

AGENCY OF INTERACTIVE SPACE IN SOCIAL RELATIONSHIP

KRISTINA BOYCHENKO

¹*University of Queensland*

¹*k.boychenko@uqconnect.edu.au*

Abstract. Embedded computation allows built space to be intelligent and get smarter, becoming interactive and gaining agency with ability not to merely adapt to changing conditions, but to process information and react, observe and learn, communicate and make decisions. The paper investigates agency of interactive space based on interpretation of input data, like users' response to the spatial agency, data from environment or other actors, and ability to change its performance accordingly. The research is focused on the role of interactive space as an active participant in social relationship communicating with users, constantly changing and having its' attitude. The research is aimed at defining social role of interactive environments and explains how they interact with users, what qualities are enabled by interactive behaviour and how do they influence space perception, revealing the significance of bi-directional communication between society and smart spaces. Interactive space does not just providing location for activities and facility for lifestyle, but influences these activities. Users and interactive space constitute one social network being constantly aware of each other establishing bi-directional communication.

Keywords. Interactive architecture; computation; programmable; design; social.

1. Introduction

The main key words of the modern life is the motion and the information. Nowadays it has become more obvious because of the development of information sources and ability to get any information fast and easy, and our habits to live in well-organized space full of devices becoming more fantastic day after day. The further the technologies and development go - the more requirements they meet and more questions they have to answer. Static architecture is limited in its ability to interact with the changing circumstances and what is more important, with the users. It is frozen in one state while nowadays there is an ability to make it fluent, changing, and communicating with people. Users seek an immediate response from the surrounding area and the modern technologies are able to provide it. Now the built environment can understand itself and better perform its function. It can understand people within it and outside, furthermore it can help them to understand themselves better. (Boychenko, 2017)

Interactive design is aimed at engagement of social and cultural dimensions of space, spatially defining interaction as a mechanism to understand, shape and

promote social interaction. The physical space can be used to include or exclude people from one another, to facilitate, dissipate, or focus crowds. In this way, in the realm of physical architecture, interactive public spaces can have a profound effect on social interactions. It is important to point out that a lot of projects in public sphere play big role in testing the durability of materials as well as the time frame of particular interactive strategies within the context of unpredictable participants. (Boychenko, 2017)

2. Approach

Interactive environment is a recent phenomenon that is related to the development of new technologies. Interactive environment transformed into stream of information, claims its continuous metamorphosis in space and time, it affirms the permeability between the body and the technology, between the subject and the space. This reminds the conception of the Flesh of Merleau-Ponty, as the interactive space effaces the border between object and the subject. The body is considered as an interlacing of vision and of movement. (Mahdalickova, 2009)

There are a lot of tools in modern technologies and design for the efficient exchange information between built environment and users. When the message is clear it deals not just with intelligence but with emotions and feelings. The environment responds to demands that appear and even more - it leaves a desire to continue a conversation between a user and an impression this building made. Sending appropriate message and having a continuous dialogue with users is one of the main aims that architect should keep in mind during the progress of designing, choreographing the movement and actions of the built environment to create a clear and appropriate response on a foreseen request the way it will be understood correctly. This enables the space to be a fully-valued part of society, an active participant of communication. (Cohen, 1998)

Public space design can also benefit greatly from implementation of interactive behavior. The space becomes one of the actors in social relationships, enhancing public involvement in common activities or reflecting their emotions, behavior or needs. With its ability to attract attention interactive public space gathers people around and lets them act together, see what do the others do and perform together.

Many applications of human-computer interaction embrace an communication component, in which a new kind of kinesthetic learning and space awareness are combined with unique experiences. Such applications enable users to utilize their bodies as well as their minds in collaborative ways. It has an entertaining interactive component; they are engaged through the aspect of controlling the event narrative. While Interactive entertainment is rapidly moving into the physical realm, it is a concept born out of electronic media. Marshall McLuhan lists “three key pleasures” that are uniquely intensified in electronic media:

- immersion
- rapture
- agency

Immersion he says, is the sense of being transported to another reality, rapture is the entranced attachment to the objects in that reality, and agency is player's delight in having an effect on the electronic world, in the world of entertainment, when an environment is engaging. It is by definition successful.

2.1. AGENCY

With fast development of new technologies built environment transitioned from a silent background of activities performed by users to another participant of those activities. Embedded computation allowed environment to become intelligent and it gets smarter day after day with technological advance, it becomes interactive and gains agency. Architectural space now is able not to merely adapt to changing conditions, but to process information and react, observe and learn, communicate and make decisions. Agency of interactive space is based on interpretation of input data, like users' actions, their response to the spatial agency, data from environment or other actors, and changing its performance accordingly. Therefore interactive environment becomes an active participant in social relationship, communicating with users and learning, trying different modes of interaction and making decisions, constantly changing and having its' attitude. Within the context of this research interactive space is considered as a participant of social relationship along with its uses through the network framework constituting one common network in which both human and non-human actors have agency.

Interactivity essentially means that both people and architectural components of the space have agency, enabling the creation of conversations between the two in real-time. The main difference between responsive environment and interactive is the agency. Interactive means the dialogue between space and users *space* forces where they both have agency enabling real-time multiple loop dialogue while responsive environment gathers data and responds to it but has no agency.

3. Methodology

When adopting a cybernetic perspective, the idea of architectural agency can be appreciated even more comprehensively. Assuming every interactive system is expected to have some sort of internal goal, without which feedback structures are not conceivable, then every single system will also display some degree of intrinsic agency, even if it does not involve complete autonomy or intelligence. Thus, if every space or architectural element can manifest extrinsic agency (in Bruno Latours' conception of the term), equivalently every interactive setting can also manifest intrinsic agency.

The agency of interactive space in social relationship can be defined through a network framework as it proposes amalgamation of human and non-human participants of this relationship, hence all of the participants influence each other. Users and interactive space constitute one social network being constantly aware of each other establishing bi-directional communication.

The role of interactive environment in social relationship can be considered within the network. It frames relationship between people and interactive space as a system that contains components of human and non-human origins, all

components are socially constructed and society shaping. All components of a system interact with each other and contribute to the common system goal. Within the context of this research on-human components are represented by interactive spaces, experiences or interactive architectural components that have agency, forming a system or a network that facilitates their social communication. (Figure 1)

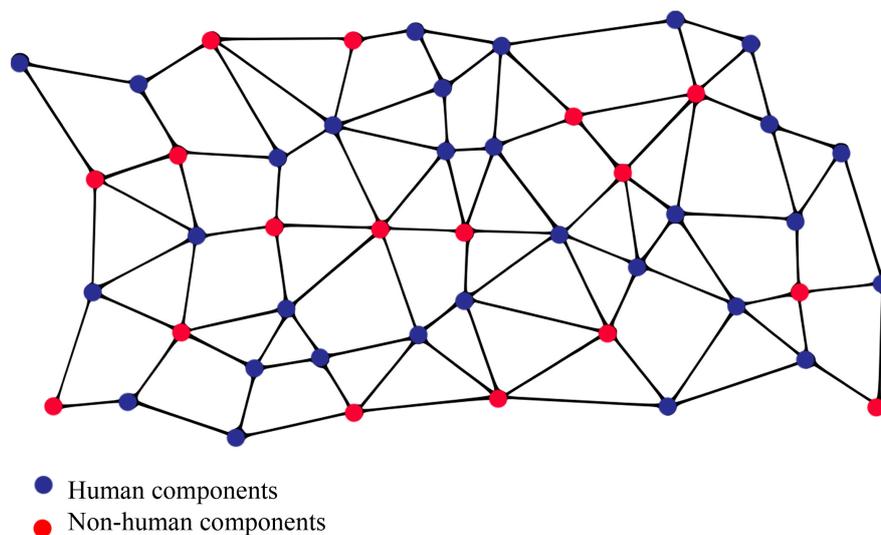


Figure 1. Uniform network of human and non-human components.

As Thomas P. Hughes argues while non-human components are generally aimed at problem solving functions, human components mostly act as providers of feedback in order to establish connection between the system performance and the system goal, shaping its behaviour and determining its agency. Degree of actors' autonomy or freedom within a system relies on the system complexity and goal and differs from one case to another. (Wiebe E. Bijker, 1989)

4. Case studies

4.1. INTERACTIVE ADA SPACE, SWISS NATIONAL EXHIBITION EXPO02, 2002

Interaction mechanism has three main modes:

Exploration mode

As an individual enters the playground they are introduced to the system, they both learn rules of communication. The system understands the degree of responsiveness and the user learns how to play, trying different moves and actions

and seeing how the playground responds. For example a jump means changing the colour of tracing light, waving hands means changing the figure on the screen, joining another user and running together results in special effect projecting on the playground and assigned figures on the screen start communicating, etc. Meanwhile the system analyses the responsiveness of users and cues them or persuades them to move and engage in a game by introducing visual effects on the playground.

Play mode

When rules of the game are learnt users can follow the cues from the playground and create their own scenarios reflected on the screen. They all act individually and watch the changes on the screen caused by their movement. They can choose to interact with other users and see how it is reflected on the screen. The playground encourages active behaviour by projecting special rewarding visual effects to those who follow the cues and react faster.

Group or story telling mode

After individual activities users get introduced to a new interaction scenario when they are able to create new shapes on the screen by moving in groups. Users now communicate not only with playground but with each other as well in order to make the figures on the screen move. The playground provides hints on new/unexplored actions to be performed so that the users in groups are always engaged and discover something new/interesting for them.

4.2. ELECTROLAND - INTERACTIVE, LOS ANGELES, CALIFORNIA, 2006

The project demonstrates a link between two remote spaces and how can the action taken in one environment alter performance of component in different location. The project integrates interaction between people and the city. An interactive playground constituted of tiles with LED lights senses visitors and displays interactive light patterns in response. LED lights on the building facade display the same light patterns that are on the interactive playground in real time. Environmental intelligence and surveillance of human activity are combined with a video-game sensibility.

4.3. IDVA GALLERY, BROOKLYN, NEW YORK, 2015

The project was designed as a virtual model yet can be feasible using a system of actuators and motors. IDVA gallery is conceptual project designed to host Virtual Art Exhibitions and Interactive Design Installations. The project site is located in Brooklyn, New York at the end of Brooklyn Bridge Park Pier 3 where the museum has a great view toward the Manhattan Skyline and also has clear visibility from downtown Manhattan. The waterfront pier which has been heavily activated central areas for transportation and manufacturing in the past has significant meanings in that it symbolizes the transforming social paradigm and urban structure. The gallery is programmed to have flexible space usage utilizing operable wall panels and ceiling grids to adapt to diverse spatial formations and activities. Each wall panel and ceiling grid has diverse formations

pre-programmed into the system which can be flexible and interactive during the exhibition hours. Open Plans will be provided for Virtual Exhibitions where viewers can utilize headset VR monitors with motion & position tracking devices to view the digital exhibits while walking around into the space. For the given project, one pre-animated single formation is assigned to each unit with which can be activated while the viewer enters and stays within the preset trigger zone. Due to the size of the data for this virtual model, limit the formations to one per unit was tested for the model, however there are future potentials to add more diverse pre-animated spatial scenarios to each wall panel. This can be rearranged to fit the given conditions for the exhibition.

5. Behaviour of interactive space

Within the discourse of this research behavioural design is introduced as design able to handle various users' needs throughout time and their feelings that adjust to the lifestyle and the way they use this space, demonstrating awareness of the social structure of their communications, a dynamic movement together in time. It includes behavioural considerations in the design of communication with the architecture as a facilitator of the human behaviour or vice versa.

According to Combs and Brown (Digital Behavioural Design) behavioural design works best when it's ethically-aligned with three criteria: transparency, social good and users' desires and is considered as a set of techniques for persuasion that respects person's intrinsic rights to freedom of choice, autonomy and dignity.

According to Ramsey and Combs, human habit system is a set of learned behaviours (default actions) that are performed unconsciously. Considering a habit is a learned behaviour, the designers could control the consequences of user behaviours via CAR Model.

Cue → Action → Rewards (CAR) Model is a proven design framework for inducing user habits that drive continued engagement and retention.

A user senses the cue in their environment that they can learn to associate with an action (behaviour), which leads to a reward (consequence). A behavioural designer knows how to intentionally construct synthetic cues to induce a particular action.

6. Learning mechanism

Three main types of rewards are used to delight users, including Rewards of the self (desire for self-mastery & proficiency), Rewards of the Hunt (desire for conquest), and Rewards of the Tribe (desire for belonging). (Kong, 2018)

How can interactive space learn to influence users' behaviour? By using learning mechanism (such as distributed adaptive control) smart environments can learn effective cues to influence users' behaviour and guide them through space and set preferred directions. Truly interactive intelligent space incorporates a bi-directional symbiotic approach to human-environment communication, being able to affect users' behaviour as well as be affected.

The research aims to explain:

Language of communication between environment and users

Instead of using gesture or voice based language it could use non-verbal language of ambience alteration like sound and light as output and tracking as input. These means of communication are used in order to avoid antropomorphization of the space as it would happen with utilizing language-based features like spoken or written words.

“Intelligence” in this context refers to the perception of space as the defining capacity of users, but it is the smart ability that is now extended in its efficacy by the sensibilities of affect. Figuring the Human in Intelligent Space relates to, arises from, or deliberately influences emotions.

Users are naturally active learners and explorers if they have a proper motivation. The major part of interactive space behaviour depends on users’ performance or other external stimuli. Interactive environment can provide cues for visitors on how to act within it, a target to move towards, possible routes, options of space use. The space tracks users and assesses their responsiveness to cues from the space, learning how to communicate effectively. In case of distributed adaptive control (DAC) the learning scheme is based on two simple rules of trial and error learning: if something works, do it again; otherwise try something else at random.

Affective design

Affective refers to emotional, but may, perhaps usefully, be confused with effective. Emotion is another component, then, needed for effective rationality. More generally, discourses of affective computing evidence some shared starting assumptions: “Affect” comprises a distinguishable domain of cognition that can be analysed into universal, component parts. Affect is the expression of an underlying emotional “state.” Affective interaction can be achieved through the replication of behaviours understood to comprise it, made up of units assembled into a catalogue of affective expressions, productions, recognitions, and normative responses. Emotional states and their affective expression can be understood in terms of their (evolutionary) utility, as a kind of primal but still functional ancestor of contemporary reason. (Suchman, 2007)

7. Interactive space and social relationship

Built space has to be linked to other environments, analogue as well as digital. For instance, the building is crossed with another location. Interestingly, the aesthetic experience may be collective as well as individual. By implementing multimedia approach and designing a new type of interface that offers selective worthwhile exchange, the new type of spatial extensibility into another dimension. Architecture now accommodates not just static construction components, but moving situations.

In connection with other systems’ networks, architecture becomes reprogrammable in meaning that the built space gain ability to play an important cultural and social role throughout longer period within their life cycle. Ability

to be updated is not a question of adaptation to new functions anymore, but the essential component in architectonic performance of static object.

The architecture now can reflect the social performance in multiple ways:

- it can change its shape according to users desire
- it can adapt itself to different types of activities
- it can be linked to remote device or other environment (virtual or physical)
- it can become a possible modality of Network activity

With these new abilities architecture now can be updated in order to communicate with the society on qualitatively new level. Architecture becomes a form of time transmission. This time can be filled with any content desired, so the architecture now offers not just the space, but also the time and the information. “The result is the rise of Digital Gothic”, as Kas Oosterhuis puts it.

8. Conclusion

Interactive environment that triggers various senses is proven to be immersive and stimulate further communication. Using unique space qualities and tangible means of interactive behavior users can be guided through space and engaged into various activities as the part of communication with the space. Users are invited to explore the space and what it does, they are offered to perform certain tasks in order to continue this communication and during this process they can be brought through different modes of space cognition requiring their active or passive participation in this dialogue.

Interaction of users and interactive space is usually considered on individual level and targeted on communication of one person with the space. Within the context of this research environment architecture communicates not only with individuals but with groups of people becoming a part of their social relationship. Both individuals and groups of people can be considered as actors of one network depending on the mode of interaction and its' final goal.

Space without interactive qualities was always a facilitator of communication between people providing a background for their relationship and letting them to pass through it, accommodating them and serving a certain function.

Interactive properties allow the space to take part in social relationship, becoming a part of it and being the driving force of their communication with each other within the space and with the space itself. Interactive space does not only provide unique experience but can also create situations engaging users and groups of users in common activities, requiring them to act independently or in groups. Space and users communicate in real time, defining further modes of this interaction and shaping the experience.

Interactive behavior has multiple qualities that assigns it as the new type of built environment such as ability to communicate with users providing unique space experience. Comparative analysis includes exploring how interactive environment can understand users and interact with them providing immersion into this communication and committing to its' rules. It refers to learning mechanisms

of interactive space on one hand and implementation of this information in defining its' behaviour on the other hand. It refers to affective design and focuses on building the most comprehensive engagement of users and space, learning their behaviour patterns and utilizing this analysis to foster communication. The space acts as alive being and it invites users to communicate, observing their response and changing its' performance accordingly.

In behaviouristic perspective interactive space can has various modes of communication determined by its function and position within the network of human and non-human actors. It depends on the rules of communication and heavily relies on response of the users and their desired degree of engagement. The ultimate goal of this interaction is to provide certain experience while allowing all users to feel comfortable within it and communicate, therefore continuous analysis of users behaviour allows the building to understand them and create beneficial and pleasant relationship.

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