional's activity; it is not merely the result of reflection but an experience in the sense that the results are not assured. Contrary to the hypothetico-deductive experiences of science, the professional does not work to refute his hypothesis, but to confirm it, to bring the situation within the new framework he has just created (Schon, 1983). He is therefore not neutral and objective as the scientist.

3.4 Tactical Urbanism

Recognizing the epistemological dimension of professional practice (Schon, 1983) transforms professional's project into a cognitive device through which new knowledge is produced (Viganò, 2014, p. 13). From this point of view, every urban project is a producer of knowledge and TU projects are no exception to this rule. However, as Viganò (2014) explains, the project's process always occurs in a context but it also is a context in and of itself.

This is where the use of TU as a protocol for designing public spaces becomes interesting. In addition to Schon's (1983, p. 271) observation that professionals "can construct virtual worlds in which to carry out imaginative rehearsals of action", TU "spirals through stages of appreciation, action, and reappreciation" (ibid, p. 271) in the real world. And in addition to the designer who, during the testing phase, "look[s] backward to determine how good a tentative product is, [and] forward to refine the image being developed and to modify the next presentation" (Zeisel, 2006, p. 24), TU devotes a privileged place to the temporality of the present – real-time – which is added to previous temporalities since the design is materialized in the public space in the form of a prototype at a 1:1 scale – real scale. More than just a representation of the image, the prototype is an unfinished product that can already serve the function for which it was created. The context of the TU is therefore the real world, the real-time and the real scale.

Seen from this perspective, TU as a design protocol enables the activation of public space at early stages of the design phase. The project itself becomes a platform for public participation wherein citizens are able to experience the proposals in it materiality and to provide its proponents with feedback. When used well, TU fosters alternative urban experiences that invite a collective reassessment of the status quo. What if we used the public space differently? The iconic redesign of Times Square in New York is

Figure 4. Times Square in April 2017 with permanent materials

enlightening in this regard (figure 3). The temporary pedestrianization of a section of Broadway Street in 2009 with paint and beach chairs provided an opportunity to re-assess the space devoted to motorized transport in the city. Without an evolutionary and reversible approach, it would have been difficult, both for citizens and planners, to imagine and foresee the consequences of street closure (Sadik-Khan and Solomonow 2016). Yet, the experiment was a success and today, Times Square is redesigned with permanent materials (figure 4).

4. Conclusions

As a protocol for designing public spaces, TU provides a new context to revisit the configuration of planning, knowledge and action's relationships. By mobilizing the concept of prototyping, TU places the design process in the context of the real world, real time and real scale. In doing so, it recognizes planning in a perspective of Social Learning where learning is done through action. The materialization of the proposal offers both a place and a moment to generate knowledge, but also to test and validate it. When professionals use UT as a design protocol, they participate in the activation of public space through experimentation. By testing alternative uses to improve the lives of citizens, professionals create a dialogue based on mutual learning. In doing so, we believe that they contribute to the evolution of the epistemology of the practice by exposing themselves differently to knowledge and by opening new ways of learning.

Further exploration of this field of study would allow a better understanding of the process of knowledge production among professionals within the framework of TU projects. From a practical point of view, research could help professionals to become aware of the knowledge acquired during the operationalization of TU projects to take full advantage of the potential of this approach. Research would also be useful to integrate these new knowledge production contexts into education programs to better prepare graduate students to become reflective practitioners. Ultimately, the studies could help to improve the design protocol of TU, thereby improving the production and dissemination of knowledge in the process of implementation to ensure the production of resilient public spaces, better adapted to their environment and the needs of citizens.

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POSTERS

HEART OF THE CITY.
AN INTERACTIVE PUBLIC ARTWORK
Anaisa Franco

SWEET REFLECTION.
A DIGITAL KITCHEN TO EAT YOUR SELFIE IN A PARAMETRIC HONEYCOMB PAVILION.
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SOUND_SCAPES. FROM INFRASTRUCTURE TO INFO-STRUCTURE
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HEART OF THE CITY. AN INTERACTIVE PUBLIC ARTWORK

Anaisa Franco
Anaisa Franco Studio

The Heart of the city is an interactive public art sculpture that pulses light according to people's heartbeats. The sculpture invites several people to sit and interact with the work. It was located on the corridor of Sydney Opera House during the VIVID Light Festival in 2015.

The piece aims to bring together the heartbeat of the citizens by creating a heart to the city where people are invited to hang out and experience an expansion of their own heart shared with others.
The interactivity of the work occurs when the viewer puts his finger on the pulse sensor located in the center of the sculpture, it begins to pulse light according to the heart rate of the user. When no one is touching the pulse sensor, the heart of the city is waiting for its next user. The work hosts 5 people sitting and one interacting at a time.

The sculpture is covered with a light skin made of flexible LED Neon flex, where half of the leds pulses according to the left heart artery while the other half pulses according to the right heart artery, which creates a unique rhythm to be experienced by the user and its spectators.

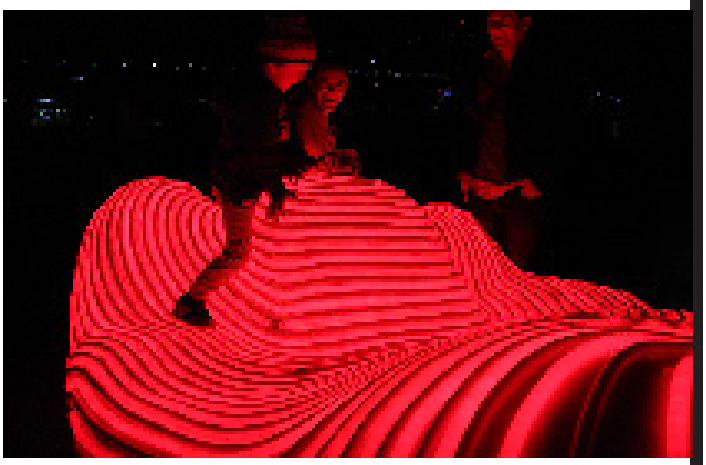
The shape of the sculpture comes from an original human heart model downloaded from the internet which was modified to get the desired shape for the interactive public furniture which was inspired by the human organ. The idea was to create an organic, cozy resemblance of a heart where several people could sit and feel comfortable in the sensitive light skin curvatures.

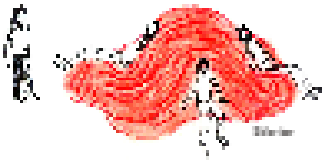
The interior structure was made by carving 3 blocks of Styrofoam using an electric chainsaw and finishing with sand machines. When we got the desired organic shape we added several layers of fiberglass and resin in order to reinforce and protect the structure, which needed to carry hundreds of kilos from the led neon flex plus 6 people sitting on it. The sculpture is robust, waterproof and durable.

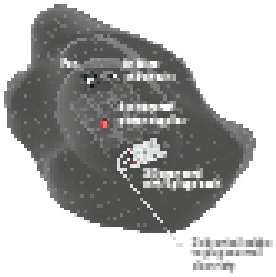
Inside the sculpture, we added the electronic system in a waterproof box with microcontrollers, power supplies, and a fan to ventilate the system. The pulse sensor was located in the center of the external part of the sculpture and there are 2 cables to turn on and off the work that was located in the bottom of the shape, each one requires 10 amp of electric power. It was developed in the Design lab of UTS, the University of Technology Sydney from April 18th until May 22nd, 2015.

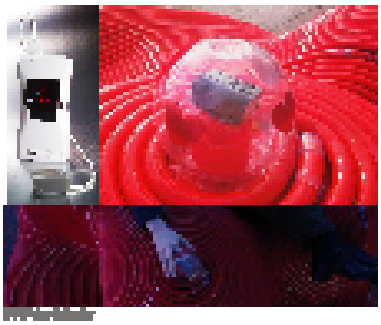
Heart of the City is a project by Anaisa Franco Studio in partnership with Aravinth Panchadcharam (programming), Tank Thunderbird (product design), Heloisa Franco and Annie McKinnon (assistants). The work was commissioned by VIVID SYDNEY 2015 and hosted by UTS Creativity and Cognition Studios in Sydney, Australia.

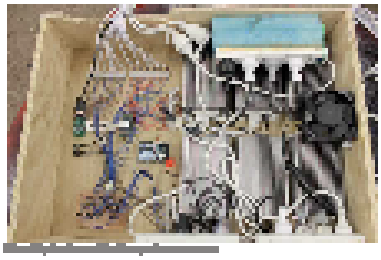
Heart of the city

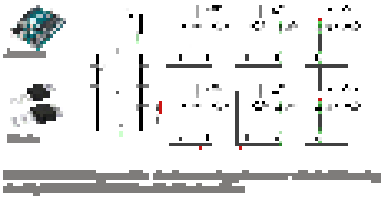


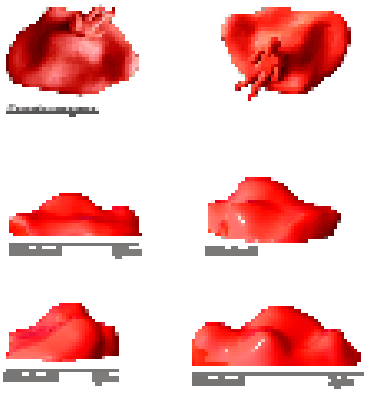


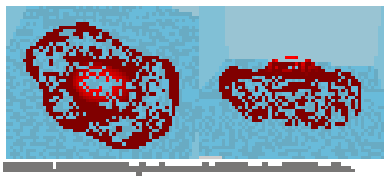


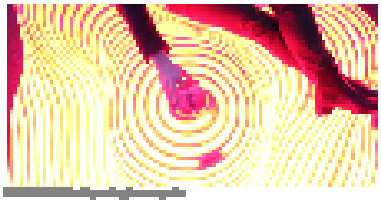












RESPONSIVE CITIES

SWEET REFLECTION. A DIGITAL KITCHEN TO EAT YOUR SELFIE IN A PARAMETRIC HONEYCOMB PAVILION

Anaisa Franco
Anaisa Franco Studio

Sweet Reflection was conceived by Anaisa Franco Studio and executed by the architect Rodrigo Waihiwe. It was a commission of URBE Festival - Public Art Show 2016 which took place between November 12th and 27th in the district of Bom Retiro, central region of the city of São Paulo, Brazil, where three different venues received the site-specific works: "Me Conta um Segredo?" by Guto Requena, "Sweet Reflection" by Anaísa Franco and "Flutuações" by Iara Freiberg, curated by Alessandra Marder, Felipe Brait and Reinaldo Botelho.

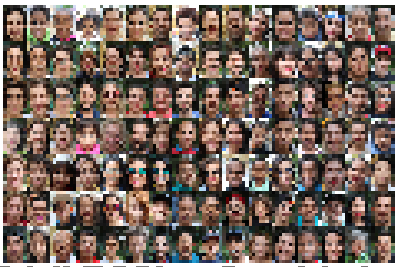
Sweet Reflection is an interactive public art in form of a parametric honeycomb pavilion where the audience had their face printed in Pancake or chocolate through a digital food printer and also printed the translucent cover of the pavilion with the image of their faces. The purpose of this record and the autophagic act symbolized by the food came from the artist's desire to create a memorial that celebrated the ethnic diversity of the Bom Retiro neighborhood and to return that experience in the form of personalized sweets. The public can literally eat their selfies.

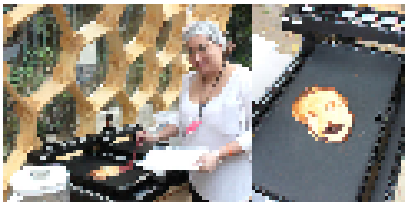
The organic pavilion projected for the sweetness digital kitchen was developed using generative modeling and digital fabrication which allows constructing an organic form in hexagonal wood structures that resemble a honeycomb. The work generates interactivity and a social participation system which transforms the facility into a kind of temporary memorial neighborhood assimilating transient anthropology in printed panels and edible units.

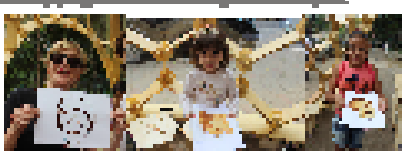
The URBE Public Art Festival aimed to investigate the public space through artistic practices that assimilate the fusion between work and place with temporary interventions, creating a course guided by the interest of the viewer. The work was installed on the edge of Luz Park, on Prates Street, its purpose was to create a temporary memorial for the population of the immigrant neighborhood and to celebrate the ethnic diversity of the Bom Retiro neighborhood by returning that experience in the form of designed personalized sweets.

Project by Anaisa Franco Studio in collaboration with the architect Rodrigo Waihiwe.
Team:
Artist: Anaisa Franco
Architect: Rodrigo Waihiwe
Architect Assistant: Wellington Conegundes
Producer: Julia Borges Araña and Beatriz Menezes
Curators: Felipe Brait, Alessandra Marder and Reinaldo Botelho
Commissioned by Public Art Show URBE.

Sweet Reflection







RESPONSIVE CITIES

SOUND_SCAPES. FROM INFRASTRUCTURE TO INFO-STRUCTURE

Areti Damvopoulou
Spyridoula Stelio

Technology tends to take on a prevailing role in the infrastructure of the cities of tomorrow, affecting constantly their public expression. Embedded information within the urban context, is being expressed mostly, through visual means. As a result, vision tends to be the dominant perceptual state leading the other four senses to atrophy, especially regarding the perception of the built environment. This state underlines issues of urban accessibility and functionality. This project aims to explore the experience of the subject within the urban fabric, through their sensorium domain. The architectural aspiration of this project, is to enhance the overall subject's physical experience as a state of perception of the urban environment, with a particular focus on the subject's senses of hearing and touch.

In order to reconstruct the human perception beyond vision, the project is coping with audio, visual and social data, expressed on the urban fabric of Thessaloniki –the case study area. Through the architectural mode of mediation, the project also wishes to redefine the existing urban qualities, constructing at some point, a beneficial state. As a result, this mode of mediation aims to be expressed in a new infrastructural network, a new urban interface or a new materiality, towards the direction of the non- yet.

The scale of the project is expressed in the spectrum between an urban skin and a human skin, divided into three sub-scales:

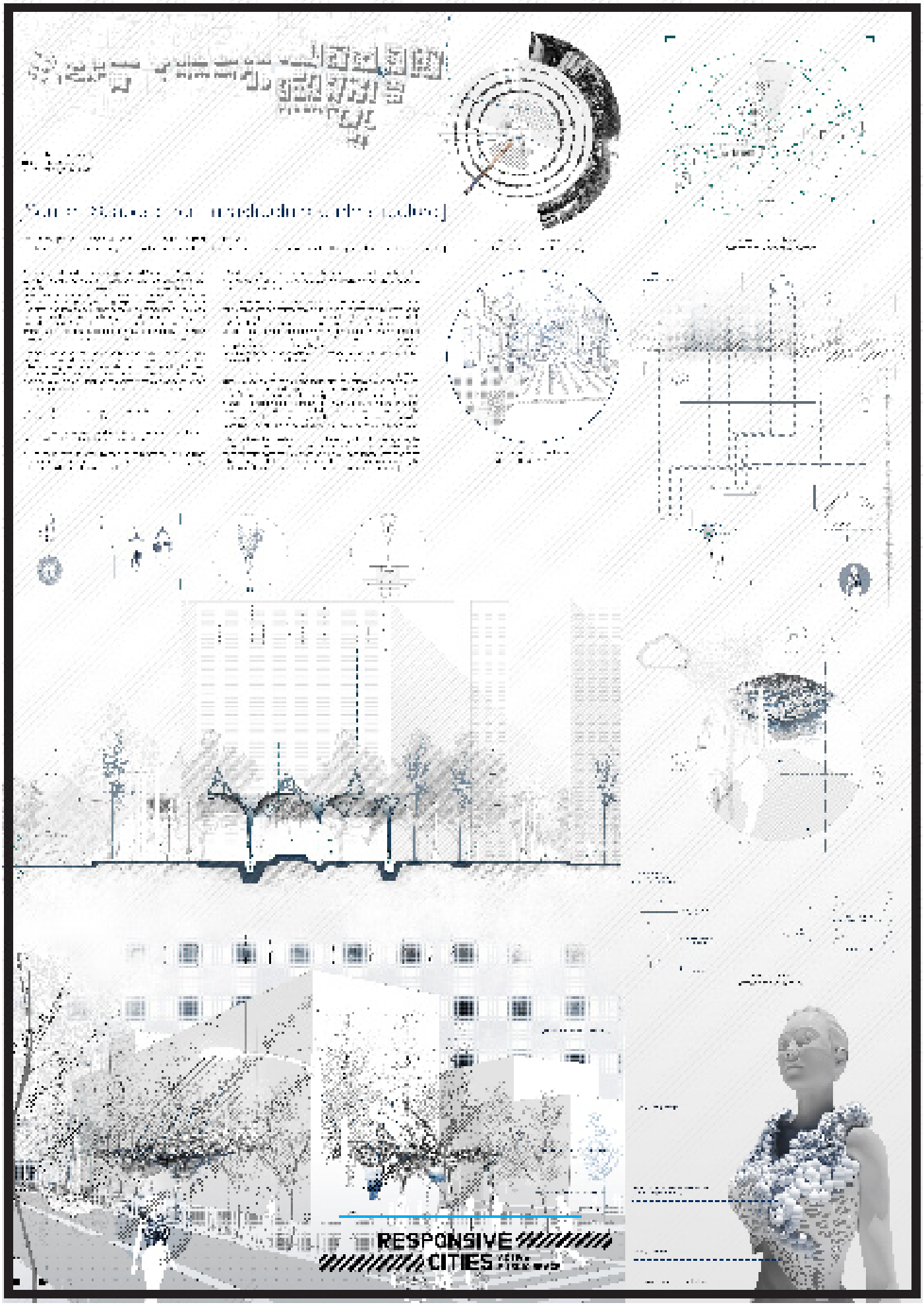
a. The virtual layer: is being perceived as an abstract mechanism of collection, and re-distribution of information in the form of a virtual cloud.

b. The spatial layer: an urban interface, an equipment that involves urban infrastructure and any visual or audio information emitted within the city, being linked constantly to the cloud of information.

c. The skin layer, a wearable device allowing the interaction with the cloud, as the medium for bi-directional information exchange, between the city and the user, helping the latter to navigate themselves through the urban-scape.
As far as the urban interface protocols are concerned, this project perceives the urban equipment as emerged interfaces that aim to inform or navigate the subject through the city scape. The point cloud, provides data to the urban skin regarding human and city performativity, such as social and cultural events, points of interest, news or sound levels. Different types of sensors, transfer data from the point cloud to the urban interfaces, or screens in order to navigate and inform subjects. According to the level of engagement and privacy a user wishes to have, they could interact whether with public screens, customized interfaces or enclosed booths. The overall network of the urban equipment interacts with local sound levels changing its performativity likewise.

Moving forward to the wearable device, this expresses the ultimate level of engagement a user may have both to the cloud and the city. The wearable device could be used, either by flaneures who aim to explore the city scape in an augmented way, or by visually impaired people who are in need for navigation through the cityscape. The human wearable is being connected to the urban skin, through the cloud of information. Signals extracted from the cloud are being translated either into sound, or vibration, informing the subject and contributing to their navigation. The sensors enclosed onto the wearable, detect the surrounding area of the user, providing signals of possible obstacles or routes.

This project examines the deconstruction of the existing urban structure regarding the urban objects, as having inert capacities, into transparent thresholds, setting up the conditions for the context to interact with the subjects. Those transparent thresholds are not only being reflected onto the city scape but also onto the human skin, expressing the continuum of the medium and the perpetual connection of the subjects and objects.


RESPONSIVE
CITIES

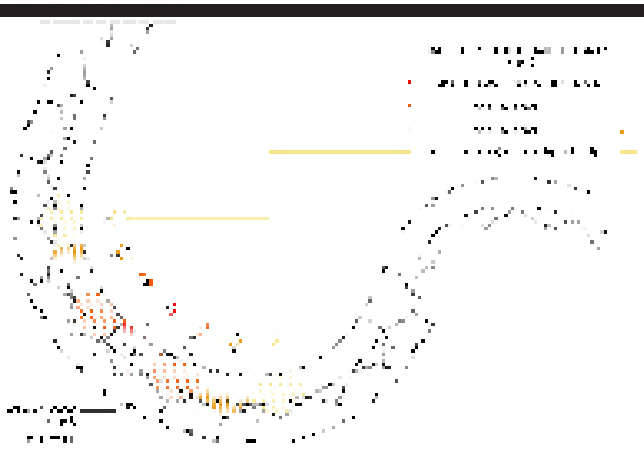
ENDLESS SEVEN – TRACKING LIGHT SYSTEM

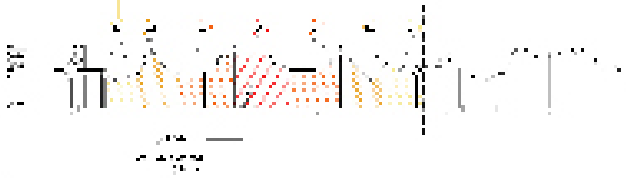
Djordje Stojanovic

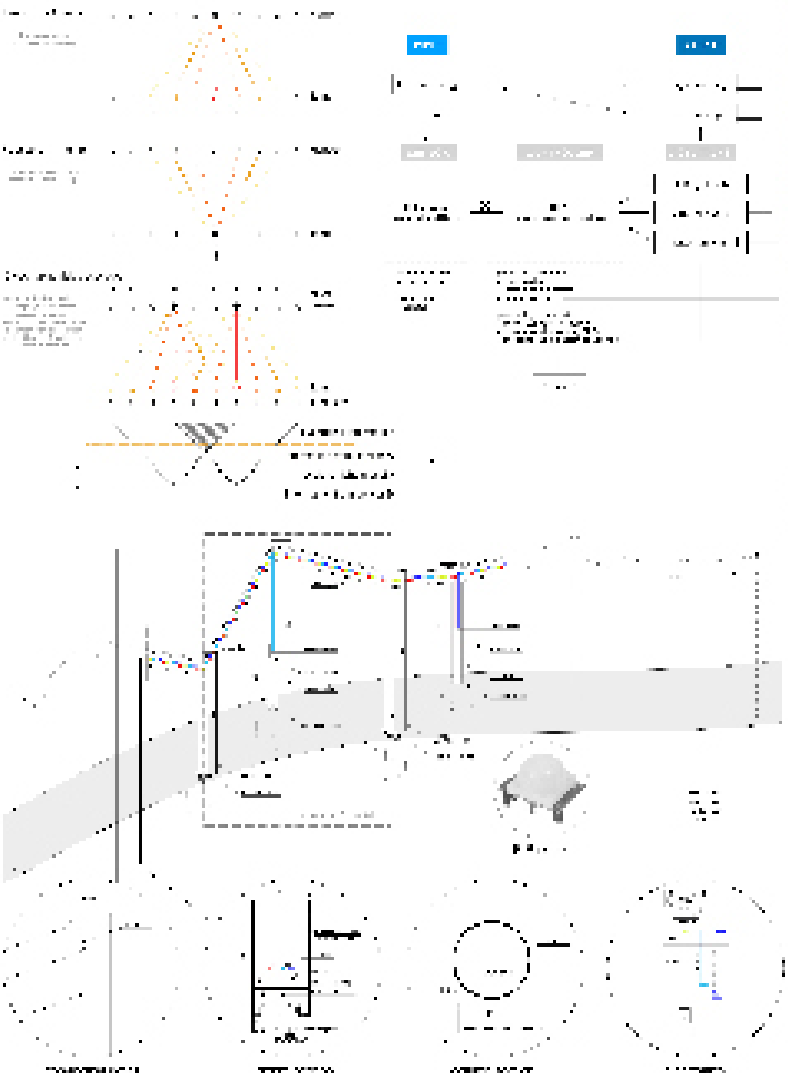
The novelty in this performance oriented project, based on the simple intervention and the use of well-known sensor actuator technology, is in the development of an algorithm and an outline of a software solution for personalization of the outdoor recreational space.

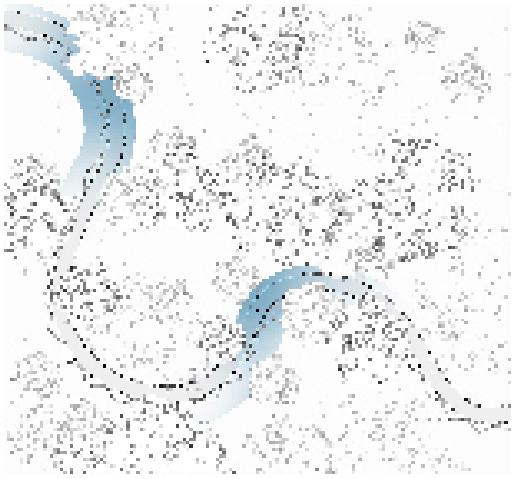
This is a system of steel columns and beams equipped with sensors and actuators distributed along the existing recreational path in order to provide security, better visibility and more efficient use of energy. Each one of the columns carries Passive Infrared Sensor capable to detect infrared light radiating from objects in its field of view while the beams contain LED bulbs and stripes acting as actuators. The system is able to detect presence of users along the path, to count their number and to calculate their velocity of movement; and accordingly to control activation of lights. Most importantly, the emission of light, its intensity and color, is synchronized with the movement of the users as well as between any simultaneously activated lighting elements.

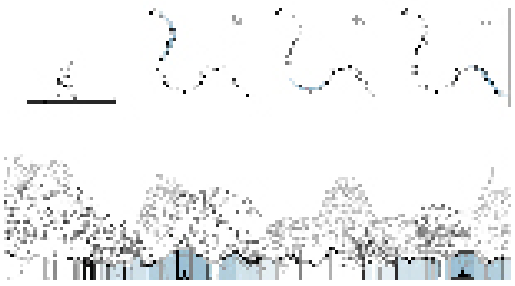
The presence of any user along the path activates seven lights bulbs at the time. The distance between the user and the light is proportional to the intensity of light with the brightest light being the closest. In this way the dissipating light effect will create a micro environment for each user. Should there be several users present at the same time, there will be overlapping activation of lights since any light source could simultaneously belong to multiples sets of seven lights triggered by each user. This is resolved with introduction of the rule to the system whereby the stronger signal belonging to the closer user will override the weaker signal of the more remote user. It is anticipated that the rule of the stronger signal could help users differentiate between private and communal space, or between individual and collective exercise. Furthermore, the velocity of movement and the count of users recognized as groups, will influence the color of light emitted by two LED strips attached to the lower side of steel beams, adding further to differentiation of space along the path.











RESPONSIVE CITIES

MASS BEHAVIORISM

Manuel Montoro Esteban

0.History

Architecture does not only involve the physical elements that define a space, such as construction elements and other qualities like light and perspective. It is also responsible for the psychological environments it creates, and the "emotional atmosphere" it provokes on the user. At least, this idea has been strongly present in architectural space theoretics since the last century, and every day we see and listen to architects boasting about the sensations their work creates. Moreover, they talk about how their search for those feelings has driven them to the final piece.

However, none of this architects has succeeded in proving scientifically –this is, with numbers and facts- that a certain atmosphere, street, walk or environment has the potential to make the user experiment a precise sensation. Meanwhile, psychology and neurology have made great advances in perception, emotional and navigational theory through experimental research.

Taking as example the principles shown by these experiments, "Mass Behaviorism" intends to adapt the current architectonical and numeric tools to the processes and theories in space experimentation from outer knowledge fields, in order to map the frontier between the average user, space and emotional environments.

1.Theory

The experiment defined in Mass Behaviorism takes as an example those carried out to study the concepts of wayfinding, perception and mental mapping of space. Therefore, it is proposed to study spatial situations with the city as the canvas that will create emotions and answers on the study subjects, which will represent the average user in the conclusions.
This behavioral relation between space and individual will be measured in two different ways: visual perception and brain activity.
Visual perception is crucial to build a behavioral theory: the user will react mostly at what he or she gets to see. It implies taking into account the different angles the human vision offers, including the color distinction ranges and blind spots. Movement of the head and ease of rotation are key topics to include in the study and later simulation and analysis. Memory will also play a key role, since visual memory is strictly linked to our mental representation of spaces.
On the other hand, brain study through an EEG sensor will reveal brain states, accurate markers of the impressions and reactions provoked on the subject. Being able to connect the observations between the two markers will be essential for extracting conclusions.

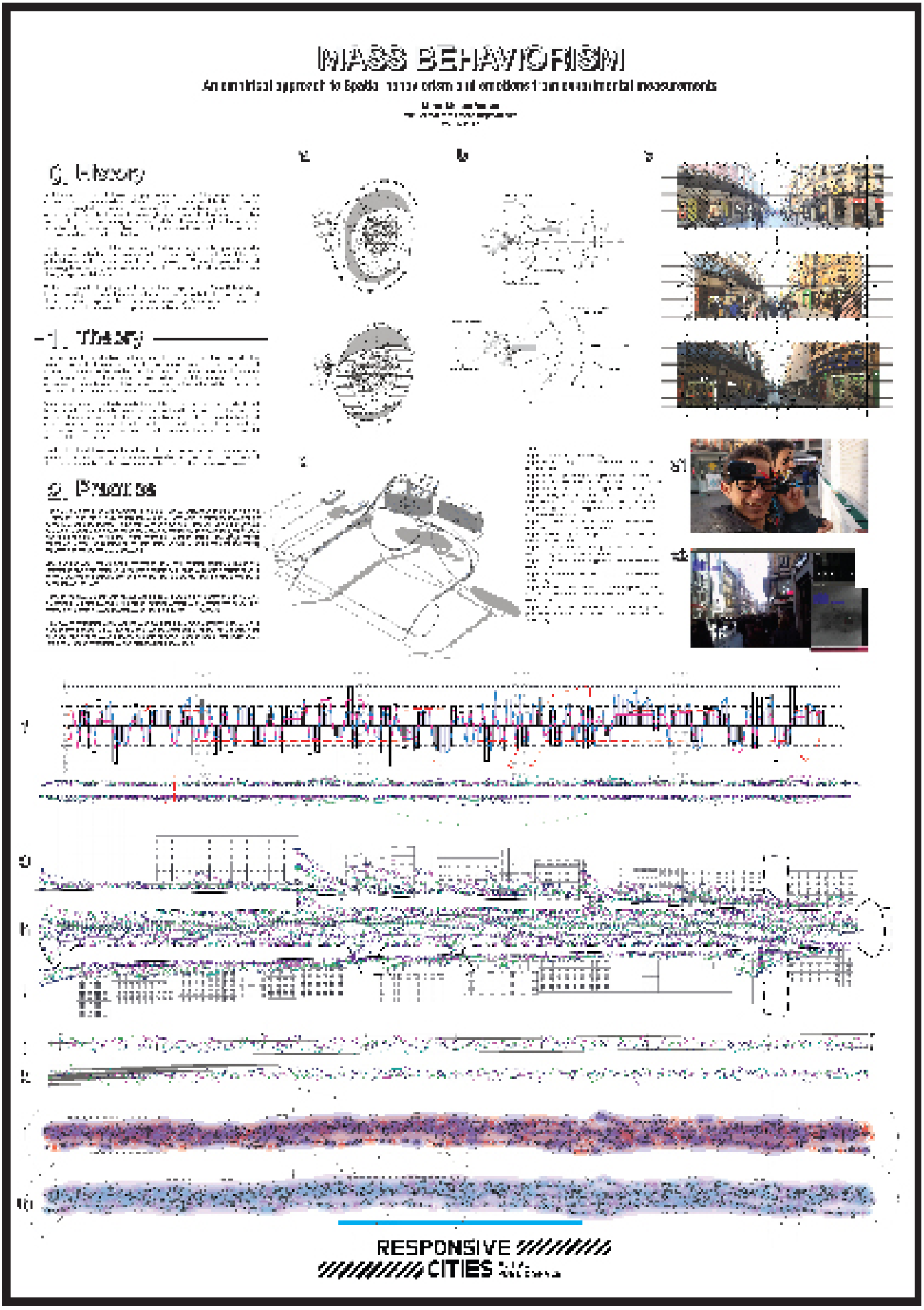
2.Practice

The way both features are sampled is simple: visual perception is studied with an Eyetracker, and brain activity through a set of wearable electroencephalographic sensors. When used together in the same space, time and individual, we obtain two data sets able to complement each other: the observed visual inputs creating the experience and the brain state of the individual, caused at least in part by the visual stimuli registered. Combined reading of the data gathered will let us tie together the stimuli received and the mental state provoked.

Geo-localized and time-stamped information from both sources permitted linking the information and brain states received into a certain point on the street in a certain second of the experiment, putting together the cause, the experience and the place creating a sensation on the user.

Through multiple experiments an average figure of space experimentation can not only be defined, but also placed in the areas, defining sectors of the street that cause, per average, the emotions and mental states identified by the EEG sensors.

This way of experimentation, and its later evolutions into more complex, accurate and deeper levels of analysis will be able to prove the defenders of spatial emotionality right or wrong, and propose a solid theory on users answers to


MASS BEHAVIOUR
1_ Theory
2_ Process
RESPONSIVE
CITIES

SCAPING THE VIRTUAL REALITY AUGMENTATION VIA DYNAMIC ARCHITECTURAL CONFIGURATIONS

Nousias Chrysostomos

This project is based on a hypothesis driven by a simple observation: Our reality is constantly accelerating as indicated by the circulation of information globally and through the urban fabric. Consequently, information holds a central role in the urban space, which is not to be studied merely as such anymore. The fields of information that are born and developed in the premises of a contemporary city have to be taken into consideration.
Therefore, we need to introduce the concept of Infoscapes. These are defined as scapes of information that cover and amplify the dynamics of the urban space that [1] can hold various levels of organization, [2] are not tangible, [3] are defined by n-dimensional variables, [4] are evolving in real time and [5] are generated both from top-down and bottom-up procedures.
The Infoscapes we chose to focus on are fields of information that cover a sufficient part of the information flow. A vast documentation process helped us deduce valuable insight for the characteristics and the instant nature of the Infoscapes. Those consist of: (a) the CCTV coverage of public space and area of influence, (b) the cell phone antennas network as the underlying foundation of the information distribution, (c) the flow of information through social media and their implications for the urban space.
Based on this study we may infer that the existing means of design struggle to follow the hyper-dynamic nature of our reality. What we need is a design that can handle the nature of the Infoscapes. Architecture needs to be able to reconcile the spontaneous and the planned, and be open to events and occurrences. Architecture should be able to act as the interface between the tangible and the augmented, being dynamic and responsive in real time.
This reasoning adds the notion of developing a system consisting of a series of procedures and protocols to architectural design. A system designed and built to manipulate the I/O of the Infoscapes.
The notion of the "event" holds a central place in this system. An event can vary from an exchange of information, like an upload at a social medium, to a large gathering of people with various social interactions.
The constant communication between the system and the Infoscapes is carried by a network of robotic functional elements that operate at the locus of the event. These robotic elements have both functional and structural characteristics, which result into various dynamic structures.
Our system is being tested on a hypothetical real life scenario: A youth festival taking place in Chrimatistiriou Sq, Thessaloniki, Greece. As the event unfolds, real-time data collection acts as a stimulus for the response of the robotic configurations and the extraction of alternative space distributions for new structures to occur. The buildings are in no means closed in form, but are subject to additions and modifications as the Infoscapes keep feeding the system with new data.
This project is a part of an ongoing process of understanding, experimentation, and development of novel ways to approach architectural design.

GRIDBOT

The GridBot constitutes the structural agent that holds responsibility for the assembly of floor elements and columns consisted by prefabricated lightweight components that are assembled into a tetrahedral-based space structure.

TENSEBOT

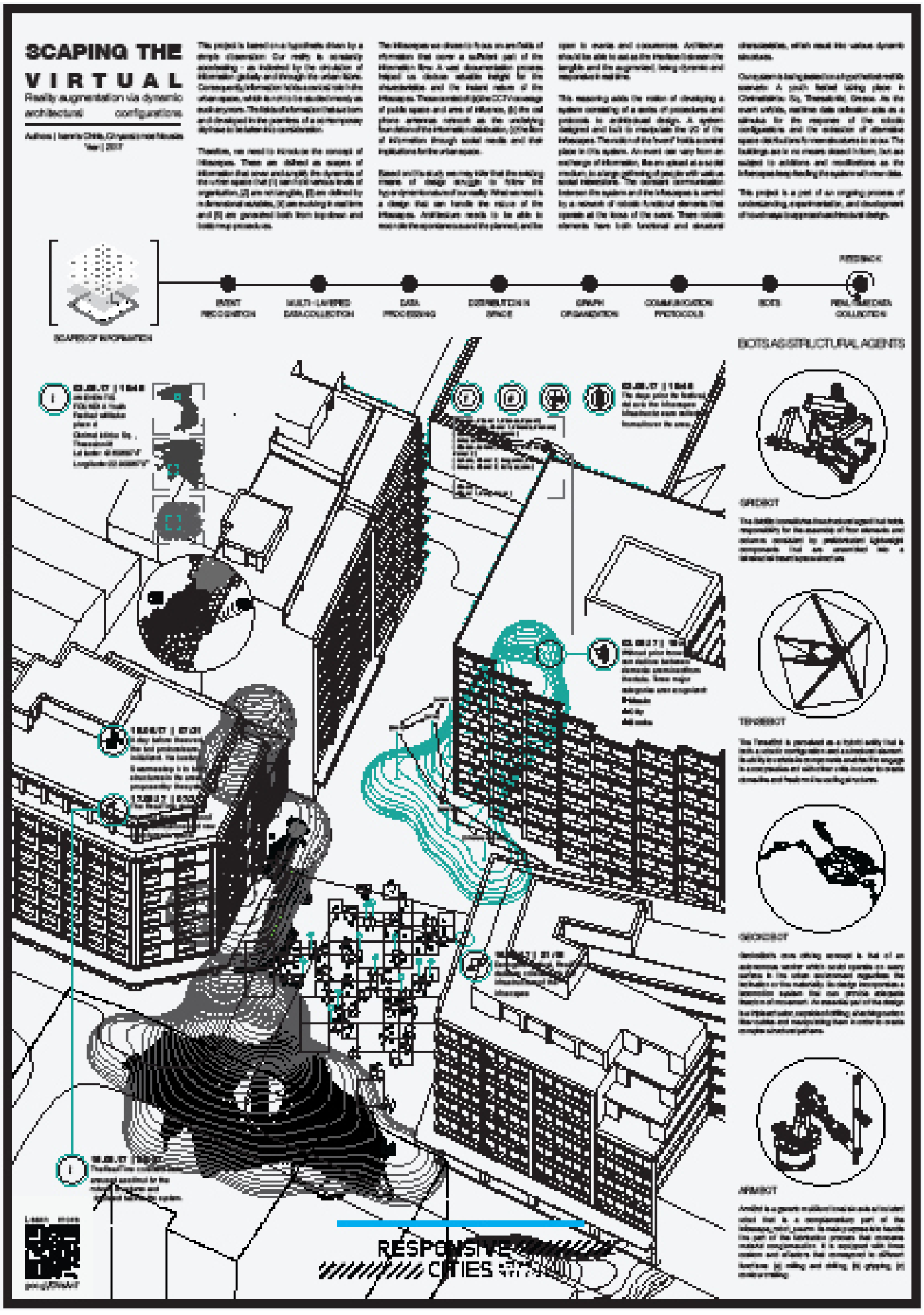
The TenseBot is perceived as a hybrid entity that is both a robotic configuration and a structural element. Its ability to variate its components, enables it to engage in a cooperative act with other units in order to create dome-like and freeform-like roofing structures.

GECKOBOT

GeckoBot's core driving concept is that of an autonomous worker which could operate on every surface in the urban environment regardless the inclination or the materiality. Its design incorporates a locomotion system that can provide adequate freedom of movement. An essential part of the design is a triple actuator, capable of drilling, attaching carbon fiber cables and manipulating them in order to create complex structural patterns.

ARMBOT

ArmBot is a generic multifunctional six axis articulated robot that is a complementary part of the Infoscape_robot_swarm. Its main purpose is to handle the part of the fabrication process that concerns material conglomeration. It is equipped with three custom end effectors that correspond to different functions: [a] milling and drilling, [b] gripping, [c] contour crafting.


SCAPING THE VIRTUAL
Reality augmentation via dynamic architectural configurations
INTENT RECOGNITION
MULTI-LAYERED DATA COLLECTION
DATA PROCESSING
DISTRIBUTION IN SPACE
GRAPH ORGANIZATION
COMMUNICATION PROTOCOLS
BOTS
REAL-TIME DATA COLLECTION
FEEDBACK
SCAPES OF INFORMATION
BOTS AS STRUCTURAL AGENTS
SPIDERBOT
TRIABOT
GEOBOT
ARMBOT
RESPONSIVE CITIES

EUDOSSIA: THE IMAGES OF THE INTANGIBLE CITY

Paolo Damato

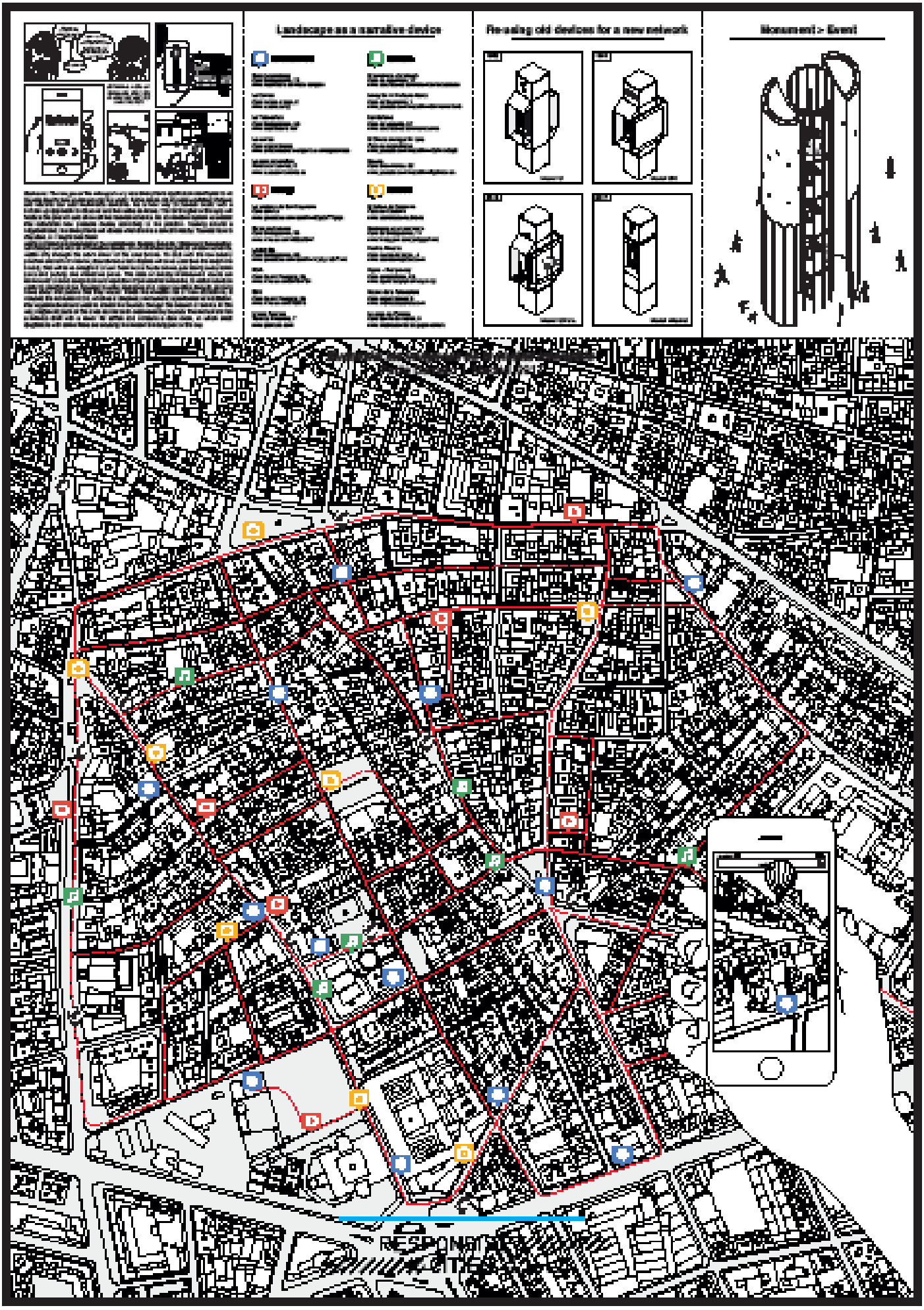
Eudossia: The images of the intangible city is a smartphone application developed to let tourists decide their routes around the world. In this sense, It's an open-updating platform and citizens can add multimedia contents. It's a new way to narrate cities, with a bottom-up approach to discover and live cities as locals.

The GPS signal of the app will localize the position and show all the nearest contents. So an iterative system is created that calculates new possible routes, according to the position. Walking around a neighborhood, the smartphone will vibrate when there's a content nearby. Tourists have to stay alert, or it might lose them!

All the contents are cataloged in four categories: Images, Sounds, Videos and information. Landscape turns into an informative device, on which there are grafted unseen contents, visible only through the black mirror of the smartphone. To deal with the low-battery problem and lack of internet, abandoned urban objects will be re-used (like the telephone boxes), that will be re-designed to turn them into a tourist device, just taking away some parts and putting one interactive piece.

The data of already manoeuvred routes are memorized to avoid congestion and repetition of precedents itineraries, to realize statistics useful to develop more focused touristic strategies and retain travellers through sending news about the places that they visited. Inside this invisible net of new attractions, is included the Monument 2.0, which is a temporary monument; a performative installation, that is geolocalized and used to attract the tourists, through the creation of events. In this way, neglected parts of the cities can be been discovered by tourists.

The monument has a mimetic shell with a mirror for selfies and contains a dark room, in which small spyglasses with some filters are focusing the most interesting part of the city.


Landscape as a narrative device
Re-using old devices for a new network
Monument > Event

GROWING BAMBOO CONVERSATION BETWEEN NATURE AND TECHNOLOGY

Sameera Chukkapalli
NeedLab

We work towards creating what's needed for the community, of the people, by the people, for the people.

Needlab voices a movement that demands more from architecture. We question how architecture functions and who it serves. We find new ways to tell the whole story of the architectural processes, the people who build, and the communities and individuals who are affected. Learning from the way they do things traditionally, contrary to imposing new methodologies. We believe that fostering public awareness of the way architecture can hurt or heal is essential to changing what people expect from the built environment.

With the ideology of "Act local, think global", we focus on unveiling new ways of creating a dialog between local materials, social customs, cultural heritage and environment. The solutions are drafted in interaction with the community involving them in the conversation connecting them with other communities/ makers. We aim at empowering, training the community, doing hands-on skill building. Developing maker values in the community, building a network with them and other makers.

We believe Architecture has a responsibility to improve quality of life; it needs to be more supportive, heal the environment and not hurt. Upon these morals, we see architecture should answer the five 'E's' which economics, education, energy, environment, and emotions. Energy; how much is the architectural structure consuming to be built and how much is it giving back? How much energy are you pumping into it, and is the ratio working between how much you're pumping versus how much it's giving back? Education through architecture; is something that usually architects miss out, they forget the fact that the process of building can be educational, at needlab we do this. We gather communities, artisans, and we train them during the process of building. Emotion: when you build something hands-on, for you to live or use, for you to be part of it, you have a sense of relationship with that space. You remember every brick that you put in there; you connect to it, so you hold more responsibility to maintain it, so that makes it sustainable. Economy: How much money are you pumping into the project, this could be world-changing for countries with emerging economies. The material can be resourced from the region, workers from the region, so the money is invested within the country. It creates employment you build something that's based on the economy of the country.

Vietnam; Ho Chi Minh city, density has increased so much that there is about two square meters green space available per person, whereas, it's supposed to be 9 Sq Meter per person. Theirs is a lack of green space per capita, with our public space proposal we are increasing the green space per person. The structure is called growing bamboo; it's a vertical garden for the typical tube houses of Vietnam which can grow food for the community. The idea is that the people who built it can have their complete meal from their vertical rooftop garden, the spinach for their pho, the pumpkins all of it grows in the structure. It's made of material from Vietnam; built for the community, by the community.

Build your architecture from what is beneath your feet'
- Hassan Fathy

Impact Numbers

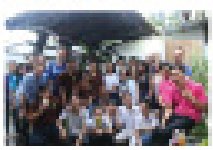
The total project cost is 850$, Material and workers 566$ + logistics 284$. During the construction of this project, 30 Vietnamese youth learned farming and bamboo construction. The cost to train one youth was 28.33$, and these youth will be building the next growing bamboo project in Vietnam. With an investment of 28.33$, we were able to develop skills in a person to make them employable. We envision the learning curve to be exponential.

Project Credits:
Location: Ho chi minh city, Vietnam.
Design and Direction: Needlab.
Project Director: Sameera Chukkapalli.
Project Coordinator: Duong Van Dai.
Bamboo Construction Leader: Nguyen Ba Tuong.
Sponsors: BIM Factory, NQH Architects.
Collaborators: Fablab Saigon, LP4Y, Vietnam.

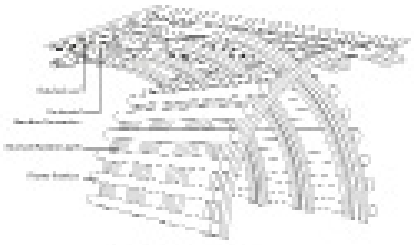
Growing Bamboo

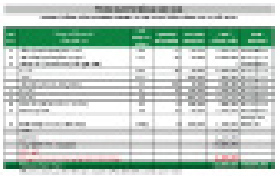
Conversation between Nature and Technology

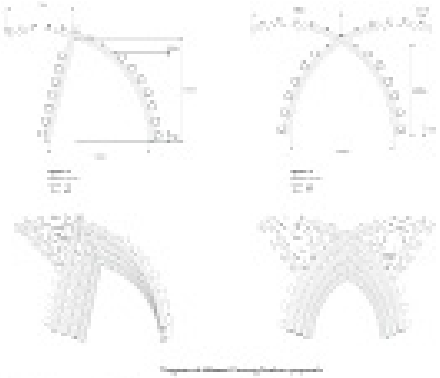
We work towards creating what's needed for the community, of the people, by the people, for the people.



'Build your architecture from what is beneath your feet'







needlab

RESPONSIVE CITIES ACTIVE PUBLIC SPACE