Accountabilities of Presence: Reframing Location-Based Systems

Emily Troshynski[*], Charlotte Lee[†], and Paul Dourish[†]

[*]Dept of Criminology, Law and Society
University of California, Irvine
Irvine, CA 92697-7080, USA
etroshyn@uci.edu

[†]Dept of Informatics
University of California, Irvine
Irvine, CA 92697-3440, USA
{cplee, jpd}@ics.uci.edu

ABSTRACT
How do mobility and presence feature as aspects of social life? Using a case study of paroled offenders tracked via Global Positioning System (GPS), we explore the ways that location-based technologies frame people's everyday experiences of space. In particular, we focus on how access and presence are negotiated outside of traditional conceptions of "privacy." We introduce the notion of accountabilities of presence and suggest that it is a more useful concept than "privacy" for understanding the relationship between presence and sociality.

Author Keywords
Location, ubiquitous computing, GPS, parolees, mobility, privacy, space, time, body

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
Computational systems and their designers find themselves increasingly attempting to understand the phenomena of every day social life and to incorporate representations of them into systems. In contemporary systems, mobile technologies move with us through a world that is more complex and variegated than the office setting to which HCI and CSCW have devoted most of their attention. As computational systems move around in the world, we would increasingly like them to know "where" they are, but the notion of "where" is as much a social concern as a geometric one. Various efforts have been made, then, to mediate between different representational schemes that might capture different aspects of location [15, 16]. Difficulties arise, though, in cases where the social and cultural organization of everyday space may not be easily reducible to a technological foundation [6].

In this paper, we wish to explore some potential reframings of questions of location and mobility at the intersection of the technical and the social, with a particular emphasis on questions of privacy. We explore these questions through empirical engagement with a very particular case – paroled sex offenders whose movements are tracked via satellite positioning (GPS) as a part of their parole conditions. We selected this group not despite, but because of, their status as somewhat extreme users of location-based systems. Standpoint theory [14] argues that the subject positions of marginalized groups gives them particular insight into the operation of the cultural institutions that act upon them. So, as location becomes technologically operationalized and incorporated into technically-mediated social arrangements, these participants have useful lessons to offer. By moving us outside of the realm of conventional location-based systems (buddy finders, geo-tagging applications, restaurant recommendation systems, etc), our participants offer us a useful perspective from which to re-examine conceptualizations of location and location-based systems in HCI. Our methods are empirical, but our goal is a conceptual reformulation of mobility and privacy that can frame new questions for design.

In what follows, we begin by introducing the research setting, and the conditions under which our participants find themselves users of location-based systems. We will then go on to explore a series of themes that emerge out of our qualitative analysis of the data from our study. These issues are specific to their particular case, but have broader resonance for the development and deployment of location-based technologies, and some conceptual frameworks that can help us rethink notions of mobility and privacy.

RESEARCH SETTING BACKGROUND
Although our paper is not about sex offenders *per se*, we need to explain the legislative context that resulted in the tracking of our participants and in the specification of prohibitions on their movements.

CHI 2008, April 5–10, 2008, Florence, Italy.

Ubiquitous computing technologies are increasingly being used by the United States Criminal Justice System (CJS) to create what Fabelo [9] describes as *technocorrections*: the use of advanced technologies to reduce costs associated with supervising convicted offenders while minimizing assumed public risks once they are released. The expansion of technocorrections by way of electronic monitoring (EM) is driven by several factors including prison overcrowding, the need for cost-effective criminal justice policies, and the pressure for politicians to demonstrate to the public that they are "tough on crime." Emerging technologies continue to be promoted as effective means for controlling recidivism rates for released offenders described as being high risk to re-offend. Yet studies conducted on recidivism rates for released offenders question whether or not public and political expectations of what electronic monitoring should achieve are realistic [30]. As sex offenders have historically been ostracized and demonized by society to a greater extent than any other group of convicted felons, they are often chosen to be on the leading edge of the technocorrections paradigm.

Legislative arrangements. In the early 1990's, US federal legislative initiativesrequired mandatory registration with law enforcement authorities for all repeat sex offenders after their release from prison. The Wetterling Act [33] required states to create and implement a registry of sex offenders and crimes against children. Shortly thereafter, Megan's Law (1996) [34] amended the Wetterling Act and mandated further requirements for states to establish community notification systems for all registered sex offenders. As a result, local law enforcement agencies within each state have developed an extensive database of registered sex offenders that includes information pertaining to their location of residence, work, and descriptions of any potential movements to and from work.

All US states have enacted sex offender community notification laws [23]. California's version of Megan's Law (2004) [35] gave the public Internet access to names, addresses, and pictures of the most serious sex offenders. Other information collected includes transient locations frequented, locality of current educational institution, updated vehicle and drivers license records, occupation and employment information, finger and palm prints, photographs and other physical descriptors including blood and saliva samples to be used for any future DNA analysis.

The Florida Sexual Predator Act: Jessica Lunsford Act [36] was passed by the Florida legislature in 2005 and established an electronic monitoring program within the state's Department of Corrections, set a 25-year mandatory minimum sentencing for convicted sex offenders, added lifetime electronic monitoring of all convicted sex offenders, and created a new felony offense for those tampering with electronic monitoring equipment. Several states have adopted similar regulations known commonly as Jessica's Law. In California, the Sexual Predator Punishment and Control Act of 2006 (California Jessica's Law) [37] enforces mass electronic monitoring of all convicted sex offenders, including juveniles, for the rest of their life. This law expands the definition of aggravated sexual assault of a child, prohibits probation in lieu of prison for all sex offenses, eliminates early release of jail for maintaining good behavior, provides longer penalties, expands a list of crimes that qualify for life sentences in prison, and extends parole. Most notably, for the purposes of this paper, this law promotes strict residency restrictions for all sex offenders upon release of incarceration, limits the location of where previously convicted sex offenders may live, and electronically monitors all sex offenders for life. As a result, the number of registered sex offenders has increased substantially. California's Jessica's Law was passed during our field research.

Technological arrangements. Primarily due to Jessica's Law, several states have recently adopted GPS systems to aid with electronic monitoring of sex offenders. When offenders are paroled, they are released subject to a series of parole conditions that must be maintained. In the case of sex offenders, these might include a schedule of regular meetings with a parole officer, therapy and group counseling, a prohibition upon possession of drugs and/or firearms, and, often, a ban or restriction on Internet use. The GPS system allows a series of spatial restrictions to be incorporated into the parole conditions.

Location information is continuously reported to a monitoring center through a direct link to a localized cellular telephone network. Local enforcement agencies receive daily reports on the sex offenders' exact location including the amount of time they have spent in any one location at any given time. The GPS system allows correctional officials to define geographic areas from which released and supervised offenders are prohibited, a condition of their parole. For instance, when a court orders a sex offender to have no contact with the victim, or with any children, exclusionary boundaries are set at an appropriate distance around the victim's place of residence and employment, educational institution, public parks, and other social gathering areas frequented, commonly referred to as *exclusionary zones*. The GPS monitoring devices are able to trigger alarms or warning notices upon approach of any such previously defined prohibited zones. If the prohibited zone is entered, an early warning alarm is sent to the corrections administrators and appropriate actions are taken, i.e. calling the local enforcement agency and applicable Parole Officer (PO). GPS can also send an alarm if the sex offender leaves an area in which he or she must stay. This parameter is called an *inclusion zone* and usually includes place of residence and employment. With exception of when alarms are triggered, the archived reports are generally not read by parole officers immediately.

RESEARCH METHODS

The state of California recently launched a pilot study looking at GPS monitoring as a means to supplement

parolee supervision of released sex offenders. Through the enforcement of constant electronic monitoring via GPS, the purpose of this preliminary program was to reduce the potential of re-victimization committed by those sex offenders labeled high risk to re-offend. Parolees under this initial supplemental monitoring program included 80 sex offenders on four separate parole caseloads within San Diego County, California. All parolees involved with this pilot study were outfitted with GPS tracking devices in 2005. Participants for the research presented here were drawn from the original four San Diego County caseloads. The research design included two focus groups with no more than five sex offenders randomly assigned to each.

Due to the ethical, practical, and administrative difficulties of conducting research with parolees, we gathered data through focus groups rather than fuller ethnographic inquiry (as we might have liked). Through their participation in the GPS trial, our participants were already attending focus group sessions; parolees were offered the opportunity to further participate in our study, on a voluntary bases. Focus groups were lead by two university researchers, following a semi-structured format. In total, ten parolees participated in the research presented here. Nine participants were under direct state care while one participant was under the care of the federal system. To enhance privacy, any data provided herein will not be attributed to any named individual. For each direct quote citation presented here, pseudonym and amount of time spent on GPS, in years and months, are included.

SPECIFIC THEMES

We will begin by considering three themes that emerge as particular concerns for the participants in our study before stepping back in the next section to explore issues that more broadly relate to the current discourse around mobility and location as technological considerations.

Structuring of Space

Clearly, the use of GPS tracking technologies are intended to maintain a series of spatial prohibitions for this population, to limit their mobility and enforce a series of proscriptions that are part of the conditions of their parole. We entered into the study not least to understand how people might deal with the practical problems associated with these prohibitions, since mapping tools and related technologies do not provide people with easy ways to ask for a route from A to B that does not come within 2,000ft of a school, park, playground, library, or swimming pool. We might naturally think that the Internet is a source of information that one might need in order to plan such a journey, although parole conditions may prohibit Internet use. Even if accessing the Internet is an option, the discrepancies associated with data retrieved from various sources are problematic. Kevin described a situation that occurred due to discrepancy between tools, "*…One day I went riding my motorcycle. That weekend my PO came over and asked where I was. I told him that I took a ride to Jamul. Now Jamul is only 23 miles away from where I live but my PO said that MapQuest [internet mapping service] says it's 32. My bike said 23, MapQuest says 32. So, the extrapolation of that data almost got me into trouble."* Kevin also told us another story about a friend of his who was walking a block and a half away from a school zone and, *"The MapQuest says he was within the prohibited boundaries and he got a violation even though he wasn't"* (Kevin, 1 year & 6 months). Local travel plans are difficult to make and to execute, and for many, the safest solution is simply to stay home.

A variety of spatial logics emerge that govern movement and presence. It is important to note, though, that since the spatial prohibitions are monitored technologically, it is also a technologically-mediated understanding of space that is particularly in question for these participants. They are aware that the MapQuest data is an arbiter of their adherence to parole conditions. In a dispute between MapQuest's view and the evidence of the odometer, it is MapQuest that will generally "win." It is clear that one's violation of spatial prohibitions is a site both of learning and of negotiation. After all, given the complexity of the technology and the infrastructure, and of the parole conditions, it is unsurprising that learning to live under the conditions is a matter of trial-and-error, one where specific infractions become the points at which one learns how to move (and how not to). In this regime, it is the representation of the space provided to the technological system that matters, because, however inaccurate it may be, it is the system against which measurements are made.

What we do see at work is a different scale emerging by which spaces are understood as safe or dangerous to traverse. While the local exclusions around schools, etc might be thought of as providing a fine-grained spatial logic, in practical terms it is easier to think of spaces on a much larger scale as being places where one might run into trouble and places where one might not. Our participants were hyper aware of the location of schools, malls, and other areas where children frequent. One participant illustrated to us, *"Before, I could have gone to a school, I don't do it now. That's the only thing that has changed. I'm so aware of where these things; like schools and parks, are now. Why just today I was driving and probably went past 20 high schools and now I realize "wait a second"* [pause] *I think it just makes you aware"* (Tony, 10 months). Subsequently, towns or regions with small child populations and an absence of schools are those that can be navigated with less fear of accidentally violating a spatial prohibition. In fact, the participants in our focus groups were familiar with the places where such parole infractions were less likely and space less circumscribed. They would talk about these places as safe sites for weekend visits, or even as potential places to live should the legal monitoring regime become more stringent (as has indeed happened, since California's Jessica's Law was passed).

Technology is not only a means of surveillance but is also a defense against accusations of wrong-doing. One participant explained, "*I travel a lot through southern California and this keeps me safe. It tracks me wherever I go. I like it. It's helped me and it's protected me. It's not going to stop me from re-offending. Like, it's not going to stop me from drinking, but it does protect me"* (Tony, 10 months). Sex offenders are continuously under suspicion of involvement in other offences. The ability to direct police to their Parole Officer, who has access to the log of information that can exonerate them, is for many a source of protection and defense against what they see as likely hassles and police attention and the technology can bear witness to their locations. Kevin, a parolee on the GPS unit for a year and a half held, *"There are good points. I'm protected and my PO* [Parole Officer] *knows where I am"* (Kevin, 1 year & 6 months). Eric also acknowledged the function of the GPS unit to act as a personal alibi. "*It keeps me safe. If anything happens, I can always tell 'em, check the thing. I wasn't there"* (Eric, 1 year & 1 month). By monitoring movement through space, GPS records maintains prohibitions and protects participants from accusations of wrongdoing.

Structuring of Time

Spatial logics were our particular focus when we initiated this work. However, temporal logics also play a significant role, in two ways.

The first of these is the way in which temporal structures affect the interpretations of space. From the perspective of someone attempting to avoid spatial prohibitions, schools are safer on weekends, while malls may be more dangerous when the school day ends. Cautiously, Steven told us a story about how, one day, he was out with his brother and best friend. They went to a mall to get something to eat for lunch and while he was there, he realized that classes must have just gotten out because kids were starting to show up in the mall. He explained, "*Now, my brother can vouch for me but this thing tells them that I'm at a mall right when classes are letting out. So I had to get out of there. I knew that. I couldn't even finish my lunch. I was anxious about that"* (Steven, 7 months). Throughout the focus groups, parole restrictions were presented as being understood vaguely, at best, by our participants. Prohibited areas seem to be unclear, oftentimes dependent upon the location and movement of children. Therefore, the structure of the space – and the structure of the prohibition – is more accurately tied to the presence and absence of others which are ordered not just spatially but also temporally.

The second, more serious, temporal structuring implied by the tracking technology, though, is a consequence of a much more mundane technological feature – charging the units. Mike discussed the amount of time spent charging and discharging his unit, "*See I work eight to ten hours a day three to four days a week. I get up at 3:30 to charge the thing. That's like three 18 hour days in a row and I have to sit there and deal with it for like three hours a day. So that's about 20 hours a week of me dealing just with parole"* (Mike, 1 year & 1 month). The batteries in the tracking units hold variable amounts of charge – around six hours for participants convicted and monitored under the State system and around eight hours for participants convicted and monitored under the Federal system. When they run out of charge, the devices stop operating, constituting a technical parole violation. The devices will warn their wearers when they are running low on charge, at which point they have 20-30 minutes to re-charge them. However, they provide no general indicators of charge that might be used for daily planning.

This arises as a problem for participants in a range of ways. One obvious consequence is that it affects patterns of work. Tony explains, *"The problem is that you have to charge every twelve hours and then you have to stop your day. A half-hour here, a half-hour there. Some get up early and charge from three to four. Some charge from five to six and then start their day. Either way, those are huge inconveniences"* (Tony, 10 months). Kevin discussed work-related complications due to charging, "*Well I can't work overtime because it interferes, and it violates my charging time. I have to be back in time to charge otherwise that's a violation"* (Kevin, 1 year & 6 months). A log of time spent charging the unit, amount of charge held, and time left until a re-charge are also kept by their Parole Officers. Steven continued, "*There's been days that I go to work with only 20 minutes of charge. I've either overslept or I can't remember if I charged it over night. If that happens, I call in sick to work. I have to. It's like my PO says, work can't put you back in but this thing can. The website tells them how long you've charged for. So, they know"* (Steven, 7 months). It need hardly be stated that our participants often times do not find themselves in jobs that afford them the flexibility to call in sick, not show up, or leave early to and from work. The consequence is that daily patterns emerge to accommodate the charge/discharge cycle, which must also be oriented towards one's working schedule, etc. When the charge warning goes off, it takes priority.

The need to ensure a regular charge also conditions the kinds of activities to which they might devote their time. One participant noted that he could no longer go camping, because it would put him out of range of the electricity supply for too long (and wondered aloud what might happen with homeless parolees, for whom regular access to electricity might be more of a problem); another noted that long plane trips to see distributed friends or family members "out East" were problematic for much the same reason. Although simple technical solutions are available, over-charging is as much of a problem as under-charging. Leaving the units plugged into the wall while one sleeps is not only problematic because of the cable length and the way in which one is literally tied to the wall, but also because the charge cycle must be monitored to avoid over-charging the unit.

Disciplining the Body

It is often the case in mobile and location-based applications that we elide the distinction between person and device. We talk of tracking Emily, Charlotte, or Paul, but not of tracking Emily's mobile phone, Charlotte's laptop, or Paul's PDA, even though that would be a more accurate account. In our study, the devices are essentially permanently affixed to the body. The final set of issues we want to draw attention to here is the way in which the coupling of the tracking technology to the body becomes relevant as a concern for the participants in our study.

As we have noted, the GPS unit is both fragile and visible to others, and both of these properties have significant bodily consequences. Participants are aware of the ways in which they must hold themselves and comport themselves in order to mitigate the dangers associated with both of these properties. The tracking device's fragility means that it must be protected from accidental damage, which in turn means that one must be careful not to bang it against a table leg, wall, or other object. In turn, this has consequences for daily bodily comportment; sitting and walking, and other mundane actions must be conducted with sensitivity towards the potential dangers they pose to the technology itself. Similarly, the body is comported so as to minimize the risk of disclosure associated with making the device too visible. This affects posture (crossing one's ankles so as to hide the device, for example) as well as clothing choices. One participant noted, *"This summer I had to wear wind pants. I don't exercise anymore. I used to run half-marathons and I just can't run anymore. I wish they could make something so I could just put it around my waist and not around the ankle"* (Steven, 7 months). Tom wished to "*Exercise more…Now, I can just golf. It'll be nice to wear shorts and play some tennis."* (Tom, 7 months). Not being able to wear comfortable clothes was something that many participants drew attention to, something that is particularly problematic in the warm climate of Southern California, the site of the pilot trial, especially when working outside or exercising. One participant exclaimed, *"I can't work out effectively, can't wear shorts. I have to wear sweat pants all the time and that's dangerous during the summer time. It's just too hot!"* (Kevin, 1 year & 6 months). Even in sleep, these questions of the way in which the technology is coupled to the body are relevant; to turn over in the night might be to endanger the device and run the risk of a parole violation and so, again, accommodation needs to be made.

We also discovered that participants often times wear their device under several pairs of socks and/or medical bandages to help keep it protected. Another frequent problem included water exposure resulting in damage. To prevent the device from being underwater, participants discussed with us how they are unable to swim or take a bath. Kevin stated, *"We got the whole what you can and can't do talk. You can't charge it, bang it, can't mask it, can't submerge it in water. I can't go swimming! I can't go water skiing. So, water sports are out. You try reintegrating into society with a ball and chain behind you. I'm talking the metaphorical and literal ball and chain. You can't get back into society normally with this* [pointing down to his anklet]. *I can't wear anything over my ankles…"*(Kevin, 1 year & 6 months). Tony also discussed the issue of water damage, *"Another guy went swimming in the ocean and he went back for another six months"* (Tony, 10 months). The problems around being able to swim and take a bath was brought up numerous times throughout both focus groups. When asked, "How do you think your life will be different if and when your GPS unit is removed?" one participant eagerly supposed, "*I could take a bath instead of a shower. Everyone thinks it's a woman's thing but, hey, I like baths. You get to sit back and just relax. Yeah, that'll be nice"* (Bob, 2 years & 10 months).

We had anticipated that the ways in which the body is deployed in space would be a consideration here in the larger sense, simply the question of where one is and where one moves. Less well examined is the way in which specific forms of technology use might focus our attention on the relationship between the body and technology, not simply in ways considered by the Wearable Computing community (although clearly those are in scope here), but in terms of a broader notion whereby technology is part of a complex arrangement that includes technology, the body, and the myriad forms of society including the state. Within this complex arrangement, the body is disciplined.

REFRAMING LOCATION-BASED SYSTEMS

So far, we have focused on the particular concerns of our study participants. They are, to some extent, "at the sharp end" of location-based technologies. While our particular case study focuses on users who are required to use location-based systems every day, all day, and under special circumstances, we believe that this research has broader applicability towards framing questions of location and mobility at the intersection of the technical and the social, to which we now want to turn our attention. Rather than conceptualizing location-based systems narrowly as simply means for the tracking and disclosure of location information, our investigation suggests looking at these systems as embedded in forms of social and cultural participation. Locations are not merely disclosed, rather users are held accountable for their presence and absence at certain time and places. Our investigation also draws attention to how information technologies render space legible and also suggests that location-based technologies might be fruitfully studied as technologies of the body.

Legibility of Space

This study illuminates the relationship between technology and the legibility of space, that is, the way in which spatial organization manifests itself for people who occupy and navigate it. It is not an entirely novel suggestion that information technologies and infrastructures render spaces legible for action in new ways [1, 2], but our study lends further support to this alternative to traditional Cartesian,

absolute, and instrumental accounts of space. In particular, it draws attention to the important articulation between two forms of legibility, legibility *from within* and *from without*.

By legibility from within, we refer to the ways in which people render spaces legible through their embodied actions, habitations, and navigations within those spaces. Patterns of movement in a city create flows and paths towards which people are oriented and through which they understand the space and others in it. Kevin Lynch [19] has documented aspects of the structure of everyday urban space as understood by its inhabitants and structured by a combination of geographical elements and patterns that organize cities into zones of particular kinds of activity. In Lynch's work, the city is understood as a place where things happen, and things happen because people do them. In recent years, a range of projects under the broad term of "locative media" have attempted to create new encounters between people and urban space that focus on the appropriation of everyday space through individual and collective activity within it.

The issue of legibility from within is perhaps even more pressing in cases in which spatial prohibitions are themselves in motion. For instance, in California, it is likely that the next group of offenders to be subject to GPS tracking is gang members, with the goal not simply of preventing them entering particular locales but, potentially, of also avoiding association. However, in this context, the zones from which one is excluded may be centered not on specific locations but on the presence of others, who are themselves moving through the environment.

What is striking in the case we have examined is the ways in which participants must be simultaneously conscious of this legibility from within – the structure of the space as enacted by participants – and its legibility from without, that is, with the structure of space as it is read and interpreted by others, in particular by authorities and Parole Officers. Here we see the orientation towards MapQuest's representations as much as to the "actual" or understood spatial relationships that obtain "on the ground." Whatever the issues of accuracy and representation at work, what is important here is that space must be navigated not only with respect to its local organization, but also with respect to how that pattern of movement will be seen and interpreted from outside.

Legibility from without is the traditional domain of state institutions, of course [26]. What is particularly interesting to us here is the consequences of the (spatial) intersection of the alternate spatialities implied by these different forms of legibility. Aboriginal land rights and curation have thrown up examples in both Australia [28, 29] and the United States [27]; these cases illustrate both how fragile particular conceptions of space might be, and also how complex it can be to mediate between different views. Our particular case here highlights, in stark terms, the potential power disparities at work in such debates.

The participants in our study are primarily concerned with understanding how their movement appear to their Parole Officers. The question of course is how that understanding is developed. How does one learn how one is seen by another through the system? How does one learn, for example, how to account for the vagaries of GPS positioning or the problems of "drop-out"? It is precisely these sorts of technological artifacts and the encounter between local and global spatialities that are the basis of the kinds of tactics we see at work in some locative systems such as Can You See Me Now, an urban game developed by the UK Equator IRC in collaboration with performance art group Blast Theory [3]. The offender tracking system is inherently asymmetric, at least in its current configuration, so that offenders are unable to see how their movements can be read as potentially appropriate or problematic except as a consequence of infractions, at which point the mediating technology may become a point of discussion. Approaches such as "social translucence" [7] might argue for location-based technologies in which one's visibility to others is also visible to oneself. However, our goal here is not to provide decontextualized implications for design but simply to note the twin concerns of legibility and the importance to interpolating between them.

Technologies of the Body

Finally, the topic of location-based technologies as technologies of the body is largely underexamined but potentially significant and theoretically rich. The irony of the GPS technologies we studied is that, while they are mobile with respect to the world, they are thoroughly immobile with respect to the body – fixed in place by design. More broadly, when we think about mobile technologies, we need to think about the disciplines that they introduce as well as the flexibilities that they allow.

Any discussion of bodies and surveillance invokes the figure of Michael Foucault. Foucault used the metaphorical image of the Panoptican, a prison design proposed by Jeremy Bentham, to illustrate the forms of power exhibited by modern states [10]. He argued that the omni-present threat of surveillance renders the actual exercise of power (or violence) unnecessary; the mechanisms of pervasive surveillance induce discipline and docility in those who are surveilled. Although Foucault wrote before the arrival of ubiquitous computing and the contemporary digital media landscape, many authors have noted the relevance of Foucault's analysis in that context [11, 24, 25].

Foucault's concerns were theoretical, but, for our participants, issues of technology and the body were very much practical ones, albeit ones that arose in consequence of their position as subjects of a state correctional system. They need to be concerned with the technology as it is integrated into such aspects of bodily conduct as posture, visibility, and clothing. These are not abstract concerns, nor are they unconscious considerations; they are explicit foci of attention, ones that must be continually attended to. It is

striking that, when asked what they most look forward to when the system is removed, many participants immediately noted the ability to wear shorts. Participants also noted that the system disallowed them from pursing favored types of exercise such as running. In this way, the system can indirectly shape the body. More broadly, we can see, associated with the development of range of location technologies, the need to attend to the question of its position with respect to the body, and how it shapes the body and its conduct through interaction. GPS units need to be positioned so that they will "see" the satellites, although these are also often locations that are visible to others co-present. The use of vibration signals versus audible alerts carries implications for devices that are carried close to the body or placed in a bag. When the configuration of the technology and the body carries implications for one's participation in an electronically mediated system (e.g. when "putting the technology away" also implies becoming "invisible") then, again, one's accountabilities to others are imply particular constraints how technologies might be worn or carried. Similarly, the link between a body in space and some technological surrogate for that body (a beacon which is assumed to be wherever I might be) is negotiated physically and socially at the same time. From the earliest studies of location-based systems, such as the Active Badge Locator system [13], the idea that the technology could be worn "unobtrusively" led to technological designs that assumed full and continual participation [22].

Although these topics have been examined in other areas of research [e.g. 18], they have not been prominent in HCI. While a good deal of attention is paid in the literature to the problems of bodies-in-space in the context of location-based systems, the problems of technologies-on/around-bodies are less prominent but, we believe, no less pertinent. While the participants in our study had to deal with one particular bodily configuration of technology – a device permanently bound to them, in a designated spot – it is, perhaps, in the more flexible encounters between bodies and technology associated with discretionary system use that the issues will become even more intricate.

Accountabilities of Presence

As research areas, HCI and Ubiquitous Computing have long recognized the complexity of the social settings into which location technologies might be deployed, and the problems associated with collecting and reporting information about location. The privacy considerations are broadly acknowledged, and various technological solutions have been presented [e.g., 16, 17]. However, satisfactory general solutions remain elusive.

As we have argued in the past, one reason for the brittleness of existing solution is that they frame the problem of privacy too narrowly [5]. In particular, HCI traditional approaches privacy as a problem of exchange that can be understood in economic terms. Essentially, this formulates the privacy problem in terms of the exchange of location information of varying timeliness and accuracy for services of varying utility. However, an alternative view looks at privacy from a broader social perspective, considering the ways in which the orientation towards information as private or towards actions and events as informative is itself a form of participation in particular social groups or relationships. So, for instance, when you get home and tell your spouse about your day, you are not simply exchanging information for love; it is as aspect of social participation in the institution of the family.

A more useful way to think about this, perhaps, is in terms of the various accountabilities of particular people's presence and absence in specific places and at specific times, and accountabilities associated with particular ways of understanding space and presence. People are accountable to each other for their presence in – or absence from – specific places in a range of ways, whether that be one's participation at a business meeting, causal time spent with friends, or the effort to avoid a school zone, and the very fact of those accountabilities is what marks one's membership in, and recognition of, social categories. The very fact that an orientation towards a school or playground is something for which one might be accountable is one element of what it means to be a member of a social group. Even one's recognition of particular distinctions as boundaries to which one should be attentive is, itself, a means of marking social status. Information exchange is one way to deal with these forms of accountability, but the exchange of information is not the point; socially accountable participation is.

Indeed, the essence of these accountabilities is their contextual nature. The issue is not where one might be, and when; it is to whom one might be accountable for one's presence, to whom, under what circumstances, and how one might be called to account. And further, it has to be noticed that the very questions of "when" (that is, what kinds of temporalities are relevant, from times of day to times when others are present) and "where" (that is, sites as defined by factors as disparate as geographical location or the presence of others) are equally relational.

Thinking of the issues around location-based systems in terms of accountabilities highlights a number of important issues that might otherwise be lost in the discussion of economic rationalities. Three considerations about accountability are especially relevant here. The first consideration is that accountabilities to different social groups are heterogeneous—the settings in which action is undertaken are rich and complex. The drive to focus on "user" and "user community" tend to erase this heterogeneity, particularly when we think of the social boundaries being enacted through information exchange. A second consideration is that the heterogeneous nature of accountabilities does not presuppose any particular structure of everyday space but rather situates accountability within the context of the practices from which spatial organization emerges. Accordingly, we need

to look at spatialities as *products* of social action, rather than as *prerequisites*. The third consideration is that the heterogeneous nature of accountabilities necessitates an orientation towards spatiality as an ongoing form of participation in social and cultural life. Taken together, these provide us with a much richer view of the consequences and implications of location-based systems than the trade-off implied by economic accounts.

DISCUSSION

Green [12] has argued that information technologies restructure aspects of everyday spatial and temporal experience, "mediating" everyday life. It is just this sort of mediation that we have had in focus here, particularly with respect to questions of location and privacy.

There are two, related ideas about privacy to which we particularly want to address ourselves. One is what we have called the "economic" account of privacy – that is, that privacy is essentially a process of trading costs and benefits, exchanging access (e.g. knowledge of my whereabouts) for services (e.g. information about nearly people, objects, or places.) [15] The second, related idea is that, for some people, or under some circumstances, or in certain social conditions, privacy "doesn't matter" – that significant numbers of people are "unconcerned," for example, or that there are people with whom we are prepared to grant access to information [16].

Our subject population is a group who have, through their actions, abrogated their civil right to privacy. Yet at the same time, subjects are continually concerned with matters related to notions of privacy such as where they are, to whom they are visible, the ways in which their presences and absences are notable, and the range of social actors and groups to whom they may be of interest. Privacy as conventionally defined around location is, we would suggest, a shorthand for forms of accountability and social participation and, by definition, these never disappear. One does not somehow "step outside" of social and cultural participation in particular circumstances or with reference to particular technologies. In other words, even when one has "no problem" sharing information with someone, one must still be oriented towards these accountabilities in terms of how, when, and why one shares [8].

So, we are interested in thinking about the contexts in which mobile and spatial technologies are deployed as already socially and culturally mediated [4]. Our starting point, then, is the sociocultural experience of space.

Anthropologist Nancy Munn describes the ways in which navigation patterns for Aborginal Australians are shaped a series of ritual exclusions from particular spaces [21]. One may be excluded from a space because of its association with particular people (e.g. with respect to traditional spatial exclusions between classificatory sons-in-law and mothers-in-law), with particular activities (e.g. sites of male or female religious ritual practice), or with events (e.g. sites of historical encounters with ritual consequence.)

These spatial exclusions are collectively captured under the term "no room." That there is "no room" for some person at some places indicates "a person's lack of sociomoral or legal space at a given location." [21: 448]:

> "In the act of detouring, actors also carve out a negative space … where they do not go, part of which extends beyond their own spatial field of vision. This act projects a signifier of limitation upon the land or place by forming *transient but repeatable boundaries out of the moving body*. … Boundaries are here 'given their practical senses as movements of the body.'" (p452, emphasis original)

There are two features of Aboriginal navigation documented here to which we would like to draw particular attention, because of their resonance with the experiences of our participants. The first is that spatial organization here is deeply relational. It depends on people and moments, and it is defined not in terms of fixed boundaries but in terms of centers of power and influence that radiate out with diffuse and indeterminate extent. The body itself is conceptualized as such as spatial field. The second is that spatial logics are produced in movement; the meanings of spaces and movements are practical cultural achievements. For indigenous Australians in Munn's work, just as for the participants in ours, movement through and presence within space displays a series of orientations towards particular places as relationally significant which lends the landscape meaning for those who inhabit it.

For our participants, this experience of space is inseparable from the regimes of power and surveillance within which they find themselves. Writing in a different context, feminist geographer Doreen Massey [20] uses the term "power geometries" to draw attention to the ways in which habitation and movement through everyday space reflects a series of power relationships with respect not just to the accessibility of technologies of navigation (as in the classic, though erroneous, example of Robert Moses' Long Island expressway) but also to broader patterns of boundedness and displacement [31, 32]. For our participants, the spaces in which they live and work are clearly structured (into, for instance, areas of safety and danger, inclusion and exclusion) in ways that reflect their position with respect to the state and its correctional infrastructure. Massey's observation is that different social groups are *always* differentially positioned with respect to flows of people, goods, capital, and information, and when we think spatially we must attend to the ways in which the spatial already shapes and is shaped by these power relations.

Perspectives such as those of Munn and Massey provide us with resources to help make sense of the experience of the parolees presented here. In particular, they connect accounts of space and mobility to broader questions, highlighting the social accountabilities at work. What might it mean for HCI and ubiquitous computing to think of space not simply as something through which mobile people and

technology move, but as something that is structured and rendered meaningful by those movements? What might it mean for HCI and ubiquitous computing to think of space and mobility as ways in which social action is achieved? How is the design process transformed if we think about location not just as *where* you are, but as an aspect of *who* you are? The primary outcome of studies such as ours is to engage with these questions and to design technologies that frame everyday space not simply as a site of consumption (of resources, social connections, and commodities) but also as sites of production (of social life).

CONCLUSION

Our study suggests that one of the reasons that the design problems around supporting mobility and managing privacy remain so thorny is that we may be working with weak conceptualizations of both mobility and privacy. In the technological domain, privacy tends to be thought of in terms of the exchange of information and the ways in which it can be modeled, often in economic terms. Mobility tends to be thought of as a negation of the assumptions of desktop computing, and so we focus on how we can regain an effective link between computer systems and the settings in which they occur. The study presented here suggests that we might think about mobility more usefully in terms of the ways in which movement through space enacts and reproduces a series of culturally meaningful distinctions between locales that are as much social as topographic. Our emphasis has been on space as something dwelled in and moved through by social actors, rather than as an independent Cartesian manifold. Similarly, we have argued for a view of "privacy" that focuses more on the ways in which common orientations towards everyday objects and events reflect forms of social and cultural participation, rather than an instrumental account of cost/benefit trade-offs or exchanges between rational actors. We use the term "accountabilities of presence" to refer to this alternative.

By attempting to reframe discussions about privacy and mobility in terms of accountabilities of presence, we want to open up discussions of location-based technologies to the questions of the uses to which location information might be put, both by those who create it and those who consume it. The notion of accountability opens up opportunities for falsehood even as it explains the contexts of demands for accuracy. Our goal here is, in part, to reframe privacy as relational. The notion of accountabilities of presence necessitates conceptualizations of mobility and privacy that are as complex, flexible and heterogeneous as social life itself. The challenge of designing a location-based system, then, becomes a matter not of simply revealing or hiding coordinates, but of considering and supporting the shifting kaleidoscope of social accountabilities.

ACKNOWLEDGMENTS

We are very grateful to the participants in our focus groups for sharing their experiences with us. This work was conducted in collaboration with Simon Cole, Samantha Smith, Jenny Terry, and I-Lien Tsay. We would also like to thank Jesse Jannetta, Susan Turner, and the Center for Evidence-Based Corrections for their support. We benefited greatly from discussions with Susanne Bødker, Matthew Chalmers, Martha Feldman, Antonietta Grasso, Beki Grinter, Jonathan Grudin, Kia Höök, Irina Shklovski, Yvonne Rogers, and Phoebe Sengers.. This work was supported in part by the National Science Foundation under awards 0133749, 0205724, 0326105, 0527729, and 0524033.

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