
Situated Displays vs. Municipal WiFi: Comparing the Interactivity of Two Public Infrastructures

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Abstract

We compare the interactive experiences of two public infrastructures — situated displays and a municipal wireless network — using a conceptual framework of place, experience and embodiment. Using the framework as a point of reference, we can begin to address some inherent design issues in these technologies. Consequently, we argue that urban technologies which take into account their environment and leave room for creativity, add and support existing meaningful experiences in the city.

Author Keywords

Place; embodiment; interaction; public displays; WiFi.

ACM Classification Keywords

K.4.0 Computer and Society; General

Introduction

The Open UBI Oulu initiative has deployed rich pervasive computing infrastructure in downtown Oulu, Finland. The objective is to turn Oulu into a civic laboratory for a long-term large-scale study of future computing systems “in the wild”. The infrastructure facilitates longitudinal provisioning of services to the general public in an authentic urban setting, thus

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establishing the technical and cultural readiness and the critical mass of real users needed to evaluate a system or service (un)successful. [8] In this paper we compare interaction offered by two particular public infrastructures, namely situated displays and a municipal wireless network. Both infrastructures have been openly available to the general public for several years. Their contrasting characteristics provide an intriguing starting premise for a comparison that is conducted with a conceptual framework of place, experience and embodiment. From the outcome of the comparison we synthesize future research directions and design guidelines for such public infrastructures.

UBI Hotspots are a network of 17 situated displays deployed at pivotal indoor and outdoor locations around Oulu since 2009. In terms of interaction a hotspot is in either passive broadcast (digital signage) or interactive mode. In passive broadcast mode, the whole screen is allocated to the UBI-channel showing a customizable playlist. When the overhead cameras detect a face or someone touches the screen, the hotspot changes to an interactive mode, where the screen is divided between the UBI-channel and a customizable UBI-portal. The current version of the portal contains 25 distinct interactive services provided by us, the City of Oulu, businesses, NGOs and creative communities. The portal is identical in each hotspot. Currently, the hotspots attract on average ~1500 clicks per screen monthly, but variations between hotspots at different locations can be very large. The six most popular services include four games, the Oulu Today page provided by a local newspaper, and the City of Oulu website.

The panOULU WLAN (panOULU from now on) is a municipal WiFi network deployed around Oulu since

2003. It currently has ~1400 IEEE 802.11 WLAN APs (access points) that provide open (no registration or authentication), free (no payment) and unrestricted (no limitations) wireless Internet access to the general public. While downtown Oulu is blanketed with a uniform coverage, elsewhere the network is deployed in a hotspot manner. For example, most public municipal premises have panOULU coverage. The connection is provided "as is" without any quality of service or security assurances. Currently, the network is used by ~50000 unique devices every month, and the number has doubled in the past 2 years, showing a steep growth trend in usage. (Fig. 1)

Conceptual framework

In the study of technologies situated "in the wild", there has been much talk about the need to understand the physical reality where these technologies are deployed [16], and rightfully so. However, what is often missing from this demand is the understanding that the physical reality and our social and cultural practices are in a dynamic relationship where one influences the other. It is impossible to talk about the physical affordances of a space without discussing the practices related to that location, as these necessarily affect our decisions and imaginations about how to use that space. Thus we consider the concept of *place* central, as it enables us to think about situated technologies and interactions in a more holistic manner.

According to Agnew [1], all places have three attributes: a *location*, a *locale* and a *sense of place*. Location refers to specific coordinates at a given point in time. In the case of Oulu, we can say it is located at 65°01'N 025°28'E, which makes it a northern European city with unique conditions. Secondly, a place must

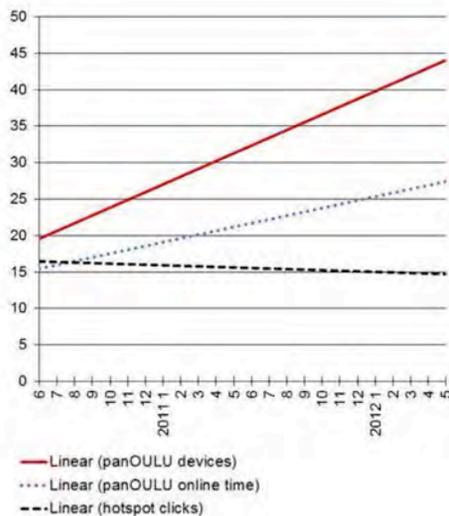


Fig. 1 Statistics comparing the use of different services over a two-year period.

have a *locale*, a materiality which serves as the setting for social interaction, encompassing, e.g, the size and shape of things and their material properties. Thirdly, we create places out of spaces by attributing meanings to them, which Agnew refers to as *a sense of place*. This sense of place is actively produced by people in their everyday lives through their experiences as embodied individuals.

To understand individuals' experiences connected to these technologies, we apply de Certeau's [4] theory about *the practice of everyday life*. According to him, we can make a distinction between *strategies* and *tactics* concerning technologies' functions. Institutions and structures of power have their own strategies, e.g. (political) agendas, visions and goals when designing and implementing new technologies in the city space. However, "ordinary people" do not necessarily adopt or even know these official versions about technologies' functions. Instead, they have a range of tactics when using it; they interpret it through their actions.¹ Through their everyday practices people create meanings for things. Dourish *et al* call this aspect "the active production of urban living", and argue it offers "opportunities to reconsider the goals and methods of urban computing" [5, p. 12]. We consider individuals'



Fig. 2 We experience and interact with our environment through our bodies.

¹ We appreciate that the term *appropriation*, which e.g. Dix [3] has used to mean users' adaptation and adoption of technology in ways designers' never planned for, is well-established in the research of interactive systems. However, we find the dual concept of *strategies and tactics* more useful for our purposes, since the use of the word appropriation does not reveal the power structures inherent in designers's work, as the term itself refers only to users. We deem it necessary to reflect on designers' intentions, as these have a profound impact on how technologies eventually take shape, and what tactics or appropriation techniques are available to users.

experiences related to urbancomp technologies profoundly *embodied*, and situated in time, place and the co-presence of other people. Place and experience are thus inherently connected through embodiment. (Fig. 2) Through these concepts, we can examine the physical appearance, digital content and the interactive experiences provided by situated technologies.

Comparison

All the previously mentioned aspects relating to place, practices and technologies are a part of a dynamic whole. Next, we will examine embodied interaction taking place within this whole by examining the intersections of *location, locale and sense of place* with *strategies and tactics*; and, based on this, cast a critical eye on the two chosen technologies.

Location-wise, a display requires the people who wish to use them to be physically present in a certain spot in a public place; a feature already identified as a challenge [13, p. 59]. Things around the displays, however, are in a constant state of flux: e.g. the weather, the sun, and the flow of people and vehicles. This has an unavoidable effect on users' experiences of bodily and psychological comfort. In comparison, the panOULU wireless network is a much more ethereal presence by design (or strategy), yet tied to the physical location where it is available. This location, however, is larger in diameter. In the city centre, the panOULU AP's form a nigh full coverage, giving its users the opportunity to choose where they would like to use it and how they want to position their bodies.

In their material locale, the displays' physical attributes bring a layer of difficulty for interaction. The two-dimensional screens necessarily dictate the shape of



Fig. 3: Skiers using a hotspot in the winter.



Fig. 4: Outdoor hotspots are double sided.



Fig. 5: 'Invisible' panOULU AP on a street light.

the overall hotspots to a large extent. Although they are three-dimensional objects, they seem rather two-dimensional. As such, the realm of possibilities for embodied interaction tactics is limited. This a design challenge which is inherent to situated displays. This particular design issue does not present itself in the case of the wireless panOULU network.

Concerning sense of place, the displays' digital content is predetermined and has not yet been tailored to their individual places for the most part. They offer a wide range of e.g. information services and games, but they do not leave much space for creativity or active production. We can conclude that applications are probably so tightly fixed, that people find it difficult to merge them into their everyday practices, leaving hardly any space for their tactics. This argument is also supported by the fact that some applications have been misused, or people are just toying with them. [9] It seems that despite the strategies inscribed into this particular technology, people have been searching for creative ways to use and domesticate it. This is further supported by the fact that some playful applications that can be used by groups of people have been popular, such as the UBI post card [15]. Furthermore, the amount that the applications are used has been found to differ from hotspot to hotspot [11], indicating that different places indeed might require different content. In contrast to the displays, panOulu's use is not restricted to certain predetermined applications. Also, people can (and must) use a technological device of their choice, thus forming a familiar experience through a personal interface. As such, we can argue that panOULU leaves plenty of space for tactics and thus caters for countless ways to include it into citizens' everyday practices.

Finally, it is important to note that the *interaction space within a public place* offered by the UBI displays does not have a predecessor in the citizens' mediascape; consequently, data from our deployment has shown that people have difficulty even imagining beforehand what kinds of services they would use on such devices [11]. A big public interactive screen also breaks down the boundaries between small, interactive private screens, such as smartphones, and large non-interactive public screens, like ads. This kind of a technology, then, is harder to adopt than more familiar forms of ICT, such as wireless networks, that many people already have at their home or at workplace.

Towards meaningful interaction spaces

The analysis presented in this paper shows that while the technologies are developed to a technologically high degree, they should also be developed towards a more experiential and participatory direction. By exploring different aspects of the built environment and the practices citizens engage in within it, then, we aim to add to and support existing meaningful experiences in the city. Rogers [17] has already made the case for experiential computing from an HCI point of view, and McCullough [12] has argued for *locational* technology from his architectural standpoint; we seek for a deeper connection between technology and *place* as well as deeper understanding between technology and *everyday practices* [5]. On a practical level, we would like to see a further bridging of the digital and the physical in Oulu. Specifically, how can our location support a digital locale that would share a singular sense of place with the physical locale? The two technologies analyzed would be a great supporting infrastructure for such a digital locale. Key research questions would be: What would this public virtual

Examples of further developments

- The hotspots could be developed further towards physical forms that would allow different spatial co-presence and co-use patterns, and towards content that would entail meaningful, context-driven applications. Another important question is, how can we make a universal screen more communicative to its intended audience?
- If the hotspots were to be interactive on all four sides, a different, perhaps richer, dynamic between co-located users might emerge.
- On the existing screens this could be mitigated somewhat by introducing a see-through mode which would utilise the two cameras. Mediated and non-mediated interactions could occur between two people in the same physical location using the same screen, whilst augmenting the cityscape that they see through the screen, bringing together the locale, the people and the digital content.
- To explore how the content could be further aligned to suit the sense of place, for instance, by utilising the unique identity, history or functionality of the main square or the marketplace.
- We aim to explore the panOulu's possibilities for developing the relationship between the citizens, the locale, its sense of place, and urban technologies.

space be like? How can we connect sensors, GIS, social media, and existing applications into a meaningful, virtual urban space, and how would this connect to the physical urban space? What needs do local communities have that could be served by such a digital public space? How would this affect the identity and sense of place people associate with Oulu? And most importantly, how could we empower citizens to use this layer towards their own creative and productive purposes?

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References

- [1] Agnew, J. Space and Place. In (eds. Agnew, J., Livingstone, D.) *The SAGE Handbook of Geographical Knowledge*, 316-239.
- [2] Caron, A.H. and Caronia, L. *Moving Cultures. Mobile Communication in Everyday Life*. McGill-Queens University Press, Montreal & Kingston, London, Ithaca, 2007.
- [3] Dix, A. (2007) Designing for Appropriation. Proceedings of the 21st BCS HCI Group Conference, Vol 2, 27-30.
- [4] de Certeau, M. *The Practice of Everyday Life*. University of California Press, Berkeley, 1980.
- [5] Dourish, P., Anderson, K., Nafus, D. Cultural Mobilities: Diversity and Agency in Urban Computing. In *Proc. INTERACT 2007* (2007) 100-113.
- [6] Dourish, P., and Bell, G. Divining a Digital Future: Mess and Mythology in Ubiquitous Computing. The MIT Press, Cambridge & London, 2011.
- [7] Dourish, P. *Where The Action Is: The Foundations of Embodied Interaction*. The MIT Press, Cambridge, Massachusetts & London, 2001.
- [8] Greenberg, S & Buxton, B. Usability evaluation considered harmful (some of the time). Proc CHI 2008 Venice, Italy, 111-120.
- [9] Hosio, S., Kostakos, V., Kukka, H., Jurmu, M., Riekk, J., Ojala, T. From School Food to Skate Parks in a few Clicks: Using Public Displays to Bootstrap Civic Engagement of the Young. In *Proc. Pervasive 2012*, (2012), 425-442.
- [10] Kostakos, V., O'Neill, E., Penn, A. Designing Urban Pervasive Systems, *Computer* 39, 9 (2006), 52-59.
- [11] Kukka, H., Kostakos, V., Ojala, T., Ylipulli, J., Suopajärvi, T. Jurmu, M., Hosio, S. This is not classified: everyday information seeking and encountering in smart urban spaces. *Pers Ubiquit Comput* 17 (2013), 15-27.
- [12] McCullough, M. *Digital Ground. Architecture, Pervasive Computing, and Environmental Knowing*. MIT Press, Cambridge, MA, 2004.
- [13] Ojala, T., Kostakos, V., Kukka, H., Heikkinen, T., Linden, T., Jurmu, M., Hosio, S., Kruger, F., Zanni, D. Multipurpose Interactive Public Displays in the Wild: Three Years Later. *Computer* 45, 5 (2012) 42-49.
- [14] Ojala, T., Kukka, H., Lindén, T., Heikkinen, T., Jurmu, M., Hosio, S., Kruger, F. UBI-Hotspot 1.0: Large-Scale Long-Term Deployment of Interactive Public Displays in a City Center. In *Proc. ICIW 2010* (2010), 285-294.
- [15] Ojala, T., Orajärvi, J., Puhakka, K., Heikkinen, I., Heikka, J. panOULU: Triple helix driven municipal wireless network providing open and free Internet access. In *Proc. C&T 2011* (2011), 118-127.
- [16] Paay, J., Kjeldskov, J., Howard, S., Dave, B. Out on the Town: A Socio-Physical Approach to the Design of a Context-Aware Urban Guide. *ACM Transactions on Computer-Human Interaction*, 16, 2 (2009) 7.
- [17] Rogers, Y. Moving on from Weiser's Vision of Calm Computing: Engaging UbiComp Experiences. In *Proc. Ubicomp 2006* (2006), 404-421.