The Embodied Hybrid Space: Designing for Digital Encounters in Physical Environments

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ABSTRACT
The emergence of mobile and ubiquitous computing has created what is referred to as a hybrid space – a virtual layer of digital information and interaction opportunities that sits on top and augments the physical environment. The increasing connectedness through such media, from anywhere to anybody at anytime, makes us less dependent on being physically present somewhere in particular. But, what is the role of ubiquitous computing in making physical presence at a particular place more attractive? Acknowledging historic context and identity as important attributes of place, this work embarks on a 'global sense of place' in which the cultural diversity, multiple identities, backgrounds, skills and experiences of people traversing a place are regarded as social assets of that place.

The aim is to explore ways how physical architecture and infrastructure of a place can be mediated towards making invisible social assets visible, thus augmenting people's situated social experience. Thereby, the focus is on embodied media, i.e. media that materialise digital information as observable and sometimes interactive parts of the physical environment hence amplify people's real world experience, rather than substituting or moving it to virtual spaces.

Keywords
Embodied Media, Amplified Reality, Ambient Displays, Public Displays, Urban Informatics

AIMS AND BACKGROUND

Our spatial practices and situated experiences are shaped by the physical environment as well as the socio-cultural context of a place. Alexander et al. (1977) propose patterns guiding the design of physical infrastructure towards supporting particular social activities, such as a city plaza for a relaxing walk or serendipitous social encounters. John Ruskin (1849) speaks of the 'eloquence of architecture.' He suggests that there are more abstract things that we want from buildings beyond just providing a shelter in a physical sense; we want buildings to speak to us. Office spaces should afford efficient working environments, our homes should facilitate relaxation and a sense of domesticity, and churches provide a deep sense of spirituality. Architecture, from this point of view, can be regarded as an object of design with a goal to communicate a message or to provide "an impression of the psychological and moral attitudes it supports" (De Botton, 2006, p. 76).

Social and cultural theorists on the other hand remind us that 'place' is not only about its location, spatial infrastructure and physical characteristics, but more so socially produced (Certeau & Rendall, 1984; Gordon & de Souza e Silva, 2011; Lefebvre, 1991; Tuan, 1977), e.g. through practices, activities, memories and meanings that people attach to a place. Such 'soft' aspects contribute a perceived social atmosphere and culture that we consider as significant components of what we think of when we say 'I like this place' – they shape our 'sense of place.' In conclusion, people's sense of place as well as their practices and experiences within a place are influenced by both, physical environment as well as the socio-cultural context of a place.

The point of departure of this study is the impact that globalisation and the introduction of information and communication technologies (ICT) have on people's sense of place, i.e. their relationship to place and to other people within the same place. Globalisation and urbanisation have been criticised in that they shape more and more of our space on earth as 'non-places,' i.e. places that miss a specific local character (Auge, 1995). Shopping malls, freeways, convenience stores and fast-food chains look and feel the same everywhere. Places become 'inauthentic' and 'placeless' (Relph, 1976). Literature in urban studies suggests that there is a need to support cities' identities and cultural heritage in order to counteract such negative effects of globalisation and supermodernities (Auge, 1995; Harvey, 1996), thus preserving the traditional 'sense of place' of and within cities. In order for a city to be a 'good place' it needs to embody and reflect its historic context,

identity and unique traditions as well as provide a public place for sociality (Jacobs, 1961; Whyte, 1980), otherwise a place turns into a non-place.

The introduction of ICT has brought both challenges and opportunities for physical place. With the increasing pervasiveness of ICT, in particular mobile phones, people can bridge physical barriers and access distant information as well as connect to anybody, at anytime, from anywhere. As a consequence however, being physically present at a particular place becomes less significant. "Because connections are to people and not to places, the technology affords shifting of work and community ties from linking people-in-places to people wherever they are" (Wellman, 2002, p. 15). People-to-people relationships depend less on particular places, hence social closeness does not infer physical closeness any longer – we have become 'networked individuals' (Wellman, 2002). Some argue that connecting to distant others causes an 'absent presence' (Gergen, 2002) and isolation of people from their immediate social environment (Uzzell, 2008), i.e. being connected everywhere to anybody at anytime, comes at the cost of people's sense and appreciation of the here, nearby and now. Putnam for example argues a decrease of local community networks and the social capital within urban spaces partially due to the impacts of ICT (Putnam, 1995).

Public libraries represent a concrete example of a physical place that has been highly affected by the emergence and integration of ICT. The option to borrow and access e-books from home, as well as the increased availability of other online information sources, challenges the relevance and purpose of library buildings as a physical place. If all human knowledge is perpetually being archived and made accessible through the Internet, sometimes even in real-time, why would people go to the library any longer? Are libraries losing their advantage of being a physical destination? What can and should libraries provide in the future? What is the benefit and strength behind having physical library buildings beyond being able to store rows of shelves filled with books? How can libraries leverage their physical manifestation as an asset towards providing services that are complementary to and not replaceable by the online world? In their mission as a facilitator for education and learning, libraries have been challenged to think about their future role alongside what the digital world offers towards meeting the changing needs of members of the public.

This work tackles the issue of the 'lost advantage of physical space' in the context of libraries. It investigates how physical presence in a library can be made more attractive through the means of ubiquitous computing technology, in particular embodied media that are designed as a part of physical infrastructure. Hence, the building, interior architecture and space in and around a library itself is investigated towards becoming an embodied medium and place for digital social interaction, fostering the visitor's experience within the library's physical manifestation, rather than substituting or moving it to virtual spaces. The resulting medium, a combination of physical and digital components, is what the title of this paper refers to as an "embodied hybrid space."

The design interventions applied in this work recognise that physical spaces incorporate some characteristics that cannot be compensated by virtual spaces. Libraries in particular, despite being physical hubs and archives for information and knowledge, also serve specific higher level roles. Freeman describes those as "to advance and enrich the student's educational experience" and underlines that "…by cutting across all disciplines and functions, the library also serves a significant social role. It is a place where people come together on levels and in ways that they might not in the residence hall, classroom, or off-campus location. Upon entering the library, the student becomes part of a larger community – a community that endows one with a greater sense of self and higher purpose. Students inform us that they want their library to 'feel bigger than they are.' They want to be part of the richness of the tradition of scholarship as well as its expectation of the future. They want to experience a sense of inspiration." (Freeman, 2005, p. 6). With the physical building as a manifestation of these aspirations, the library provides a particular "sense of place" – an experience of various people coming together to a centralised location for similar, mostly educational purposes.

The focal point of this research is to investigate how people's perceived 'sense' of a place can be amplified through digital means. Informed through embodied interaction research, we in particular explore opportunities through embodied media, i.e. media that materialise digital information as observable and sometimes interactive parts of the physical environment. They enable people to bridge spatial, temporal and social barriers and make meaningful experiences in and through physical places, which would not be possible otherwise. Similar to augmented reality, embodied media enrich the real through the digital, but do this in a way that is publicly accessible through direct observation, manipulation or interaction with objects in physical environment, e.g. public touch-screen or ambient information displays. Using the concept of embodiment (Dourish, 2001), digital information and interaction affordances become a public and visible commonality of space. The motivation is to investigate the implications of embodied media for people's shared sense of and social experience in a particular place.

RESEARCH QUESTIONS AND APPROACH

In order to explore opportunities provided by ubiquitous computing technology and embodied interaction, and investigate their impact on sense of place, we focus on an explicit case study environment – the Edge. The Edge (http://edgeqld.org.au/), an initiative of the State Library of Queensland (SLQ) in Brisbane, Australia, represents a tangible example and prototype of a new library concept as part of SLQ's evolution in the digital information age. As

an answer to the lost advantages of physical space in traditional libraries, for example through online information repositories and search engines, its concept focuses on the social space and human factors of its visitors. Officially labelled as a '*Digital Culture Centre'* it maintains the library's traditional values as a physical hub for knowledge and information, though, not through books and information archives but as a "*hub for both planned and incidental collaboration – people stumble upon each other and create new possibilities that wouldn't have existed otherwise*" (unconventionbrisbane.com, 2010). Providing a master-planned place and cutting edge technical infrastructure, it envisions to attract, support and nourish a community of primarily young people to meet, explore, experience, learn and teach each other creative practices in various areas related to digital technology and arts.

The Edge was launched in February 2010 as the first institution of its kind in Australia. Our preliminary findings indicate that the Edge, having introduced this innovative concept of a Digital Culture Centre, still provides a weak identity of place. The general public, in particular first time visitors have a weak sense of what the Edge is and what it provides. Even though a lot of resources have been invested in its physical architecture, interior design and infrastructure, it remains a challenge for the Edge to shape its socio-cultural space and visitor activities as envisioned by its architects, i.e. facilitate shared and serendipitous encounters among visitors, collaborations, discussions, sharing of ideas and other forms of open-minded peer-interactions. Based on these preliminary findings, the key question guiding this research is:

What are the strategies to employ ubiquitous computing technology, in particular embodied media to facilitate a stronger shared sense of and social experience at the Edge as perceived by its visitors?

In order to gather an understanding of the social space at the Edge as well as evaluate how future design interventions affect this space, we apply Lefebvre's triad of social space (1991) as a conceptual framework. It provides a trialectic lens (Soja, 1996) for spatial thinking, i.e. from a (1) conceived, (3) perceived and (3) lived point of view. Thereby we regard the *conceived space* of the Edge as the vision and long-term goals set by the Queensland Government and SLQ as the funders and initiators of the Edge. The *perceived space* represents the infrastructure, services and facilities that the Edge as an institution provides towards fulfilling its purpose and mission, and how these are perceived by its visitors. The *lived space* represents how individual Edge visitors live and practice the Edge as a social space on an everyday basis, and the underlying motivations for their spatial practices.

The following sub-questions will guide the research process towards potential solutions for the specific case study environment at the Edge.

RQ 1) What is the conceived identity and 'sense of place' as envisioned by the Edge's makers and designers? What is the Edge's targeted role, vision and mission?

RQ 2) How is the Edge's identity and 'sense of place' perceived by visitors and staff members, and how is that reflected in their lived activities, practices and behavioural patterns in their everyday visits and work life?

RQ 3) ***How can ubiquitous computing technology be designed towards supporting a stronger sense and identity of place for visitors at the Edge (perceived space)? How can it facilitate activities (lived space) that meet the intended purpose of designed space at the Edge (conceived space) – especially in regards to visitor engagement, participation and incidental collaboration?***

The research questions, as stated above, focus on three aspects: (1) The Edge as place yet-to-be shaped and communicated in regards to its identity; guided by RQ1, we first investigate the Edge as an envisioned prototype for a new library and its role in providing a response to people's needs in the digital information age. We analyse the Edge from a conceived point of view, i.e. why it was built and which purposes it strives to achieve. RQ2 sheds light on how the Edge as a social space is perceived, used and lived through its visitors' and staff members' everyday activities. Based on the findings of RQ1 and RQ2, RQ3 aims to explore opportunities provided by embodied media to augment the Edge as a perceived and lived space. Thereby, we plan to engage in design, development and evaluation of a set of selected new embodied media prototypes informed by the organisational and socio-cultural context of the Edge.

The case study at the Edge analyses how different ambient media and content can enhance the identity and sense of a place as perceived by its visitors. The nature of these goals implicitly suggests a conceptual framework that holds characteristics of both, Action Research (targeted at social change) and Design Science Research (targeted at the creation of innovative design artefacts). Hence, the study utilises a design-oriented Action Research approach, i.e. a framework, which in principal follows the canonical goals of Action Research, yet has an orientation towards designing and building new technology artefacts as intended by Design Science Research.

DESIGN INTERVENTION IDEA

This section outlines a first draft for a potential design intervention at the Edge. We expect this plan to be further shaped or even changed through the iterative process of action planning, action taking and evaluation. The proposed design intervention is an ambient information system that aims to facilitate shared encounters and a better sense of other visitors who are currently at the Edge.

The system enables visitors to virtually 'check-in' at the Edge (e.g. using their Edge ID swipe-card or a mobile

phone application). Keeping track of 'checked-in' visitors and the digital footprints they leave at the Edge, the system will display a visual patchwork of aggregated information, e.g. who are the people who currently hang out at the Edge? What are their backgrounds, interests and key areas of expertise? What projects are they working on and what questions are they currently struggling with? The items are presented in a tag-cloud, while the size of keywords is determined by the number of people and level of expertise these people have in the given field. New visitors who enter the Edge get a glimpse of what profiles and knowledge other visitors who are or who have recently been at the Edge inhabit (Figure 1).

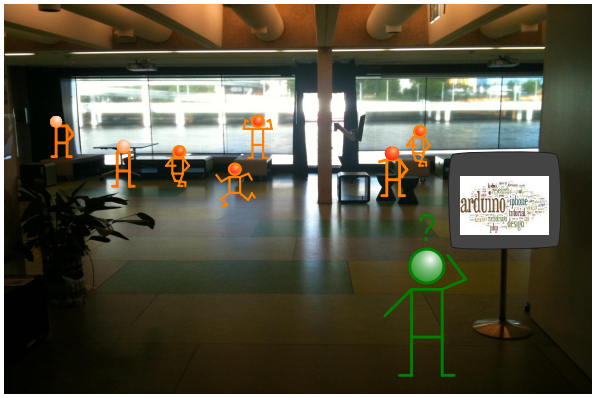

Figure 1: Ambient and public displays mediate a sense of place at the Edge and facilitate shared encounters between visitors.

The public screens with people's areas of knowledge and expertise is expected to strengthen visitors' 'sense of place' at the Edge, as well as the identity of the Edge as a place defined through the diversity of its visitors and opportunities evolving from this diversity. This gives visitors a sense of what the place is about. The focus is set on the visitor base, promoting the Edge as a hub of creative people and their knowledge and expertise in topics relevant to any form of digital culture. Rather than highlighting the infrastructure and technical equipment, it promotes the Edge as a space that is socially produced by and through visitors. The screens dynamically display the available assets and social capital at the Edge at each point in time.

Furthermore, the displays aim to help visitors make serendipitous in-situ encounters, i.e. identify and ice-break conversations and potential collaboration opportunities with fellow visitors who have similar or complementary interests, skills or knowledge. Visitors who check-in at the Edge can specify if they are happy to be approached or if they prefer to work alone. Ambient lights installed in the window bays will glow green or red, depending on what option the visitor has selected when he checked-in.

In contrast to most previous work about digital projections on physical buildings (Scheible & Ojala, 2009), the focus of this study is not simply on digitally augmenting the building in an artistic way, but rather on bringing it alive towards conveying relevant information about its current status, events, people, social encounters and the like which is happening inside the building. The design of the installation would follow the paradigms of public and ambient displays (Greenberg & Rounding, 2001; Guzman, Yau, Gagliano, Park, & Dey, 2004; Hazlewood, Connelly, Makice, & Lim, 2008; Mankoff et al., 2003; Rogers, Hazlewood, Marshall, Dalton, & Hertrich, 2010; Wisneski et al., 1998), conveying information in an unobtrusive, non-distracting, yet visually appealing way.

Combining in-situ advantages of the physical space with the benefits and 'social translucence' of digital ICT and social media, the overall aim is to explore how ambient and public displays can facilitate and augment social interaction in the hybrid space. The system is expected to contribute to the overall visitor experience and motivation to visit the Edge. The advantage of being physically present at the Edge is increased by the sense of community, exposure to a variety of topics embodied in the community, and afforded links to particular individuals within this community.

INNOVATION

The findings from the case will produce actionable knowledge for the Edge. Even though the case study tackles issues in the particular context of the Edge, the findings might be applicable to other institutions of the GLAM (galleries, libraries, archives, museums) sector with similar settings and goals as well as inform the role of embodied media for placemaking strategies in general. Furthermore, the results will inform and contribute new knowledge to the research community of urban informatics and human-computer interaction, in particular relevant to interaction design matters of mobile, embodied and ambient information systems.

Combining design and development of innovative prototype artefacts that mediate people-to-place relationships and methodologies from human geography, this work is timely and significant to both place-based technology and human geography oriented studies. As Humphreys notes, *"despite a 25-year history of computer-mediated communication research, the role of physical and social spatial practice has been relatively neglected in the field"* (Humphreys, 2010, p. 775). This work follows a recent trend of studies that have recognised the significance and importance of studying the interplay between people's spatial practice and the embodiment and ubiquitous integration of computing devices in our everyday environments (Dourish, 2006; Dourish & Bell, 2007; Galloway & Matthew, 2006; Gordon & de Souza e Silva, 2011; Willis, 2010). The study's findings contribute to this body of research by informing a design and development process of innovative embodied artefacts and evaluating their impact on socio-cultural settings and spatial practices in the specific context of future library models.

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