The Science of Location:
Why the Wireless Development Community
Needs Geography, Urban Planning, and Architecture

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Abstract. Location-based information services have the potential to become the "killer app" which drives widespread adoption of mobile Internet technologies. Yet, the technology and engineering enterprises driving the development of mobile computing and communications have yet to engage these disciplines and communities in a meaningful way. As a result, applications that effectively and productively bridge the gap between virtual spaces and physical places have been slow to emerge. This position paper argues for an engagement of wireless developers with the 'professions of location' (geography, urban planning, and architecture) whose task it is to understand and design the places in which we live, work, and play.

1 Location-based services as the "Killer App" for wireless Internet.

Mobile Internet has had a troubled history. Throughout the 1990's numerous promises were made that wireless Internet access would soon be ubiquitous. None of these efforts have come to fruition, although ventures like Palm.net and Ricochet have had limited success in a handful of cities. Most recently, the attempts to bring wireless Internet to mobile phones through the Wireless Application Protocol is widely regarded as a failure in the technology press, where the consumer response has been dubbed "WAP-lash" and "WAP-athy." Wireless, mobile Internet remains expensive and fraught with technical problems, although great progress has been made in engineering and marketing during the last 6-12 months.

Much of the reason that wireless Internet has not reached a critical mass is that the available bandwidth is typically inadequate for the desktop network applications which users have grown accustomed to, and few new custom applications designed for the mobile Internet user have emerged. However, it is highly likely that context-awareness will emerge as the "killer app" for mobile computing and communications devices. Location-awareness and location-based services (LBS) will comprise a key component of this context-awareness.

LBS have been around since the 1980s, with the earliest applications such as Lojack, being use for auto theft prevention and recovery. More recently, in the latter half of the 1990s, GPS-based systems have been used for tracking parolees and trucking fleets.

Compelling LBS for personal computing and communications devices are slowly starting to emerge. The most popular are those for navigation of roadways, as well as restaurant and entertainment guides. Some, such as Vindigo, do not even require location-sensing equipment or a wireless connection, instead relying on the user to provide this information manually. In Hong Kong, Hutchinson Telecom offers a match-making service which connects a call between singles in the same neighborhoods whose dating profiles match.

2 Mobile computing, communications, and the 'image of the city'. Assuming that LBS will drive the development and adoption of mobile computing devices, they will have a profound impact on how people perceive and use their homes, workplaces, neighborhoods, and cities.

Kevin Lynch, one of the great pioneers in urban design, performed a series of studies in the 1960's in which he asked people to draw maps of the cities in which they lived. He repeated this with hundreds of subjects in three cities – Boston, Jersey City, and Los Angeles. While each city possessed qualities that generated certain kinds of maps, Lynch found that people all create and carry a mental "image of the city" that they use to order the complexities of urban space in their mind. What was most interesting though, was the typology of elements – districts, nodes, edges – that Lynch found again and again segmented the city in people's mind into digestible chunks.

The urban dwellers Lynch studied - while familiar with the telephone and the television, and even possibly a mainframe terminal at their office – largely built their city "images" through physical interaction with built environment of cities. The same study today would have to take into account the interactions people are having with remote databases and computation, or those stored in their handhelds. These interactions generate new non-physical components for mental map-making, while also dramatically altering perceptions of the physical environment.

One telling example of this occurred recently to a friend of mine. You'll remember that in Tom Wolfe's bestseller, *Bonfire of the Vanities*, the protagonist is thrown into a series of trials after taking an exit off an expressway in the Bronx, getting lost, and striking a pedestrian. It's the classic "urban jungle" theme. My friend, recently in the same situation, merely called 800-555-TELL with his mobile phone and let the TellMe service read him automatic driving directions in response to voice input and commands. A potentially threatening interaction with the urban environment was averted through the processing power of a Geographic Information System located 3,000 miles away in California.

Much of the form and function of cities, in both a social and physical sense, is designed to minimize the time and cost of searching for people and information. The whole host of wireless applications will dramatically change the "cost structure" of the city. You can see this at concerts, clubs, etc where people who arrived separately are locating each other via mobile telephone. Architectural features like the waiting room, or places to meet lose significance when people no longer need to do that. Another example,

one of the most costly and difficult to obtain types of information – meeting celebrities – has been tackled by the *UPOC.com community* "nyc-celebrity-sightings."

But a decline in search costs carries an opportunity cost, one that has always been the lifeblood of cities – a decline in serendipity, the random chance encounters through which we meet friends, colleagues, and even lovers. But that is another paper. In general, my perception is that in idle moments when people used to look to strangers around them for conversation and entertainment, they now look to the familiarity of connections available through their mobiles.

3 Wireless development can gain from the 'professions of location'. I've explained some ways in which mobile technologies and cities are interacting. But what this position paper is really about is how the design of cities[1], and the people who design them, ought to change the way the technologies are designed.

You wouldn't let a software engineer design your house would you? On the other hand, most architects avoid rewriting CAD software for every design project by buying off-the-shelf software. It seems to me that there has been little dialogue between what I'll call the 'professions of location' – geography, urban planning, and architecture – and the wireless development community. While no doubt a number of Geographic Information Systems professionals are playing key roles in the location-based sector, there has not been a systematic

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[1] I use cities as shorthand for 'human settlements' which includes suburbs as well.

engagement of the base of knowledge these disciplines have built up over the years about how people relate to the places where they live, work, and play. Do designers of mobile computers and applications read the work of thoughtful practitioners like Lynch? I sincerely doubt it. And it shows in the poor quality, even naiveté of services and ideas that are being developed. And it's hindering adoption of wireless Internet.

To me, the key issue is that most of the software industry's experience in product design has been for interfaces in highly controlled situations – typically, an office with a desktop computer. There was no need to consider the surrounding environment, because it was largely void of distraction and largely designed to focus the user's attention on the terminal and his/her work. As a result, most development efforts focus purely on the HCI aspects, leaving external factors largely absent. Yet LBS are going to drive computing platforms out into the open, where they must compete with many other things for user attention.

As a representative of this group of disciplines, I must admit that we have failed equally by ignoring these new technologies. The growth of mobile communications and computing technologies has yet to stimulate as much interest from social science researchers as have Internet technologies. As Schemman notes, "even though it seems obvious there must be social consequences… the telephone as well as the mobile telephone have aroused very little academic interest and have received hardly any criticism."

According to technology critic Andy

Seybold, in Japan where mobile I-mode Internet reigns, half of all mobile data connections made occurred inside buildings. (Seybold, 2000) I can't fathom why, confronted with such statistics, wireless developers aren't looking towards architecture, urbanism, and geography for ideas and inspiration.

The sad part is that we both lose from failing to make this connection. People don't buy your products, and we miss a chance to make our cities make more sense.