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URL: **http://www.urban-atmospheres.net/UbiComp2004/**

UbiComp in the Urban Frontier is a one day workshop to be held at the 6th Annual Ubiquitous Computing Conference in Nottingham, England. This workshop will be focused on understand how the rapidly emerging fabric of mobile and wireless computing will influence, disrupt, expand, and be integrated into the social patterns existent within our public urban landscapes.

There is little doubt that laptops, PDAs, and mobile phones have enabled computing to become a truly mobile experience. With these new computing devices, we emerge from our office, work, and school into the urban fabric of our cities and towns. We often view these urban areas as "in-between spaces" – obstacles to traverse from one place to another. However, not only do we spend a significant amount of time in such urban landscapes, but these spaces contribute to our own formulation of identity, community, and self. Much of the richness of life transpires within our own urban settings. Similarly, there is a growing body of work within the field of social computing, particularly those involving social networking such as Tribe, Friendster, and Live Journal. At the intersection of mobile and social computing, we seek to provoke discussion aimed at understanding this emerging space of computing within and across our public urban frontiers.

While toting a laptop around a city may seem a like an example of such city computing, the urban frontiers workshop will be more deeply concerned with addressing several sub-themes, including (but not limited to):

- Place – What is the meaning of various public places? What cues do we use to interpret place and how will Urban Computing re-inform and alter our perception of various places?
- Community – Who are the people we share our city with? How do they influence our urban landscape? Where do we belong in this social space and how do new technologies enable and disrupt feelings of community and belonging?
- Infrastructure – How will buildings, subways, sidewalks, parking meters, and other conventional, physical artifacts on the urban landscape be used and re-appropriated by emerging technology tools?
- Traversal – What is a path or route through a city using these new urban tools? How will navigation and movement, either throughout an entire city or within a small urban space, be influenced by the introduction of Urban Computing technology?

The timing of the Urban Frontiers workshop is aimed at capturing a unique, synergistic moment – expanding urban populations, rapid adoption of Bluetooth mobile devices, and widespread influence of wireless technologies across our urban landscapes. The United Nations has recently reported that 48 percent of the world's population currently live in urban areas and that this number is expected to exceed the 50 percent mark by 2007, thus marking the first time in history that the world will have more urban residents than rural residents. Current studies project Bluetooth-enabled devices to reach 1.4 billion units in 2005 alone. Nearly 400 million new mobile phones are scheduled to be sold worldwide this year alone. WiFi hardware is being deployed at the astonishing rate of one every 4 seconds globally.

We are gathering for an event to expose, deconstruct, and understand the challenges of this newly emerging moment in urban history and its dramatic influence on technology usage and adoption. We invite position papers on topics related to these themes.

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UbiComp in the Urban Frontier

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ABSTRACT

UbiComp in the Urban Frontier captures a unique, synergistic moment – expanding urban populations, rapid adoption of Bluetooth mobile devices, tiny ad hoc sensor networks, and the widespread influence of wireless technologies across our growing urban landscapes. The United Nations recently reported that 48 percent of the world's population current lives in urban areas and that this number is expected to exceed the 50 percent mark world wide by 2007 [1]. In developed nations the number of urban dwellers is even more dramatic – expected to exceed 75%. Current studies project Bluetooth-enabled devices to reach 5.4 billion units by 2005 – five times the number of mobile phones or Internet connections [2]. Mobile phone penetration exceeds 80% of the population in places like the European Union (EU) and parts of Asia [3]. WiFi hardware is being deployed at the astonishing rate of one every 4 seconds globally [4]. We argue that now is the time to initiate inspirational research into the very essence of these newly emerging technological urban spaces. This paper and resulting workshop seek to understand how our future fabric of digital and wireless technologies will influence, disrupt, expand, and be integrated into the social patterns within our public urban landscapes.

Author Key existent words

Urban computing, wireless, public place, WiFi, community, Situationist, *dérive*, *détournement,* mobility, socio-techno infrastructure, urbanism

INTRODUCTION

There is little doubt that laptops, PDAs, and mobile phones have enabled computing to become a truly mobile experience. With these new computing devices, we emerge from our office, work, and school into the urban fabric of our cities and towns. We often view these urban areas as "in-between spaces" – obstacles to traverse from one place to another. However, not only do we spend a significant amount of time in such urban landscapes, but these spaces contribute to our own formulation of identity, community, and self. Much of the richness of life transpires within our own urban settings. The introduction of mobile computing tools upon our urban landscape affords new methods of viewing our city, community, and neighborhood. They can empower us to better understand our social relationship to community, place, and self. Similarly, there is a growing body of work within the field of social computing, particularly those involving social networking such as Tribe, Friendster, and Live Journal. At the intersection of mobile and social computing, we call for a discussion concerning research directed at understand this emerging space of computing within and across our public urban landscapes – technology at the urban frontier.

URBAN LIFE

While toting a laptop around a city may seem a like an example of such city computing, Urban Computing research is more deeply concerned with addressing deeply human issues and concerns embedded within urban living.

While Urban Computing is focused on understanding technological effects on the urban landscape, it's important to reflect on urban life itself. We explore the meaning of our living urban landscapes and then return to the discussion of Urban Computing.

The spectacular image of the modern urban city is that of a facilitator of commercial exchange, a place where people go to shop: the city as mall. The city is also a workplace – a center for government and business functions. While work, commerce, and business are the focus of cities, it is also a place for individuals and communities – a place where people can play. People come there to eat, drink, dance, meet friends, and just hang out. The potential for sociable exchange and the pursuit of happiness is vast. For its workers, the city also provides leisure zones – what Foucault calls "sites of temporary relaxation" [3].

However, the nature and locations of these social encounters are not always predictable. Whyte's "Street Life Project" [4] observed that usage of New York's downtown plazas varied wildly and bore little relation to extant

theories of constructed space. Similarly, Lynch and Milgram exposed the difference between peoples' mental maps of the city and the physical city plan [5, 6]. Jacobs discusses the creation of small neighborhoods in cities [7].

Public urban spaces also manifest a degree of anxiety and fear. The 1964 murder of Kitty Genovese exposed the tenuous and conditional links urban dwellers have to their neighbors and community of Familiar Strangers [8]. Genovese was murdered on the streets of New York City while her neighbors listened to her die. Not one called the police or came to her aid [9]. Afraid for their own safety unable to even telephone the police for help.

While massive physical changes are still rare in urban settings, a new social-technical landscape is emerging. Massive "invisible" changes are taking places through networks of technologies that enable behavior in urban spaces to transgress the lines and protocols between public and private space, altering understandings of time and space. Boundaries between home, office, automobile, and street are increasingly blurred [10]. Jain exposed how individuals used mobile phones within a city to influence the nature, negotiation, and navigation of urban space [11].

Guy Debord and the Situationists [12] sought to reinvent everyday life in urban spaces by constructing situations which disrupted the ordinary and normal in order to jolt people out of their customary ways of thinking and acting. Using *dérive* (the urban flow of acts and encounters) and *détournement* (rerouting of events and images), the Situationist developed a number of experimental techniques that stressed the relationship between events, the environment, and its participants – our urban community.

As computer and social scientists we have the responsibility to look critically at such underlying forces and trends. In this workshop we take the urbanist's perspective on the application of these new technologies within cities by their inhabitants. We think of the city not simply in spatial terms or temporal rhythms but also in terms of flows of people, information, signs, images, and artifacts. We are interested in the movement and activities of people as well as the familiar patterns [13] that comfort individuals within our seemingly chaotic, crowded urban landscape.

URBAN UBICOMP

Only very recently have we seen the playful re-appropriation and novel uses of wireless devices and personal technologies in urban spaces. Such spaces contain trace elements of themes often found in traditional ubiquitous computing literature such as those exploring the ubiquity of computing devices in the home, office, school, automobile, *etc*. However, urban landscapes are both crowded and lonely, comforting and frightening, public and private, and shared and exclusive. Urban places and our actions there are critical to forming our understanding of community and belonging – often without direct interactions with members of the community. Overall, while Urban Computing can draw from foundations in ubiquitous computing, we argue that it diverges significantly from traditional computing spaces, actions, objects, and communities. Furthermore, with mobile and wireless devices in their infancy of adoption in urban life, we argue for an open research forum aimed at promoting a broad inspiration of urban possibilities. This calls for new techniques and methods to engage and explore this field.

COMMUNITY

Who are the people we share our city with? How do they influence our urban landscape? Where do we belong in this social space? How do we understand "us" and "them" as we move through time and space? How are communities enabled to share space or fortress themselves with new urban technologies? How do new technologies enable and disrupt feelings of community and belonging? How will new technologies enable or collapse social and psychological geographies of urban areas? How are understandings of boundaries of public verses private changing? How do current designs and thinking in UbiComp blur the boundaries in good and bad ways? Social movements have played key roles in technology use, in adoption and rejection. How might the cultural movements of rights for women, gay people, the differently abeled, ethnic minorities, older people, younger people and spiritual minorities affect and be affected in an urban UbiComp environment?

INFRASTRUCTURE

How will buildings, subways, sidewalks, parking meters, and other conventional, physical artifacts on the urban landscape be used and re-appropriated by emerging technology tools? What do UbiComp designers need to know about environmental and urban design? What is the role for UbiComp in this space – solving timeless problems of urban design in new ways, improving existing solutions, or causing new problems!? How does UbiComp in the urban frontier exploit, augment, interfere, and supplement physical environments and the perception of the urban? What problems are faced in UbiComp design as it approaches an urban infrastructural landscape that is characterized by fragmentation?

FLOWS

What are the paths or routes through a city using these new urban tools? How will navigation and movement, either throughout an entire city or within a small urban space, be influenced by the introduction of urban technologies? How do we design for movement, rather than the stasis? How will flows in and between urban environments develop? Where will the social-technical networks merge and separate, and how can we design for this heterogeneity?

APPLICATIONS

Although clearly UbiComp has imagined many obvious location based applications, we hope to push the conversation toward more challenging research and design

issues in the urban landscape like "limited attention budget" that urban dwellers have or "designing for difference."

URBAN INTERFACES

What sort of things will be made and why? Where shall we begin the imaginative exploration of potential interfaces and hardware? Should inputs and outputs be more heterogeneous? What about interfaces beyond the visual such as sound, touch and smell? In the urban environment, is there a need to design around ruggedness? If so, what does "rugged" mean in an urban interface? How will we handle scale and group usage "ruggedness"?

CITY AS OPEN SOURCE

The urban is an environment that can be considered an infrastructure environment. It is through these systems that UbiComp can and will happen. This raises questions of what is the right balance between user-provided and environment-provided capability. For example, do I need to buy a WAN cellular wireless connection or should I assume good places have open WiFi? What is the role of authentication in an urban environment? What can the grass roots WiFi initiatives tell us about UbiComp? What ownership issues arise from the expected provision of services and devices? What concerns for design emerge from the urban digital divides?

URBAN PROBES

We have a unique opportunity, right now, to invigorate the very role that technology will play in our cities. We argue for an approach that encourages a divergent brainstorming style, perhaps even away from practical applications, to promote rapid discovery of radical potential ideas, devices, applications, and interactions. Primarily, this research investigation should begin before urban inhabitants acquire strong mental models and expectations of a suite of standardized urban applications.

We argue that now is the time to initiate inspirational research into the very essence of our newly emerging urban spaces. We encourage urban inhabitants to become proactive in the evolving and future design of our urban landscapes. In the spirit of cultural [14, 15] and technology probes [16] we propose a lightweight, provocative, inspirational research methodology for exploring computing in urban environments – Urban Probes

GOALS OF THE WORKSHOP

Taking the above perspectives as a springboard for discussion, this workshop has the following aims:

- To bring together a multi-disciplinary group of practitioners to discus how our future fabric of digital and wireless computing will influence, disrupt, expand, and be integrated into the social patterns existent within our public urban landscapes.
- To elaborate new methods and models in design practice that can accommodate designing technology for urban environments and lifestyles.
- To develop an agenda for future collaborations, research and design in the area of urban computing and identify critical opportunities in this space.

CONCLUSION

The very essence of place and community are being redefined by personal wireless digital tools and mobile devices that transcend traditional physical constrains of time and space. New metaphors for visualizing, interacting, and interpreting the real-time ebb and flow of urban spaces are certain to emerge. Without a concerted effort to develop a deeper understanding of the implications of emerging technologies on our urban landscape, computer and social scientists, city planners, and others run the risk of losing touch with the reality of our urban streets and their inhabitants. The UbiComp in the Urban Frontier workshop aims to provide a starting point for exploring, deconstructing, and understanding our urban landscapes as well as empowering city dwellers to participate in the construction of their newly emerging digital city landscape.

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Wirelessness and urban spaital organization

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The major argument of this position paper is that whereas ubiquitous adoption of wireless technologies may change the overall behavior of urbanites in urban space and its use, these changes do not necessarily imply and involve major changes in current urban spatial organization of land-uses. Thus, the focus here is on space, rather than on people.

Several writers referred in recent years to mobile and wireless communications devices as changing urban behavior. Kopomaa [3] stated that mobile telephony put the sharing of information back into the public sphere, thus turning the mobile telephone into a place by itself, complementing the home and working place, and permitting increased personal physical mobility. Contemporary urbanites, notably those dwelling in metropolitan areas of developed economies, equipped with private cars driven on expressways, as well as with mobile information appliances, were called by Castells [1] and by Prato and Trivero [5] *nomadic workers*, with their "office on the run"(see also [7], 288 and [6]). Workers may currently work both in their offices or in their homes, as well as while traveling, creating what Castells termed an *individualization of working arrangements*, with all the work arrangements networked individually for each worker through the Internet. As consumers, these urbanites may use the Internet to compare prices of a certain material product, and then purchase it physically in a store, or *vice versa*. Gillespie and Richardson ([2], 242) interpreted these changes in work and consumer activities as an expansion of individuals' *activity spaces*, creating *hypermobility*.

It seems as if an aggregate change of behavior and use of urban space may bring about some change in urban spatial organization, and *vice versa*. However, the cumulative experience of major transportation and communications technologies has been far from decisive. On the one hand, urban railways, whether trolleys or subways, followed by the automobile, have facilitated the extensive urban expansion and suburbanization, typical of modern urban development. By the same token, the much later introduction of information and communications technologies has permitted the differentiation and geographical separation between front and back offices, and the development of extensive edge cities in suburbia and exurbia. On the other hand, however, the ubiquitous adoption of the telephone by both businesses and households has not brought about nor has it facilitated any significant change in urban spatial organization of the magnitude described for transportation and ICT innovations. The telephone and its associated changes in personal and social conduct have rather facilitated a more efficient and convenient use of and adaptation to existent urban spatial organization.

Mobile communications technologies, whether for telephony, the Internet, visual transmissions, and other possible applications, seem to constitute an extension of the conventional wired telephone in its limited significance for possibly changing urban spatial organization, rather than to wired ICTs and their extensive ramifications to urban structure. An urbanite equipped with wireless communications devices may use travel time for work, and may attempt at a more efficient use of urban space through location-based services. By the same token, the communications between various sites in cities, e.g. stations of emergency services and emergencies occurring elsewhere may be more efficient. However, the very locations and land-uses within cities may not change dramatically.

In other words, the behavior of urbanites in cities may change dramatically with mobile computing and communications, making it much easier to move about cities and making use of their land-uses. However, the very idea of mobile computing and communications implies that information may be received and transmitted anywhere, regardless of any existing spatial organization. Why, then, should the spatial organization of a city change in parallel, or as a result, of mobile computing and communications? Such "no change" of spatial organization may imply tremendous aggregate savings, as the current spatial structure becomes more effective for its use by urbanites through ubicomp, without investments in physical restructuring, as has been the case regarding the adoption of new transportation modes at the time.

The adoption of previous transportation and communications technologies and their associated changes in urban spatial organization occurred first in American cities. In the case of wireless communications technologies attention should focus on Asian cities, notably Seoul and Tokyo, which lead in the adoption of wireless devices. Seoul currently enjoys some 20% of the world's hotspots [4].

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Biography:

Aharon Kellerman is Professor of Geography and Vice-President for Administration at the University of Haifa, Israel. He earned his Ph.D. at Boston University (1976), and he specializes in the geographies of telecommunications and information. Among the books he authored two are in these areas: *Telecommunications and Geography* (London: Halstead/Wiley, 1993), and *The Internet on Earth: A Geography of Information* (London and New York: Wiley, 2002). Professor Kellerman serves as the chair of the Commission on the Geography of the Information Society of the International Geographical Union (IGU). He held visiting positions at the universities of Miami, Maryland, Bar-Ilan and Ben-Gurion, was a Fulbright Scholar, and will become Research Fellow at the Oxford Internet Institute (October).

Converting Crowds of People to Advantage: Application to a Lost and Found System

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ABSTRACT
High population density is an annoying problem in metropolitan areas. However, recent trend of implementing wireless LAN interfaces and RFIDs onto mobile phones can turn such crowds of people into an advantage. In this paper we propose a system of lost and found for public-transportation passengers and discuss its pros and cons.

Keywords
RFID, wireless LAN, association, ad hoc networks

INTRODUCTION
Intense concentration of population can cause many problems in large cities. These problems vary from an environmental aspect to congested traffic. However, in some cases, crowds of people which cannot be expected in rural areas can help designing a communication system using multi-hop data transfer.

There has been a tremendous progress in short-range wireless communications in recent years. In particular, RFIDs are commonly used for detecting devices, although most applications are still in the stage of experiments. We can expect wide coverage of detecting devices by combining IEEE 802.11b LANs and RFIDs. As such an application, we propose a lost and found system for public-transportation passengers.

We believe that ubiquitous personal lost and found systems are realized using RFIDs, wireless LANs, and Mobile IPv6 [3]. Towards this vision, we are building a prototype system called CRUISE/r. The main features of CRUISE/r are the following.

- implicit and periodical probing of proximity of objects
- immediate initiation of tracing lost objects
- use of other people's cooperation

Assumptions
To design people-assisted lost and found systems, especially for public-transportation passengers, we assume the following.

- People bring mobile phones equipped with a wireless LAN interface and an RFID reader. The mobile phones have computing capabilities such as maintaining database.

- Every personal belonging held by a passenger is assigned a unique ID. The ID is embedded into an RFID tag.

Although we cannot expect the above assumptions as of the year 2004, we will see the rapid progress of technologies related to mobile phones and RFID that can achieve the assumptions.

System Design
We define the following terms.

Personal OBjects (POBs): Personal belongings held by a passenger.

Personal Pobs Assisting Devices (PPADs): Devices that passengers always carry.

Object Information Managers (OIMs): Stations to detect PPADs within their IEEE 802.11b communication range. Usually OIMs are placed inside stations. However, some OIMs are installed inside trains.

OIM cells: Communication areas that each OIM can cover.

Grouping of Devices
When a passenger begins his journey, his PPAD detects IDs of POBs which are registered into the POB database inside the PPAD. Thus grouping of POBs and a PPAD is conducted implicitly. The PPAD polls the existence of POBs continuously and thus maintains the relationship between the PPAD and registered POBs.

Figure 1 Passengers at railroad stations

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Network Connectivity

A PPAD is equipped with IEEE 802.11b in addition to a short range RFID reader. OIMs also use IEEE 802.11b to communicate with PPADs within their cell. To record the route of journey, a PPAD periodically obtains IPv6 addresses of OIMs which can be unique IDs of OIMs. In contrast to OIMs that are fixed to station areas, OIMs inside trains are mobile. To cope with this mobility, mobile OIMs use Mobile IPv6 addresses that are assigned to their home cell. Note that all areas are not necessarily covered with OIM cells; only areas where passengers are likely to pass by are covered with OIM communication cells.

Object Discovery Process

We define a protocol called Ad hoc POB Discovery Protocol (APDP). APDP discovers the location of a POB by relaying discovery requests through OIMs and PPADs. The main feature in APDP is utilization of other people's PPADs since OIMs themselves cannot detect POBs. Once a PPAD determines that a POB is lost, one component of PPAD, which we call SPPAD, identifies the IPv6 address of the OIM that is expected to exist near the lost POB. Let TOIM represent such an OIM. Since some OIMs might not have been recorded into the PPAD, the POB may exist in a cell of another OIM near the TOIM.

The SPPAD sends an APDP_DISCOVER_REQUEST message with the ID of the lost POB to the TOIM. Upon receiving the message, the TOIM broadcasts the message within its cell assuming that several PPADs exist in the cell. A PPAD that has received the message initiates search for the requested ID using RFID communication. If the ID is detected, the PPAD sends an APDP_DISCOVER_RESPONSE message to the TOIM, which forwards the response message to the SPPAD.

Discussions

CRUISE/r relies on assistance from other people's PPADs. Therefore several uncertainties arise to realize the complete discovery process. First, the communication range should be large enough to find another POB. Although a range of a few meters is sufficient for identifying own POBs, a larger range is required to detect other people's POBs. This leads to a tradeoff between the size of RFID readers and communication range. Second, sufficient number of people need to exist in an OIM cell. Thus CRUISE/r implicitly assumes that the system is used in metropolitan crowded areas. Therefore we need to think about the benefits to people who help detect other person’s device. Participants to this system should be given an economical award. For instance, fares for passengers to join CRUISE/r may be reduced.

These two factors are limitation to the deployment of CRUISE/r. To promote such a system of cooperation to other people, we need a social consensus of cooperation.

Another challenge is avoiding malicious messages and SPAM messages which are already seen in the Internet. We also need to consider techniques of filtering undesirable messages. Similarly, but as a different aspect, personal information can remain in other people’s devices. This can lead to undesirable proliferation of personal information.

Related Works

Smart-Its[2] exploits an explicit interaction for grouping devices. Smart-Its devices integrate sensing, processing, and wireless communication for connecting smart artifacts. In the concept of Smart-Its friends, multiple devices that are shaken together and have the same acceleration pattern, they are considered to belong to the same group. This concept can be extended to implicit grouping of devices [1]. When multiple everyday objects experience the same acceleration pattern, then these objects are treated as members of the same group. Although CRUISE/r does not provide this type of grouping, devices can transfer the association to each other.

As a routing protocol used for sending packets to a destination without its identified location, epidemic routing [3] was proposed. This protocol utilizes users' mobility to deliver messages. In contrast to epidemic routing, routing used in CRUISE/r can limit the broadcasting area based on the history of the location of PPAD.

Summary

We have proposed a system of lost and found system utilizing high density of people in public spaces in metropolitan area. This system relies on an assumption that many people bring mobile phones that can help communications for the sake of other people. The deployment of such a system needs a social consensus.

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Biography

Yoshito Tobe obtained B.E. from the University of Tokyo, M.S. from Carnegie Mellon University, and Ph.D. from Keio University, in 1984, 1992, 2000, respectively. He is currently a professor at Tokyo Denki University. His research interests include ad hoc and sensor networks for ubiquitous computing.

Neo-nomads and the Nature of the Spaces of Flows

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ABSTRACT
In this paper we are posing the paradoxical realm of neo-nomads and the spaces that characterize them.

General Terms
Design, Theory.

Keywords
Information society, mobility, neo-nomads, places.

1. INTRODUCTION
Today, we observe an increase in mobility, people being able to travel "everywhere" they are permitted to for work, living and leisure while staying connected from "anywhere" in the global matrix. In this space of mobile populations, goods, and information, a new breed of nomads arises, as dependant of the environments they travel in as traditional nomads. These new nomads, neo-nomads, are technologically geared and pass through environments, essentially urban, which offer the receptive milieu they need to survive. These nomads are no "Flâneurs." [1] They move purposefully, and fast usually.

If anywhere and everywhere is their realm, and in a time where there is no limits to roaming, be it mental or physical one wonders how these new nomads assert a sense of belonging to a place, and what is the nature and extent of their territory.

2. NEO-NOMADS…
2.1 Dematerialization of Architecture
Already in the analysis of the information age, dynamic spatial metaphors such as "*Network*," "*Space of flows*" and "*variable geometry*" proliferate. In the space of global interconnectivity, mobility arises at different levels, at the physical level, and at the mental level. First, physical mobility occurs as transportation becomes more important, and faster, linking territories, while at the same time, giving the impression of a spatial shrinkage because of the facility and the time spent traveling. Second, digital technologies like the internet (e-mails, chat rooms…) enable the mental roaming of populations, reaching out in search for connection with family members or people with similar interests. As Castells writes, "*The increasing diversification and fragmentation of social interests in the network society, results in their aggregation under the form of (re)constructed identities*." [2] Sometimes both occur, as the mental roaming enables physical shifts—and vice versa.

How does the architecture embody and enable mobility in the information age? For instance, today in Europe, you can purchase bus tickets… online. An electronic data is then sent to your mobile phone, which displays a bar code to be scanned. This is your ticket, an electronic data. A machine in the bus will read it, and validate it. Thus, while the mobile phone becomes the indispensable—precious—urban tool (also object of theft), it also participates to a reduction of paper use. Certainly however, the ticket "*dematerializes*." [3] So does the infrastructure around the traditional ticket, since no more distributors would be needed in the urban environment. In fact, personal assistants (PDA, mobile phones) now serve to open doors, and enable (if not channel, as it introduces another social divide) mobility. There are many further examples that prelude a fundamental shift in the making of architecture and cities. For example the advent of internet shopping, has many drawbacks as Steve Woolgar claims in "*Five Rules of Virtuality*." As online shopping becomes more popular, traffic gets congested of delivery vehicles, introducing the need for storage spaces, and larger roads infrastructure. [4] Thus the society of online shopping and also the automats (mini oases where urban nomads stop), is building a meta-architecture of storage space. When globalization and technology participate to the shifting and transforming of territorial boundaries, one must wonder what the new architecture in the making, and the new spatial relationships are between the individual and his environment.

Can we, as Antoine Picon writes about his cyborg, envision a spatiality that remains of the domain of architecture and urban design? [5] If the bus ticket dematerialized to be read from a portable device, what does it mean for the infrastructure and the architecture of the city that traditionally was build around the needed ticket providers, cashiers…etc…? As another example, when one no longer needs, in theory, to work in a particular office to be connected, what does it mean for the planning of office buildings? Are we going toward the making of a generic and dematerialized city?

2.2 Non-Places

In *Non-Places*, Marc Augé examines the new relationship between the body, time and space. He characterizes supermodernity as the convergence of "*three figures of excess*," the "*overabundance of events, spatial overabundance*, [and] *the individualization of references*." [6] Indeed, we are in an era of "*Change of scales*," a time "*Homogeneous in its diversity*," where "*We may not know them* [landscapes] *personally, but we recognize them*." We are in fact living in a time of paradoxes. Neo-nomads embody these paradoxes as they are the figures of supermodernity. For Marc Augé "*If a place can be defined as relational, historical, and concerned with identity, then a space which cannot be defined as relational, or historical, or concerned with identity will be a non-place*." His hypothesis is that "*supermodernity produces non-places*," like airports and railways. To that, one could add the information highway or "*Infobahn*," as Bill Mitchell calls it in his *City of Bits*. The spaces neo-nomads inhabit, as they want to be near and far, have one identity and endorse new ones, are exactly what Marc Augé has called "*non-places*." Even temporarily inhabited, they become legitimate living places. Hence neo-nomads move in a succession of temporarily inhabited places, to which they relate, and thus to which they define an identity, however ephemeral.

Neo-nomads, these technologically geared individuals, are the figures through which "non-places," regain their status of "places."

2.3 Negotiation of Territories

The question hence arises as to how neo-nomads negotiate their territory? For example, in their study of "*everyday use of mobile telecommunication*," scientists "*demonstrate how devices apparently designed to render location insignificant are in fact always used within, and with reference to, a particular local context. They note some of the myriad ways in which posture, gaze and gesture are used to negotiate the boundaries between the private and public, and consider the argument that mobile usages are part of a contemporary reconfiguration of space and time. Their careful assessment of various competing propositions about the determinative effects of mobile technologies leads them to urge caution in adopting summary views of the impacts of mobile technologies upon societies*." [4] If anything becomes transportable, from memories to beings, via the means of memory chips, or transportation infrastructures how neo-nomads give an identity to a place and, alternatively how architecture for people on the move does adapt to new needs?

Digital technology, greatly participates to the fragmentation, individualization, then recombination and ultimately the redefinition of territories. At the nano scale, the body can be decoded, re-engineered, and hybridized. Families become "*recombinant families*," changing the space of interaction in which family members interact (interactions do not anymore occur in one space, traditionally the family house). [7] At the same time, people engineer a plethora of portable objects and technologies born from the need to travel and the need to connect—the need to reach from anywhere. As such, a new experiment like the "*Radio Logicielle*," or "*Software-Defined Radio*," [8] is an attempt to overcome the multiplicity of norms, and versions of mobile technologies like 3G and WiFi among others, by allowing a continuous connection, switching automatically from one to another, no matter the type of receptivity in the environment. Hence technologies themselves somewhat re-aggregate, disappear almost, allowing for a continuous and smooth connectivity while on the move. With chips embedded under our skin, and receptors in the architectural environment, one can open doors without having to touch a handle. Distributed and embedded computation and technologies have become a trend.

Such re-arrangement of space and identities raise the question of their new inter-locking. In order to define the architecture in the making, the thesis might be that neo-nomads transform "*non-places*" into "*places*," using new technologies.

3. ACKNOWLEDGMENTS

My thanks to Antoine Picon, my thesis advisor, and Edith Ackermann, member of my thesis committee, at Harvard University.

4. BIOGRAPHY

Yasmine Abbas is a French professional architect (Paris UP4, 1997) and holds a Master of Science in Architecture Studies from the Massachusetts Institute of Technology (MIT 2001), where she interacts with the Design Inquiry and the Intelligent Kinetic Systems groups. She is now a Doctorate Candidate at the Harvard Graduate School of Design (GSD 2006), for further research on technologies and space making. Hybrid and nomad, she has lived and practiced internationally.

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Getting Out of the City: Meaning and Structure in Everyday Encounters with Space

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ABSTRACT

In an article on the informational aspects of the biodiversity movement, Bowker (2000) notes a fundamental iniquity in biodiversity spending. Although there are literally millions of species of beetle, it's hard to get funds to preserve their diversity, while it's easy to generate support for protecting species like elk, moose, or bison. These are what are known in biodiversity circles as the "charismatic megafauna." Similar charismatic prototypes tend to be evoked when we think of urban space, engendering a focus on San Francisco, New York, Paris, Madrid, Tokyo, and other "charismatic megalopoles," at the expense of others – Shanghai, Istanbul, Jakarta, San Palo, Mexico City, KL, Cairo – and an even wider range of other urban spaces, both big and small, within our comfort zones and without.

Here, we want to focus not so much on a celebration of urban form, but on human encounters with urban (and other) environments. We are concerned with people's experience of urban and other landscapes; not least because it is this experience that is disrupted and transformed when new technological opportunities enter those spaces.

At the heart of this is a concern with the many layerings of infrastructures in any urban environment. This is a layering of many sorts. First, a physical layering; most cities exhibit complex topologies that operate on more than simply three dimensions. Second, there is a historical layering; physical settings reflect aspects of their historical evolution. And third, there is a layering of many forms of cultural experience – religious, secular, commercial, civic, communal, familial, and more.

Kevin Lynch has perhaps most famously explored this question of the urban environment as encountered by the people who occupy it (Lynch, 1960.) In Boston and other cities, he conducted studies of the imageability of the city and the ways in which people thought about its structure in terms of their own movements through it. The Boston that his subjects describe is not a Boston of grids and precise measures; it is one of loosely-defined regions, paths, landmarks, and networks. Lynch helps illuminate how the ways in which people encounter a space, and find it structured for them in terms of their opportunities to act, can yield many different ways to see it and experience it.

In his book "Imaginary Cartographies," Daniel Smail explores the emergence of a primary aspect of our experience of urban settings – street addressing – in medieval Marseille. In the 1400's, street addressing as a form of reference had yet to emerge. In the records that Smail explores, there are three competing forms of location identification. The first is a form of navigation by regions and neighborhoods; informal understandings of the city in terms of the people who live there, the work that they do, the churches that they attend, and so forth. The second is a form of navigation by landmarks; squares, statues, churches, civil buildings, and so forth. The third is based not on streets but on "islands," what we would call city blocks. Interestingly, this view seems to color the entire experience of the city; businesses cluster not on streets, but on islands, so that one has the Island of the Shoemakers, or fish merchants, and so on. Lynch talks of the ways in which people imagine cities, but these imaginary cartographies are much more radically different from our own, and really condition our experience of the city.

In Smail's Marseille, the idea of streets as the primary way in which location should be described emerges only slowly, and its appearance seems to be conditioned by a couple of factors. One is that there is little need for most people to be able to refer to location anyway, because they simply don't exhibit the kinds of mobility that we associate with cities. That is not their experience of the city; they don't roam around it. The first people who need to be able to identify locations are those who own the buildings; but they tend to own islands, so that's just fine. Streets start to become more relevant to the notaries who draw up contracts for a wide range of interactions and exchanges (far more than we would, today, appeal to a lawyer for.) They need to be able to identify people by their residences. But – and this is the key part – the notaries do move around the city. They are the first people who, on a consistent basis, start to think about the city in terms of navigation, and for whom the streets become figure rather than ground.

Cities, then, are layerings of infrastructures (McCullough, 2004). We read infrastructure broadly here: not just power, water, and sewage, but other infrastructures that define elements of the experience of space. The naming of streets is an infrastructure for encountering and experiencing the city – street naming defines patterns of sameness and difference that critically define what you see when you look around you. Of course, some urban areas never name their

streets at all but rely on a set of socio-spatial directions to guide an individual or mark a journey. In this way, certain cities become untraversable to those not already resident within them – the location markers are not abstract demonstrations of the city, but concrete manifestations of social relationships, historical events and institutional memories.

We have many different infrastructures that define one's experience. Transportation systems are an obvious example. For example, when first visiting London and traveling on the Underground, one's experience of the city is of a series of islands connected by Tube stops – until one day you walk down the street, realize that some of those stops were only a couple of blocks apart, and start to experience the city as a continuous phenomenon. Religious sites, or institutions (i.e. churches, temples, mosques) suggest a different sort of urban infrastructure. Not simply as destination in and of themselves – fixed points on a particular sort of encounter within a city as resident, tourist or pilgrim – but also as manifestations of inter and intra-urban connections. School children in Britain, and ironically all over the former British Commonwealth, grew up with mnemonic to remember the various sounds of London's churches – a city's soundscape reflected as nursery rhyme so one was never lost. In contra-distinction, mosques all over the world orient themselves to Mecca – Islam's holiest city – suggesting a different kind of invisible geography or infrastructure rarely accounted for in current theorizing of the city or the mobile technologies therein. Traffic flows, parking patterns, service times, calls to prayer, regions and neighborhoods, these are all things infrastructures that shape one's experience by making it meaningful in different ways.

Ubiquitous computing technologies add new infrastructural layers. Ever had to wander around an unfamiliar city trying to guess where there might be an Internet café? Or used your G3 handset to locate Mecca and discern the appropriate local time to pray? Or how about having to step around the corner to get a better cell phone signal? Choosing a hotel on the basis of 802.11b or GPRS coverage? Wireless technologies impose new physical infrastructures that are invisibly layered on the existing visible physical world. How could you walk across the room without ever letting the cell phone in your pocket come within range of another Bluetooth device?

The central argument here is that spaces have structure and meaning for us in terms of our relationship to a variety of infrastructures of action and interpretation. Schegloff (1972) notes the range of ways in which place is formulated in conversation, and shows that the interactional determination of an adequate formulation is much more than simply a selection from a hierarchy of degrees of ambiguity. Critically, this experiential aspect of space is not simply a feature of urban living; it applies too in thoroughly non-urban settings. Through a range of telling examples, Goodwin (1994) argues that "the ability to see a meaningful event is not a transparent, psychological process but instead a socially situated activity accomplished through the deployment of a range of historically constituted discursive practices." Australian aboriginal peoples, for example, experience the land in terms of the way that their lineage lines confer a ritual responsibility for the land; not just for protecting it, but for dreaming it into existence. On a more local level, they also experience it in terms of the intersection of patterns of habitation and kinship structures; places where I might encounter my second cousins, etc. This structuring of space is every bit as meaningful and present as my experience of cities as the set of places reached via the J Line, or those areas where we might expect to find a good martini.

From these perspectives, we draw a number of conclusions. The first is that space is organized *not just physically but culturally*; cultural understandings provide a frame for encountering space as meaningful and coherent, and for relating it to human activities. Cross-cultural explorations of urban experience can draw attention to these issues.

The second is that *architecture is all about boundaries and transitions and their intersection with human and social practice*. That's really what we're talking about when we talk about mobile computing and networking in urban settings. We need to think architecturally about the mobile and wireless technologies that we develop and deploy, the human side of infrastructures.

The third is that *new technologies inherently cause people to re-encounter spaces*. This isn't a question of mediation, but rather one of simultaneous layering. The fascinating thing about the move from the systems we built on the wired internet to those that we experience through wireless and mobile networks is that we are creating not a virtual but a thoroughly physical infrastructure, and we need to think about it as one that is interwoven with the existing physical structure of space.

Finally, there is *already a complex interaction between space, infrastructure, culture, and experience*. The spaces into which new technologies are deployed are not stable, not uniform, and not given. Technology can destabilize and transform these interactions, but will only ever be one part of the mix. We need to design not simply for settings, but for the processes by practice and meaning evolve.

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Not in Karlsplatz anymore: Navigating Cities Together

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ABSTRACT
Support for asynchronous navigation of city spaces via location-specific annotation is a promising research area, but does not cover all ways that people can help each other navigate. This position paper discusses the motivation for and design of three studies being conducted concurrently at our lab, each exploring ways that technology can support synchronous navigation by groups of people in urban environments.

Categories and Subject Descriptors
H5.3. [**Information interfaces and presentation (e.g., HCI)**]: Group and Organization Interfaces – *collaborative computing, evaluation/methodology.*

General Terms
Design, Experimentation, Human Factors.

Keywords
Group navigation.

1. INTRODUCTION
When navigating city streets, we bring with us a deep awareness of being in a social space. As we engage with the city environment we rely on cues, context, and communication provided by others directly and indirectly. Social convention gives us license to approach strangers for directions, and a stranger might approach us if we appear lost while looking at a map. We readily share our city knowledge and navigational expertise.

Maps themselves are a communicative medium, combining in their design knowledge of human cognition, formal models of sign communication (semiotics), and an understanding of how maps are interpreted 'lexically' by individuals [3]. It is important to realize, however, that reading maps in public is often done collaboratively. Collaborative use of maps adds an additional social dimension that must be appreciated if we are to develop systems that support navigation in urban spaces.

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At the EDGE lab, we are exploring ways in which technology can support groups of people when navigating foreign and familiar urban spaces using maps and other aids.

2. GROUP NAVIGATION
Our efforts have been inspired by personal experiences touring Vienna while attending a recent conference. One evening while traveling in a large group we needed to find the location of a party. Even with two maps and a one-time Vienna native, locating the party did not give us enough information to determine the best way to get there (by foot, by cab, city bus, etc). Only after many turns looking at the maps, miscommunication, and much debate, we decided to take taxis. After another party, a group of people decided to go to a nightclub. There were too many people to take a single cab, so we decided to meet at a common meeting place before heading to a nightclub. That meeting place was Karlsplatz. Unfortunately, Karlsplatz encompasses several city blocks in Vienna – after much effort only two of five groups actually met up with each other at our agreed meeting point.

Our experiences led us to consider how technology could support synchronous navigation by groups of people. Such technology might increase the quality of communication by promoting awareness of one another's actions and intentions, or by providing shared visual aids. It might reduce the chances of navigation error by making information available when needed, or by supporting group problem solving approaches. We are exploring three simple prototypes (see Table 1), each designed to explore the subtle ways in which technology can impact group navigation.

Marked up Maps looks at how an RFID-tagged paper map can be used with handhelds to support co-located group navigation.

Coordinated Views looks at how sharing common views with handheld computers assists groups when navigating together. This project also examines how a synchronized view with a remote guide might be useful.

Rendezvousing is concerned with how awareness of one another's location may facilitate meeting in public spaces.

Table 1. Prototypes/studies and their focuses

Study	Artifacts	Remote / Co-located	Annotation	Shared View
Marked up Maps	Yes	Co-located	No	Paper map
Coordinated Views	No	Both	Yes	Optional
Rendezvous	No	Remote	No	Yes

Our inital approach is best described as a summer navigation blitz. Lab researchers will test interfaces by conducting navigation activities themselves in either complete studies or extended pilots. Using ourselves as participants is possible because we navigate, and practical because setting up experiments for evaluation in context can be expensive and time consuming. After these initial field trials, our prototypes, methodologies, and the questions we wish to focus on will be refined. Field trials with recruited participants can then begin. Because we are not directly comparing each technological support, the three studies are allowed to evolve as appropriate for their specific line of inquiry. This will allow us to explore a range of methodologies for conducting context-based research of this kind, and employ different activities (sightseeing, rendezvousing in a mall, scavenger hunts and other navigational games). This keeps each study fun, fresh, and interesting.

2.1 Coordinated Views

Sharing a single handheld device means individuals must gather together around a small screen. Screen size and viewing angle aside, this is difficult when sitting across from each other in a crowded subway. Following from research on shared views for remote collaboration [see 2, for example], we are looking at co-located sharing with small displays in dynamic environments.

In the first phase of this study, we will explore the use of a shared view for navigation during two organized city scavenger hunts. We will examine the case when views are synchronized (identical), coordinated (giving each participant control over awareness of each other's interactions), or independent. Maps can be annotated, and the annotations shared. Pairs of researchers are teamed up and assigned different conditions to use during the scavenger hunt. Each team has a remote support person they can communicate with via phone and their devices if the condition permits it. In addition to audio and input capture, an observer will shadow each team, taking field notes, video and photos.

2.2 Marked up Maps

In prior work, a survey of attitudes toward paper and electronic maps gave interesting if predictable results. Paper maps were preferred for their easy portability, and for displaying a wide area in a way that is easy to study and manipulate (by rotating, folding). Electronic maps were preferred for their greater coverage and control over level of detail (via overlays, zoom and pan), and textual search. Many said they used paper maps when mobile, and electronic maps for planning.

Following from work in tangible interfaces and mixed reality [4, for example], marked up maps attempt to provide some advantages of both paper and electronic formats. In our "mixed media" prototype, map locations are identified using small, flat RFID tags affixed to the back of the map. An RFID tag reader is attached to the back of a PDA, such that locations are queried by holding the PDA display-side up in front of a map region.

When navigating in groups, a marked-up map can serve as an overarching context from which group members can pose questions and into which they can relate their findings. In an exploratory field study, groups of three or four will conduct sightseeing activities in three separate sessions. For each session they will use a different set of tools (purely electronic, purely paper, and the marked up map configuration). Feedback will be gathered from semi-structured diaries and group interviews.

2.3 Rendezvousing

This study focuses on the specific activity of meeting at a previously or dynamically specified location. Awareness of group member locations can permit more enhanced rendezvousing (find a suitable location for everyone dynamically, or determine where someone is). Cell phone communication doesn't give this contextual information unless everyone knows an area well.

The first experiment is situated in a shopping centre, without suitable location technology to permit a live evaluation of rendezvousing. A wizard of oz technique will be used to create the impression of updated awareness of location. Participants' screens are remote-controlled by facilitators who keep in contact with each other. To the participants, it appears as though their locations are being automatically updated.

Individual scenarios are derived from earlier work by Colbert [1] on the nature of group rendezvous activity.

3. WHERE TO GO FROM HERE?

As much as we might imagine them to be, urban areas are not extensions of our home or office - they are fundamentally shared spaces. Because so much of our time in urban spaces is spent with others, technology needs to support social interaction, not detract from it, if it is to be useful in this realm. In our exploration of navigation-related group activities, we will continue to build knowledge about user acceptance, patterns of use, and effectiveness of a range of technologies supporting group interaction in urban spaces.

4. BIO

Derek Reilly is a PhD candidate in Computer Science and a member of the EDGE Lab, Dalhousie University, Nova Scotia Canada. His areas of interest are broadly Information Visualization and Ubiquitous Computing. Most of his research has involved geographic maps, including how display attributes impact collaboration in map orientation tasks, and an interactive visualization technique called Map Morphing. In a prior life he has developed city guide prototypes, software for the mobile workforce, and innovated in patterns-based participatory design at U S WEST's Global Village Labs.

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What Will Happen When My Mobile Phone Has a Sense of Smell?

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ABSTRACT
This paper presents two scenarios describing novel self-organised social groups of the kind that may emerge from the digital residues of behaviour and localised transfers of information afforded by ubiquitous computing.

Keywords
Ubiquitous computing, self-organising systems, dissent, activism, anarchy, neighbourhoods, gaming, hooliganism.

BIOGRAPHY
Andrew Wilson has spent four years designing and implementing large scale public art events (with a conservatively estimated total of 10 000 users and 50 000 interactions) utilizing the ubiquitous GSM mobile phone, including The Guardian (London, England) newspaper's two SMS events (2001, 2002) and Citypoems, a citywide low-fi locative media project in Leeds, England, which has been live and open to the public continuously since February 2003, and is being repeated this year in Antwerp, Belgium. He is currently Visiting Fellow in the School of Biology, University of Newcastle, studying emergent self-organising behaviour and ubiquitous computing.

1. WHAT WILL HAPPEN WHEN MY MOBILE PHONE HAS A SENSE OF SMELL?

1.1 Gamer 4 Life
In the earpiece I hear the barking of the dogs change, which means they've found something. I can tell by the sound that it's as far out as they go, about a kilometer, and the phone screen shows just one target, well inside his Elf territory and not coming my way, but I turn in another direction to get out of his range, and double check in my pocket that I've got a knife. Sure enough after I get half way down the street the dogs go back to that random sound they make when they they're just quartering the ground and I go into a shop to get a Mother's Day card.

This is what it's like, all day every day. Just because I'm not hunting Elves today, doesn't mean they're not out hunting Orcs.

You've got to stay awake, keep your ear tuned to the alerts your phone gives you. Some people have them set like the sonar echoes on old submarine films, but I like hunting dogs, sniffing the Elves out, running them to ground. The game we play is LOTR – stands for Live Only To Riot. It's one of the old school ones, piss easy to play[9]. Get more of your bodies into one cell than theirs and you win. If it was still a game that is. I bet whoever designed it didn't expect all of this to come from that.

Our side of town is a hundred per cent Orc. Original Riot Crew. And civilians, but they don't count. Over the river is Elves. Every neighbourhood has a clan, about 10 or 12 Orcs, two or three clans make a tribe, all the tribes in the city are the nation [13]. Once you are in the clan you never turn your phone off. Ever. You get buried with it, like Vikings buried with their shields and spears. That means you can always see when someone from the nation is in trouble. And everyone else can see you're the nearest Orc. So you have to go and help them, no matter how many Elves they are up against, no matter if you can see it's their best Orc killers, and you'll end up in hospital, or dead. You might get away with not helping once or twice, if it's an Orc from a clan you never drink with, by saying the police stopped you, or you were trying to find a weapon. But after that you'll be sorted out. You'll turn up for a battle with the Elves and when you charge you'll look round and you're the only one charging, up against ten or twenty Elves. It's sick, the look on the Orc's face when they realize, when they know what's coming next. I've seen it twice. That's enough. Then when they've finished, one of the Elves will stamp on the Orc's phone, and their name just disappears off the lists. And we walk off. The Elves do it for us, and we do it for them. That's the code, the law, that's how we live. Gamer 4 life.

This side is Orcs, that side is Elves, the battleground is in the middle, the city center, where no one lives. All those shopping precincts to charge around. Not that anyone fights much anymore, they are all too busy making money. Not like the old days, massive battles going on for weeks, hundreds of fighters, Elves and Orcs even coming in from other cities. Thousands of police chasing everyone around, trying to keep up. My uncle told me about all of that. I wish I'd been around then. We still fight, but it's just random, when we run into a few of them off their guard, or about who can sell drugs where. Not for the glory, for the sport of hunting Elves [16].

I've got two phones, my civilian phone, to show to the police. That runs on the Networks. It's got my ID chip on, so I can buy things legally [15]. I could even go to college or get a job with

that. And my war phone. That runs on the mesh [4] [5] [11]. It's stripped down for the game: battle lists, messaging, voice calls and alerts from the hunting dogs. Every Orc has to pay for his own phone, but as well the clans pay a tribute to the nation. That pays for hackers. They maintain the system, sell us new stuff - alerts for the police, cloaks from the Elves. My brother, my real brother, not my Orc one, threw his Network phone in the river, just uses the mesh. So now he doesn't exist. That takes nerve, I admit. That's him, down there, crossing the street to avoid me. As if I can't track him down - we even share a bedroom at our mum's house. The dogs told me he was nearby. I've got a special alert just for him. Laughing, like hyenas.

1.2 Electric Gardens

He knows where to find me, but he doesn't need his "hunting dogs" to do it. Our mesh covers the whole neighbourhood, and whenever anyone is in it they're tracked, all the time, adults through their phones [17], kids through little friendship bracelets with tags in. Every few minutes the system asks where everyone who is in our neighbourhood is. Then it produces maps and charts, endlessly updated maps like time-lapse photography of snail trails, or cars at a roundabout or patterns of stars crossing the sky at night. This is who we are, it shows us where our boundaries are, our hubs, where and when we come together and flow apart. The maps are us [14].

The maps aren't just movement though, they show us side-by-side, one place for everyone in our neighbourhood. These places show where each person goes to, and when, how they travel, what they buy in the shop, where their children go to school, how often they visit their neighbours, if they turned up for the bonfire party [8]. They show who is on the edges of the neighbourhood, and who is in the middle. And they let us see the public life of everyone else. And we know that everyone else is watching us.

This is how things grow. By pictures of information. Information is much more important than control from above. It lets us control ourselves [10]. There are just four streets in our neighbourhood. Any more than that and it's really hard to keep track of people, they just get lost in the crowd. Everyone follows the lead of the people at the centre of the map, bit-by-bit [2]. If they don't, they start to feel it. No one wants to be an outcast where they live [10].

The neighbourhood is something good that we share. We have to look after it, and if we grow it, things grow from it. There are three or four invisibles on our streets. People like me who have thrown away their Network phones. We can't buy anything, since they got rid of cash, and we can't work for money, because we don't have m-accounts. So we work for the neighbourhood. We've got three allotments, garden plots out in the countryside, about two hours away on the train. Some of the full citizens clubbed together and bought them, knowing that there were some invisibles who would do the work. We grow fruit and veg', and the owners take what they want and we sell the rest through the shop. I work on the gardens about three times a week. When I get there I just kiss my mesh phone on the reader in the tool shed, and again when I leave. Just like a proper job, clocking off.

If I wanted I could sit could sit there and do no work, but then the gardens would get overgrown, and the neighbourhood would know who was to blame. No one would trust me. I couldn't be invisible without trust. Every morning people post up jobs they want doing, like painting a fence or picking up kids from football practice [12]. I check the deal page through my phone, and offer them a price. Because people know me I can charge a higher price. I get paid in credit at the shop, or drinks behind the bar at the pub, or contributions to rent, or people use their m-accounts to buy things for me when I need them. Sometimes I don't call in the payment for months. People know they can trust me, and I trust them [7]. They just need to check my maps, or handshake their phone and mine, to see the thousands of jobs I've done for the same people over and over again. But mostly it's just word of mouth. I bump into everyone. If it's a job I can't do I give it to someone else I trust. Information comes to me and I pass it on. It's a small world, our neighbourhood, and it's tightly knit.

That's what we grow, in the electric gardens, density of ties [6]. That's the one thing the Gamers have got right, you can only really trust people who are nearby. People try to cooperate when they're thousands of miles apart, but they have to go to such lengths to manufacture trust for the simplest jobs. We can find out who to trust so much better just chatting in the queue at the local post office. That's what people the world over are good at. We're evolved to cooperate. Face to face [3].

The only person I avoid is my brother.

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Children at the Urban Frontier

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ABSTRACT
Mobile and wireless technologies have the potential to enable children to explore their physical environment while creating, inhabiting, and playing in a virtual landscape, if the technologies being developed acknowledge their presence, both real and virtual. Mobile Bristol has worked with children to explore and map their local physical and virtual.spaces.

Keywords

Children, wireless, mobility, urban space, surveillance, sound.

INTRODUCTION

The emerging spatial capacities of new wearable and mobile computing generate new possibilities of association and new spatialities within the city. Most of the current theorizing around these issues makes little or no mention of children and their current and future relationships to these technologies, even though they have the potential to be used to enhance children's independent access to outdoor, public, urban spaces. If this is so, then children and the communities they rely on must have a stake in the development of these new urban forms. Children should be acknowledged as participants in urban communities, and be enabled to design, place and use mediascapes in the outdoor space, as freely as adults.

MOBILE BRISTOL

Mobile Bristol has developed a toolkit of software that enables the user to annotate and augment the real, physical space with a digital media landscape. Projects have involved collaboration with a variety of individuals and groups: artists, educationalists, media producers, and schoolchildren. These collaborations not only produce interesting content for the end-user audience, but give grounded insight into potential future uses and attitudes to the technology, and valuable feedback in to the iterative development of the toolkit [1].

Children

"A New Sense of Place?" (NSOP) is a Mobile Bristol project in partnership with researchers from the Community Information Systems Centre at the University of the West of England, and Ordnance Survey Research and Innovation. The title "A New Sense of Place?" refers to the potential of the technology to re-engage children with their local environment.

Children first explore and map their local environment in a variety of ways before being introduced to hands-on experience of using the toolkit to develop their own digital landscape of soundscapes over an indoor or outdoor space [2,3,4] They were given free choice in the sounds they chose to populate their virtual landscape, allowing them to play with creating their own ideal sound environment.

Suggested usage

All children who have participated in the NSOP workshops have been able to conceptualise and design their personal digital landscape, and have used their experience of using the tools to make suggestions for future applications that may be grouped into the following three dimensions:

Mobility and safety – relating to going outdoors, locating, marking and tracking, negotiating with parents/guardians and negotiating fear and risk

Social – relating to the above characteristics with the addition of meeting with peers and friendship groups, and sharing experiences such as play, shopping, and listening to music

Information – relating to school, transport, shopping and news

The children were struck by the potential of the technology to allow them to negotiate increased ranges of mobility with parents. In a similar way to their current use of mobile phones to keep in contact, they thought that a 'benign' surveillance tool would allow them increased freedom to roam as their location could be monitored remotely.[1] They were also keen on its use among friendship groups as a way of keeping track of each other.

As with the world wide web, there is potential for many types of applications and use. Some of these may generate new forms of commercialised child-play and child-

[1] The age of the children was doubtless a factor in attitude, we worked with two groups of ages 9-10, and 11-12.

supervision facilities. They may also be used in quite draconian surveillant ways, with some parents and guardians developing new forms of temporal and spatial controls. It is quite possible that both positive and negative applications of these technologies, in terms of childhood, will exist side by side as they do in relation to other childhood-technology interactions.

CONCLUSIONS

The positive aspect is the promise of these new technologies in their quintessentially spatial mobile outdoor-use capabilities. They may offer children a ways of (re)occupying certain spaces in the city by offering a means of negotiating risk and fear, and of permeating adult-ordered geographies of the city with alternative (virtual) children's geographies. The possibilities of the technology seem vast and unpredictable and will not offer a panacea for the problems of children's mobility, but will always need to be deployed in conjunction with other initiatives (such as traffic calming) to retrieve urban spaces for childhood.

FUTURE RESEARCH

Questions for ongoing research include:

How will new wearable and ubiquitous technologies interact with childhood?

Could their use as 'benign' surveillance tools enhance children's mobility?

How can such devices be steered towards enabling rather than constricting applications?

What fears will adults have around children's appropriation of the technology?

What content will be deemed suitable for children to access and create?

Can the technology allow the children to feedback their experience of the city, so that their knowledge can be used to develop the physical space alongside the virtual?

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PERSONAL BIOGRAPHY

Dr Constance Fleuriot is a research associate from the Department of Computer Science, Bristol University and one of the principal investigators in lifestyle and experience design on the Mobile Bristol project. For the last two years this collaboration between the University of Bristol, HPlabs and the Appliance Studio Ltd. has been exploring the value of pervasive, mobile and situated media in Bristol, UK. Information about Mobile Bristol projects is available on www.mobilebristol.com. She is currently planning the third phase of 'Mobile Bristol: A New Sense of Place?' which will be working with various user groups to develop located community narratives and furthering the development of the Mobile Bristol software.

Placing Ubicomp

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ABSTRACT

This position paper introduces the question of *placement* in ubiquitous computing design, and more specifically, the *placement* of ubicomp services for people in public space. One way to address this is to triangulate the placement from three perspectives. It is proposed here that ethnographic studies, space syntax analysis, and *in place*-prototypes would capture important aspects in the way people inhabit public space and thereby deduce ubicomp services placement.

Keywords

Ubiquitous Computing, Placement, Space and Method.

1. INTRODUCTION

The design efforts for ubicomp application have so far focused on tangible properties and the interaction aspects of artifacts. In contrast, the issue of the actual placement of ubicomp technologies has not been addressed too a large extent. Where exactly in a public space should computers augment the physical or social environment? How can we ensure that these augmentations occur where they are fully beneficial for their purpose? How do we systematically investigate the space we inhabit? The absence of a serious discussion of these questions is odd, since the biggest concern of Ubicomp is to leave the desk and get out in a computer augmented world, let it be domestic space, semi public space or public space. These spaces all need to be analyzed from many different perspectives using methods from different research fields. Of course, great efforts are being made by researchers around the world to open up the public space for novel technology. Although there are many interesting approaches for finding new and exploitable "sociotopes", none seem to be concerned with the actual placement of technology. Maybe ubicomp technologies have not yet matured enough and have not been disseminated into the actual world to an extent that would warrant or require an actual placement analysis?

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2. URBAN CAMPUS

We have started to investigate placement of ubicomp technologies in the context of the e-Campus project at Lancaster University. E-Campus is a multi-year initiative centered on public displays and ubicomp technologies for user interaction and context-awareness across the entire Lancaster University campus. This project gives us the opportunity to generate new knowledge within this field. The design approach proposed in this paper is a direct result of running into the problem of moving ubicomp from the lab out in the real world. In the lab, placement is often of very little importance. The lab prototypes are design proposals and therefore not in everyday use and not dependent on users' whereabouts. In this project we want to design and place ubicomp services *to maximize exposure and to maximize benefits* for the users. Ultimately, we want to design systems that are useful and intuitive – not dull and unused.

Let us first guide you through Lancaster University campus. It is an urban complex in a mini format, with the architectural layout inspired from a southern European mountain village. If we start in the middle there is a big main square which is the heart of the campus. Literally, since we underneath, in the underpass, find the main buss stop, which regularly pumps up people on campus. Here are also many of the stores and banks on campus located. Going out from this square there is a "street" called Spine which beams out in a north and south direction. This is the campus high way, the aorta, heavily trafficked with pedestrians on their way to somewhere. Along the Spine departments and other facilities are easily reached, and through smaller paths the spine is linked with the ring road around campus. The campus area is as a whole rather long and narrow so the Spine is quite enough for the transferring the pedestrians. So far it is very symmetric, but we have to include numerous small piazzas, stairs, canopies and ponds to closer map what it really looks like. The square, the bus stop, the spine, and the ring road are important on campus, and from which people start to explore the more inaccessible parts of it. It may seem easy to skip the placement analysis here but I think it is easy to fail to just "pick a spot" randomly based on a general feeling.

Therefore, when incorporating ubicomp services in this 'assemblage' of complexes of compositions, plans, and styles [4] it means that we somehow have to mark out the prerequisites which define the placement for these services. It means that we have to ask for clues from different points of view

3. TRIANGULATING PLACEMENT

To determine proper placement of ubicomp technologies we use triangulation – by which we mean the use of multiple methods to study the same issue. The methods might intersect and answer the same questions but the redundancy improves the quality of results and facilitates validation.

The clues we are looking for when designing for ubicomp applications differ depending on what space we are talking about. So for public space, what are we looking for?

First, in public space we will find many potential users. It is a place in our urban world that is occupied with all sorts of people. They have by definition the right to be there since the public space is meant for every one that wishes so, to freely be there. This indicates that ubicomp in public places is likely to be targeting a big audience of users. Does placement matter for who the user is? Secondly we have to consider the very diverse compilation of people in a public space. Different locations in the public place will invite different people with their particular interaction preferences. Does placement matter for how the interaction takes place? A third typical urban characteristic is people in their everyday routine. Things and happenings will invariably become ordinary and peripheral once we experience them on a daily basis. Will ubicomp services still be used if they are not "hot" anymore and can placement make a difference? I propose to triangulate this problem using three methods, namely ethnographic studies, space syntax theory, and *in-place* prototyping:

First, the ethnographic study is always too good to leave out. It provides the qualitative input and integrates the user in the actual design [1]. Secondly, the theory of Space syntax [3], which deals with the configuration of space, has developed a toolkit for analyzing spatial layout and the use of space from various perspectives. As opposed to ethnography, it contributes with strong quantifiable measurements. The Space syntax theory argues that spatial and social aspects of architecture are two, inseparable sides of the same thing. The tools can explain the relations between the social life and the spatial form. Even though space properties such as shape, size, and texture contributes to our main experience of space, the properties of space that is analyzed with space syntax are the relations to other spaces, in terms of connections, topological views and visual fields. This means that space is a relational system, where structure and function of the system is dependent of the relations between the elements in it. By analyzing this system with space syntax, it is possible to understand the social aspects of spatial networks and, possible to foresee the effects of changes in public space, e.g. pedestrian movement, space use, and safety. Thirdly, prototyping lo-fidelity mock-ups have successfully been used for a while in the design of tangible artefacts. However I propose that such mock-ups, which we call *in-place* prototyping, also can be used to try out and evaluate placements in space. In-place prototypes can be attached to things around us, to visually expropriate locations and thereby create reflection and stimulate imagination about a potential placement for ubicomp services. In-place prototyping involves for example putting up objects, signs and posters on specific locations which gives passing people different clues of what an ubicomp service on this spot would provide. Here we are interested in looking at the same phenomenon but in a different space as the Placebo project [2], in which they were 'interested in the stories people developed to explain and relate to electronic technologies'.

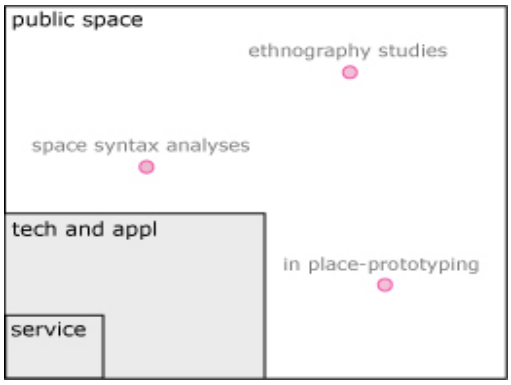

Figure 1. The placement analysis' focus is on the public space and triangulates this realm with ethnographic studies, space syntax analysis and in place-prototyping

I believe these three methods would deliver a thorough placement analysis as it triangulates the design problem by using three different shades. One labeled ethnography, another Space syntax and a third in place-prototyping. They come as representatives from three different fields of research and provide their view to the design process.

4. AUTHOR BIOGRAPHY

Henrik Jernstrom is a researcher and PhD student at the Computing Department, Lancaster University where he does research in the areas of ubiquitous computing and embedded interactive systems. His main research interests are design methodologies and conceptual development of ubicomp applications. His background is in social science and informatics. Previously he worked at the Interactive Institute and as social worker in Gothenburg, Sweden.

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Community Participation in the Age of Mobile Computing

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ABSTRACT
In this paper, I outline changes in how individuals participate in location-based communities as a result of wireless mobile computing.

Categories and Subject Descriptors
J.4 [**Social and Behavioral Sciences**]: Sociology

General Terms
Human Factors

Keywords
Community, location, participation, mobile

Biography
I am currently entering my second year at the Interactive Telecommunications Program, at NYU. In August of this year I completed a 3-month internship with the Social Computing Group at Microsoft Research in Redmond, Washington, working with researcher Scott Counts on finding ways to augment community interaction with the use of wireless technology. During my first year at ITP (2003-2004) I created Neighbornode (http://www.neighbornode.net), an extensible network of open wireless nodes in the East Village of New York City, which allows residents of participating streets to communicate with each other via a series of interlinked bulletin boards. Before attending NYU, I acted as an Internet strategies consultant for various San Francisco companies, winning Forbes Magazine's Best of the Web award for my work with real-time auctions at PBA Galleries (www.pbagalleries.com). I graduated with honors in American Studies at University of California, Santa Cruz, and attended California College of the Arts part-time. Documentation and links to some of my recent projects at ITP can be seen at www.subfuzz.com.

1. INTRODUCTION
The notion of community has always been tightly bound to location. Historically, a person's ability to be actively engaged in a community was contingent upon being situated within that community. Whether the community in question was a tribe of hunter-gatherers, or a loose group of regulars at a local café or club, being physically co-located with others in a community was, to a great extent, requisite to being an active participant of that community. Being outside the boundaries of a particular group would largely render a person a non-participant in that group. For example, though you might be considered a 'local' at the pub down the street, you could only be an active part of that pub's group dynamic during the time in which you were physically present. When you were not there, you were essentially severed from the group, and the pub community would go about its business without you. And while being situated within one community's boundaries enabled you to participate in that community, it also meant being absent from, and thus not an active participant in, all the other groups to which you belonged. For the individual, this translated to traveling to various locales in order to participate in group activities, and committing oneself entirely to interaction with one particular group for the duration of one's stay in any of these locales.

2. GROUP PARTICIPATION WITHOUT CO-LOCATION
Today, with the development of wireless mobile computing, we are witnessing the arrival of a new sort of community, one that does not recognize location or presence as prerequisites for participation. In these communities, people no longer find themselves exclusively located either within or outside community boundaries, but often find themselves able to be both within and outside these boundaries at once. They increasingly find themselves able to choose which community to participate in at any given time regardless of their location. For example, with my Pocket PC and the help of Microsoft Research's HereNow software (http://herenow.msresearch.us) I can interact either with people at my café or with those at my school, while stuck in midtown traffic. The software, a location-based chat system, allows a user to chat remotely with others located in the spaces the user frequents. As the people in those places increasingly interact with one another via their own wireless devices, it becomes less and less important for me to be there in order to be an active part of their group. In fact, they might not even notice that I'm not physically present, if they don't happen to glance up from their devices. Location, as a factor for participation in today's real-world communities, is disappearing.

2.1 Concurrent Participation in Multiple Communities
Furthermore, because location is less and less a consideration in determining an individual's participation in any group, people today are able to be active participants in multiple communities

at the same instant. I can be at the local café, talking with people there over coffee, while sending text messages to my network of friends in Dodgeball (http://www.dodgeball.com/social/index.php) across the city about where we're planning on meeting for drinks, and at the same time I can be wirelessly emailing the group list at ITP about where to find Bluetooth OEM devices. Since these communities do not require us to define ourselves as absolutely present or absent (via location), we can be both of these things simultaneously, and to varying degrees, and we can divide our presence among several different groups at once as we navigate our way through the city.

3. COMMUNITIES ARE NOW SIMULTANEOUSLY PHYSICAL AND VIRTUAL

This situation is created by the fact that today's communities are no longer confined to being either purely physical or purely virtual in nature. More and more, communities are able to define themselves as both physical and virtual at once. My project, Neighbornode, is an example of this blending of real-world and online community. In the project, users log on to an open wireless network to converse online with other neighbors on their street. The boundaries of community in this case are determined by the range of the wireless router that users connect with to access Neighbornode - if your apartment falls within the 300-foot range of the router, you can participate in that Neighbornode's community. This community is, in this sense, to some extent synonymous with the immediate neighborhood community. However, once you have logged on to a particular street's Neighbornode by connecting wirelessly to that node's router (i.e. once you have 'joined' that community), you are free to log on again from anywhere in the world by entering a simple password, revealed in the process of logging on, into a web form on the site. Having logged in to Neighbornode from 4th street at Avenue B in the East Village of New York, I can then revisit and participate in that community from Seattle, or Montreal, or anywhere in the world. Given these circumstances, is the Neighbornode community to be considered a physical or a virtual one? Clearly it must be considered both. The strict boundary between physical and virtual has broken down. In this situation, location becomes more relevant in the case of the Internet (where before it had no bearing) and less relevant (or at least less crucial) in the case of physical communities. There is a joining of the two as people increasingly bring their online worlds with them as they venture through the city spaces of building, parks, and streets, and eventually the difference between the physical and the virtual comes to be seen as unimportant, negligible.

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4. A CONTINUUM OF COMMUNITIES

What we are left with is an increasingly complex overlap between the groups in which we engage at any one moment. Actively engaging in a group becomes less an all-consuming activity, and more simply another option to be exercised at will, regardless of one's location or situation. Rather than traveling to a particular location to participate in the community there, you take that community with you throughout your day - you take your neighborhood with you to work, you take your entire group of friends with you to your café, you take the café to school. Able to participate in multiple communities simultaneously, the individual becomes a real-time link between groups separated in space. These groups in turn become joined together in real-time by the individuals participating in them. A continuum of one's personal communities [1] emerges - as you remain actively plugged in to all of your various groups simultaneously, the boundaries between these groups diminish, and the level of exchange between each of the groups increases. The effects these new continua of communities will have on our lives will likely be profound – they are among the biggest developments in the way we interact with each other to have come about in a generation. It now lies with the artists, the researchers, and the entrepreneurs working in the field of mobile computing to have the vision to make these effects both dramatic and positive.

5. ACKNOWLEDGMENTS

Thanks to Scott Counts and the MSR Social Computing Group for their input on this paper through numerous conversations and group discussions on the subject of mobile computing, and to the organizers of the Ubicomp in the Urban Frontier workshop for helping me to clarify the thoughts outlined here.

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Ordinary technology: a methodological study of urban mobility through a London Routemaster bus

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ABSTRACT
In this paper, I describe the methodological approach of *73 Urban Journeys*, a research project located on and around the No.73 Routemaster bus in London. The project is designed to investigate the intersection between technology, mobility and social relations in the urban environment. I argue for a re-appraisal of ordinary, everyday and sometimes neglected technological experiences, embedded in cultural practice and social norms, which can provide researchers with rich and textural metaphors for the ways people explore, annotate, narrate and experience the city.

Keywords
Bus, technology, mobility, methodology, ordinary, place.

INTRODUCTION
Increasingly we experience urban place as a hybridisation of the real and the virtual. As more mobile technologies, (phones, WiFi, digital cameras, mp3 players, laptops) occupy our personal, private and public space their intertextual modalities provide new sites of sociological study and with them come many methodological challenges.

Much like the increasing convergence of technology itself there is a merging of disciplinary discourses within sociology, anthropology, visual culture, urban, media and cultural studies dealing with these areas of enquiry. Each offer a distinct focus on practices of representation, consumption, production, material culture, location, the sensory, textual and visual which provide a locus on the interface of technology studies.

In addition to negotiating multi-sited fieldwork and the plethora of disciplinary frameworks, the researcher should also contend with decisions about the locus of her attention. [1] For instance which devices and users tell us about the integration of technology in everyday urban life? We live in an age where new technologies are intensely fetishised in public and private domains and it is easy to be swayed by new, innovative, hip and cool devices and applications. This paper looks to the everyday and ordinary in the urban environment for inspiration.

Mapping the mundane
To be ordinary is to be 'regular', 'common', 'customary', 'usual'. It is defined by what it is not. [2] This paper is supported by a long sociological history of mapping the mundane and the minutiae of daily life such as studies into domestic appliances to speak about gender relations and sites of power and resistance. [3]

This paper illustrates alternative ways to probe and excavate the urban landscape, its technologies and communities. Here I am particularly concerned with the ways in which my project field site was selected, navigated and examined in both real and virtual spaces and the insights these permit.

Figure 1: A No.73 London Routemaster bus.

73 URBAN JOURNEYS: THE BUS AS A FIELDSITE
73 Urban Journeys is a research project I undertook as a short term research fellow within INCITE at the University of Surrey, under the larger scope of an INTEL funded project - *Urban Mobilities; Locating Consumption of Ubiquitous Content*. It investigates digital consumption in urban space from two specific perspectives; how people narrate the city through technology and how people negotiate technology through the city. As the bus is a constantly mobile social space for its passengers, workplace for its staff and embedded daily in the granularity of the city, it operates as a lens for interpreting places where mobility, technology and social relations intersect. [Fig.1]

The No.73 bus is a distinct field site for several reasons. It is both a place where people are mobile and way of

sampling the city. Over seven million people live in London and one million of them travel into the city each day between 7am to 10am. [4] 85% of these trips are by public transport and bus patronage has been steadily increasing over the last five years. [5] The No.73 route travels from Victoria to Tottenham representing a slice of London's economic, ethnic and social diversity.

The methodological approach

The initial research fellowship commenced in June 2003 and officially lasted three months, however the research is ongoing. In addition to participating as a regular traveler and observer on the bus, I undertook historical and theoretical research, qualitative interviews with bus users (passengers, drivers and conductors) and people who shared the road (taxi drivers, vespa riders) as well as designing and maintaining a website and a weblog. The website exposes the research process and ongoing data collection. The weblog is split in two parts; a Bus Blog of my personal everyday narration of the bus and 73 Stories which collects 73 word stories about the No.73 bus from visitors to the website. These stories and other multi-media materials are posted to the website where I allocate them to specific seats on the bus floor plan. [Fig.2,3]

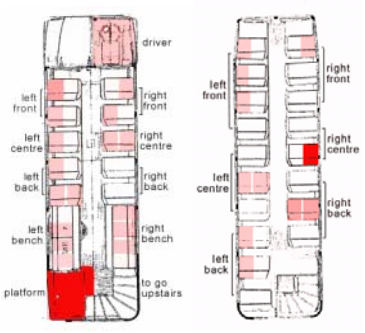

Figure 2: Floor plans of the No.73 London Routemaster bus with stories allocated to specific spaces on www.73urbanjourneys.com.

I've got an ability to forget from one stop to another because whatever happens here it really doesn't affect the people who come on the next stop. They don't need to know about it. You just keep moving. Who wants to argue?
Denise. Bus Conductor. Platform. 15.08.03

Figure 3: A story allocated to a specific space on the bus floor plan.

LEARNING FROM EVERYDAY MOBILE SOCIAL SPACE

There are many ways the No.73 bus and bus route can be read to reflect the changing nature of urban space, mobility and technology. Below I discuss three briefly.

Firstly the bus can be considered a 'time thickened' place. [6] It is provocative to think of it as a location that can be excavated to reveal layers of memories, experiences and events that connect people. I have been experimenting with non-textual representations of ethnographic data evident in the bus floor plan in which the bus is a vessel for the urban mobile experience. In this way tangible and intangible data in the form of images, sound, illustration and stories are 'interwoven and made meaningful'. [7] For example in this context Denise's story reiterates the nature of the bus itself as it travels through the city. [Fig.3] As a conductor, her job is to manage the delicate balance of the timetable, bus and human traffic. Only rubbish, dirt, graffiti and her memory trace the presence of previous passengers, like clues randomly discarded from a puzzle. I have used the bus floor plan as a way of capturing, piecing together and representing a sense of collective story telling.

Secondly the project provides an interesting vantage point for exploring how ICT's (information communication technologies) support desires to annotate the city. Websites and weblogs in particular offer ways of making visible and visceral that which is normally invisible and intangible. *73 Urban Journeys*, authored by myself and others through weblog posts, represents a virtual experience of the bus using multi-media annotations of many journeys.

Thirdly, the bus operates as metaphor. For example in thinking about the bus as an urban technology itself, with its upper and lower decks as mobile social spaces, the conductor can be read as a metaphor for a public interface. As the conductor is in constant contact with the public, weather, noise and traffic pollution, their bodies and minds are branded with corporeal and psychological transactions. Stories like Denise's talk of the textures of translation between the bus and the driver, the city and passengers, memory and mobility. [Fig.3]

This paper seeds the idea of studying everyday ordinary spaces for insights into technology usage models. The technological frontier is here, now and will always be populated by ordinary experiences.

ACKNOWLEDGMENTS

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A Sense of Place: Urban Tourism and Wireless Technology

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ABSTRACT
In this paper, I will explore the ways in which a typical tourist's movement and navigation around a city can be assisted by newer urban-oriented wireless technologies.

1. INTRODUCTION
Just as any urban life offers an endless supply of events, culinary adventures, retail sprees and more, a city's true charm is in its number, diversity and convenience of these elements and the idea of "stumbling upon" an interest; a factor that does not as often happen with tourists, who are constrained to specific, known locales. Although a city visitor may typically choose a restaurant for its name brand or proximity to a landmark, the tourist well-armed with wireless technologies may be privy to information typical to locals, substantially altering the travel experience. For example, if a family visiting from Omaha left Rockefeller Center looking for food, wouldn't they prefer a "real New York slice" to an all-too-familiar dinner at McDonald's? And wouldn't a traveler in Paris interested in seeing local poetry readings want to access this information? Using wireless technologies like Dodgeball, Upoc and Vindigo, and by expanding these technologies, tourists may easily learn of events and interesting locations, the routes used to travel there, and information about new surroundings; further, long-term residents, along with tourists, may also be affected by an ever-growing set of wireless technologies.

2. COMMUNAL TRAVEL GUIDES
Tourists' resources have already extended prolifically past the paper-based guidebook, giving rise to contacts between residents and visitors and allowing tourists a number of advantages. They can avoid price-gouging, find the best ways of traveling between locations, and learn about local events that are unlikely to appear in guidebooks. The most popular communal travel site (called "Travelogues") is VirtualTourist.com [1], which hosts nearly half a million members and user-written information on more than two million cities. Here, users can acquire a plethora of tips and stories written by local residents and other travelers, usually learning more current and independent information than what are usually corporation-written guidebooks have to offer.

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3. MAKE IT MOBILE
While VirtualTourist's resources are extraordinarily beneficial, they are limited to users sitting at computers with web access. So as much as a user may prepare for her journey by printing out information or loading it into her PDA, she is restricted by the lack of portability of travel sites. The best solution to accessing information on VirtualTourist and other websites is to make the information mobile. Not only should the data automatically be downloadable to PDA, but it should continue to arrive as updated by mobile phone and/or wireless network. This way, the information is available as the user needs it, and not before.

Many major airlines already convey information to travelers before and while they need it: flight schedules are downloadable to PDAs before the traveler leaves; updated departure and arrival times can be sent by text messaging to the traveler's phone or wireless-enabled PDA. Why not imitate these successful tools with customizable information that travelers might not acquire elsewhere, like art gallery openings, pub specials and clothing sample sales? Some technologies, including Dodgeball, Upoc and Vindigo, have already infiltrated this front successfully, and their capabilities are certainly expandable, as explained below:

3.1 Dodgeball
Dodgeball.com hosts a service that allows members to find bars, bar features and friends through text messaging on mobile phones. The technology makes it possible to choose a location based on intentional choice of that venue, rather than the happenstance that often occurs during travels. That is to say that a person would be more likely to visit a specific establishment when its address is readily available; otherwise, he might opt for the nearest location, a more typical response in city life. Furthermore, because of the availability of information about bars' interior features, like billiards and extensive beer selection, Dodgeball is a major advantage to the nightlife-seeking traveler. She may only have to learn the Dodgeball address of that city to find her ideal night out. Still, it should be noted that this resource is limited by the inability of most US residents to use their mobile phones abroad, and vice versa. The hardware here must catch up to the software.

Dodgeball's services could be expanded to cater to tourists by adding landmarks and other tourist-friendly locations. If average tourist families are anything like this author's, the tendency is for

all family members to do different things when visiting a new city. But, for example, “London on Your Own” (as this author’s family declared) would not be so challenging if every member of the family had a mobile phone and a Dodgeball account; each person could check in via Dodgeball at their given destination so that their location is always known by others. For example, if sister Rachel checks in at the Tate Museum, sister Jenn at Madame Tussauds, and Mom and Dad at the Globe Theatre, the situation is not as worrisome as fretful parents may think. Furthermore, if Jenn comes across a restaurant she thinks the family will enjoy for dinner, everyone can easily converge on, say, Wagamama after determining its exact location using Dodgeball and after making the decision using Upoc, as explained below.

3.2 Upoc

Upoc (Upoc.com) enables groups of people to communicate via mobile phone text messages, allowing users to send messages to an entire group. Upoc’s text message “blast” functionality is extremely useful to tour groups and other large sets of travelers, which might need to know consistently where to meet the bus and what time to meet for breakfast. This tool could also serve as a way of accounting for all travelers in the group.

Equally important to both the local and the tourist, Upoc enables groups of strangers with similar interests to “blast” text messages back and forth, somewhat like an open email forum. Upoc groups relating to urban life include free events, political rallies, celebrity spotting locations (often with grainy photos attached), and discount theater ticket availability. Such information, received periodically throughout the day or week, lets a resident or visitor (Upoc can be set up temporarily) learn about local events without having to purchase a newspaper, visit a cybercafé, or seek out people with similar interests. This service could substantially affect the things people do while they travel.

However, as with Dodgeball, Upoc cannot truly apply to abroad travel due to system incompatibilities. Furthermore, if important information is transmitted via Upoc to a user inside a location without wireless service, the consequences of their not receiving the information until emerging could be problematic. Finally, this service would be difficult to customize by language, as the information depends on the posting member’s language.

Still, if these aspects are improved, as they could before long, Upoc could prove to be an excellent resource for tourists and event-seeking residents alike. In addition, the silent capabilities of messaging are useful in museums and other locations where verbal conversations would not be tolerated.

Given the future outfitting of landmarks with wireless resources, a potentially great addition to Upoc is the limited-range dispatch of event and special location-based information, such as, “Return to Battery Park tonight for a free concert,” or “Visit the café one block away during the next hour for a free cup of coffee.” Such announcements, which could be sponsored by local businesses and business improvement districts, are useful to both tourists and long-term residents of an area. And if the tool is expanded even to places like office complexes and malls, the local resident, who would sign up to receive these messages, would enjoy certain benefits her unconnected neighbor might not.

3.3 Vindigo

Vindigo, a PDA application, is perhaps the best tool a tourist can acquire. With restaurant, bar, museum, bank and post office listings and reviews, a tourist can navigate a new urban setting with the ease of a local, particularly when employing the map and travel directions featured in Vindigo. Where near the Globe Theatre can one find great fish and chips? What is New Orleans’ favorite jambalaya eatery? Following walking directions on a PDA or mobile phone screen makes the tourist feel less awkward then spreading a map in the air in front of his face. The advent of Vindigo can change a tourist’s experience from a guidebook-induced walking tour to a personalized meandering of landmarks and local venues (See Figure 1). Furthermore, by storing the information on a PDA before departing for the trip, a traveler does not have to rely on local – and potentially incompatible – telecommunications resources, a major advantage over Dodgeball and Upoc. (There is still a matter of charging the device, which brings in a potential incompatibility of power resources). The result of Vindigo’s usefulness is the outdating of tour books, the minimization of the city map and a decrease in vulnerability often felt by tourists.

Although Vindigo has already built an excellent foundation for the urban tourist, further potential lays in a more tourist-directed application. A useful deployment of Vindigo, or a system of its likeness, would be in the rental of wireless-enabled PDAs to tourists with pre-loaded information that tourists can select. When a tourist arrives at an airport, train station or city tourist center, she may request her customization in the forms of native language, a channel for news from her home country, and, in addition to the usual Vindigo channels (food, bars, shopping, services, museums, movies and theatre), she may desire some of the following options: Landmarks/monuments, information about neighborhoods, cybcercafes, pay phone locations, calling card sellers, car rentals, airport transit and train locations. Outfitting a tourist with this experience can make her travels easier and her guiding resources less burdensome.

Of course, this information would only be useful if it was updatable, particularly in the weather, film and theater sections. Furthermore, the devices might not have enough memory to hold information about every location the user may visit, given that the rental versions will not be state-of-the-art. It is thus important to embrace trends in wireless deployment and install wireless access points for tourism purposes at landmarks, at the very least, and, ideally, notable intersections and significant structures. Long-term residents may also find this wireless system of use, since a resident would usually only grow fonder of his location after learning of the history of his block, discounts near his workplace

Figure 1. Vindigo’s main screen serves as a portal to useful tools for tourists and residents alike.[2]

and whereabouts of necessary services.

3.4 The Wireless Network

To set up a feasible wireless network, the hardware would involve access points that deploy signals in either the 2.4 GHz spectrum or a WiMAX (2-11 GHz spectrum) system. The 2.4 GHz spectrum includes the 802.11a, 11b and 11g standards; while 11b is the most common type of local area network (LAN) and therefore is incorporated into the largest number of wireless-enabled devices. 11g is the most functional given its ability to support both 11a and 11b standards, which are not compatible with one another. The maximum data rate on this standard is 54 Mbps, and the signal usually does not extend past 150 feet at a reasonable data transfer rate. The outdoor signal distance is typically much greater (up to 500 feet), but in major cities it could be severely impeded by obstacles like buildings. Nonetheless, for the purposes of this tourist wireless network, requiring only a small signal distance from landmarks and relatively low-traffic, 2.4 would serve as a worthwhile system. [3]

WiMAX, or IEEE standard 802.16, is an exceedingly advanced option and would be of major benefit to the tourist wireless system, although it will not be fully available until early 2005. WiMAX, a metropolitan area network created through efforts by multiple leaders in the telecom industry, powerfully augments current 802.11 hotspots by adding roaming capabilities and therefore allowing users to travel between sites much like mobile phone users currently do [4]. The data transfer rate can reach 70 Mbps, while the signal can reach up to 31 miles, which is, again, hindered in city settings by structural and interference obstacles [5].

The major issue with implementing WiMAX as the tourism network standard is one of hardware: devices being used by tourists must be compatible with the network to use it, and most commonly used portable devices are still equipped with 802.11 capabilities, not 802.16. At the same time, the physical infrastructure still needs to be put in place, which becomes an issue of city planning: how does one site an access point that must have clear signaling abilities, but must also be guarded from the elements and not interference with its technological and human neighbors? While this question remains for all such telecommunications hardware, the answer is more optimistic for WiMAX, where fewer locations are required for the access points, although the placement will still surely prove difficult from a planning standpoint.

An upside of WiMAX is that the standards developed for it have been a purely international effort, and therefore will see universal use of the same standardized technology, making future usage of this network seamless.

The wireless network used in this tourist function will most likely fall under the 802.11g standard (due to the currency of this project). The means by which devices would acquire information would rely on a “pull” technology, such that the device “asks” for information [4]. For users of the tourist network, information would be pulled to the device upon the user’s request, as when the tourist reaches a landmark and selects the “get information” option.

4. THE AUXILIARY BENEFITS OF TOURISM TECH

A WiMax network provides a persistent connection, and so “push” technology, which provides information to the device immediately and without request, would be more advantageous on many levels. First, it would provide location-based information at unexpected areas, like history of an intersection that was once the site of an important political protest, or suggestions for exploring that block for souvenir shopping. Because it would permit automatic location detection, walking and driving directions could be updated continuously, so the misdirected traveler can still find her way. Finally, if a network user is headed in a route that is blocked off for construction or security purposes, she can be alerted and avoid being snarled in the mess.

Despite the network technology, its capabilities could prove useful even for the long-term resident, who would no longer be forced to sit at his desk to use the Internet; a network would let people get out more. Not only is some of the information deployed to tourists also useful to residents, but they might decide to indulge in the well-visited locations of their own cities, therefore allowing a newly rejuvenated interest in their own domains. In addition, a great resource in cities would be a rapid deployment of emergency information; if a catastrophic event occurred, it would help most people learn from authorities what their best options are (given the withstanding of the network’s electrical power). Users may also learn about local issues and events, like community board debates, political rallies and street fairs.

But most important on a day-to-day basis is that local residents might flock to landmark areas to enjoy popular wireless hot spots, encouraging interaction among users. Providing an interactive network among users, rather than a separate connection from each user to access point, could provide positive social encounters. For example, given the ability to send messages to the entire set of users at the same landmark, one could send messages like, “Anyone up for a game of frisbee? Meet at the flagpole in 20 minutes,” or “Please come plant a flower in our community garden anytime today.” Or, most likely, “Discounts at the deli next door for the next hour!” Such advertisements, though usually unwanted, would help pay for the free access provided. Of course, the interactive network could serve as a source of fun; users could play video games against one another or create communal digital art projects. Another use, one that could possibly lead to face-to-face interaction, is a dating service of sorts: users could sign up for the service by filling out profiles and ideal mate characteristics; when they sign on at these landmarks and a potential mate matching their characteristics is present, their computers indicate as such and open instant messaging windows so that they may speak in that realm first. After all, is it not better to remember meeting atop the Eiffel Tower than in a dark nightclub?

All of these possibilities for the wireless network are, of course, dependent upon the ability to loiter at and around the landmarks. Still, there are many such places in New York City, such as Battery Park, the Metropolitan Museum of Art and Lincoln Center and abroad, including the Louvre in Paris, Shibuya Crossing in Tokyo and the Pantheon in Rome.

Figure 2. Could potential business partners, friends or soulmates be missing each other in this Yankee Stadium crowd?

5. MATCHING TOURIST NEEDS

If, as suggested earlier, cities do provide rental PDAs for tourists, in addition to previously mentioned functions would also be the following useful information:

- Embassies location
- Police precinct locations
- Currency exchange information
- Common phrases, local tipping information and native behaviors
- Applicable laws (e.g., gun control, drug use, abortion)
- Miscellaneous local information (e.g., time change)
- Re-routing needs (e.g. subway/road construction)
- Medical:
  - Hospitals (including 24-hour emergency rooms)
  - Pharmacies (24-hour, plus emergency refills for stranded passengers)
  - Foreign language clinics
  - Specialized medical needs (pacemaker repair, STD care)
  - Travel vaccines and foreign illness treatment

Clearly, all of this information would be provided in their native language.

6. TO WANDER IS HUMAN

The technologies discussed above are by no means the exclusive list of existing and possible wireless technologies to be used for tourism. It should be noted that the actual inventory of such resources constantly grows, even further helping tourists blend into their surroundings more easily, which seems to be an auxiliary goal to seeing sites and experiencing locally-appropriate situations. Nevertheless, there are major advantages of these technologies to remember, namely that they are less bulky and more up-to-date on events and essential advice than any guidebook, are often less expensive than the purchase of travel information and are ever-increasing in their amount of information. Such assets help tourists embody their true roles as short-term residents rather than hesitant guests.

Nevertheless, there is a downside to predicated exploration, in that the tourist may be pre-empting her own potential discoveries, those unexpected finds that can often create the most poignant memories of a vacation. After all, if the major purpose of travel is learning about and opening one's mind to new things, it seems counterintuitive to seek out predetermined meals and cultural events. The serendipity of travel experiences is limited by the probability encouraged by the technologies.

Thus, it must be up to the tourist to keep her head out of her mobile phone and PDA and keep her eyes open for points of interest along the way. It was this author's experience, upon being extraordinarily lost during a visit to Paris, that Vindigo not only directed the traveler but more importantly introduced her to one of the greatest of street foods: the giant Belgian waffle, served right on a sidewalk.

7. ACKNOWLEDGMENTS

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9. BIOGRAPHY

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Spatial memory: marking in urban public space

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Abstract

This research is the first iteration of design ideas for the marking of public space with personal or community memory. It proposes that accessing collective memory is most effectively achieved through existing spatial senses, rather than digital information architecture, and that the existing marking of urban public space is good evidence for future work.

Keywords

Urban, interaction, public space, spatial annotation, marking, graffiti, stickering.

Spatial memory

Cities currently hold personal and collective memory in the abundance of marking, stickering, tagging and graffiti in public space. Dense urban spaces push individuals to expose personal identity at every opportunity and compress layers of stories into overlapping spaces. Existing research and projects in this area cover graffiti[1], stickering[2] and digital spatial annotation[3].

Stickers, graffiti and flyposters are a rich layer of urban information and interaction, commonly used for events, subversion and personal expression. I want to explore extensions that build upon this layer, using technology to supplement the visual and typographic information already well implemented and tested.

It is likely that parking meters, billboards, lampposts and signage will become increasingly functional for commercial, marketing and advertising using wireless technologies. These infrastructures of urban life are unlikely to become more useful to a community by being adaptive, hackable or available for public use, and will continue to be subverted in the way that they are currently subverted by stickering.

Spatial interaction

We now have models for digital tagging from a participatory, user-centred perspective, reversing the conventional idea of digital tagging as an invasive surveillance technology. With the first consumer RFID mobile phone[4] and barcode systems like Spotcode[5] it seems that tags might be the triggers for interactions, not just for information retrieval, using spatial memory and understanding to perform actions and tasks.

The urban environment itself could become an interface to information and an interaction layer for functionality, using our spatial and navigational senses to access local and situated information.

There is concern that in a dense spatially annotated city we might have an overload of information, what about filtering and fore-grounding of relevant, important information? Given that current technologies have very short ranges, we might be able to use our existing spatial skills to navigate overlapping information. We could shift some of the burden of information retrieval from information

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architecture to physical space.

Why hide information inside digital tags, aren't visual stickers instantly readable and more effective? Is this the urban equivalent of 'mystery meat'[6] navigation? I think there is a compromise where visual markings provide clues for spatial interaction, leading to rich and relevant information gathered on a personal device. Physical stickers offer us patina; we see the physical decay and spatial layering, giving us a sense of time and relevance without digital tools (see figures 8, 10, 12).

At the level of lampposts, billboards and signage, current evidence suggests that stickering and graffiti is respectful of previous work, resulting in readable and usable layouts (see figures 2, 9). Markings are usually relevant to the area that they are in, allowing spatial filtering at the level of neighbourhoods, areas and streets.

Spatial content

Performances, events and gigs skilfully utilise local stickering and flyposting to gain awareness. At the most simple level, integration of physical spaces, places and objects into personal calendars and information has enormous potential for site-specific events.

At a community level, collaborative marking might be very powerful for advocacy and awareness, in the same way that posters and signage are now.

At a more abstract level, a system for images or media that are tied back to locations via posters and stickers, has enormous creative potential, as a platform for artwork as well as commercial or cross-media projects.

Future work

I propose research into 2 areas:

Visual design of markers for spatial interaction, taking clues from existing urban marking and visual systems such as Spotcode. Find distinctions between visual content, typography, signage and digital content.

A platform for simple data interchange and storage, using standard open formats, what kinds of information do we want to store and communicate? What platforms are available[7], and how would they work with hardware?

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Timo Arnall

Timo Arnall is an interaction designer and researcher. Recent design projects include a temporospatial interface for geo-located photographs, a social networking application, an MMS based interactive television show and a web-based media archive for experimental animation. Current research directions explore mapping, photography and marking of public space.


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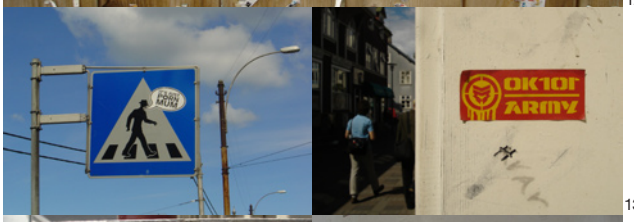

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transcate: Navigating Idiosyncratic Urban Transit Practices

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ABSTRACT
As mobile application designers have struggled widely with the interface, processing, and communication limitations common to mobile devices, they have employed as solutions strong user-modeling techniques. In the course of reconsidering these solutions, this paper describes the ongoing work of the *transcate* project: the design of a mobile phone-based transit planning application, and in parallel, a study of the public transit practices of several residents of the San Francisco Bay Area. Our experience with the rich, urban setting of public transit shows marked variability and situatedness among and within individuals' goals and values, and questions the use of strong assumptions about user intent, values, and goals.

Keywords
Urban computing, location-based services, user modeling, public transit, mobile interfaces

INTRODUCTION
In the industrialized world, mobile phones are a fertile but frustrating platform for developing applications, a fact that has led to misguided attempts to overcome their interface limitations. Both mobile phone technology and its practices of use are tantalizing: mobiles are almost always on, almost always connected to a network, and seldom beyond their owners' reach as the owner moves through the world. However, mobile phones are impoverished from an interaction perspective, as they suffer from limited processing power, relatively small displays and – particularly in the US – dismal data throughput and latency. To improve the effective human interface bandwidth of mobile devices, some application developers have employed the use of strong models about the intent of a mobile user, *e.g.,* "Jane likes Italian and Indian cuisine and would prefer suggestions for these restaurants when she's restaurant-hunting in the city." Unfortunately, these approaches fail persistently in urban settings, where choices for action abound and the intents, values, and goals of users are often situated or idiosyncratic (particular to a group or individual) in a manner that defies tractable modeling or inference.

As it began, the *transcate* project (a neologism from "transit" and "locate") was intended to support more-fluid and transparent use of public transit, an inherently fixed and semi-periodic system. Our initial prototype leveraged knowledge of the time and location of an individual's appointments, her current location, her (fixed) transit provider preferences, and static public transit schedules to notify her with a reminder and directions "just-in-time": right before a nearby transit vehicle departed for her destination. By "pushing" transit information to the user, we tried to avoid directly exposing the user to the interaction lags caused by high network latencies. Simultaneously, our inquiry into how individuals actually organize their public transit use led us to question the simplicity and rigidity of our application model, the implied interchangeability of providers, routes, stops and locations, and the expectation of symmetry and consistency for a user's goals and values.

The remainder of the paper describes the two-week audio diary study we conducted to examine current transit practices, discusses the subjectively rational but idiosyncratic behaviors we discovered, and concludes by advocating maximal exposure of infrastructures in urban interface design.

STUDYING EXISTING TRANSIT PRACTICES
To better understand existing transit practices among students at UC Berkeley – our target population for the transit planner – we conducted a two-week audio diary study in June 2004 with four Berkeley students, including both graduates and undergraduates. The students, two men and two women, were regular public transit users and ranged in age from 22 to 35. During the study, the students reported using five different public transit providers. This broad use was fostered by geographic diversity: two of the students lived in San Francisco (approximately 18km) and commuted daily across San Francisco Bay, one lived within blocks of campus, and a fourth lived in a suburb just north of Berkeley.

For the course of the study, the students were asked to carry a GPS-enabled mobile phone, and to dial into a voicemail system and answer several open-ended questions about their trip *every time* they traveled more than half of a mile (800m), regardless of the transportation mode. This resulted in more than 180 trip-entries over two weeks. Each time a student dialed into the system, his mobile phone also relayed his geolocation to our database. Both the recorded audio diaries and the location information were used to ground discussion in two hour-long one-on-one interviews, conducted midway through the study and at its conclusion.

TRANSIT IDIOSYNCRASIES
While the "push" design of the transit planning tool successfully managed the interaction lag, we came to

realize that the "just-in-time" notification model did not support students' actual transit practices. Aside from the practical matter of providing more-interactive control to the user, our participants' organizational practices called into question the plausibility of effectively modeling their goals and values. Below, we first discuss two classes of idiosyncratic behavior we observed, and then describe how they defy representation, and the implications for design.

Waiting

Among the student participants, there were several practices for managing the wait for a transit vehicle. A student who managed his time very carefully (*e.g.*, he knew showering in the morning took him exactly 15 minutes, start-to-finish) extended his printed bus timetable to include precise information about the stop where he commonly boarded the bus (**Figure 1**). One fairly common technique (reported by three participants) was to wait at a

Figure 1: Tangible transit-planning tool. In the middle of the second column, a student noted the interpolated arrival time of the bus for his stop, which was not listed on this timetable.

single stop and take whichever of several transit routes departed first. At the extreme, one student so disliked the experience of waiting at a single stop that he had devised a morning walking route, toward his destination, that took him past several bus routes and allowed him to see a bus coming in enough time to make it to the next stop. At the opposite extreme, another student knew the frequency of service for a bus line, though not the scheduled times, and she was content to walk to the stop and wait for the next bus. This last case is particularly notable considering that student suffered from a medical condition that made standing at the stop for long periods painful.

Symmetry and consistency of routes

Participants' transit use practices were also notable with respect to the lack of symmetry and consistency of their routes, evidenced here by the situated choices made about transit providers and bus stops. For example, the two students who lived in San Francisco and commuted to Berkeley almost always took a bus into Berkeley in the morning because the fare was free for students, but they were more likely to pay approximately US$3 in the afternoon to take the commuter rail system back into San Francisco. While one student described this as mainly an issue of timing – the route into the city was more congested, and therefore slower in the evening – the other student noted that the bus was less pleasant in general, and that it was worth the expense after a tiring day to take the commuter rail train. In another example, a student who took a bus from her home near the Berkeley campus to a shopping mall near the bridge to San Francisco did not take the direct return bus to campus, but instead continued across the bay on a loop through the San Francisco bus terminal, adding approximately 20km (12 miles) and 30 minutes to her travel. She described this decision as a problem of convenience and safety – she did not know from where the return bus departed – and as an opportunity to enjoy the view of the San Francisco Bay from the bridge.

AN IMPLICATION FOR DESIGN

In contrast to the students' practices, the initial transit planner design inscribed typical engineering values of efficiency and cost, and provided routes based on quantifiable criteria like cost, time, and distance. This is understandable given the difficulty of measuring subjective values like a beautiful view, or modeling the dynamic and individual economy of comfort and cost. The difficulty and fragility of building and maintaining these representations contraindicates techniques – such as recommending a particular set of transit routes – that limit individual choice or prescribe individual behavior. Alternatively, we advocate a focus on design approaches that expose as much of the underlying urban infrastructure as possible, and interface techniques that allow an individual to navigate this information and her own city.

INSPIRATION FOR *TRANSCATE*

The interactional perspective presented here is likely recognizable as derivative from the ethnomethodological program, introduced to computer scientists by Suchman and recently advocated by Dourish [1, 4]. From the urban-ecological perspective, we are encouraged by McCullough's introduction of "on the road" as one of many modern urban types, and Jungnickel's compelling exploration of London's 73-line bus [2, 3].

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Viability of Urban Social Technologies

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ABSTRACT

From the perspective of viability, we critically examine the attractiveness of urban social technologies. We discuss two inherent difficulties in design of this type of technology, namely intentional design of social activity and the need for social innovation a long side a technical innovation. Finally, we touch upon the relevance of ethnographic inspired methods in the design of urban social technologies.

Keywords

urban technologies, ubiquitous computing, social innovation, design

1. INTRODUCTION

In recent years, we have seen a steadily growing interest in urban social technologies (UST)[1] especially in academic and research communities with a host of different and interesting projects (e.g. [1, 2, 8, 10, 11]). We are intrigued and fascinated by this new domain of applications, but at the same time we are uncertain about the viability of the concept in general. In this position paper we will examine why urban social technologies seem attractive – maybe even seductive – and look into what we see as two inherent difficulties in realizing this vision. This is meant as a way of prompting critical yet constructive reflection about urban social technologies and their viability[2]

2. THE ATTRACTIVENESS OF UST

On a general level, the strength of UST can be said to arise from the convergence of ubiquitous and social computing in themselves two strong trends (see e.g. [3, 9]) More concretely, however, several specific and heterogeneous forces seem to have rendered this new field attractive.

First and probably most banal, UST is a new phenomenon that holds the vision of bringing computing into the urban environment. It's a novel concept and therefore benefits from intellectual freshness as well as from the rhetoric of the new.

Second, the interest in spatial issues across the social sciences has recently increased (see for example [6]). In direct relation to UST we see a growing interest in philosophers and cultural theorist that pay attention to locational and spatial issues like Lefebvre, de Certeau, Foucault and Bourdieu; urban planners and theorist like Whyte, Jacobs and Gehl. Hence, it is possible to talk about a *spatial turn* in the social sciences and it is likely that this trend has increased the interest in UST and vice versa.

Third, in today's increasingly networked societies information technology is used to maintain and develop social networks (see e.g. [13]) by management of relations, by communication, and by arrangement of activities. With the form factor and interactional modes of ubiquitous technologies [12] it is tempting bring that development out into the city where people already engage in social activities of a similar kind.

Finally, UST makes it possible to reinterpret existing physical and social spaces. In particular, increased social awareness (see e.g. Familiar Stranger [8]), new ways of social communication (see e.g. Urban Tapestries [11], TagandScan [10]) and direct support of a specific activity like gaming and dating (see e.g. Botfighters [1] and Dogdeball [2]). These promising effects of implementing UST make it attractive.

The factors above (and possibly several others) have arguably contributed to the interest in social urban technologies and several concepts and applications are now developed and deployed. The critical question is whether this attractiveness also *translates into an uptake by everyday users?* Looking at the above list it seems like the idea of UST has allied itself with formidable powers: Backed by the rhetoric of the new, strengthened by the armory of the French philosophical brass, surfing the tide of societal change, promising new applications, and to a large extent supported by the largest players in industry as well the future of UST should

[1]We understand social urban technologies as information technologies applied in urban seetings and with a social purpose. We primarily think of technologies that go beyond simple communication between two persons such as mobile talk and sms.

[2]We do not intend to say that the goal of all UST is viability, but we critically examine the conditions for such an ambition.

be bright.

However, UST is not a ready-made technology but technology in-the-making to paraphrase Bruno Latour [5], hence it is not yet possible to conclusively settle the future of UST. We doubt that the various arguments for UST as presented above – despite their attractiveness – are sufficient to secure widespread adoption of this type of technology. We will now discuss two inherent difficulties relating to UST that illustrates this point, namely the problem of *intentional* design of social activity and that *technological* innovation in this field partly depends on *social* innovation as well.

3. INTENTIONAL DESIGN OF SOCIAL ACTIVITY

Presumably, a lot of research and experimental activities aim at designing UST in order to create good urban environments much like traditional urban planning. Therefore it is interesting to look at experiences from urban planning where the ambition is the same: to intentionally form the life of the city.

In Europe, before the renaissance, the villages, towns and cities were by and large self-grown. It was during the renaissance that a class of planners took over the design of towns with certain aesthetic ideals and with certain purposes – often military (e.g. boulevards for parades and fast transportation) [4]. This professionalisation of urban planning, which focuses on a physical dimension (public health and hygiene), culminated in the functionalistic period from about 1930's to 1970's and seen from a social point of view with relatively devastating results [4]. In relation to design of urban social technology it is important to pay attention to this lesson – because it underscores the difficulties in designing social activities intentionally. We might end up with all kinds of unintended consequences like the functionalistic architects and urban planners did. It is in other words difficult to deliberately turn a space into a socially meaningful place. This does not of course exclude all attempts of planning urban space – as several successful projects also have shown (see e.g. [4, 14]) – but it should warn us about the possible risks such a strategy entails.

This difficulty seems to transpire in the related field of computer supported cooperative work (CSCW) where attempts to design socially meaningful places in the domain of work through technology has been pivotal. First, in CSCW a major effort has been made to understand work through thorough ethnographic studies (see e.g. [7]) as a basis of design of cooperative and interactional technologies. And even then it is questionable how many widely used collaborative applications that originates from the CSCW community. And second, urban life is arguably more difficult to grasp than work: it's less delimited; there is not necessarily a clear set of activities to support in a confined location, or any clear collaborative goals or partners. From this perspective, it could be argued that design of urban social technologies faces an even starker challenge than CSCW does.

4. SOCIAL INNOVATION

As argued above the *object* of innovation in urban social technologies is somewhat social, though the means used primarily are technical. The strategy of social innovation through technology is to a certain extent shaky. As Latour [5] points out technologies do seldom move and propagate by themselves. Technologies are so to speak carried through society and the innovator's job is to secure that the innovation has enough allies to get out of the place.

It is questionable whether UST's allies are strong enough to carry the technology beyond its benevolent creators. If we look at many concepts for urban social technology they are not just technological innovations: they also presuppose a new social practice around the technology – a social innovation. Tagging and scanning text messages and pictures on certain locations in the city is about developing a new graffiti culture; Familiar Stranger [8] is based on a new perception and appreciation of strangers; Dogdeball [2] is dependent on a changed dating culture and maybe even new sexual practices and identities and so on and so forth. We don't claim that these and related concepts cannot succeed – but we are pointing out that their viability go along with cultural and social changes. In a sense UST is more radical than other technical inventions, which more readily "fit" into existing social practices by solving obvious problems and satisfying clear user needs.

Various ethnographic inspired methods and techniques are often part of the development of urban social technology and new and exciting approaches are employed like bodystorming [11]. Despite the *vitality* of those methods it's debatable to what extent they enhance the *viability* of UST. There is an inherent conflict between "radical" technologies and the use of ethnographies because a radical technology presupposes a new user or new use practice that doesn't exist yet. What might happen during design is that technology and user is simultaneously co-constructed. Unfortunately, that leaves us with a unique user – a user only representing herself.

5. CONCLUSION

We see no simple way out of this predicament. Our attractive allies described above seem to be the last ones to come to rescue - they are too abstract, idealistic, and academic to do the hard practical work that is needed to attract everyday users. We will have to consider how to forge a chain of hands in practice that help integrate social urban technologies in everyday life.

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Coincidence and Intersection: Networks and the Crowd

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ABSTRACT
This paper looks at the crowd and coincidence as an essential part of the urban landscape. Through creating opportunities for "points of intersection" within urban environments, the authors present an experimental platform for creating ad-hoc networks based on coincidence or chance occurrences. The "UMBRELLA.net" project examines ways to join different rhythms and circumstances which accent everyday life. Through exploring mobile ad-hoc networking (MANET) technology and coincidental network creation, the project examines how co-location of individuals in public space, might lead to new types of connections amongst strangers or friends.

Categories and Subject Descriptors
H.5.2 [User Interfaces]

General Terms
Performance, Design, Experimentation, Human Factors

Keywords
Public space, urban space, handheld devices, mobile ad-hoc networks, everyday object, umbrella networks, everyday life.

1. INTRODUCTION
The presence of other people is one of the first and most striking characteristics of urban environments. Whether following daily commutes, spending leisure time, or waiting, it is human activity that fills the city and creates a sense of action and potential. While often derided and blamed as an obstruction or source of frustration, the presence of the crowd an essential element of urban life. Indeed, it is hard to imagine a thriving city without other people, some known to each other, others not, populating our streets, cafes, and parks. The ebb and flow of everyday life, motivated by differentiated goals and intention, creates a pulsing backdrop for individual experience. Amid this activity, it is easy to allow routine to dominate, inuring the individual to feelings of discovery and the unexpected. Immersed in our own daily rhythm we neglect to see the polyrhythmic nature of the city around us, unaware of the "open totality" [5] the urban environment suggests. To address this, what we in the Disruptive Design Team at Trinity College Dublin suggest is that coincidences, used as "points of intersection" in the public sphere can create unexpected and poetic relationships between people and the environment. Through exploring mobile ad-hoc networking (MANET) technology and coincidental network creation, we are looking at how co-location of individuals in public space might lead to new types of connections amongst strangers or friends.

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2. CROWDING AND COINCIDENCE
In Crowds and power, Canetti speaks of our propensity to shield ourselves from the touch of others through everyday actions such as closing doors, protecting our bodies, and remaining shut in houses. [2] *Other people*, a fixture on the urban landscape can be threatening, causing us to preserve psychological distance when personal space is scarce [4]. Yet the power of the crowd as equalizer and propellant of unity cannot be denied. Whether for social protest or entertainment, crowds bring people together and provide a context for shared experience.

It is precisely this feeling of shared commonality that is lost in the fleeting rush of transportation schedules and pedestrian traffic. Individuals, competing for time and opportunity do not see themselves as related to the urban flows surrounding them. The investment banker, late for work, sees the other commuters in her path as hurdles which need to be jumped in order to bring her closer to her destination. Desperate to make it on the next train a young associate will push past others around him, managing to squeeze in at the last moment through closing doors. Urban crowds, of whom we are often a part of, do not always have the benefit of being pleasurably experienced. Aside from modern day Flâneur, [1] most people view the hassle of the urban crush as a necessary trade-off for the benefits (near jobs and services) of living in a city. Hägerstrand's time-geography model [3] shows how human spatial mobility is governed by constraints rather than the independent choice of individuals. In light of this, our question turns to how interstitial spaces, between destinations and prescribed activities, be invigorated with the spirit of the crowd?

3. UMBRELLA.NET
Our project, UMBRELLA.net is an experimental platform for developing ad-hoc networks based around coincidence or chance occurrences. The project utilizes haphazard and unpredictable patterns of weather and crowd formation as a catalyst for network formation. Our intent is twofold: 1) to challenge traditional conceptions of how networks form and function by correlating their existence to circumstances beyond people's direct control. 2) To integrate a network into the common accessory thus breaking down barriers to entry and increasing the proliferation of these networks in public spaces. The system consists of a set of umbrellas which operate as network nodes that can spontaneously

connect based on weather conditions, as well as a screen based visualization which allows users to see their relative positioning in the ad-hoc network. As a MANET, communication occurs by forwarding packets from the source to the destination via intermediary nodes [7]. Therefore the source and destination do not need to be in radio range, provided a valid path exists between them.

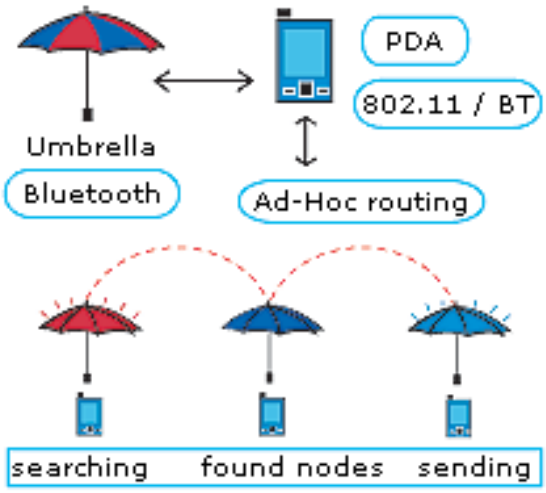

Figure 1. UMBRELLA.net system diagram.

UMBRELLA.net instantiates and dissipates as quickly as the conditions set to create the network appear and disappear. As an unexpected and disruptive occurrence, the project highlights relationships between individuals in public space, drawing attention to shared conditions which temporarily unite a divergent group. In addition to providing a visual footprint of network activity, the project creates a framework for sharing localized information among connected individuals.

The "Umbrella.net" system [Fig.1] includes a personal digital assistant (PDA) that interfaces both to the umbrella hardware and the other umbrellas within range, utilizing the Dublin Ad-Hoc Wireless Network (DAWN) [6] infrastructure (DAWN is a Trinity College wireless network test-bed). The PDA software only communicates with others when specific conditions are met i.e., when the umbrellas are open and other nodes exist in close proximity. Sensors in the umbrella detect its state (open or closed) and transmit this via Bluetooth to the PDA. If open, the software can engage with the network. Once engaged, the state of the current connection is made visible on the umbrella by illuminating it with LEDs based on three criteria: 1.) If searching for a node it pulses red, 2.) If a node(s) is found it turns solid blue, 3.) If data is sent between umbrellas, it pulses blue.

4. APPLICATION SCENARIO

A typical scenario for "UMBRELLA.net" is a crowded multi-use pedestrian street, where different people are engaged in various activities. (For example, two people might be shopping leisurely with each other, while another is rushing to complete errands during lunch hour.) When it begins to rain the individuals deploy their umbrellas and join the network. As each person continues along their business, the "UMBRELLA.net" network illuminates, showing the shared condition of all the individuals who have opened their umbrellas (allowing data exchange between people) until the conditions for the network no longer exists.

5. SUMMARY

In areas where the power of crowds turns to overcrowding and frustration, UMBRELLA.net provides an alternative perspective on designing ubiquitous computing applications for public space. Through exploiting coincidence and co-location, the project unites through seemingly random events and actions. By cutting through multiple rhythms of the city (through accessibility as an everyday object, and the locally-oriented and decentralized architecture of MANETs) Umbrella.net creates a "point of intersection" which may draw new attention to the everyday crowds which populate our urban environment. Our future work includes examining other forms of coincidence, other types of everyday objects, and how urban dwellers might be able to develop and customize ad-hoc networks for their own needs.

6. ABOUT THE AUTHORS

Katherine Moriwaki is an artist and researcher investigating clothing and accessories as the active conduit through which people create network relationships in public space. She is currently a Ph.D. Candidate in the Disruptive Design Team of the NTRG, Trinity College Dublin.

Jonah Brucker-Cohen is an artist, researcher, and Ph.D. candidate in the Disruptive Design Team of the NTRG, Trinity College Dublin. His focus is on creating interactive projects that attempt to deconstruct the use and perceptions of network culture and experiences.

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The City Streets

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"The streets find their own uses for things" William Gibson

Cities have long been an metaphoric and emotional symbol for artists, social scientists and city inhabitants, symbolizing a broad range of concepts from complexity, to decay, renewal, community or commerce. At then end of this long line, the city streets have recently become an attractive new site for technology developers. As with the continuing move away from the desktop, the city streets allow experimentation with new forms of event and interaction [5]. Following artists, who have long been interested in the streets as both producer of (and canvas for) art, city streets offer a range of new challenges, practical and conceptual for technology design.

One potential criticism of existing work (such as CYSMN, and our own work on gaming in the streets [3]) is that while the streets act as canvas or backdrop there is little concern for what is distinct about the streets of cities, as opposed to the insides of our offices and homes. The challenges encountered and discussed have remained very much at the level of the practical – those of power, network, and weather – rather than those of the social and environmental composition of the city. Yet city streets are more than just container, they are the setting for much of our public lives, as well as the the site of much public squalor. They are the connecting architecture of our travels, along with the highways of other less visible networks.

I suggest five concerns which present themselves as distinct from working with the safe indoors. These cover the distinct differences which the streets present to us as designers, to be both copped with and potentially exploited.

Feelings of isolation are rarely as decisive and intense when one actually finds oneself alone as they are when one is a stranger among many physically close persons, at a party, on a train, or in a city. (Simmel, The Metropolis and Mental Life)

First, the role of streets as public presents is both an opportunity and challenge for design. Our interactions with strangers are highly regulated in public. It is not that we do not interact with strangers – we do it all the time with those in shops, or when we cross the road – but rather than we seldom interact with others as like us, outside official roles. As Simmel was first to point out, cities establish a gambat – I'll ignore you if you ignore me. Goffman sharpens this point:

The more clearly individuals are obliged to refrain from staring directly at others, the more effectively will they be able to attach special significance to a stare, in this case, a request for an encounter. The rule of civil inattention thus makes possible, and 'fits' with, the clearance function given to looks into others' eyes [7].

Yet despite the work of Goffman, Sacks [8], and even more broadly the Chicago School ethnographies (and its availability for study) we still surprisingly know little about interaction between strangers. We do know that ignoring strangers is a fundamental gift which makes city life possible. Breaking those boundaries is hardly simple.

Yet like so much of our social conventions there is often 'time out' from our commitments. The carnival and the riot both stand as settings where these regulations can be relaxed (or at least new ones adopted), or even of heterotopias [6] where the unconnected can meet. The exceptions which are essential for the renewal of the ordinary.

Second, the city streets stand as an ever present milieu around what we do. The rich environment of the streets, and particularly of great cities like London, New York or Las Vegas, presents at least a sensory environment. Different places in different cities are on one level simply different to look at it. Yet central, and at times absent from the discussion of place [2], we find different affordances in places – we can do different things in different places. Not just spatial affordances - the environment beyond the streets (shops, attractions, public provision, offices) stands to constitute in part the nature of those streets. Moreover, our interactions with these environments and places goes beyond use– we dwell, as long term repeat inhabitants of streets, even those we visit intermittently. "I know the way, I've been here once before".

Our language can be seen as an ancient city: a maze of little streets and squares, of old and new houses, and of houses with additions from various periods; and this surrounded by a multitude of new boroughs with straight regular streets and uniform house (Wittgenstein, Philosophical Investigations, § 18)

Third, while it is tempting to see the streets as static or without change, as Brand [1] has pointed out change is constant yet mediated in different ways and with different time spans to interiors. Building codes control those changes, as does the ever present commercial imperatives. Buildings change over the course of our lives in a way that can transcends any individual lifespan, a country is its buildings in that many of them live on, when everyone around here will be dead.

Fourth, as becomes apparent to anyone who runs an event in the city streets, the streets are inhibited by many of those who are marginalised or even bodily excluded from activities indoors. The homeless make their homes on the streets, and must manage those of us who only visit the streets and make our homes elsewhere

[4]. In turn, children and animals, homeless in very different ways, also adopt streets as places where they can inhabit and control their environment.

Today's news was published by word of mouth in the streets of ancient Athens. (Anonymous, popular quotation)

Lastly, (and at times a trap for social scientists to get out of fieldwork), the city streets are documented and symbolised in perennial representations, as well as being the surface for representations themselves. Guidebooks, maps, photographs document streets, duplicating their presence with streets in turn becoming constituted by those reproductions – the popularity of the tourist image of Lombard street/ 'the windiest street in San Francisco' conflicts with its poor (yet very rich) inhabitants. In turn, with a literal interpretation of canvas, advertising, graffiti and the works of a not inconsiderable number of arts are literally pasted or drawn onto the streets. Billboard are joined by community notices, road signs as well as the frontings of businesses and houses, presenting messages as a constant backdrop to our travels.

This array of concerns presents a challenge for moving beyond practical concerns and to grapple more specifically with what it is about the streets which can make technology distinct and appropriate. The challenge is also that in designing for the public, we may end up with systems for very different purposes that what we are used to.

Biography

Barry is an Equator research fellow at the department of computing science, university of glasgow. He has published widely on the use of leisure technology, space & place, and the practices of mobile workers. His recent work concerns the crossover between geography and technology, and the design of technologies for pleasure and leisure.

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Privacy's Role in Mobile Social Software for the Urban Community

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ABSTRACT
Sociologists have illustrated that desires for privacy often work against tendencies toward community creation and sustenance. Social technologies adapted to assisting people living in urban environments may be able to help resolve the conflicts in this relationship. Well-designed mobile device applications that help users to integrate well into urban environments have the potential to benefit communities while addressing participants' concerns regarding privacy.

INTRODUCTION
Over the past few decades, many have argued that neighborhood features such as eyes on the street, "public characters" and locales for ad-hoc public gathering create safe, vibrant, and cohesive environments for community members. Jane Jacobs based her career in large part on these ideas and discussed the surrounding issues in her seminal work, *The Death and Life of Great American Cities*. Urban architects and planners have widely accepted the basic tenets behind these ideas and have attempted to incorporate them into their work. Technology can serve complementary purposes in promoting community cohesiveness. New types of location-aware mobile social software (MoSoSo) applications allow people to develop both weak and strong relationships with others who live and work around them. However, location-aware MoSoSo applications bring with them the ability to keep track of community members and invite unwanted communications, a feature that often prompts anxieties about intrusions into privacy.

LOCATION-BASED MOBILE APPLICATIONS
Many of the current applications of location-based mobile technologies serve functions such as tracking a mobile workforce or tracking loved-ones such as a child or a senior relative. People tend to be scared of the idea of using tracking technologies because they fear the tools could also serve to invade their privacy. I argue that a combination of better application design and giving users enhanced control of application functions and features can mitigate the perceived invasions of privacy.

Currently Deployed Applications
Some widely deployed tracking technologies that spark concern include automatic toll collection systems for toll roads and transit system debit cards. These systems, as an ancillary effect of their primary purposes, afford those with access the ability to track their users and, indeed, they have been used in the past by law enforcement organizations to track individuals. Recently journalists and academics have written a great deal about one of the most widely suggested applications of location-based mobile technology – location-based advertising. They envision a near-term future in which corporations and businesses knowing the locations of potential customers deluge innocent people walking down the street with advertisements related to their location. These applications worry people; they would rather not have large entities with powers out of their own control have access to such personal information as their travels. They are apprehensive about further intrusion into their "private lives" by corporations that they feel are solely seeking to make money from them.

Mobile Social Software
The field of MoSoSo is evolving quickly, with many new types of applications being developed and deployed. MoSoSo at its most basic level is any software that allows people to connect with others while mobile. This would encompass applications as varied as a simple, mobile voice-mail service and a mobile and location-aware buddy list such as AT&T Wireless's Find People Nearby service. Once location is integrated with the features of social software, that software becomes potentially more powerful as a way for people to meet while moving around physical space. Incorporating location-based features makes it easier to bring relationships created or nurtured in virtual communities to the physical world and vice versa. It also allows for developing relationships in the physical world that otherwise would not have formed. MoSoSo has the potential to lessen privacy issues since access to personal information can be limited to those within one's social network, but issues regarding invasiveness remain.

REMEDIES
In order to maximize the usefulness of MoSoSo, we must take steps to remedy the associated negative issues.

Surveillance Versus Location Awareness
When people refer to location-based applications, especially those that can be used by employers or law enforcement, they often use the word "surveillance" to describe the feature that locates people or physical assets. This word implies an invasion of privacy. While surveillance is one function of location-based applications, for social

applications, I suggest the term "location awareness" is often more appropriate. While the terms may be similar in definition, their connotations are quite different as are the purposes of obtaining the location information.

Both surveillance and location awareness applications keep track of where people are, but they differ in terms of how the tracking is carried out. In order to clarify how community knowledge of location can be possible without causing users to feel like they are under surveillance, I suggest the following core requirements of mobile applications that require location awareness in order to function usefully:

- the ability to turn off tracking lies primarily with the person being tracked,
- configuration of others' access to one's location information is performed easily and location information is available only to those who the person being tracked grants access, (and)
- when leaving tracking off, there is as little social stigma and suspicion attached to this choice as possible.

System Architecture

There are also remedies to privacy concerns about location information that stem from the design of system architecture. Services can be built that are based completely or partly on peer-to-peer models of application workflow. Instead of a central server tracking the location of a person, a community can use its own systems. Thus, the community itself retains the power to grant or deny access to the data collected to others via a central clearinghouse or commercial entity.

User Interface

A key to implementing systems in which the person being tracked retains control lies in the interface. It must be simple for the person being tracked to decide who has access to information about them at any given time. In order to accomplish this, visibility settings must not be buried within a preferences or configuration menu in the user's application interface. They must be immediately available at any time.

For the person being tracked, it is often desirable that their friends or associates are aware of where they are, but it may not be desirable for them to be tracked on demand. A person can choose, for example, to give out their location at a specific time, but not allow others to check on their location whenever they like. This represents, not a difference in terms of technology, but a difference in terms of perceived – and actual – control; and perception is key when it comes to feelings of being watched.

Trust

Location awareness will carry with it some surveillance. In order to minimize the negative effects of surveillance, trust must be built between the various stakeholders involved with the systems in question. It must be clear to users of the system what data can be collected by the service providers, what can be done with the data and under what circumstances. It also must be clear to users what their rights are in terms of the ability of governmental authorities, commercial entities or other people to gain access to, and use, the data collected.

Application - Socialight

I am one of the creators of Socialight, a project dedicated to building a mobile social software system that runs on top of an existing social network and provides a set of applications that aim to make social connections captured by computer networks more useful when mobile. We have tried to develop our applications with users' privacy concerns in mind. Two tools currently being prototyped are called Sticky Shadows and Tap & Tickle.

Sticky Shadows are virtual multimedia sticky notes placed in physical space. Using a mobile phone, a user places a Sticky Shadow at their present location for people in their social network to retrieve when passing through that same space at a later time. These notes allow people to tell others about their location in a time-shifted manner. Thus others can learn about the person who left the note and the place where they left it without the ability to learn where that person is whenever they like.

The Tap & Tickle are ways to communicate with other people nearby through a mobile phone that are similar to the casual ways we communicate with others gesturally and physically. A Tap is a short vibration sent to another's mobile phone. The Tickle is like a Tap, but with more control. A user can send a series of vibrations to another's mobile phone in a pattern determined by the pattern with which a button on the sender's phone is pressed. Tap & Tickle afford people near each other with a mode of communication that is less invasive than a phone call or even a text message.

AUTHOR BIOGRAPHY

Dan Melinger is a communications theorist and technologist. He has worked as a consultant to companies developing and implementing wireless data technologies and has experience in the production of radio and television. Dan holds a Master's degree from the Interactive Telecommunications Program at New York University and a Bachelor's degree in Communications from the Annenberg School at the University of Pennsylvania. He is a co-founder of Socialight. Dan's latest research interests include exploring new consumption models for peer-to-peer distributed media.

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Zooke: The Camera Phone Game

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Abstract

Zooke is a camera phone game which allows individuals playing within social groups to challenge one another to take photos of different things in and around their habitats. It creates a compelling way for users to creatively explore their own worlds. By being presented with different challenges to capture, the game forces users to make decisions about existing social and physical boundaries currently established within their familiar spaces. Zooke creates a rich imagery-centric interaction exploring social and physical boundaries of individuals and communities living within urban spaces.

Categories & Subject Descriptors: H.4.3 [Information systems applications]: Communications Applications; H.m [Information systems applications]: Miscellaneous
Keywords: Mobile Camera Phones, Augmented Reality, Mobile Gaming, Social Media

INTRODUCTION

Mobile technology challenges current urban boundaries. As technology becomes more ubiquitous, it begins to be immersed into different aspects of users' lives. The likelihood of its interference into daily activities and interactions becomes heightened.

Games possess the power to allow individuals to mentally remove themselves from a physical world and create a set of game world boundaries. With the immersion of pervasive technology, users can begin to bring the real world into the game world or the game world into the real world [1, 2, 3, 5]. During this intersection, a tension is created as the user decides what actions are necessary to continue game play and if that set of actions fits within the normal boundaries of the existing real world social context.

Thus, as games begin to take advantage of the affordances of mobile technologies, social interactions, physical boundaries, and social rules within public spaces can begin to be challenged. Zooke, is a camera phone game which challenges the boundaries of social interactions and forces users to struggle to reconcile conflicts presented at the intersection of the game and real worlds. At the same time, however, it presents users with the opportunity to examine the real world in a new way, thus making it a compelling engagement, allowing exploration of familiar spaces within a new context.

DESCRIPTION

Zooke, a game designed specifically for camera phone devices, is a multiplayer reality game played within social groups. Players create challenges on their camera phones and distribute them to a group who completes them by taking photos of the challenge. Challenges can range from something concrete, a flower, to something abstract, a subliminal message. Their content is completely determined by the creator and group, itself. After a player has captured the challenge in a photo, the challenge is submitted and then distributed among the group for the other players to verify that it has been completed accurately. Upon acceptance, the photo is then posted to a website where all players can view and comment on the photo. In this way the players in the game are the creators, judges, and competitors of their own game.

The game is persistent and meant to be played in downtime or spare time that one may have. It is a quick game that requires little involvement. Each action in the game should take no longer than 30 seconds at longest, and more realistically takes about 15 seconds. It is the players' decision which subject matter they would like to capture. It may be themselves or another individual. Creativity levels are left to the discretion of the group and the personality of the players.

ANALYSIS AND FINDINGS

We mocked up this play through SMS and Email on the phones before creating a Java MIDP1.0 client. We then distributed the rules of the game and the methodology of how to play to two groups of users with 12 and 13 participants respectively. Each group played the SMS prototype version of Zooke for 1 week. We then held a focus group to discuss the results of the game.

To our surprise, players commented on their deep enjoyment of the game. Prior to playing many were very skeptical of the idea, but afterwards commented very positively about it. They played it in places that we had previously anticipated: bus stops, walking down the street, waiting for people, eating alone in a restaurant, and the airport. As well, they played in some places unanticipated: at home, and driving. Regardless, the times when they played composed of mental downtime when they were able to concentrate and fill their minds with other thoughts: the game.

Strikingly, not only did the game just fill their minds with more engaging thoughts, but it challenged them to view the world differently. No longer were they only walking to school, but they were searching for something at the same time. Creative analysis of the elements within their urban space was happening in the minds of each player. The following is commentary by players of the test versions:

"I started looking for Zookes [when walking down the street]"

"I enjoyed it, I found myself looking at things differently"

"I was trying to figure out how do I capture this in a picture?"

"[I was trying to] find 'subliminal messages' in a shopping area in San Francisco."

As well, however, the game also challenged the players to revisit their social boundaries. Can I capture that person in a photo? Should I ask first? Can I attach that person to a negative connotation challenge? The poor resolution on the camera phone device itself also forced the players to explore physical boundaries. How close can I get to the element of capture? If it is a person, will they notice that I am taking a picture of them? How close can I get without them seeing me? Participants commented on struggling with these decisions themselves and finding resolution to be difficult. One player resolved to not take a photo of a woman wearing the challenge "ugly jacket":

"I had an 'ugly jacket' Zooke. I saw a woman wearing a red jacket, but I couldn't get her because the resolution was too bad. So then I didn't know if she would notice me, if I approached her… and then I started to wonder if I should ask her if I could take a picture… then I felt bad because I was fulfilling 'ugly jacket'… no, I didn't take it."

DISCUSSION

Zooke forces users to challenge the physical boundaries and social interactions of spaces. By creating an ever-present thought in the back of each player's mind players begin to look at the world differently. A thought of hunting, searching, and interpreting allows each user to explore their environment further. After a target is found, the hunt, a challenge of how to approach and capture, then begins.

The hunt allows players to deconstruct the social and physical space they live within daily. It enables them to search critically for unique findings within these spaces. It teaches them to analyze the everyday activities happening within their urban habitats and attach a new label to it. It provides them with a tool to help decontexualize their own familiar spaces and utilize its embodiment in a whole new world: the game world. In this world the meaning and context may be entirely different. Players are then forced examine the connotation of the meaning in the game world and establish their own set of new boundaries within the real world.

The capture process reinforces this critical decision as players are forced to express their game world decision in reality space. Physical proximities are challenged. Some players may get close enough that their target notices their position and action. Others may ask their target permission, before deciding to fulfill the capture. Yet, others may use other urban elements in new ways: perhaps as hiding or concealing mechanisms. It is in within these interactions that new boundaries are established in the real world. The game, thus, provides a conduit to examine, explore, challenge, and ultimately alter or reinforce existing real world physical and social boundaries.

CONCLUSION

I am interested not only in the outcome of how players resolve these conflicts, but also at which point contention arises. What forces some players to ask permission, and other's to go ahead and capture? Further, at what point does it even begin to become a conflict? As technology becomes increasingly more ubiquitous, these boundaries are pressed even further. I'm interested in providing users' with mechanisms which allow them to explore these boundaries and to watch as they themselves facilitate such change. I strive to create enjoyable environments with which users can expand, learn, and grow.

BIO

I am a recent graduate of UC Berkeley School of Information Management Systems. I conducted this study as a portion of my thesis project – Zooke: The Camera Phone Game. I have worked on mobile systems utilizing social networks to attach metadata to photos for the past two years. I am very interested in mobile reality games, especially those involving social networks. I am currently continuing work on this project and hope to continue to explore its effects in different social contexts. I love to dance, play soccer, build things, and talk with people.

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The Point and the Path - a Relationship Between Space and Time

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ABSTRACT
Projects that locate experiences in geographical space usually involve an approach that favours either the point or the path. Each approach has strengths and weaknesses, and sometimes a solution is to attempt to include both kinds of information within a project. What kinds of meta-data need to be attached to a project to make point and path information useful? Which approach provides a richer user experience?

Categories and Subject Descriptors
J.5 [Arts and Humanities].

General Terms
Documentation, Performance, Design, Experimentation.

Keywords
Geo-location, paths, tracks, traces, meta-data.

1. INTRODUCTION
Several recent locative media projects have mapped points in urban space as places of interest, highlighting them as a place for users to send or receive experiential information. What is missing from this point-based approach is a sense of time. Mapping urban spaces and embedding media spaces within them is an exciting development for the future of cities, however, the way that people interact with the city is also time-based. Where do people linger, and what spaces are, for one reason or another, simply transitory spaces to get through as quickly as possible?

2. CASE STUDIES

2.1 [murmur]
A point-based urban narrative project, [murmur] geo-locates stories for passerby with cellphones to discover. Specific points in space are marked with a sign; users are invited to call the telephone number on the sign to listen to a story about that locale while experiencing the space where the story took place. [murmur] is poetic, it hangs the ghosts of the past on the structures of the present. The stories are sometimes charming, sometimes quotidian, but either way, they never fail to alter the perception of a point in space.

But how should one navigate [murmur]? The map of activated points (viewable on the website)[1] sprawls over several city blocks, and the project itself lives in three different cities. By not offering paths through the project, the experience becomes somewhat random, a self-guided tour of sorts. But which thread of [murmur] stories is the most compelling? How can a user's experience of the project be guided to produce maximum effect? By encouraging one story to follow another, the equivalent of a narrative arc be created. It may be useful to view the path one should follow to hear all the stories about certain things. Perhaps as a user I would like to take the "broken hearts" path and hear all the love stories, or if I am in the mood for something less personal, the "historical" path to hear what buildings used to be. This would involve generating meta-data to classify stories, deciding which categories should exist, and possibly filing some stories in more than one category. It is also be informative to map user paths. With an analysis of the logs of calls to the system, it would be easy to generate the paths of users through [murmur], revealing who listened to which stories and in which order, which may serve to analyze how foot traffic generally traverses the areas of town where [murmur] is installed.

2.2 Teletaxi
In an example where the "point" in question is a moving target, Teletaxi is a project that uses GPS to deliver location-specific video content to passengers in a taxicab. When the taxi passes through activated areas, video clips related to the location play on the flat screen installed in the taxi. In addition to relating content to the point, content is also triggered by states. When the taxi doesn't move for a period of time, video works that address the lack of movement are launched [2].

To extend the use of GPS beyond a point-based approach, artists creating work for the Teletaxi platform could also consider using GPS to track the taxicab passenger over time, and play clips based on a certain traversal through the city. The use of GPS as a state (changing or fixed) rather than a simple indication of location that triggers an event is already an improvement on the standard methods of treating GPS within creative projects.

The Teletaxi platform may also benefit from some ordering of the types of content, to produce paths for the user that would reflect a subset of interests. Certain classifications of content are already obvious - by artist or by neighbourhood. Further classifications to the type or style of content may add to the user experience, but to do so must take into consideration the possibility of providing too many options, rendering the

experience confusing or unpleasant. These approaches could be considered to be a kind of curation within curation, a creation of sub-themes to a project where the larger unifying theme is simply location specificity.

2.3 PDPal

A project that marries path information with point information well is the New York-based PDPal. PDPal is a project that enables users to map their "emotional GPS"[3], by either using the web or a PDA to annotate their experience of Times Square. Users select from a host of icons when choosing to place a point on their map, and can annotate it with text. In addition, however, users can mark their path, which offers a whole other layer of information about your experience in Times Square - did you get lost? Where did you start and where did you end?, et cetera. The addition of path information furthers the individualization of the space, since it would be rare that two users would take the exact same path. Viewing how you navigated Times Square also enables a remembrance of experiences as they happened over time ("Oh yeah, first we went there, then took a wrong turn and ended up over there...") The creators of PDPal also have generated a number of exercises that they conduct from time to time with open groups, where interested parties gather to experience the project, but with a mission, such as: make an "Official Field Guide", behave as though you are an anthropologist from an alien planet, use an algorithm to guide your walk, etc. By using these exercises, navigation is also effected, and the history of that effect is apparent in the paths created.

2.4 Crowd Compiler

PDPal, in a way, enables users to "perform the space", which requires that an event occurs over time. Implementing a way to annotate not just space but time, while upholding certain visualization standards, is a difficult problem, though there are some tested ways of tackling this. Christian Nold's "Crowd Compiler" software, which layers images of people using a space on top of one another, decodes ways that people flow through space and therefore how they use it [4]. This method effectively reveals both virtues and flaws in the design of a space. The classic example of mapping both space and time, Charles Joseph Minard's map of Napoleon's march, addresses both with elegance. Current projects should strive to implement the same grace and balance when representing both spatial and temporal data.

3. CONCLUSION

The point and the path, when they act in unison, can be a very powerful way of mapping experience. They are each useful methods on their own, though path data can be more compelling for its ability to act as a timeline of events. My thoughts on the projects above and the possible uses for paths within them may be unworkable or unnecessary, but raise questions about what information is useful to collect and provide when working with location specificity. Ultimately, it is up to the author of each piece which item bears greater relevance to their work: the points of interest or the ways that people flow between them.

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4. ACKNOWLEDGMENTS

Thank you to the artists for providing me with additional information about their projects.

5. AUTHOR BIOGRAPHY

Michelle Kasprzak is an award-winning artist, writer and lecturer. She is currently an M.A. candidate in the École des Arts Visuels et Médiatiques at the Université du Québec à Montréal.

Her study of performance art and technology at the Master's level is complimented by her concurrent teaching career and independent research. As adjunct faculty for the Canadian Film Centre's new media programmes, she designs and delivers curriculum that addresses the most recent creative applications of new technologies. Michelle is also currently a researcher in the Mobile Digital Commons Network, a cross-disciplinary research group funded by Heritage Canada for the purpose of investigating the transformation of public space through the development and deployment of location-specific content.

Since winning the InterAccess Electronic Media Arts Centre *Emerging Electronic Artist* award in her early career, Michelle has proceeded to exhibit her work and present performances across North America and Europe. She has been featured in numerous publications and on radio and television broadcasts syndicated worldwide.

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The Myths of Micro-coordination?

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ABSTRACT
In this paper, I will discuss the use of mobile and wireless technologies for the micro-coordination of everyday life in the urban context. I hypothesize that while, with the greater adoption of mobile and wireless technologies, decision-making could become even more dynamic, flexible and spontaneous, this may not necessarily be the case. In addition, while significant increases in efficiency or dramatically different patterns of movement could emerge, things may stay more-or-less how they already are. I will present several future scenarios, which could result from these new forms of organization and movement.

Categories and Subject Descriptors
J.4 Social and Behavioral Sciences

General Terms
Design, Economics, Human Factors.

Keywords
Micro-coordination, social organization, navigation, ethnography, cross-cultural.

1. INTRODUCTION
In recent years, mobile and wireless technologies have been commonly used to for the dynamic, flexible and spontaneous reorganization of everyday life, in particular, in the urban context. While this function may seem relatively mundane, the use of mobile and wireless technologies in this way has become a source of new social norms, which contradict earlier patterns of social organization and coordination of movement.

These new social norms both support, and also, importantly, counteract the dynamic, flexible and spontaneous re-organization of everyday life. Thus, while micro-coordination has the potential to dramatically increase efficiency, the opposite may also be true. Similarly, micro-coordination could lead to completely new ways of navigating urban environments. Or, things could remain much as they already are.

As a result, it is possible to conceive of future scenarios in which the widespread deployment of mobile and wireless technologies in the urban context could lead to even more dynamic, flexible and spontaneous forms of organization and movement.

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2. LITERATURE REVIEW
In particular, Ling and Yttri coined the term 'micro-coordination' to describe the instrumental use of mobile phones for logistical purposes, which they associate with demographic factors. 'Micro-coordination' was found to be common among two-career parents (2002). In addition, Plant's research has discussed the more extreme aspects of micro-coordination, which she calls 'approximeeting'. In this mode, schedules are always tentative and everything is virtual until the meeting takes place and it becomes real (2001).

The micro-coordination of everyday life could have a significant impact on the economy by increasing efficiency. In general, people spend a great deal of their time organizing and reorganizing their schedules, coordinating their movements. As Townsend describes it, "time becomes a commodity that is "bought, sold and traded over the phone," (2000). Katz estimated that if half the people in the US could save 20 minutes a day by coordinating events via their mobile phones, then 1.6 million person/days could be created daily (1999).

With respect to new patterns of movement, Okabe and Ito's ethnographic studies have shown that Japanese teenagers report spending less time waiting for their friends in fixed location, instead, they gradually converge in a face-to-face meeting after a stream of messages and voice communications (2003).

While it is becoming apparent that micro-coordination is commonplace among certain groups of mobile and wireless technology users, it is less clear how this change is manifested and what the impact on urban environments might be. To date, there has been little empirical evidence to support dramatic increases in efficiency or changes in patterns of mobility.

The following analysis will use Woolgar's "Five Rules of Virtuality" to analyze how micro-coordination via mobile and wireless technology might impact the urban environment. More specifically, Woolgar argues that the widespread use of new technologies often have counter-intuitive results because:

technology uptake depends on social context; fears and risks associated with new technologies are unevenly distributed; new technologies supplement rather than substitute for old ones; the more virtual, the more real; and the more global, the more local (2002).

3. "NOW I'M FREE"

In theory, micro-coordination could be completely automated with the use of a digital planner and mobile communications device. In fact, such applications have already begun to emerge. For example, Dodgeball in New York and *Ima Hima*, translated from Japanese as "Now I'm Free", in Tokyo make it possible to inform existing networks of individuals about minute-to-minute movements in the urban landscape or meet new people with similar interests who are proximate in location. This eliminates the need for constant voice calls and messages to multiple friends, because location information can be broadcast to groups. In addition, these applications are able to detect friends and friends-of-friends within the immediate area. These applications merge social software such as Tribe, Friendster and Live Journal with location information. Thus, such applications can save time and make spontaneous meetings of friends more likely.

4. FUTURE SCENARIOS

4.1 Scenario A – No Change

In this scenario, I hypothesize that despite the widespread use of mobile and wireless technologies, things will remain much as they are today. This is because people have always had the capacity to make flexible, dynamic and spontaneous decisions irregardless of the technologies they were using to communicate. Whether or not our coordination becomes *more* flexible, dynamic and spontaneous, may not have a significant impact on efficiency or patterns of movement in the urban environment.

4.2 Scenario B – Extreme Micro-coordination

In this scenario, I hypothesize that by using automated social software applications in conjunction with mobile and wireless technology, we will move into a phase of extreme micro-coordination. This will be further enhanced by the ubiquitous availability of maps and other data. This could result in substantial increases in efficiency and widely divergent patterns of movement in the urban environment.

4.3 Scenario C – Social Norms Adjust

In this scenario, I hypothesize that social norms will adjust to counteract efficiency gains or changes in patterns of movement. For example, since mobile and wireless technologies allow constant communication, lateness may no longer have the social stigma that it once did (Ito 2003). In addition, micro-coordination often requires that many, many more communications take place before the face-to-face meeting occurs. This could present a significant loss of efficiency, rather than a gain.

4.4 Scenario D – Mixed Model

In all likelihood, mobile and wireless technologies will coexist with a range of social practices already used for the coordination of everyday life. Thus, neither extreme scenario is likely to occur. This is because while sometimes new technologies completely replace earlier modes of doing things, most of the time they become a supplement rather than a substitute (Woolgar, 2002). In addition, since the technology has the potential to enhance the capabilities of all users

5. CONCLUSION

These scenarios present a range of possibilities for the future of mobile and wireless technologies in the urban context. It is hoped that future studies will begin to illustrate how the widespread use of these technologies could change efficiency of social organization and pattern of movement. Using innovative research methods such as combining quantitative data analysis and ethnography, and using visualizations and geographic information systems (GIS), may help to illuminate how urban areas are changing.

6. ACKNOWLEDGMENTS

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7. Biography

Laura Forlano, a Ph.D. student in Communications at Columbia University, is researching the social implications of mobile and wireless technologies in the urban context. During Summer 2003, she conducted research on Japanese teenagers use of mobile phones in Tokyo with funding from the National Science Foundation (http://wirelessociety.blogs.com/photos/teentokyo). She is leading a special interest group on this topic for NYCwireless (www.nycwireless.net). Forlano has worked as Project Manager for the Information Technology and International Cooperation program at the Social Science Research Council (www.ssrc.org/programs/itic) since April 2002.

She has been writing a monthly technology column for Gotham Gazette (www.gothamgazette.com) since October 2000. Forlano received her B.A. in Asian Studies from Skidmore College and her Master's in Science and Technology Policy from the Columbia University School of International and Public Affairs.

Urban space as a large-scale group playground

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ABSTRACT
In this paper, I describe CitiTag, a research project aiming to explore the potential of spontaneous social behaviour and playful group interaction in public spaces through the use of mobile technologies. I discuss briefly the idea and motivating themes, the design of CitiTag, a wireless location based multiplayer game and findings from two user studies.

Keywords
Mobile computing, social computing, presence awareness, wireless location based games, multiplayer games

1. INTRODUCTION
The uptake of mobile technologies has undoubtedly been changing our communication practices and affecting our everyday life patterns. A key concept in this work is p*resence awareness*, which is knowing or being aware of other people's existence, for example whether one's friends and colleagues are online or not. With the advent of mobile technologies, presence becomes a richer concept as well as more ubiquitous, integrating virtual presence with physical presence through location information.

New opportunities emerge for individuals and groups to communicate and coordinate their activities spontaneously in urban environments. Rheingold's discussion of *Smart Mobs* [2] highlights the overwhelming power of social cohesiveness that can be brought about by knowledge of the presence and location of others in both real and virtual spaces. We also know that wirelessly internetworked groups of humans can exhibit emergent prediction capabilities [2] and thus demonstrate self-organizing dynamics.

Our work is motivated by the idea that the presence awareness of many other people can enhance the 'feel good' factor of being part of a large group and thereby afford spontaneous interactions. Previous online studies [3] have shown that spontaneous social behaviours can 'emerge' among groups present in multi-user environments, even without explicit and verbal communication. The recent Flash Mobs phenomenon illustrated that people do not hesitate to perform certain acts in public together with many others, which otherwise would have been quite embarrassing. In fact, people participating in those events seemed very engaged and amused.

These acts of spontaneous play have been thought-provoking within the context of our research. Play has been inherently social, before the advent of communication technologies, as we see everyday on school playgrounds. Presence enabled technologies create new prospects for play, for adults as well. In our research these are the boundaries we explore: what kind of engaging social experiences can emerge in the real world based on the awareness of individuals participating in a parallel virtual experience? Does virtual presence penetrate physical presence in any way?

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2. THE CONCEPT
The 'CitiTag' project is focused on social experiences and group play in public spaces, based on the awareness of other peoples' presence, through the use of mobile technology.

Our CitiTag game has been inspired by the simplicity, spontaneity and instant fun of 'playground tag' [1]. We have further developed the 'tag' concept to encourage emergent social behaviours in an urban context. City space is used as a playground and passers-by can become the usual or unusual suspects in a novel experience.

3. DESIGN
CitiTag is a multiplayer, wireless location-based game, played using GPS (Global Positioning System) and handheld, iPaq PocketPCs connected to a wireless network. The game has been designed for many people, potentially as an everyday experience one could have in the future with a mobile phone while walking about in a city centre. As a player of CitiTag, you belong to either of two teams (Reds or Greens) and you roam the city, trying to find players from the opposite team to 'tag'. You get the opportunity to 'tag' someone when you get close to them. You can also get 'tagged' if someone from the opposite team gets close to you. If this happens, you need to try and find a team member in the vicinity to set you free, to 'untag' you.

Each game event (e.g, someone is close and you can tag/untag them) appears as an alert on the iPaq screen with a sound (Figure 1). The player can then tap the screen to respond to the event.

The project is motivated by the hypothesis that very simple game rules based on presence states (e.g. I am Green and 'tagged') can result in an enjoyable social experience, stimulated by real world interaction among players. Another hypothesis is that certain interactions may 'emerge' once a critical mass of users has been achieved, making the experience different every time as it is stirred by group dynamics.

Figure 1. Game screens: default, you got tagged, rescue a friend

4. USER EXPERIENCE STUDIES

We have carried out two user trials: a pilot trial with 9 participants in an open field space at the Open University campus in Milton Keynes and a trial with 16 participants in a square in the city centre of Bristol (Figure 2). These were followed by group interviews, in addition to which all participants completed a questionnaire about their experience with CitiTag. Our observations are described next.

4.1 Spontaneous behaviours

Participant interaction in both events was particularly interesting as various emergent tactics were displayed: using gestures to attract attention from a distance, following others secretly or running, trying to surround a person in pairs, hiding and waiting for passers by, and other similar ones. In the Bristol trial there was an 'assassin', a player who cheated by joining the opposite team and then switched back to the original at the very last minute to 'tag' as many people as possible whilst being among them. There was also an 'invincible pair', two players who just went along together to tag others and kept rescuing each other, without having verbally agreed to collaborate beforehand.

Figure 2. User trial in the centre of Bristol

4.2 Presence awareness

Our participants in both trials valued the group state awareness features of the game and expressed their wish for more awareness features in a future version of the game, particularly more audio cues and variable levels of proximity alerts when someone is close, but not yet 'taggable'. Many participants also wanted to be able to see more people in the vicinity on their screens, including members of their own team. In the Bristol trial, the awareness of the presence of other players was correlated with how much our participants enjoyed the game as well as with how engaged they felt. This is an indication that in physical technology mediated games like CitiTag, immersion in play is associated with real people around rather than with interaction through a game screen as in most computer games. This in fact endorses the principles of the lightweight design of CitiTag, which reveals one aspect of someone's presence (a name of a person within 10 meters or so) but without making everything too explicit (the person's actual location on a map).

4.3 Experience and everyday life

Participants discussed various scenarios in which they could play CitiTag, for example as part of a timed event, a gathering with friends outdoors, an opportunity to form groups/clans and socialize. In our pilot trial people needed an appropriate location to play the game, a city landscape, rather than an open field where players are constantly exposed. In the Bristol trial the location was more appropriate for the game and a couple of participants suggested specific city locations, such as pedestrian areas in Bristol with more places to hide, where they would like to play CitiTag.

5. FURTHER WORK

The trials have provided extensive feedback on the conceptual design of the game as well as the user interface to allow us to design the next, more advanced version of the game. With CitiTag we aim to identify design implications for future technology mediated social experiences.

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