Proceedings of
6th International Conference on Digital Arts

Faro, November 7-9, 2012

Teresa Chambel, Alberto García Ariza, Gavin Perin, Mírian Tavares, José Bidarra, Mauro Figueiredo (Eds.)

Organized by the University of Algarve
In cooperation with:
Artech International
Grupo Português de Computação Gráfica
Towards socially engaging and transformative urban interactive interfaces

Ana Paula Baltazar dos Santos, José dos Santos Cabral Filho, Lorena Melgaço Silva Marques, Marcela Alves de Almeida, Guilherme Ferreira de Arruda

Lagear (Graphics Laboratory for Architectural Experience), School of Architecture at Universidade Federal de Minas Gerais, Belo Horizonte, 30130-140, Brazil

Abstract — This paper discusses the hegemony of the visual and its pervasiveness in current urban installations and technological gadgets. It draws a distinction between functional and playful interactions, showing the prevalence of the former in the design of most urban interactive installations. It, then, argues for an interactive interface that moves beyond the visual towards physical action. Such a discussion draws from physical computing to enable remote physical actuation aiming to enhance people's feelings of belonging and presence. It then describes a technical experiment called Long Distance Voodoo—where remote actuation connected two public spaces through the Internet. An assessment of this experiment leads to little pointers for future interactive installations concerned with social transformation.

Index Terms — Human computer interaction, body sensor networks, remote sensing.

I. INTRODUCTION

We currently witness a period of enthusiasm related to the emerging technologies. They overcome the gap between space and time—being omnipresent and granting a remote access to the world in real time—but also present some limitations, obliterating our complicity with the tangible features of space such as temperature, luminosity and materiality. In this way, most interactive urban installations are strongly based on visual rather than tangible features. The resulting experience is more contemplative than bodily engaging leading to ephemeral rather than socially transformative experiences. Questioning such an approach, the research developed by Lagear (Graphics Laboratory for Architectural Experience) focuses on interaction design by means of tactile interfaces to allow remote actuation and negotiation through action. The resulting experiment—Long Distance Voodoo—had as main objective the preliminary development of the technology and explores further practical possibilities of the theoretical background.

II. THE DIALECTICS OF SPECTACLE AND EXPERIENCE

Hegel stated that vision and hearing are the two superior senses, as they do not consume their objects; what is seen and what is heard remain the same, while what is eaten, for example, finishes. According to Alberto Pérez-Gómez and Louise Pelletier [1] the privilege of vision and hearing over other senses dates back to classical Greece, when the ‘distance’ that has marked Western science and art was established—when Greek Tragedy separated stage and orchestra from spectators in the amphitheater. The ‘logic of the visual’—to use Henri Lefèvre’s term—has its impact on space first as a ‘spatial practice’, and only later, in the Renaissance, as the dominant means for the production of space, which Lefèvre calls ‘representations of space’ [2]. Such an impact means a clear distancing from ‘lived space’, the space in which people are bodily engaged in its simultaneous design, building and use, towards conceived space, in which design, building and use happen separately.

The hegemony of vision is not usually acknowledged by historians of architecture and urban space. However, Pérez-Gómez and Pelletier in their history of architectural representation point out that such hegemony of vision culminates with the shift from embodied to visual spatial practice. For the user this means a contemplative practice and for the designer it means that perspective and projections are used to foresee space as an object. Moreover, Sérgio Ferro [3] shows that as well as representing space as an object, this design process serves to make space into a commodity.

The privileging of the visual is questioned in some of Pérez-Gómez’s works. For instance, he introduces the ‘erotic paradigm’ as an alternative to the perspectival paradigm, a means to ‘retrieve a new depth, a true depth of experience’ [4], a return to embodied participation, even in visual representations such as paintings. The problem is that it presupposes space and its meaning as representation. And even if the erotic paradigm escapes the hegemony of vision, it is only an illusory escape: the result is still a finished painting or building that contributes nothing to change the tradition of the visually based production of space.

A. The ‘Logic of the visual’ in current urban interactive installations

Most urban interactive installations follow the same logic of the visual becoming product–commodities rather than interfaces that privilege processes of production of space open to people’s engagement, highlighting three main points. First, most of them still rely on the spectacle and propose contemplative
experiences, even if collective. Second, since most installations are ephemeral, they tend towards forgettable experiences, fostering little social awareness, let alone social transformation. Third, they rely on the ‘magic by ignorance’ [5], which means that the illusion resulting from the interaction is sustained only by ignorance of the system, the ‘black box’. As soon as the system is revealed, the spectacle’s magic is gone.

There is a range of interactive urban installations that use physical devices to promote people’s engagement, but most of them do not trigger social transformation. A few examples which are directly related to the issues addressed here might clarify what is meant by visually based, bodily and socially engaging, ephemeral and socially transformative installations.

Nowadays, most urban installations, such as urban screens and video mappings, rely too much on the spectacle and end up proposing a contemplative and ephemeral experience. Even when such installations are interactive they are still based on the visual.

A good example is ‘Gravity’, an urban installation that depends on people interaction to happen (Fig. 1).

By means of the Internet people send phrases that are dismantled in words and projected in an urban surface. The words are animated by simulation of gravity and their trajectory mapped on the physical surface avoiding the surface’s holes, such as doors and windows. If on the one hand the installation depends on people’s input to happen, on the other, the output is a visual ephemeral spectacle, which despite beautiful does not trigger any sort of bodily engagement or social change.

Another example is Rafael Lozano-Hemmer’s ‘Solar Equation’ (Fig. 2), a public art installation with which people interact in real time by means of portable devices (ipad, ipod or iphone).

This public installation simulates the sun in a balloon 100 million times smaller than it. This balloon was tethered over Federation Square in Melbourne and displayed a simulation of different phenomena in the surface of the sun animated using live mathematical equations sent by five projectors. People could use their portable devices with a free application to interfere with the animation and choose between different modes of visualisation.

One of the main problems of this approach is that people do not easily understand what they are doing in the installation, what are their real interaction with the system, when they are really triggering a response and when the response is pre-programmed. Moreover, the outcome is mostly visual and interaction becomes a means to hold people’s attention, not to engage them in any sort of social transformation. Contemplation might trigger thoughts, but as Lozano-Hemmer says “while pertinent environmental questions of global warming, drought, or UV radiation might arise from the contemplation of this piece, Solar Equation intends to likewise evoke romantic environments of ephemerality, mystery and paradox, such as those from Blake or Goethe” [6]

In his Relational Architecture series, Lozano-Hemmer has proposed a range of more bodily engaging installations. However, all of them, even when
motivated by social questions, are still strongly based on the visual. The outcome of bodily interaction is usually an astonishing ephemeral moment of images (pre-recorded or captured in real time), which even if memorable due to its visual effect, has no social impact.

Very few urban interactive installations escape the hegemony of the visual managing to trigger social transformation. A good example is the ‘D-Tower’ (Fig.3), a 12-metre high sculpture in the city of Doetinchem, attached to a website and an online questionnaire. It was conceived as a visual display, changing colours according to the responses of the citizens to the online questionnaire. As it is a permanent installation, different to ‘Gravity’, people’s inputs are not only part of the ephemeral moment that composes the visual installation. Differently from ‘Gravity’ and ‘Solar Equation’, ‘D-Tower’ is an example in which the visual outcome can lead to social transformation, because it is not based on the logic of spectacle. It actually triggers a meaningful output for all citizens, working as a long-term thermometer of the city’s mood. Despite being apparently merely visual, different to ‘Solar Equation’, it is the example that most triggers social transformation. Once people know what the displayed colour means, the whole city gets involved in cultivating the mood or in changing it. The tower triggers a social collective response, which is only possible because it puts the overall mood in evidence. The tower, however, is not bodily engaging though it stimulates social engagement.

**B. The ‘logic of the visual’ in current technological gadgets**

The same ‘logic of the visual’ also drives the production of gadgets, such as smartphones, tablets, laptops, and their applications. If urban interactive installations are becoming more and more related to consumerism, the production of gadgets is driven by it. There is a clear prevalence of exchange value over use value, summarised by what John Thackara [7] calls ‘the innovation dilemma’: most devices are produced because technology is available, not to meet social demands. Thus, the dominance of usable over useful devices reinforces a passive attitude of users before their gadgets, which gives continuity to the already established spectacle. Paradoxically, current technologies have great potential to promote social engagement beyond merely reproducing visual practices, as discussed with the example of D-Tower. However, such a potential is overshadowed by the spectacle, the ephemeral and the illusion proposed by ‘black boxes’. New pervasive gadgets like Nintendo Wii and Microsoft Xbox 360/Kinect have made bodily engagement by means of technologies affordable and ready for use. Still, most interfaces available for those devices do not fully explore their interactive potential and rely mostly on visual output. While playing these games, the body interacts with an image that transforms itself recursively keeping the players mesmerized by the spectacle. A carefully designed interface might change this scenario. Therefore, a broader discussion on interaction is needed.

### III. Functional and Playful Interactions

As urban interactive installations draw from digital technology and games, it is important not only to understand the state of art of technology, but also discuss interaction and its possible development. Therefore, we might envisage two stages of interaction. First, when interacting with an interface to access a predetermined content; second when interacting with content through an interface. When interacting with a music box, for example, by winding the crank, one is interacting with the interface, not with content—the music—which is a predetermined output. On the other hand, when playing the piano, the musician creates music, an indeterminate content—accessing predetermined notes through the keys. While in the first case those interacting tend to become functionaries of the ‘apparatus’, acting as expected, in the second, they might use the apparatus to engage playfully with content.

According to Vilém Flusser [8], ‘play’ is a means to overcome a functional relationship with the apparatus. A playful interaction means using the apparatus beyond its prescriptions, engaging with content and not only with the interface. Certainly, a music box might be used in a playful way, but its prescriptions are much more limiting than those of the piano. On the other hand, who plays the piano might become a functionary when struggling with the interface—keys and notes—or merely reproducing a song. As the piano, current technology—such as that of video games—has a potential for playful interaction, but, paradoxically, it has been mostly used in a functional way, as the output of interaction brings no novelty, let aside social transformation. It might be said that the ‘magic by ignorance’ is no longer an issue for video game users, as the pervasiveness of technologies leads them to lose interest in unveiling the ‘black box’. In fact, there is no magic at all: users become functionaries of the games they consume.

Interaction in urban installations is usually designed for people to interact with the interface, not with content. They are not playful in Flusser’s sense, but only to the extent that the ‘magic by ignorance’ prevails. Moreover, as discussed above, even a bodily engagement is predominantly mediated by images. The visual facilitates people’s immediate grasp of ephemeral installations, leading to a lack of a more enduring engagement of people with each other and with the space. In order to overcome the stasis prompted by image-based interaction with the interfaces, it is needed...
to increase people’s feeling of belonging. This might be achieved when people are encouraged to negotiate and physically act in a playful interaction with content by means of an interface that enables communication.

IV. ENHANCING PRESENCE: BEYOND REPRESENTATION TOWARDS REMOTE ACTUATION

In the field of architecture, digital technologies have clearly influenced the way offices are organised. However, the ‘logic of the visual’ prevails and most offices still use the computer as an extension of the ‘perspectival paradigm’; that is, information technology is reduced to representation, making technical drawings digital, reproducing old processes using new tools. Nevertheless, the new computational paradigm is now a reality and it is not tied to perspective and its space-time context; on the contrary, it is based on speed—space-time dynamics—and on the possibility of change—flexibility.

Exploring the actual potentialities of digital technologies in the design process means that architects must acknowledge this major paradigm shift. A few pointers are therefore relevant: destabilising the space-time relationship; privileging time and behaviour over the three dimensions of space; making space dynamic; emphasising processes and not products; producing interfaces for experience and not representing predetermined experiences; looking at space as an entity between object and subject, between event and substance, between real and virtual. These pointers provide the foundation for our approach to information technology and architecture. It is also against these that we assess the current use of the so-called interactive technology in space, which mainly happens in interactive installation art. Similarly to architectural practice, the appropriation of digital technologies in installation art has not yet been able to overcome the hegemony of the visual towards an enhanced participation.

The first works of installation art have attempted to establish a bond with the audience by means of participation, but the user was just a piece that complemented a script. Afterwards, artists started to propose a critical attitude for the audience, making the works interactive, as those of Lygia Clark and Hélio Oiticica in the end of the 1960s [9]. However, when information technology enters the realm of installation art, it comes more as the former than the latter. The development of interface design did not go as fast as the advances in technologies and the focus of the works are mostly on what technology can do—how to use technologies—rather than on what we would like it to do—why to use technologies [7]. Thus, there is a need for strategies to design interfaces that explore technological developments to add value to people’s life, and therefore, enhance people’s feelings of belonging and presence.

One common approach to achieving these in digital environments is based on realistic representations of physical features—the so-called virtual reality. Such investigations regard how to best represent the physical world and its features for a better reproduction of physical presence, as shown by Martin Usoh [10]. However, the interfaces and environments designed are no more than poor imitations of reality, and presence is not explored beyond its limitations in the physical world. In other words, the possibility of developing means to enhance the feeling of presence taking advantage of information technology is not discussed. Nevertheless, this development is crucial in our approach to interfaces, mainly when our goal is to promote negotiation by means of remote communication. A possible way to start wondering about that is using principles from physical computing to promote remote actuation.

IV. THE PROJECT LONG DISTANCE VOODOO: INTERFACE DESIGN AND INTERACTION

Long Distance Voodoo, an experiment tested in 2011, connected people located in different public spaces and the Internet. Its main goal was to develop and test tools, using off-the-shelf hardware and software, to promote remote communication beyond the visual, such as a wearable that allowed people to be remotely touched.

Long Distance Voodoo connected people from different countries—Brazil and Germany—, putting in evidence cultural contrasts, as people in one country stimulated dancers on the other by means of signals sent through the Internet. It must be said that the dancers are part of a group that usually start their improvised movement when another dancer touches them. Therefore, the signal sent through the Internet directly promotes negotiation by means of remote actuation, enhancing people’s feeling of belonging and presence.

This ephemeral event happened physically in two remote public spaces: in Germany, in the Oderberger Straße in Berlin, in front of the Kauf Dich Glücklich Café; and in Brazil, at the Raul Soares Square in Belo Horizonte, using the Internet to create a dialogue between both spaces and to broadcast the event (Fig.4). Berlin was equipped with a projector displaying images from Belo Horizonte, a physical doll equipped with sensors and a computer connected to the Internet sending the output of the doll’s sensors and images from Oderberger Straße to Raul Soares Square. The latter hosted the dancers, one of whom dressing a wearable (equipped with actuators) and two computers connected to the Internet—one sending images from the Square to
Oderberger Straße and the other receiving signals from the sensors in Berlin and activating the wearable.

The doll had five pressure sensors—on the head, each arm and each leg—which captured people’s touch. The doll was wirely connected to a microcontroller Arduino that received the sensor’s output starting a Processing program in the computer at the Café sending the sensor’s data through the Internet to a computer in Belo Horizonte. The signal was then received in a Processing program and was transmitted to a wireless radial module Xbee mounted in another Arduino placed in the wearable [11]. Thus, the output of Berlin became the input of the wearable triggering small vibrators producing physical stimuli on who wore it. In this way, the performer in the public square was remotely touched by the person playing with the doll in the cafe. There was a LED near the vibrator that turned on at the same time the vibrator became active, i.e., if the right arm of the doll was touched, the vibrator and the LED on the right arm of the performer became active. So there was a correspondence between the action upon the doll, in Berlin, and the stimulus produced in the dancer, in Belo Horizonte (Fig.5).

V. LONG DISTANCE VODOOD ASSESSMENT

As a technical experiment, *Long Distance Voodoo* successfully connected two remote spaces. Its tactile interface, between doll and wearable, between both spaces, pointed possibilities of remote negotiation by exploring the feeling of presence beyond representation as people established a bodily connection by means of physical remote actuation. This connection triggered spatialised communication, as people playing with the doll gradually realised they could remotely touch the dancer initiating a more lasting and meaningful interaction—based on physical actuation instead of representation. The dancer participated in this conversation by reacting to the remote touch, influencing the rest of the group by reverberating the stimulus received. Nevertheless, the most important contribution of *Long Distance Voodoo* is the further discussion it fosters regarding both the achievements and their limits related to the theoretical approach that inspired it, especially those relating to the engagement of people in both spaces.

In Berlin, it was identified that people were mostly interested in the ‘magic’ of the remote touch, not realising its potential for negotiation and dialogue. The interest in the interface—the ‘magic by ignorance’—was reinforced by three main features of the installation. First, the need to look at the projection to understand what happened in the other space and therefore give meaning to one’s own action, reinforcing the logic of the visual; second, the static position of the doll, hindering the bodily engagement; and third, a technical constraint leading to a delay between the action of poking the doll and the answer from the dancer, making remote negotiation difficult.

These three aspects contribute to a more functional than playful interaction in Berlin. Even though Flusser states a possibility to ‘play’ by overcoming the apparatus’ prescriptions—that is, engaging with content and not only with the interface—the doll eventually worked more as the music box than as the piano, limiting people’s interaction with the content and reinforcing the difficulties to avoid the hegemony of the visual.

In Belo Horizonte, however, the dancers were much more involved in the experience, focused on the interface’s possibilities to promote conversations by engaging with people in Berlin—leading to a ‘magic by experience’. Even though the interface—the wearable—was limited, for it provided and individual and reactive experience, it allowed the dancers to more freely interact among themselves and with the space. They
were prone to bodily engage in the experiment, since they are already comfortable with performing in public spaces. They also knew beforehand the mechanisms of the wearable and used it to tease people in Berlin to further interact with them. Nevertheless, the experiment did not integrate other people in Raul Soares Square, since passers-by still perceived it as a performance to watch and not to participate, reducing the experience for those in Belo Horizonte again to the ‘logic of the visual’. Therefore, despite the possibility of actual playful interactions between those remotely connected noticed in the interaction of the dancers with the wearable, the experience ended up highlighting a functional relationship to technology, hindering any possibility of social awareness, let alone transformation.

Despite the problems above discussed Long Distance Voodoo has fulfilled its main objective: to develop and test an interface that allows remote touch by using low-tech and low-cost devices. As a result, it configures an important step in the research towards the development of tools for social transformation. Those are most likely to happen by means of remote actuation and bodily engagement.

Following Long Distance Voodoo, the research group is focusing on developing an interface to spatialise remote actions, beyond devices—such as the doll or the wearable—that restrict interaction to a reactive individual response. Both spaces should offer possibility for bodily engagement. It is our belief that exploring negotiation beyond the ‘logic of the visual’ by means of remote actuation is a way to enhance the feeling of belonging and presence.

VI. CONCLUSION: BEYOND THE VISUAL TOWARDS REMOTE PHYSICAL ACTION

An interactive urban interface capable of fostering playful interactions should be designed to create limits or rules to enhance people’s experience instead of prescribing their actions. Its ultimate goal is to trigger people’s engagement with their production of space. For that it is needed to overcome the three points usually present in urban interactive installations. Instead of a contemplative and visual experience, embodiment and dialogue; instead of an ephemeral installation and a forgettable experience, permanence and memorability; instead of the ‘magic by ignorance’, ‘magic of experience’. These features are desirable to awaken people’s awareness of the collective hybrid space they might create—the third space—instead of reproducing individual experiences in collective installations. Such a discussion leads to the development of playful interactive interfaces for remote communication, including remote physical action. Our research group is currently concerned with a discussion of the relevance of remote physical action and how it might overcome the hegemony of vision focusing on negotiation as a means to create the third space and trigger social transformations.

It might be said, at last, that our negotiation experiments started in 2006 with a very social drive (connecting two remote favelas by means of a third space created in a collective negotiation), but was deviated by technical challenges. Nowadays the experiments still lack a more socially transformative outcome, despite our emphasis on bodily engagement and remote actuation. Nevertheless, it is a continuous research and the current focus is more on solving technical problems, such as developing interactive interfaces that enable people to communicate while creating the third space remotely. The next step is certainly to develop interfaces to enable or trigger collective social transformations.

ACKNOWLEDGEMENTS

We would like to thank the Brazilian Agencies Fapemig, CNPq, CAPES and FINEP that fund the research projects taking place at Lagear and also acknowledge the participation of Graziele Lautenschlaeger, Sergio L. Saraiva Junior, Estevam G. Quintino, Marina S. Paolinelli, Wallison B. Caetano, Tiago C. Alves, Marcus Vinicius A. F. R. Bernardo, Gelson Veloso, Leandro H. Britto and Contato e improvisação group.

REFERENCES

