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# Interactions & the built environment: some challenges.

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**Abstract**

With the popularity of mobile and ubiquitous services, and the rise of urban sensor-based systems, interaction design has moved into the arena of disciplines traditionally concerned with the design of the built environment. In this position paper, I outline questions raised in our work on mobile, location-based services that illustrate that sharing experiences between our communities is crucial.

**Author Keywords**

Mobile, location-based services, built environment

**Introduction**

With computing moving away from the screen and into the environment around people, pervasive services and urban computing (see e.g. Foth, 2009) have been gaining a growing interest in the HCI community. Location-based services are increasingly popular and used by Millions of people. The physical environment in itself has become an interface with urban sensing on the rise (Kuznetsov, 2010), Internet-of-Things-type applications reaching mainstream, and 'smart' or 'robotic' buildings hardly being new research topics (e.g. De Ruyter, 2006). Discussions of place and social interactions within them have been going on for years (e.g. Dourish, 2006). Interestingly however, exchanges of methods and knowledge with the disciplines that

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traditionally focus on design of the built environment appear to have lagged behind.

Below I outline a number of challenges encountered during our research on location-based services, and areas in which discussions with architects and urban planners would be especially helpful.

### Perceptions of the city

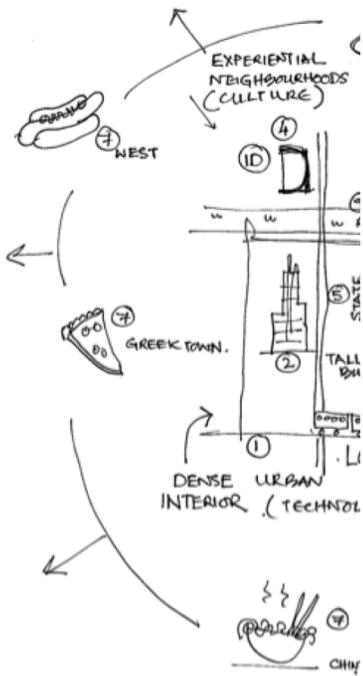
In building location-based services, it is important to present information in ways that are congruent with users' manner of perceiving the city. In Bentley et al., (2012), we are presenting an adaptation of the 1970s Mental Maps study by Milgram to understand differences in people's views of the city based on their backgrounds and technology use. Our participants, both tourists and residents, drew maps of Chicago with the places important to them (Fig 1.), and answered a series of questions about their perceptions of the city's neighborhoods. Correlating demographic data and background in (mobile) technology used with their perceptions of the city revealed a number of differences. Tourists were for example twice as likely to draw maps that included pictorial representations of buildings or landmarks, while residents focused more on neighborhoods, streets, or transit routes. The categories of places included in the maps interestingly also did not necessarily match the types of places to which most location-based services cater. The encountered differences also raise question on whose perspectives are less visible, and whether users are presented with targeted, but segregated 'silo' views of cities. A follow-up on this study is now under way in Stockholm, and questions on international differences, and local perspectives on 'cities', already have arisen during this preparation and data collection phase.

Encountered differences can guide development of ubiquitous and mobile services, but we have few studies actually catering to such questions, whether on a city level, or scaled down to neighborhoods, or to buildings and venues within them. This includes methodology: while our study for example used classifying features from Lynch's urban planning taxonomy, an active dialogue with architects and urban planners, beyond just using methods from classic literature, would be very useful.

### Perceptions of venues in location-sharing

Of the location-based services that have been gaining popularity with millions of users, location-sharing and recommendation services are particularly interesting in the questions they raise in perceptions of place, and (un)desirable places to be and share. Location-sharing services are used for a wide variety of reasons (Lindqvist et al., 2011; Cramer et al., 2011), including for reasons of finding new interesting places, rather than just learning about friends' location. The currently most popular model of checking-in to a named, user-generated venue (rather than automatic tracking), facilitates expression and presentation based on location. This changes location from a property or state into a meaningful 'performance', with considerations of an 'audience' of others users, and 'norms' on when and where to check-in, as reported in Cramer et al., (2011).

Of specific interest in this latter study in which we interviewed and surveyed users of location-sharing service foursquare, was the creation of venues by users that were not universally considered to be 'proper' venues, but were important to them, or expressed the way they perceive a certain location. Sharing location, especially when it led to a mayorship (checking in most



Fragment of Chicago map drawn by one of our participants in Bentley et al., 2012; Drawingthecity.org

to a venue), also highlighted social signals such as ownership and personal identity. Perceptions of desirability of places differ, and social serendipity through place recommendations has to be adapted to individual, social and local circumstances.

### **Connecting to the physical environment**

The issues above to an extent appear to be amplified when introducing physical artifacts into location-based interactions. In the  $\phi$ 2 project (Büttner et al., 2010) for example, users could generate their own QR codes, and scan them using a downloaded app to check-in and share their location on foursquare. Of interest here were not the QR codes - which we consider to have a rather large number of drawbacks (Büttner et al. 2011). The project here rather aimed to explore effects of tighter coupling of location-based media and physical environments, and to explore which issues arise when users are asked to generate infrastructure by placing artifacts such as tags. Data was gathered through a public release of a scanner app (>10,000 downloads, >4500 tags for 2800 venues), and in-depth interviews with 7 trial users and 14 representatives of venues for which barcodes were generated.

Involving the physical environment in interactions, even when using mundane artifacts such as printed barcodes, did not only affect the user's experience in terms of practicality. Rather, the increased visibility and tighter connection with the physical environment increased performative and audience management considerations, highlights issues such as perceived ownership of venues and posed social acceptability issues in adding visible artifacts to buildings. This however does raise the question of how to connect these invisible services with the physical environment

in meaningful manner – echoing the need for our disciplines to connect.

### **Big data & 'apps for buildings'**

The increasing popularity of mobile (location-based) services, combined with the increasing amount of sensors in devices and the built environment, provide a huge opportunity to gain data about people's interaction with their environments, provide them with (hyper)localized information, and adapt the environment to them. For buildings, adapting to individual users and monitoring building performance are opportunities that are being explored by various researchers. As Khan and Hornbaeck (2011) point out, most modern office buildings are equipped with tens of thousands of sensors, all generating sensor data streams already serving a variety of purposes. When sensors, devices, services and data streams are combined, interoperability of protocols and 'standards' from traditionally separate industries, access and proprietary platforms are important factors. Buildings, and cities, also vary widely worldwide – as well as existing specialized practices and systems that the HCI community might not necessarily be familiar with.

Data on an urban scale could also potentially be used to inform data-based urban policy and planning surrounding issues such as mobility, and local trends (e.g. Bawa-Cavia, 2011). However, the massive raw data sets that could be collected, must be aggregated and visualized to be usable; and which questions are most interesting to explore needs input from the fields focusing on the built environment. This also raises the question of who owns the data that is collected. What if your environment is constantly, and unperceivably, sending information about you to other services? How

do we allow users control over their sensor- and actuator-equipped environments? How do we offer 'counter-surveillance'?

### **In short**

Mobile apps aiming to offer new local experiences, and advising people on where to go, are becoming mainstream. Sensors and actuators are rapidly introduced in the physical things, and environment around us (see also Greenfield, 2008; Van Kranenburg, 2008). While these developments offer huge opportunities, they also pose huge challenges and risks– of which only a tiny fraction have been mentioned above. Investment in opportunities for people and their human experiences, rather than just physical structures is crucial (Glaeser, 2011). Arguably, researchers and developers are aiming to transform urban spaces, but if we indeed are to enhance the experience of the physical environment around us, the HCI community has to connect with disciplines that already have an overwhelming breadth of experience in people's interaction with their environments, rather than to re-invent the wheel.

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### **Author**

Henriette Cramer is a sr. researcher at Mobile Life @ SICS in Stockholm. Her research focuses on mobile location-based services, 'Research in the Large' & wide distribution of apps, and users' interaction with autonomous 'things'.

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