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CONNECTED URBAN SPACES: exploring interactions mediated through situated networked screens

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ABSTRACT

In this paper we explore the types of encounters that new media technology enables in urban space.

We developed new urban experiences and carried out a pilot study using screen applications that 1) connect two remote locations using video conferencing technology; 2) create an interactive visual interface that encourages a playful engagement mediated through the screen content.

Big networked screens were situated in two geographical/cultural localities to connect people across spatial, temporal, and cultural boundaries.

In this paper we describe how people appropriate the medium and perform embodied interactions in diverse contexts. We discuss our findings and outline the urban mediated interactions. We argue that the generated urban experience is strongly related to the characteristics of the space, the people use these spaces, and the activities that take place and the properties of the media installation itself. In particular, we note the significance of creating meaningful relations between people mediated by these technologies.

INTRODUCTION

Urban environments at the heart of the 21st century will be media rich and globally connected. Large digital and interactive screens are becoming embedded into our urban space, triggering an important shift in the way we think about public space and its social importance, as it is mediated by these technologies. Urban screens are already used for advertising, art, local information and global newsfeeds, as well as providing public viewing to sporting and cultural sporting events [1, 2]. In this context it is often proposed that urban screens will somehow help regenerate communities, giving free access to culture and providing a focus for local social cohesion and global networking [3]. This technology is not without its problems, however [4, 5]. Most public screen experiences are characterised by display blindness [6]. Most of the time people look briefly and even ignore the display completely [7]. A recent report by the Commission for Architecture and the Built Environment (CABE) and English Heritage highlights concerns for the impact on heritage and urban character, calling for installations to be thoughtfully designed [8]. Our own research found issues with screens becoming a focus for groups of teenagers and perceived antisocial gathering [9]. In this respect, understanding issues of implementation for this technology and its impact on place and the quality of public experience is key. Increasingly, these screens are interactive allowing two way local communications with the screen content. More

recent they are networked allowing two way remote communications mediated through the screens.

The recent technical possibility of enabling connectivity now raises many questions about how the public will experience both the urban space and the mediated urban interactions enabled through this infrastructure.

In this paper we report on a study carried out using two media screen applications that 1) connect two locations in London , UK and ShenZhen, China; 2) create an interactive interface that triggers people's attention and encourage a playful engagement with the screen using interactive moving images.

In both situations, the screen is used as a platform for generating emergent behaviours and supporting embodied interactions in the public sphere.

RELATED WORK

While it is well understood that architectural built environment and its spatial configuration give rise to movement and encounter patterns, creating a platform for rich and diverse social encounters [10], there is little understanding, however, of how movement and shared encounters are influenced by the advent of location-based media technologies [11].

Previous research (within the work environment) has considered the idea that virtual environments can be used to digitally extend the physical space, leading to hybrid-spatial configurations [12, 13], and generating a new type of interactional framework.

Previous studies have explored people's social behaviour and relationships to large screens in the city context and provided useful findings on which we can build; for instance, Kate Taylor's qualitative studies highlighted behaviours around the BBC screen in Manchester [14, 15]. In related work, urban projects have been designed to use full body movements when interfacing with digital technology [16]. Projects such as Aarhus by Light and Citywall have addressed some of the design challenges, in particular the open-ended but framed nature of interaction [17, 18]. Our previous research has contributed considerably to the understanding of situated interactions and shared encounters mediated through large urban screen acting as a stage for social interactions and performative play. Our findings demonstrate the importance of taking into account full body and performative interactions as an essential factor of human experience [19, 20]. We observed clear differences in the intensity of interactions with the technology and with other people mediated through this technology in different locations in the city. This seems to be determined, to some extent, by the spatial configuration of the city. More significantly, we noted that city rhythms – the way that variations in pace and density are structured over time – play a key role in shaping the type and intensity of interactions mediated through media technologies [11, 21].

Going beyond local interaction, urban screens are becoming networked (and increasingly connected through audio and video technologies), allowing new possibilities for social interactions and emergent encounters to arise [2]. Previous projects have suggested using these screens to augment the connectivity of remote communities using videoconferencing technologies (eg Hole in Space connecting New York and Los Angeles [27]; Hole in the Earth linking Rotterdam to and Indonesia [28], and the Telectroscope between London and New York) [29].

Fig 1: telematic connectivity creating a window between London and New York, 2008

More recently, projects have been exploring connected cities using large urban screens (e.g. Connected Cities with 6 European cities and Spatial Aesthetics [22] connecting Melbourne and South Korea) or the on-going project PD-NET [30] with the aim to create technologies for large-scale pervasive display networks through the design, development and evaluation of a robust, open platforms.

The background research presented above has not addressed a number of highly significant challenges in urban screens design and implementation. There has been too little consideration of large digital screens as a facet of urban design, of the methodological challenges in the understanding of deployed systems and of the challenges related to medium to long-term community support. Where work has been developed for single screens, there has been an emphasis on existing infrastructure with little emphasis on mediated social interactions through different spatial and cultural boundaries [2, 5].

As Jiaccuci et al [18] pointed out, the interactions with large screens in urban settings is a new and fairly unexplored area of research. Similarly, we focus on the social organization of interaction but with notable differences in the type of location and duration: Jiaccuci et al introduced a shop window- sized display on a shopping street during an eight days period in Helsinki, whereas we implemented screens that connect two urban space across physical and cultural boundaries; linking a street with office buildings and cafes in London, UK to ShenZhen, China.

In the following section, we introduce our design intervention based research methods and present the concepts underlying the digital and shared encounter mediated through the public display. We then describe our evaluation methods and go on to outline our findings from the analysis of the emerging spatial connectivity, people's communications, sense-making and social mediation. We conclude by summarizing our ongoing work.

THE STUDY

In this section we describe our design intervention. The aim is to generate urban experience mediated through digital screens that connect people locally and remotely.

Designing the mediated urban experience

We developed urban experiences mediated through two different screens applications. The screen setup aims to supports and afford performative bodily interactions. It was developed and modified according to the site conditions through iterative prototyping:

1) Connecting two remote locations: In this application, the screen was used to connect two places (in China and London) across different cultural, spatial and temporal boundaries, using video conferencing technology. The encounters in the virtual world and around the screen become part of the encounters in physical spaces and vice versa. Unlike, London, interactive interfaces are a relatively new idea to the local citizens at the location in China. The objective of this application is to explore ways people interact with other people around them or remotely mediated through the screen infrastructure while focusing on the social and physical context in which the interactions take place.

Fig 2: Shenzhen, China (left) interacting with London, UK (right)

2) Using interactive interface in one location:

In another part of the study we implemented a simple interactive application in London. Digital interactive sketches were developed as the screen content. The sketches were enabled using computer vision based interaction (with a webcam) to detect and interpret moving bodies within the camera view range. As a result, the emergent behaviour takes different forms and shapes triggered predominantly through gestures and bodily expressions. Here the focus is on the visual quality and the relation to the viewer rather than the technology we use.

Fig 3: a man interacting with the coloured moving images using gestures and full body movement.

EVALUATION METHODS

Our approach in the real world setting, and unlike in a 'lab' setting, required applying a range of methods from interpretative-ethnographic to experimental approaches. In this section we explain the methods we implemented together with the limitations and constraints that were encountered during its application.

Initially we ran a pilot study to help understand issues related to the implementation 'in the wild'. Lessons learnt were used to inform the final experiment in both locations.

During the final study we have applied the following methods:

1) Before setting up the screens.

We mapped information about the physical conditions of the location; this includes defining the boundaries, exits, entries, street furniture (for instance mapping the position of benches, seats and trees). In addition active and passive facades were mapped in order to understand the relation between interactions triggered by installing the digital platform and the immediate surroundings. Before the actual test sessions we have implemented a range of empirical observation methods in the selected areas. We recorded the static use of public space by people using 'static snapshots' method. Moreover, pedestrian flow levels and people's movements in and out of the space were captured using 'gate counts', and the type of activity taking place in the immediate surrounding was captured using a camera.

Fig 4: ShenZhen café with static activities (right), London location with office building and varying movement flows

2) During the experiment:

We ran the each test session lasted for three hours. During the sessions people's movements in and out of the interaction space were observed. The form of interactions with the screen content, and with the other people in the area was recorded. Shared encounters were captured using a digital camera mounted on the screen. Various interactions were videotaped by the researcher using a digital video camera. The aim is to identify the interaction pattern and the movement paths taken by people.

3) After going through the mediated experience:

Following the interaction sessions, a number of participants (16 for the connected spaces application and 15 for the interactive installation) were debriefed in both a semi structured discussion and using a questionnaire.

RESULTS AND DISCUSSION

Through the implementation of large screens in the real world setting and the empirical observations, we can start to understand key aspects related to the urban experience and emergent behaviours enabled through this technology.

Our observations indicated that public interactive installations may provide a stage for emergent social interactions among various people. However, situating the digital platform in different locations across different cultural and spatial boundaries, and depending on the context, might generate diverse and unpredicted social behaviours designers are unaware of.

During the sessions, we observed the following emergent patterns of behaviour:

URBAN ENCOUNTERS

Some people simply glanced at the screen installation others stopped and wondered about its function.

Fig 5: initial encounters with the screen in London 'walk-by-and-interact'

Fig 6: initial encounters with the screen in London 'walk-up-and-interact'

PHYSICAL PROPERTIES OF THE INSTALLATION

One of the central issues in introducing a new form of technology in the public space is people's uncertainty concerning how to interact with it. The physical properties of the digital platform and the affordances of the public display can have an important effect on the way it is used in a public setting.

We observed a few people pass by the screen they then stop and return to interact with the screen content. This pattern of behaviour appeared few times throughout the final experiment 'pass-by-and-use' and it was supported by the screen affordance for interactions.

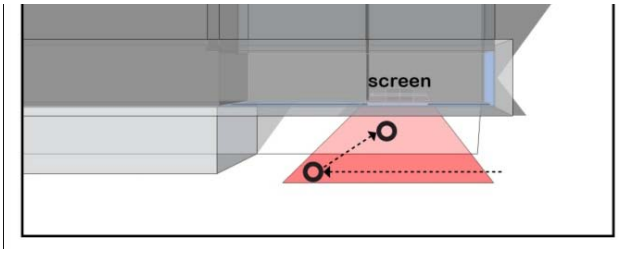

Fig 7: London screen location (top view). Interaction space, which was supported by the web cam visual field, is indicated in red. a repetitive pattern of behavior; people walk in front of the screen, stop and then return to interact with the screen.

THE URBAN DISPLAY AS A STAGE FOR SHARED ENCOUNTERS

Making sense of the environment seems to be at the heart of how we understand and experience technologies [23]. Watching other people before participating seems to be effective as it is unclear to many people how to behave in this new situation [18]. People tend to rely on each other to learn about the possibilities and constrains of the setting. Often people formed a honey pot effect [11] as they stayed at a safe distance from the installation from where they could passively observe ongoing interactions with it before choosing to join in. Another aspect we identified was that people tend to mimic behaviours.

Fig 8: people observed passively ongoing interactions with the screen before choosing to join in. A few of them tend to invite people and explain the project to them, which encourages people to interact as they show understanding of the project.

INTERACTION SPACE MEDIATING URBAN PERFORMANCE

While the interaction with the mediated setting was a social inhibitor for some people, for others the installation created a feel of an urban performance that unfolds over time.

People attracted more people. Observing people interact is pretty much part of the experience. In both studies, when there were people interacting with the installation, other people were attracted to observe and engage with it themselves.

Fig 9: The installation as an urban performance

PLAYFUL ENCOUNTERS

The screen offered a platform for playful interactions between strangers that unfolded at different locations over time. For instance two people were involved in a collaborative performance mediated through the screen by simply following the instructions given by the other side.

Conversations through texts:

ShenZhen: *"Hello London, this is Shenzhen, population: 11 million, Location: Canton province , north of HangKong"*

London: "Hello Shenzhen, London can see you, we are in front of planet organic"

ShenZhen: *"London, dance with me"*

London: "Show me your move"

Fig 10: mediated embodied and performative interactions. Conversation across the temporal and cultural boundary through the digital window

In a few instances the interaction was initiated by an event, which was mediated through traditional forms of communication such as written texts. For instance, a person in ShenZhen who showed up a written message briefly on the screen to introduce herself to London, received an immediate response. Sustaining the conversation between strangers is a real challenge, however.

Fig 11: a man (London) and a woman (ShenZhen) interacting using written messages

MAGIC MOMENTS

Performances in everyday interactions are shaped by the environment and the audience. The individuals assign roles to themselves, and the others, and perform face-to-face interactions suitable for their assumed roles [24]. However, one of the interesting aspects of mediascapes is that interactions could be triggered unintentionally, for

instance through the process of walking through a digital layer intentionally or unintentionally (in our case through the digital interaction space ie the camera view), which would take the person into a parallel world [25].

In our study, for instance, communication was initiated thorough a message (not intended for any specific person), as it was on the display it caused a surprising effect, which triggered meaningful shared encounters and generated rich interactions.

Fig 12: a 'magic moment' generating meaningful shared encounters

Another interesting aspect is the notion of accidental interaction [15]. For instance, in the case of the colourful interactive interface (Fig 3), accidental interaction occurred when the public passed in front of the screen; the camera caught their movements and generated various visual patterns of moving images. People who watched those accidental interactions were more likely to interact with the screen.

In Summary, initial findings indicated that people are willing to negotiate their social and spatial boundaries when faced with mediated intervention in urban space. Spectators engaged in performative interactions (with each other locally and with others remotely) mediated through this technology. The nature of these interactions is linked to the nature of the space as well as the affordances offered by the technology. Overall people preferred interacting across the boundaries with other people more than the local interaction with the interactive screen. This may suggest that face to face interactions (locally or remote) could play a key role in forming sustained and meaningful interactions in the augmented space.

Factors that influenced the overall experience include the type of audience and their cultural backgrounds, the temporal dimension, and the nature of the spatial context. Our observations highlighted the importance of space and the role of place in providing temporal and spatial mechanisms facilitating different types of shared encounters across the boundary. Good local knowledge of city rhythms with respect to the urban space is key in determining the appropriate screen location [2].

Overall, engaging the public with the installation, and in particular sustaining the interactions over longer period of time is challenging. The size of the public display plays a clear role in influencing the nature of these interactions [26]. In some locations, it wasn't immediately possible to trigger or support social interactions. Many passers-by did not realize that the installation was there. Having said that, mediating interactions through a small screen, and unlike with a larger screen, could support more intimate interactions over time. We believe that a portrait format – rather than a landscape format- will help in particular mediate full body interactions and/or interactions of children. Moreover, treating the screen as part of the 3 dimensional architectural surrounding is key. In this way the screen design and implementation should extend beyond the screen digital content and include architectural solutions using 3D objects in space and/or painted surfaces. This should include adjacent architectural elements such as the floor, the adjacent walls and even the ceiling (when applicable).

To conclude, the complexity of the urban setting requires further research into various aspects over a longer period of time with the aim to maximise the quality of the public experience within the urban environment. We argue that behaviours around these big screens need to be explored across a wider range of different urban environments over a longer period of time in order to understand the impact of particular social and spatial city characteristics in relation to this technology and how the urban experience mediated through connected large screens can be designed to augment real world interactions.

In order to response to this question, we will implement in our on-going research, Screens in the Wild [31], four big networked screens in four geographical/cultural localities in the UK to connect real world and digital communities across spatial, temporal, and cultural boundaries. The aim is to investigate the potential of urban networked screens for communities and culture.

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