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Hybrid Place: Blurring the edge between the digital and physical layers of urban environments

Glenda Amayo Caldwell

Queensland University of Technology, Brisbane, QLD, Australia

g.caldwell@qut.edu.au

The purpose of this paper is to investigate the edge condition between the digital layers and the physical layers of the city and how tangible expressions of the interrelationships between them to create and define new experiences of place, creating *hybrid place*. To date there has been discussion and investigation into understanding the importance of place, similarly into defining hybrid space. This paper explores principles of place and space to question how they can be applied into defining and proposing the notion of *hybrid place* in urban environments.

The integration of media spaces into architecture provide infrastructure for the development of *hybrid place*. The physical boundaries of urban spaces become blurred through the integration of media such as computer technologies connecting the physical environment with the digital. Literature and case studies that reflect the current trends of use of technology by people in space and place within urban environments are examined.

Key Words: hybrid place, digital fabrication, creative catalyst

Architecture can be seen as a way to give form and pattern to the social life of a community (Sinclair, C., and Stohr, K., 2006).

The purpose of this research is to investigate the connection between the digital layers and the physical layers of the city and how tangible expressions of the interrelationships between them creates and defines new experiences of place, creating *hybrid place*. To date there has been discussion and investigation into understanding the importance of place, similarly into defining hybrid space. This paper will examine these principles to question how they can be applied into defining

and proposing the notion of *hybrid place* in urban environments.

The Problem

Place, space, and hybrid space have been defined and discussed from a range of perspectives however what has yet to be explored is the notion of hybrid place. Ubiquitous computing, mobile devices, the web 2.0 etc. have become a part of our daily lives including the ways in which we work, play and learn. The world in which we live in is composed of a constant flutter between the physical and digital spaces we experience with our multiple senses and it is the memories and meanings

that we attach to these spaces that create place. It is understood that place can occur either in digital or physical environments, but why not in both simultaneously?

Key Principles of Hybrid Place

There are four main factors that inform this research falling under people, place, space, and technology. This literature review investigates the current trends within the use of technology by people in space and place. The use of technology weaves the different disciplines of architecture, urban design, media design, interaction design, and urban informatics together to create opportunities for social interaction to occur within the digital and physical layers of the urban environment.

Space and Place

Paul Dourish has written two key papers that provide the foundation for this literature review. Initially it is important to understand that space is three-dimensional and provides the structure or the area for objects to exist and for things to happen (Harrison and Dourish, 1996). The “affordances of space” or the interactions and actions that are available through space are different from person to person. Space can exist both in physical and digital environments, together or separately.

It is out of lived experiences and through applied meaning that people as groups or as individuals change spaces into places (Carmona et al., 2010). Within the fields of urban design and architecture there is discussion about the creation and understanding of place (Jackson, 1994; Trancik, 1986; Arefi, 2004). When discussing place

phenomenology is often drawn upon as it refers to the phenomena that influence the experience of the human consciousness and it is this human experience that creates the understanding of place (Carmona et al., 2010).

Harrison and Dourish (1996) recognise that people also establish meanings and memories within digital space, and acknowledge that the notion of place is also critical to the development of technology in interaction design. It is the use of space by people, their memories, their history and meanings that create the experience of place (Harrison & Dourish, 1996) and that people are the essence of place. From their research within interaction design, Harrison and Dourish (1996) state that the critical factors contributing to the creation of place rely on the ability for users to participate, adapt, and appropriate. These factors are useful in the development and measurement of place within this research.

Hybrid Space

Harrison and Dourish (1996) define hybrid space as “one which is comprised of both physical and virtual space, and in action is framed simultaneously by the physical space, the virtual space and the relationship between the two,” (p.72). In Dourish’s paper from (2006) he re-examines the role of technology in the creation of space and place and states, “is it time, perhaps, to re-space place. More importantly, it is important to see both as critical aspects and products of the circumstances of interaction,” (p.8). Dourish acknowledges hybrid space, and that place can occur in either physical or virtual space however he

does not go on to investigate the potential for place to occur in both simultaneously.

The paper by Adriana de Souza e Silva (2006) continues to build upon this idea of hybrid space while specifically examining the use of mobile technologies as interfaces between the digital and physical environments. Souza e Silva (2006) states, “Hybrid spaces are mobile spaces, created by the constant movement of users who carry portable devices continuously connected to the Internet and to other users.” Through the use of mobile technologies one is continually connected to the Internet while navigating through the city, therefore the space in which the user exists becomes hybridised. Souza e Silva conceptualizes hybrid space on three trends: “hybrid spaces as connected spaces, as mobile spaces, and as social spaces,” (p.261). From Souza e Silva’s definition of hybrid space one can understand that it is created by the merging and blurring of borders between physical and digital spaces due to the use of mobile devices however it is not constructed by technology, “.it is built by the connection of mobility and communication and materialised by social networks developed simultaneously in physical and digital spaces” (2006, p.266). Therefore the mobile technology assists in connecting people with one another in digital and physical spaces. Although Souza e Silva’s research is extensive in discussing hybrid space, it does not discuss how these connections affect people’s experience of place.

Media Space and Media Architecture

“Media spaces integrate audio, video

and computer technology to provide a rich, malleable infrastructure for workgroup communication across time and space,” (Harrison and Dourish, 1996, p.70). In media spaces people have a tendency to appropriate space, and give them personal meaning, creating memories out of the media space, therefore experiencing place (Harrison and Dourish, 1996, p.70).

The discipline of architecture focuses on designing the physical infrastructure of the built environment in response to the needs of society, reflecting culture through materials and forms. The integration of media spaces into architecture provide infrastructure for the development of hybrid space. The physical boundaries of the built environment become blurred through the integration of media such as computer technologies connecting the physical environment with the digital. Media architecture has the potential to combine digital and physical spaces by materialising information through interactive public screens, 3D projection mapping, amplified or augmented reality, digital fabrication and other technologies, which inform hybrid space. The question remains, how does media architecture inform the creation of hybrid place? How do media and architecture come together to affect the experience people have within space to create hybrid place? A couple of examples will be explored in more detail.

Digital Fabrication within Architecture

There is the potential for architectural design to become socially responsive and interactive through the use of digital tools and digital fabrication

methods to translate digital information into tangible formats and hybrid space (Foth et al., 2011).

“Architecture continually informs and is informed by its modes of representation and construction, perhaps never more so than now, when digital media and emerging technologies are rapidly expanding what we consider to be formally, spatially, and materially possible,” (Iwamoto, 2009). Digital fabrication is a method of creating physical outputs from digital data, relying on computer driven tools. The machinery, tools, and processes within digital fabrication stem from aerospace, naval, and automotive industries (Kolarevic, 2003). Since the late 1990s the architectural discipline has been conducting applied design research relying on digital fabrication methods. Digital fabrication has been described as revolutionizing design through the ability to test and experiment complex forms and concepts (Iwamoto, 2009). Time and material intensive approaches to design can be reduced through the use of digital fabrication tools by eliminating steps from design to production (Sass, 2007).

Fabrication processes are described as subtractive or additive methods (Seely, 2004). Computer Numerical Control (CNC) methods create physical objects through the removal of material. Alternatively rapid prototyping processes fabricate objects by adding and building up layers of materials (Seely, 2004). The wide range of digital fabrication tools combined with traditional construction methods have stimulated the Architectural discipline to explore formal and material possibilities while promoting the process of making. The

output of digital fabrication tools is limited to the scale of the equipment and the materials that are used ranging from representation models to the creation of 1:1 building components. Digital fabrication methods have been appropriated within the architecture discipline as a means to convey digital information through physical and tangible artifacts.

Digital Fabrication: From bits to atoms

Since 1997 Hiroshi Ishii of the Tangible Media Group MIT, has conducted considerable research in bridging “the gap between cyberspace and physical environment by making digital information (bits) tangible,” (1999, p.23). Ishii’s focus has been on bringing the immaterial bits of the digital space into the physical space through developing the physicality of digital interfaces as the connection between digital and physical spaces, known as Tangible User Interfaces (TUIs) (Souza e Silva, 2006, p.265).

The main challenge in Ishii’s research has been the seamless transition of the physical affordances of objects and their physical properties into the digital environment. The purpose of TUIs is to allow digital information to be physically manipulated by the users hands, allowing a haptic interaction. The physical forms become controls and representations of the digital information (Ishii, 2008, p.16). The materials and objects that Ishii has utilised in his research are relatively low-tech and familiar to the everyday user, such as modeling clay, blocks of wood, plastic bottles, etc. The objects are connected to the interface and manipulate the digital information.

Typically in architectural applications of digital fabrication the digital information informs the physical output and creation of physical objects or prototypes. There is a lot that can be learned from Ishii's research, which can be explored further by questioning how TUIs have affected the experience people have within the digital or the physical space and whether TUIs have a role to play in the development of hybrid space or hybrid place.

Trends in Digital Fabrication

Neil Gershenfeld from MIT discusses the future where there will be personal manufacturing machines, "...like the earlier transition of mainframes to PCs, the capabilities of machine tools become accessible to ordinary people in the form of personal fabricators (PFs)...implications are likely to be even greater because what's personalized is our physical world of atoms rather than the computer's digital world of bits," (Mota, 2011, p.279).

Digital fabrication machines and tools turn digital information (bits) into atoms through the subtraction or addition of materials to create physical objects from digital information and designs. The benefits of these fabrication tools are the abilities to create one of-a-kind parts, which can be individualised and personalised. Due to the additive nature of some of the tools, minimal waste is created.

The cost of digital fabrication tools has significantly decreased and is becoming more accessible to a larger part of the population. In 2001, 3D printers tended to cost \$45,000 US dollars, in 2011 personal 3D printers

cost between \$1000-10,000 US dollars (Mota, 2011, p.280). Based on this continuing trend it is thought that 3D printers will become a part of every household, similar to laser printers. Many factors contribute to the significant cut in costs for 3D printers, including the development of technology and materials however most importantly is the exchange of information surrounding the use and development of these tools. Knowledge sharing across the globe via social networks and community groups within the digital and physical space has supported the development of digital fabrication tools. Two of these community groups are MIT's FabLabs and Hackerspaces.

The MIT FabLabs begun out of the Center of Bits and Atoms as a workshop aimed at providing self-replicating tools to communities. Currently there are 89 FabLabs in 23 countries

(<http://fab.cba.mit.edu/about/labs/>).

Hackerspaces are informal learning spaces that are community operated and promote collaboration. Hackerspaces are a direct response to the needs and interests of the community who participate within them, most of which will incorporate digital fabrication machinery and tools within their workshop space (Mota, 2011, p.280). Mota attributes the success of digital fabrication to the Do-It-Yourself (DIY) movement, which is based on self-improvement through the development of new skills and knowledge (2011, p.283).

"Access to tools capable of turning digital designs into physical objects, coupled with the ease with which digital files can and are being modified and circulated, is bringing a third

dimension to the practices of sharing, mashup and remix, and giving everyone the opportunity to not only reinvent and shape the world of bits, but also the world of atoms. The next decade will tell if indeed, as Doherty suggests, more than consumers, we are makers,” (Mota, 2011, p.286). Similar to the notion that digital fabrication has returned craft to architects and designers; digital fabrication along with the affordances of digital space and networks is increasing expression of personal creativity and the power of making throughout communities across the globe.

Digital Fabrication & The Internet

Social media is a powerful and pervasive trend not just in media and communications but also in associated fields such as architecture and urban design. Social media and Web 2.0 services along with the development and wide uptake of smart mobile devices have changed the way that people live and communicate (Kolbitsch and Maurer, 2006).

Web 2.0 technologies has provided for the creation of communities revolving around access to information regarding digital fabrication ranging from wikis, blogs, podcasting, file sharing, and social networking (Kolbitsch and Maurer, 2006). The power behind these tools lies in two areas: Firstly, the vast amount of the population who interact with social media, “If Facebook were a country it would be the world’s 3rd largest and 2x the size of the U.S. population” (Qualman, 2012), and secondly, the fact that social media allows for more individuals to participate and have a voice amongst the ample area of the internet (Foth et al., 2008).

The critical factor to the success of emerging technology within the web is the bottom up approach where the users become the creators. This is a fundamental shift in thinking which encourages innovation within the development of new content (Kolbitsch and Maurer, 2006). How can this similar approach where the experience is created by the user, be utilized in the design of hybrid place?

Hybrid Place

As discussed previously, the use of digital fabrication tools provides methods for creating physical atoms from digital bits. Would it be possible for digital fabrication to be the method in which to capture and materialise digital environments that would inform our working, playing or learning parts of life? Can place be redefined based on the interaction and experience of both the digital and physical world, creating hybrid place? The opportunity for digital fabrication is not only in the translation of digital information into physical objects, it is the empowerment of the individuals to express themselves. The individual is the creator of the digital information in order to create the physical artifact through different digital fabrication methods. Through this process the individuals are expressing themselves and contributing to the overall experience of a space. The creative process from digital to physical is memorable and powerful allowing the user to contribute to the shift in meaning of the space into a hybrid place.

Exemplars

Two case studies are discussed in this paper serving as examples of how

media and architecture come together to create hybrid places.

The Russian Pavilion

The Russian Pavilion shown in figure 1, at the Venice Biennale 2012, uses QR code technology as links between the digital and the physical environments of the exhibition. The QR codes covered all the walls, floors, and ceilings of the pavilion. Participants use tablet computers to read the QR codes linking them to a central website that explores ideas for a new Russian City for science (Etherington, 2012). This pavilion was awarded a special mention by the Jury of the Architecture Biennale (Basulto, 2012) signifying that it was acknowledged as a good piece of design and highly regarded by the architecture community. The pavilion is unique in its design, the aesthetics created by the QR codes on all the surfaces, the content of the exhibition, and the experience of the users.



Figure 1. Russian Pavilion. Source: copyright Li Di

Sergei Tchoban and Sergey Kusnetsov of the design practice called SPEECH Tchoban & Kuznetsov curated the exhibition. When discussing the design idea behind the pavilion the curators say, “In our pavilion we have tried to find an architecture metaphor for connecting

the real and the virtual. People today live at the intersection of on-and off-line; ‘our common ground’ is becoming a cipher for infinite mental spaces,” (Etherington, 2012). The commissioner of the pavilion stated, “We have created a space that is physical and virtual at the same time” (Alice, 2013). From these quotes the design intention is very clear where the purpose of the pavilion was to combine media and architecture to explore how these digital and physical environments inform each other. The special mention award and the media attention received by this pavilion indicate that society recognises the value and opportunities for architecture to actively explore the connection between digital and physical environments.

Although the link between the digital and the physical environment of the pavilion is incredibly clear what is lacking in this exhibition is the ability for the user to participate or contribute to the creation of place. In figure 1, one can see that the room is filled with visitors however they are all focusing on the tablet computer and there appears to be a lack of face-to-face interaction amongst them. According to the critical factors for assessing place, as described by Harrison and Dourish (1996), the Russian Pavilion does not allow users to adapt or appropriate the content of the exhibition. Users participate but not in an active way, they are merely observing and learning from the content however they are not contributing to it.

Although the experience of engaging with the pavilion is possibly memorable to the users due to its unique design, the experience of place

is questionable. How much meaning would the people attach to the pavilion when the face-to-face interaction is not promoted? The use of the technology evidently serves the purpose to connect to on-line content important to the exhibition however the use of the technology can be seen to detract from the human experience within the pavilion. The opportunity for the individual to contribute to the experience of the space and place is relatively limited and could have been explored further in this pavilion.

Shadowgram by Ars Electronica Futurelab



Figure 2. Users create a shadowgram. Source: Ars Electronica Futurelab.

In 2010 the Ars Electronica Futurelab in Linz, Austria developed *Shadowgram* as a way of combining the creation of a tangible object with the notion of social brainstorming. Social brainstorming, a term developed by this group, describes the dynamic process of stimulating creativity and inspiration from other people (Gardiner et al., 2011). The process of creating a shadowgram allows users to pose in front of a camera to take an image of their shadow. The shadow is then cut out of adhesive vinyl producing a sticker, to be placed on the wall of the installation. Users have the

opportunity to attach a speech bubble to the shadow and write a comment. The intention for the comments is to create dialogue between the local communities.

Social fabrication, another term developed by the Futurelab, has been defined as “a type of fabrication for shared creation with others in public spaces” (H. Ogawa et al., 2012, p.58). The purpose of this concept is to promote communication within society through the illustration of individual or collective perspectives. These terms come together to define the notion developed by the Ars Electronica Futurelab as the Creative Catalyst, where creativity is produced through the participation of individuals and the content is generated by the people, “the output has significance for individuals and for the collective,” (H. Ogawa et al., 2012, p.58).

Researchers from the Carnegie Mellon University, Willis et al. (2011) have defined interactive fabrication, which incorporates real time input by the user to directly produce fabrication by sound or shape. The purpose of interactive fabrication is to bring back the craft power to the user providing new creative opportunities. Fundamental to these alternative fabrication methods is the interaction of the user for creative expression.

When assessing the creation of place in *Shadowgram* against the principles mentioned by Harrison and Dourish (1996) it is understood that the users actively participate in the adaptation and appropriation of place through the creative catalyst process. *Shadowgram* allows users to participate in the creation of hybrid place by connecting the digital with the

physical layers of the built environment. The purpose of *Shadowgram* is to encourage interaction between users while allowing them to express a part of themselves. This installation promotes the unique potential of digital fabrication where the digital content created by the individual and the physical artifact that occupies the space is a personal expression of that person. It is the connections that are facilitated between the participants through every part of the process that create a memorable experience in both the digital and physical space, therefore exemplifying hybrid place.

What can be learned from these examples? The Russian pavilion is a provocative step towards blurring the edges of digital and physical space. The architecture provides the infrastructure for the digital layers of the environment to be accessed and experienced. In order to make the overall experience more meaningful to the participant, opportunities for the participants to express themselves or contribute to the overall experience could be explored further. The success of *Shadowgram* can be attributed to the fact that people had the ability to create something that reflected them while contributing to a larger discussion that was relevant and of interest to the broader community.

Conclusion

Although the case studies discussed in this paper are of a small scale in relation to urban environments a few critical factors can be highlighted which can be scaled up to affect design on multiple levels. The experience of place can occur anywhere in any space. The use of technology in our everyday

lives is continually evolving and becoming more and more ubiquitous. The Russian pavilion makes a strong and clear statement acknowledging that the digital environment cannot be ignored and should be included in the design of our physical environments. Although accessing digital information can be informative it can also restrict the purpose of architecture and design, which is to create spaces for the experience of people.

The proposition of hybrid place is to embrace the affordances of technology to improve the overall human experience within built environments. The technology can be used to promote interaction amongst people allowing for the expression of individuals and creativity. Screen based media architecture are evolving to become more and more interactive however the screens are currently limited to 2-dimensional interaction. Although augmented reality is an exciting opportunity to continue to develop the blurring between the digital and the physical environments it is only capturing the phenomena of a purely visual sense. The creation of tangible artifacts through digital fabrication methods promotes the process of making, individual expression, and includes a multidimensional and sensory experience.

Based on the work by Lentini and Decortis (2009) who established a framework for determining the potential for technological devices to support experiences of place, of particular interest to the future of this research will be; to encourage the physical exploration of the environment, enable the discovery of the environment through the senses, empower the users through

responsibility and value, “elicit face-to-face interactions and favour rich collective experiences between users,” (p.414).

The intention of this research is to develop the concept of Social and Interactive Fabrication further. This can be done by producing a small installation within a large Australian university to act as a “Creative Catalyst”, to promote a collective creativity experience through the process of making. Digital fabrication technology such as 3D printing and laser cutting while questioning the experience and definition of hybrid place will be explored. Similar to the work of Lentini and Decortis (2009) the aim of the installation will be to promote face-to-face interaction of people through the use of technology therefore combining the digital and physical layers of the urban environment. The involvement of users through creative collective and face-to-face interactions provokes opportunities of hybrid place by providing memorable experiences.

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