CHAPTER THREE

Colonizing Play: The Ubicomp Games

As ubiquitous computing researchers, we must be aware of this human tendency to play, and use it to our advantage.

—Ubicomp researcher Genevieve Bell, et al "Intimate (Ubiquitous) Computing" (3)

3.1 Is Ubiquitous Computing There Yet?

Since the turn of the twenty-first century, one of the most oft-articulated sentiments in pervasive and ubiquitous computing has been the impatient query: "Are we there yet?" Leading ubicomp research Albrecht Schmidt first gave public rise to this sentiment in a keynote for the 2003 Mobile Human Computer Interaction conference. He memorably asked: "Is ubicomp inevitable? Is it done? *Are we there yet?*" ([5]) Comparing the goals of Xerox PARC's seminal ubicomp statements from the mid-1990s with the results of the most advanced work in the field to date, Schmidt then pronounced: "Ubiquitous Computing: Not there yet"—as if the defining characteristics of ubiquitous computing comprised a discrete destination that could be mapped, navigated toward and objectively arrived at ([7]).

In a field that takes its name from the Latin root for "everywhere" (*ubique*), it is not surprising that the ultimate goal of ubicomp research has come to be regarded as a "there". Success tends to be conceived of symbolically as a location because the entire ubiquitous computing project is linguistically bound up in the notion of whereness, or *ubiety*—the condition of being located in a particular place.

While scientific fields of research are often said to have metaphorical frontiers at which innovators push the limits of knowledge and technique, ubiquitous computing also has actual *physical* frontiers—the material objects and built environments it seeks to colonize for computing. But frontiers pose a territorial mystery: they remain unknown to their explorers until approached, investigated and claimed. And so ubiquitous computing does not always seem to know where it is going next, even as it asks if it is there yet.

A panel for the 2004 Mobile and Ubiquitous Computing Conference, for example, took as its seemingly paradoxical title: "Are We There Yet? *Where Will We Go?*" The question "Where will we go?" suggests that the *there* of ubiquitous computing is still being defined. The panelists observed: "Despite a decade of research into the area, we are seeing very limited deployment of mobile/ubiquitous computing technology" ("Mobiquitous 2004 Conference Program"). And as their title suggests, not being fully deployed "there" yet may be a consequence of not yet fully knowing what it *means* to be deployed there.

Is the original goal of ubiquitous computing everywhere is too abstract? The term "ubiquitous" implies infinitely many 'there's; does the field need a more specific notion of 'where' in order to make its own success condition discernible? If so, then what we have in the current state of ubiquitous computing is not so much a failure to *arrive* at a state of ubiquity as it is a failure to *articulate* the details of that desired state. The question "Where will we go?", when combined with the "Are we there yet?" refrain, therefore serves a special tactical purpose. It proposes further exploration and definition of the possibility space as a strategy for dealing with the limited progress of networked computing toward achieving a meaningful measure of ubiquity.

Here, the possibility space is approached a literal concept: the many potential sites for computing need to be identified, charted, occupied and tested. Being "there yet" can only be achieved through meticulously surveying the computing landscape of the future—that is, by provisionally planting the flag of computing in as many novel sites as possible. To adapt Gertrude Stein, there's no *where* there… yet.[1] Ubiquitous computing needs a map.

But how will the field generate such a map? In a lecture for the 2005 International Conference on Pervasive Computing, Laurent Ciarletta proposed a mapping strategy based on mimetic technological performance. Ciarletta opened with the question "Are we there yet?", by way of suggesting that we are most certainly not ([3]). He demanded: "Where are the applications? ... Where is the public use?" ([2]) In the face of ubiquitous computing's failure to manifest itself in the present, Ciarletta suggested a playfully performative mode of redress: faking it. The title of Ciarletta's talk, "Emulating the Future", recommended *imitating* now an imagined, future state of truly ubiquitous computing in order to better understand the destiny of the field. In the accompanying paper, Ciarletta writes:

> In order to specify good applications, it would be interesting to completely emulate those systems, creating fake worlds where the specific piece being developed can be embedded, tested, compared with other solutions and demonstrated in its context, even though some of the technologies have not been developed yet, or are available only as prototypes on a small scale (3).

In other words, by creating *as-if* ubicomp systems—working, local demonstrations of ubicomp technologies and infrastructures that are not ubiquitous yet, but which might someday be—the field can mimetically manifest ubiquitous computing's hoped-for "there".

[1] Stein originally said of her childhood hometown Oakland, California "There is no there there" in her 1937 work *Everybody's Autobiography*.

Ciarletta's suggested "fake worlds" call to mind a kind of theatrical play, a staged magic circle in which computing behaves *as if* it were already ubiquitous. To adapt theater-games activist Augusto Boal's famous provocation, such emulation might not be the ubicomp revolution in itself—but it could be a *rehearsal* for the revolution.[2] If this language of revolution sounds rather confrontational, consider Schmidt's proposed solution to ubiquitous computing's problem of not being *there* yet. He encouraged his HCI audience to continue aggressively pursuing Weiser' vision, "confronting real people in real everyday environments" with more and more functional ubicomp prototypes ([20]). If we are not at the desired "there" of ubiquitous computing yet, Schmidt suggested, perhaps it is because we have not staged a dramatic enough confrontation. Ciarletta's plan to fake effective ubiquitous computing by "emulating the future" offers precisely such a dramatic means to advance the field.

The term 'emulation', of course, has a special meaning in computer science: emulators are programs that allow computers to masquerade as a different make and model. The most popular such emulators are those that allow users to run programs from the past. (For example: I can use an emulator program to install and run Commodore 64 code written in 1988 on my 2006 Sony Vaio laptop.) Given the close relationship of technological evolution and games development discussed in Chapter Two, it is not surprising that game programs for obsolete personal computers and consoles comprise the vast majority of available emulator-related downloads. Widely circulated emulators

[2] Boal originally writes: "Perhaps the theater is not revolutionary in itself; but have no doubts, it is a rehearsal of revolution!" in the essay "Poetics of the Oppressed" from his 1979 collection *Theatre of the Oppressed*.

for various Commodore, Amiga, Spectrum, and Colecovision models, to name just a few, enable users to play literally thousands of classic and cult-favorite computer games.[3]

Whereas traditional computer emulators are designed to allow us to play games from the past, could *ubicomp* emulators let us play games from a specific, hoped-for technological future? What might we learn from such provisional, forward-looking games—about the present state of ubiquitous computing, and about the future of gameplay in a ubicomp society? Would emulating the future of play help define and advance the field toward the ultimate *there* of ubiquitous computing, the there where we are not yet?

In this chapter, I explore the role of experimental, emulatory game development in furthering the expansionist efforts of ubiquitous computing. First, I will examine how researchers create novel game prototypes that aspire to be both *smart* and *persuasive.* By smart, I mean designed to produce research insight about current ubicomp platforms, infrastructure and interfaces. By persuasive, I mean designed to convince future ubicomp users and technology gatekeepers that the manifest destiny of ubiquitous computing is indeed a vision worth pursuing. A smart ubicomp game aims to advance the field *technically* closer to its goal of computing anywhere and everywhere by revealing how to better construct, embed, network and deploy ubicomp technologies. A persuasive ubicomp game aims to advance the field *socially* and *organizationally* by demonstrating to the public the potential benefits of ubicomp technologies.

Then, I will explore the performative function of play in ubicomp games research. It is not enough to design smart and persuasive games; their arguments and results must be

[3] Perhaps the best current emulator resource is The Old Computer (www.theoldcomputer.com), which houses downloadable emulators and game programs for 338 VIC-20 games; 842 Atari 2600 games; 913 Nintendo games; 2455 Commodore 64/+ games; and many, many more.

made citable, that is to say, replicable. As a fundamentally scientific practice, ubicomp gaming therefore constructs its own “theater of proof”, Bruno Latour’s term for the mechanism through which scientific aims and findings are introduced into a network of circulating references (*The Pasteurization of France* 85). Organizational sociologist Diane Vaughan argues: “For engineers, a design is a hypothesis to be tested. But tests only approximate reality. *The proof is in the performance*” (quoted in McKenzie 96-7). Ubicomp game design, I will argue, formulates hypotheses about the value and feasibility of ubiquitous computing. *Playtests*—a term frequently used to describe the prototype demonstration of ubicomp games—are the experimental performances that provide citable proof of these hypotheses. I will examine how the network of playtests attempts to make manifest, that is to say to make legible and credible, the destiny of ubicomp technologies—a destiny whose *self*-evidence is arguably called into question by the persistence of the field’s question: “Are we there yet?” The work of the playtests, then, is to provide better evidence, to construct a convincing map of viable future ubicomp sites—both in terms of contexts and locations.

Finally, I will consider the play values expressed through ubicomp game design. What are the particular qualities of play that are explored and enacted in these games? What kinds of gamers do they produce? As I have argued previously, ubicomp games represent the joining of two mutually supportive manifest destinies: the tendency of games to colonize new technological platforms, and the desire of ubiquitous computing to colonize new everyday objects and social spaces. I therefore will analyze how ubicomp technology values, as articulated in major manifestos of the field, subtly transform the aesthetics of digital gaming and, more importantly, how these values train the players themselves to embody and enact ubiquitous computing's vision of an ideal network.

2. Ubicomp Games as Research and Rhetoric – Academic Projects

In 2002, computer scientists Kay Römer and Svetlana Domnitecheva created *Smart Playing Cards*, a perfectly distilled example of a ubicomp game that attempts to be both smart and persuasive. The project augments a traditional four-player card game, Whist, with a range of novel ubicomp features. The centerpiece of its design is a deck of "smart cards", which Römer and Domnitecheva created by attaching Radio Frequency Identification (RFID) tags to ordinary playing cards. Each tag was tuned to uniquely identify one of 52 distinct cards in the Whist deck (see figure 3.1). To accompany their smart deck, the researchers constructed a 'smart table' by mounting an RFID reader with an antenna to the underside of an ordinary card table. The reader picked up radio signals from the smart cards as they were laid on top of the table. This real-time gameplay data,

3.1 Smart Playing Cards. These ordinary playing cards are made "smart", or computationally enhanced and network-capable, through Radio Frequency Identification (RFID) tags attached to the backs of the cards. (Distributed Systems Group, 2005) such as which cards were played by whom, was processed by a hidden PC connected to the RFID reader. Gameplay data was then displayed to players in one of two ways. Public game information, such as the current score and a winner history, was displayed on a 'smart wall', equipped with a large flat panel monitor wirelessly connected to the PC. Private game information, such as hints for beginners and ratings of a player's individual moves, was relayed to individual Personal Digital Assistants (PDAs) through a wireless link. In this way, even the players were made smarter—in a ubicomp sense—than traditional card players. Finally, hidden wireless speakers in the 'smart room' enabled the game system to announce when players were cheating. An alarm was triggered whenever the central game server detected that a user had played an illegal card.

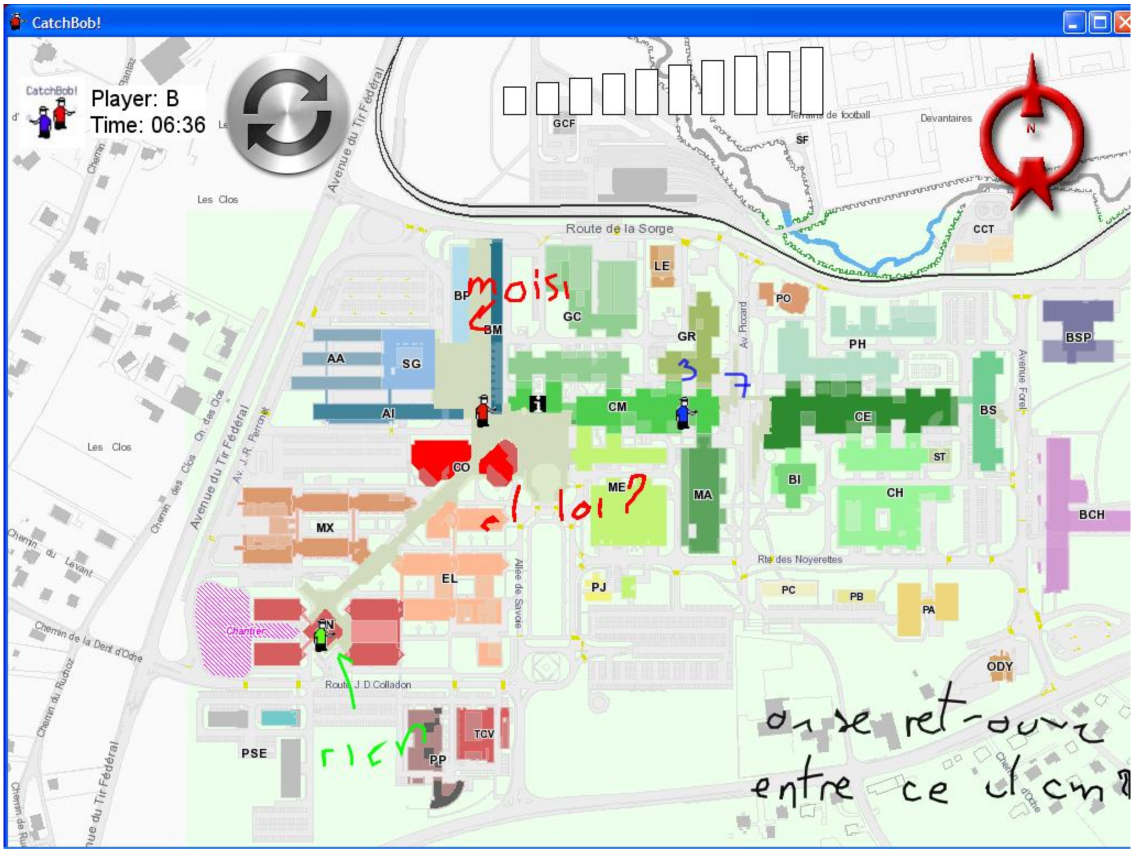
Despite all of this added functionality, the authors report in an article for the journal of *Personal and Ubiquitous Computing* that the technology was on the whole "unobtrusive… retaining the look and feel and social interactions of the classic game" (377). I would suggest, however, that there is in fact a significant and archetypal act of obtrusion taking place via the game's implementation. The game props, game environment and even the game players have been fundamentally and physically imposed upon by the technological infrastructure. Where once there was not silicon, now there is—attached to, embedded in, and grasped by new ubicomp objects, new ubicomp spaces, and new ubicomp users, respectively. This is a non-trivial intervention; it is successful ubicomp colonization of the kind Rich Gold predicted would be one of the hallmarks of the field. It is a tangible act of territorial flag-planting, with chips and sensors serving as the flags.

Why do Römer and Domnitecheva select *gameplay* as a medium for staking their ubicomp claims? As the *Smart Playing Cards* authors note in their introduction: "Recent technological advances allow for turning parts of our everyday environment into so-called smart environments, which augment the physical environment with useful IT functionality" (371). The authors are eager to develop infrastructure to support this transformation; however, they identify a considerable obstacle to significant IT expansion. "The main challenge of ubiquitous computing is to envision smart environments that provide a reasonable advantage for people using it, without violating the social and legal rules of our society and life" (371). In other words, before ubiquitous computing can approach any degree of actual ubiquity, future users must be convinced of the benefits of computationally enhanced objects and spaces. Researchers and developers therefore need a suitable medium for demonstrating the value of embedded IT functionality. Otherwise, the power of social norms, user expectations and practical inertia are likely to create significant friction against the widespread adoption of ubiquitous computing.

Games, Römer and Domnitecheva suggest, are the most persuasive medium available for their particular cause. They observe: "The area of games looks promising with respect to ubiquitous computing, since due to the entertaining nature of the social interactions, users are willing to explore innovative metaphors, modalities and hardware even when they are not as apparent or fluid as the designers might have hoped" (371). Here, the authors invoke an oft-referenced argument first made by computer scientist Thad Starner, whose 2000 article "Towards Augmented Reality Gaming" is frequently cited as a research rationale by ubicomp gaming projects. According to Starner's original discussion, gameplay offers technology researchers two major benefits. First, Starner writes, "there is a certain universality of a sense of play that entices users who would not be interested in testing prototype systems normally" (1). In other words, a prototype developed in the form of a game is likely to attract and to engage a more diverse group of testers than non-game prototypes. Developers looking to expand the user base for ubiquitous computing—a necessary step toward achieving ubiquitous computing's manifest destiny—will find that base through gameplay. Indeed, in the case of *Smart Playing Cards*, its authors note that a majority of their testers had no previous interest in, or experience interacting with, 'smart' objects or 'smart environments' like the RFID-enhanced playing cards and game room. However, in the section on "User Experiences", Römer and Domnitecheva report: "Our observations led us to the conclusion that people seem to basically like the idea of ubiquitous computing in this special setting" (4). Here, the authors present a finding that, if broadly true, would certainly be as important to the future success of the field as the technical innovation of their project's implementation: ubiquitous computing can be made more appealing through gameplay. The authors' emphasis on the "special setting" of the test—a gaming environment—underscores the fact that games are specially suited to doing this persuasive work, the work of making ubiquitous computing seem like a good idea.

The second major research benefit of the game medium, according to Starner, is that gameplay is perfectly suited to smoothing over the inevitable flaws or incompleteness of early technology deployment. He writes: "Another advantage is that game play can be designed to hide limitations in the current implementation of a system while exploring its potential" (1). Players are accustomed, Starner suggests, to trying multiple approaches until they find success. Practicing patience is part of learning the rules and the ropes of a new game. The flexibility and tolerance required of a gamer is ideally suited for interaction with novel computing devices and displays, which may not be grasped easily or effective continuously at the prototype stage.

In “Getting Real with Ubiquitous Computing,” a 2005 paper for the *International Journal of Human-Computer Interaction*, Fabien Girardin and Nicolas Nova take up Starner’s second point to explain their project *CatchBob!*, a game that studies flaws in existing ubicomp infrastructure. Like *Smart Playing Cards*, the experimental game design of *CatchBob!* is emulatory. But rather than emulating ubicomp infrastructure of the future, *CatchBob!* emulates ubicomp *interaction* of the future. It situates players in an already everyday ubicomp environment: a college campus, where the Wi-Fi access is spotty and the buildings significantly distort and interrupt the Global Positioning System (GPS) data. In this unmodified present-day environment, the players are then asked to accomplish a game mission better suited for a future ubicomp society. That is to say, the challenge is designed to reflect what players might be able to accomplish if the ubicomp infrastructure were better developed and more consistently deployed. The central gameplay unfolds as follows: First, teams of three players are separated from each other by up to a kilometer on the campus grounds. They must work together to discover, and simultaneously arrive at, the “Bob,” a virtual object mapped to real-world coordinates somewhere on campus. Using location-sensing and Wi-Fi enabled mobile devices, such as an iPAQ or Tablet PC, players hunt for each other and “Bob”. When more than one teammate has Wi-Fi access, they can log into the central game server to view a shared map of the campus grounds and to use instant messaging to coordinate their actions (see figure 3.2).



3.2 Screenshot from *CatchBob!* Three players in different locations share the same game display on personal tablet PCs. This screenshot shows how players could communicate strategies and directions by writing text messages as well as drawing arrows and X's on the game map. (CRAFT - Swiss Federal Institute of Technology, 2006)

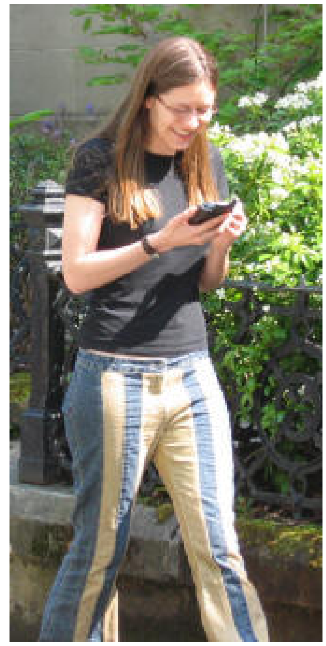
In a paper for the *International Journal on Human-Computer Interaction*, the *CatchBob!* designers situate their game-related research as part of the field's popular "Are we there yet?" discourse. They write: "Ubiquitous computing is still a maturing field of investigation. Ubiquitous environments must deal with unreliable network, latency, bandwidth, security, unstable topology, and network homogeneity. The vision of the seamless integration of computers to people's life has yet to happen" (60). Girardin and Nova are interested in how user improvisation and collaboration may be able to make up for these present-day flaws and gaps. They note that users often grow skilled at overcoming the flaws of a technological system: “Many times we learn strategies to adapt, to avoid, or to rectify the systems’ failures” (60). They liken this practice to gameplay, since it is typical for players to learn and to deploy multiple, improvisational strategies in their early and often frustrating interactions with a new game. Therefore, they argue, a game should actively produce a range of generalizable strategies for dealing with the frustrating *not-quite-there-yet* state of current ubiquitous computing.

In tests of the game, Girardin and Nova collected both quantitative data, such as how long and how frequently users were disconnected from the system, and qualitative data, such as the content of Instant Messages sent during the game and player-reported solutions for working around the technology gaps. This data was reported and analyzed in their research publication as a way of charting the road between the present, imperfect ubiquitous computing and a future, more seamless ubiquitous computing. In this way, *CatchBob!* effectively served as a research platform. Girardin and Nova write: “We are interested in studying the impacts of technological limitations on user manipulations. The platform we use to meet this end is the emerging field of ubiquitous computing games” (60). Like Römer and Domnitecheva, Girardin and Nova not only are using gaming as to become smarter about ubicomp usage in the everyday environment; they also have persuasive intent. They propose that by presenting the technology in a particularly engaging context, their game can “support the more widespread acceptance of ubiquitous computing” (61). Here, as in *Smart Playing Cards*, we see that gaming is a means to both research and rhetorical ends.

Andrew Rosenbloom, editor of a special 2003 games-themed issue of the *Communications of the ACM*, captures such tactical use of gaming strikingly in his introductory essay “A Game Experience in Every Application”. The essay praises games not for the play they produce, but rather for the data and public favor they are capable of generating on ubiquitous computing’s behalf. Rosenbloom’s title is both an observation and an entreaty. As an observation, it suggests the tremendous conquering momentum Jan Jörnmark ascribes to digital games in his paper “Wherever Hardware, There’ll Be Games”. There is not one single interactive application, Rosenbloom proposes, that does not have the potential for gaming inherent in its design. Wherever *software*, there’ll be games. As such, every researcher has the opportunity to take advantage of the specific research and rhetorical benefits of the gaming medium. Here, the title becomes an entreaty, urging computer scientists and software developers to harness games’ momentum for the benefit of ubiquitous computing. Rosenbloom specifically advises researchers to consider using game design in the early stages of testing. He writes: “Games provide an ideal prototyping environment, constructing test beds for emerging technologies in a relatively rich environment before they are ready for the real world” (29). Rosenbloom’s choice of words is telling. Ubiquitous computing is expressly designed to put computing “back into the real world”, as its earliest manifestos have argued (Wellner, et al 24). But here, Rosenbloom suggests that ubicomp technologies are not always *ready* for the real world, that is to say, not ready to be experienced through the cognitive frame of ordinary life. Instead, the technologies must first be experienced through the cognitive frame of play, a frame that allows both the technologies and the users to fail safely while still producing interesting results.

Indeed, the major ubicomp research initiative *Seamful Games* argues that gaming is the perfect medium for learning about, and even embracing, the failure of ubiquitous computing to be effectively ubiquitous. Part of the Equator Project, sponsored by the Engineering and Physical Sciences Research Council, *Seamful Games* proposes that it is counterproductive to try to create a perfectly smooth experience of present ubicomp infrastructure. Instead, inevitable gaps in user access to wireless networks and positioning systems should be highlighted and designed into the experience. Project lead Matthew Chalmers explains on his Glasgow University homepage: “Seamfulness is about accepting… the edges and gaps in Wi-Fi cells, and the patterns of where you can and can't get GPS positioning. Sometimes you can't smooth these 'seams' away, and so seamful design is about taking account of these reminders of the finite, limited and physical nature of digital media.” He notes that ubiquitous computing has failed thus far to incorporate these seams effectively into interface and system design. “Seamful games are a means to try this kind of system design out.”

The *Seamful Games* project has developed two games as research platforms to date: *Treasure* (2005) and *Feeding Yoshi* (2006), both of which are played on handheld PDAs in real-world environments with variable Wi-Fi and GPS coverage. Each game—the former a collaborative quest for virtual gold and the latter a competitive game of hunting, gathering and trading—requires users to navigate strategically in and out of network coverage. During these seamful games, for example, it is sometimes advantageous to a player to be inside the network—to collect virtual treasure or virtual food, for example, and then to upload it to the central game server. At other times, it is preferable to be outside the network—to avoid being detected by other players, for example, or to prevent an opposing team from stealing your virtual inventory.



3.3 Screenshot from *Treasure*. Gold icons represent treasure that a player can collect, while colored blocks represent the strength of known network coverage. (Seamful Games, 2005)

3.4 Live *Treasure* Playtest. A *Treasure* player moves across the real-world campus lawn represented on her PDA's screen. (Seamful Games, 2005)

The seamful design of these ubiquitous computing games ultimately works to increase the social acceptance of ubicomp technologies while simultaneously producing research insight. By recasting flaws in ubicomp infrastructure as design features that can be leveraged by users, ubiquitous computing is made more appealing. What once may have proven frustrating now offers utility. At the same time, the seamful games engage users in the larger research project of mapping the current state of ubiquitous computing. Through play, the gamers articulate areas of network coverage and areas of network failure (see figure 3.3). A screenshot of a *Treasure* playtest shows the PDA's digital representation of the real-world terrain explored by players; colored blocks on the screen represent data collected by the players about varying signal strengths and gaps. The effectiveness of the local ubicomp infrastructure is literally mapped during gaming, and in this way, the players mimic the work of the ubicomp research community to chart the technological possibility space. The *Seamful Games* therefore propose that even if the current response to ubiquitous computing's constant query "Are we there yet?" is a pronounced "No," the public can be recruited now to embrace and to aid its futurist vision.

3.3 Ubicomp Games as Research and Rhetoric – Industry Projects

So far, I have focused on ubicomp games designed and developed at universities. However, academia is not the only arm of ubiquitous computing that has adopted gameplay as a smart and persuasive medium. As explored in Chapter Two, powerful economic factors also drive the manifest destiny of games and ubicomp technologies. And so it is important to observe the important role that industry research has played in the development of a ubicomp game design culture.

The very first documented experiment in developing original games for ubiquitous computing platforms was an industry-sponsored project: *Pirates!*, a joint initiative of the Nokia Research Center and the PLAY research studio at the Interactive Institute. Implemented on PDAs connected in a wireless local area network (WLAN), *Pirates!* combined physical, location-based gameplay with virtual, screen-based gameplay. In demonstrations of the game, as many as a dozen players explored the same physical environment while simultaneously navigating a fantasy archipelago depicted on their handheld PDA screens (see figure 3.5). The layout of stationary, sensor-augmented objects in the real-world game space corresponded precisely with the spatial arrangement of graphical islands in the virtual game space. As players wandered through the room in which *Pirates!* was played, proximity sensors attached to the PDAs and to the everyday objects triggered game events: a player discovered a new island, for instance, by standing next to one of the Radio Frequency-equipped objects in the local environment, and encountered other plundering pirates by approaching nearby players.

3.5 Screenshot from *Pirates!* The question marks represent islands that the player has not yet discovered, while the exclamation point represents an island the player has visited. The islands on the PDA display correspond with real-world, sensor-augmented locations in the room where the game is played. (Nokia Research, 2001)

Like *Smart Playing Cards*, the *Pirates!* prototype required the local environment to be temporarily modified with a range of embedded sensors and a stronger WLAN. The conference room where the game was played therefore was, in a sense, as fantastic and make-believe as the imaginary archipelago depicted on the PDA screens. It embodied a fantasy of the future of ubicomp technology. In an article for the 2001 Conference on Human-Computer Interaction, the *Pirates!* researchers proffer this fantasy as a probable eventuality. They describe their project as the obvious next step in the historical co-evolution of games and digital platforms. "With computers and other interactive technologies, new forms of games have been made possible. Indeed, some of the very first computer applications were games, and computer games have permeated every computer and operating system, sometimes even pushing the development of new hardware and software techniques" (1). This appeal to the intertwined histories of game and computer development positions *Pirates!* as a natural extension of the tendency for games to colonize new platforms. Moreover, it argues that this colonization is mutually beneficial—games get to evolve in new directions, while ubicomp hardware and software may be forced to improve as a result of the gaming medium's insatiable demands for newer and more robust technology.

In an interview with the popular digital gaming website *GameSpy*, lead designer Staffan Björk discusses how *Pirates!* relates to the expansionist goals of the ubicomp industry. *GameSpy* reporter James Hill asks Björk, "How does this project fit into Nokia's core business of selling mobile phone handsets?" (2) Björk, in turn, describes experimental game design as an important tool in the effort to expand the ubicomp user base while improving the platform. He argues: "Mobile phone sets are constantly becoming more powerful as new use areas are constantly being discovered for them" (2). He then identifies games specifically as the new use area that is driving the development of, and demand for, personal mobile technologies. "The popularity of *Snake* [one of the first games for the Nokia mobile phone platform] shows that people at least partly see their sets as entertainment appliances. Supporting that… is strategically important for Nokia" (2). Here, we see again that experimental ubicomp games are not only about producing play. They are also a means to an end—in this case, an economic end.

It is important to note that Nokia never released *Pirates!* to the public—how could it? The infrastructure for the game still does not exist in the real world, yet. So there are no *immediate* financial stakes to such an experimental ubicomp game. But the clear hope is that positive word-of-mouth about the future possibility of a game like *Pirates!* will advance ubiquitous computing socially, while the published research advances the field technically. Here, the *GameSpy* article serves to generate such public and persuasive word-of-mouth, while the HCI paper acts as the official research communication.

The *Pirates!* game, like all of the other projects discussed to this point, was developed as a working prototype. That is to say, it was played at least once by actual gamers. But are games so persuasive of the benefits of ubiquitous computing that publishing a strong game design *concept* could do the same rhetorical work as prototyping the actual game? Another significant industry project in the ubicomp gaming space suggests that this is indeed the case. *The Drop*, an original game concept developed by the Intel Research team of Ian Smith, Sunny Consolvo and Anthony LaMarca, is more of a thought experiment than an actual experimental game. In a 2005 article for *Computers in Entertainment*, the Intel researchers document a strictly *imagined* future ubicomp game that has been neither developed nor tested. *The Drop* scenario, instead, serves as a kind of meta-ubicomp game project. It self-consciously reflects on the relationship between the structural components of game design and their potential benefits to the industry of ubiquitous computing, without creating any real-world play.

The Drop engages multiple ubicomp platforms: everyday consumer devices, such as mobile phones and laptops, as well as proprietary location-sensing systems, such as Intel's beacon-based Place Lab, which creates an indoors, micro-version of the Global Positioning System (GPS). The game is designed specifically for a shopping mall environment, where two teams of seven members each play a version of the traditional schoolyard game *Capture the Flag*. However, while the players move through the real, physical space of the mall, the flag is virtual. Complicating the gameplay, participants are not told which other seemingly ordinary shoppers are in fact the opposing team. To detect

3.6 Mock-up of Mobile Interface for *The Drop*. This figure from a technical paper on the proposed ubiquitous computing game shows a mock-up of the mobile interface. Since the game was not actually developed or tested, only imagined evidence of its future technological implementation exists. (Intel Research, 2005)

the other players and to discover the location of the invisible flag, or "the briefcase" in the fiction of the game, players use their mobile phones as local information displays, complete with a game timer and detailed map of the playing area (see figure 3.6). These displays, which are continuously updated with real-time location data from the Place Lab system, report the presence of other players or the flag when the user is within 50 meters of a target. A speed limit, enforced by the Place Lab location tracking system, requires players to adjust their movements during the game—the fastest pace allowed is a brisk walk, the slowest pace enforced is standing completely still. A virtual combat system similar to the dice combat of *Dungeons and Dragons* allows players that have successfully located each other to fight over the flag without actually engaging in physical contact. Meanwhile, stationary team captains devise and update strategies, which are communicated to their teammates via text message or mobile phone calls. The captains track all of the gameplay on individual laptops, which are connected to the game system through a local Wi-Fi Internet connection.

While the authors discuss a range of game design challenges they faced in developing *The Drop* concept, two in particular stand out as indicators of the game's persuasive aspirations. First, the researchers were committed to creating a non-disruptive game. Here, we are reminded of the central problem identified by the *Smart Playing Card* project: the need to imagine potential ubicomp scenarios that would not violate social norms or laws. How do you produce a multiplayer game for an environment like a shopping mall without violating the implicit and explicit rules of the space? *The Drop* team made several design decisions expressly to meet this goal. They explain, for instance, their decision to use a virtual flag instead of, say, embedding tracking technologies in a real, physical suitcase: "The goal to find the virtual briefcase was designed to be challenging… while causing minimal or no disturbance to others in the physical space who are not involved in the game" (8). In other words, a *real* smart suitcase might prove to be too disruptive in its visibility to non-players, who would have no context for understanding its purpose. A real game prop might also pose a problem in its material tendency to take up space—that is to say, to take *away* space from the commercial operations of the mall.

Other key design choices were made to limit the visibility of, and potential interference caused by, the game. For example, while the speed limits create interesting gameplay—different players are working under different limits at any given time, requiring team captains to come up with inventive strategies for exploiting those differences—they are primarily intended to keep players from behaving in a way that might signal ‘game’ to bystanders. The authors write: “The speed statistic and the penalties for violating it are designed to ensure that players will move at an appropriate pace…. All physical interactions among people in the physical space should be normal for that space” (9). This respect for normal use of spaces is a common theme in ubicomp games research. The *Pirates!* project, for instance, also highlights the fact that “the game could be played in an environment where other activities were taking place without disturbing other activity” (Björk, et al 8).

That *The Drop* system works with extremely detailed maps of the local environment is another result of the designers’ desire to minimize social friction caused by the ubicomp activity. The game server’s context-aware maps not only enable teams to devise more specific and more strategic game maneuvers, thereby improving gameplay experience; they also serve as a guard against inappropriate player movement. “The location system needs to calculate and understand boundaries to ensure that players cannot do things like hide in places restricted by gender, such as dressing rooms, access closets or storage rooms, which might cause a problem for others in the space, or exploit permissions to go to places in the playing space that are usually *verboten*” (Smith, et al 11). Therefore, the fact that “*The Drop*’s application can be supplied with highly accurate, registered and up-to-date maps of the interior space to be utilized by the game” is not just a game feature; it is also a limitation that prevents the game from changing the rules of the space in which it is played (11).

The second major challenge addressed by *The Drop*’s design is the problem of creating a persuasive organizational and business model for a ubicomp game. “The most basic question is this: Why would a space (like the Westlake Mall) *want* to allow a game like *The Drop* to be played on its premises? Put more negatively, wouldn't any sensible mall administrator simply ban all *The Drop* players, jam their wireless networks, and threaten players with trespass charges if they return?" (12) Here, the authors confront what they consider to be a serious obstacle to the proliferation of ubicomp systems in everyday environments: How do you create incentives for organizations and companies to allow the technology and associated games in any given space? "Unless the people who own and or operate the game's playing space at least tacitly agree to have the game played there, it cannot be played successfully on a large scale" (12). Assuaging concerns of technology gatekeepers—such as the property owners and government officials who might want to keep ubicomp technology out of spaces under their control—is an important step in the industry's ability to gain a foothold in already occupied territory. Accordingly, the authors write, "We have chosen to explore designs that make it *desirable* to host a game" (12). These desirable design strategies include "a number of ways the owner of the space could monetize a game like *The Drop*," such as a pay-per-game or pay-per-hour approach (12). The central game server could enforce payment, the Intel team suggests, and allow easy billing and payment to the owner of the space. They also propose more creative design solutions: "Perhaps a drink, for example, '*The Drop*'s Stealth Mochachino' could be offered at a café. By purchasing the product the buyer receives a receipt with a code that is entered in *The Drop*'s application and gives the player bonus points on the stealth statistic for the next 60 minutes" (12). What better way to dramatize the economic aspects of ubicomp game research than for a company in the very business of producing ubicomp technologies to conceive a potentially revenue-generating game for an already commerce-saturated site?

Of course, this particular game scenario is entirely hypothetical. In an article for *Computers in Entertainment*, the Intel research team notes: "*The Drop* is currently still in development; it is not fully implemented and has not, as described above, been played by anyone" (7-8). Indeed, they do not commit to carrying out the game in a full playtest. The authors are content, instead, to leave the game in the conceptual stage, where it can inspire further work by others. "We have contributed pragmatic design solutions to challenges that arise when creating games that are both compelling and workable, to—hopefully better—game designers" (13). *The Drop* concept is designed, then, to recruit more people to the ubicomp cause, to persuade them not only that desirable ubicomp applications are feasible, but also that they are feasible for places we don't necessarily associate with computing, like the shopping mall. *The Drop*, like so many other ubicomp games, is both *staking* a claim—we can put ubicomp technologies here—and *making* a claim—putting ubicomp here is good thing for all involved. The authors conclude: "We hope that our work encourages other designers to investigate compelling games using these popular, cheap and already deployed systems" (11). Here, the researchers' purpose in presenting solutions to various social and business design challenges in public gaming is most explicitly stated. In designing a ubicomp game concept, they hope to establish a foundation for future, more widespread installation of ubicomp technologies in more diverse and unexpected environments.

3.4 The Conspicuous Absence of Gameplay

The Drop is a particularly interesting example of a ubicomp game project because it does not intend to produce any instances of live play. It is, we might say, a prototype of ubicomp *game design* rather than a prototype of an actual ubicomp game. In this aspect, I want to suggest, *The Drop* is an extreme example of one of ubicomp gaming's most unusual traits: the tendency to under-produce play. That is to say, most ubicomp games neither effect nor aspire to live play on a massive scale, even as the games work to support the massive scalability of the ubicomp network.

It is quite common for a ubicomp research team to publish and present a total number of papers about a particular game that matches or exceeds the total number of occasions on which the game has been played. The *Pirates!* team, for example, published two peer-reviewed articles about the game after producing one playtest for a total of four hours of gameplay and 31 players (Björk, Falk et al 5). The Seamful Games project published three peer-reviewed articles about *Treasure*, after producing the game for eighteen players in a single playtest (Barhkhuus and Chalmers, et al 7). Two playtests of an earlier version of the game for forty-six additional players brought the total *Treasure* implementation to three tests and sixty-four players (Chalmers, Barkhuus, et al 5). Meanwhile, as of May 2006, in the ACM digital library alone there are 273 citations of the two *Pirates!* papers and its lone playtest. There are 204 citations so far of the seamful game *Treasure*. As such, the number of researchers *citing* the games vastly outstrips the number of people playing them. *CatchBob!*, the most recently developed game discussed here, seems well on its way to achieving this same asymmetry. It has already spawned eight peer-review publications and poster sessions, all available on the project page, out of just one playtest that engaged a total of 60 players (Nova, Girardin et al 7).

This repetition of play citations in the absence of actually abundant game play is perhaps the most distinctive and non-intuitive quality of the genre. As game designer Eric Zimmerman observes, "the point of game design… is to have players experience *play*"

(184). But ubicomp games clearly have a different agenda, as noted by several online forums attempting to play games such as *Pirates!* and *Treasure*. One would-be player at *Pocket PC* writes of *Treasure*: “I checked all through the site there, but there is no hint of a download that I could find, or mention of code status (stable, alpha) etc. Is this a real thing they are doing, or only a mockup for design purposes?” (foebea #38699) *GameSpy* interviewer James Hill makes a similar point about *Pirates!*: “When will consumers see a project like this turned into a real game that they can set up and play locally with a bunch of friends?” (2)

Note that for both of these ubicomp games, even as they represent a turn for digital gaming toward physical reality, the very “reality” of each project’s gameness is questioned. The questions ‘Is this a real thing they are doing?’ and ‘When will it be turned into a real game?’ perfectly capture the performative nature of ubicomp games research. After all, an emulation is not really the thing it emulates; it is a convincing, mimetic performance. So, too, are the games that emulate the future of ubiquitous computing. Once the playtests are over, the ubicomp games are real only as references, a series of citations that linger in the scientific literature long after the live performance of future ubiquitous play has concluded. To explore the work of this publications-based performance practice, I turn now to the phenomenon of playtesting in ubicomp research and its role in creating a citable and credible scientific network of games.

3.5 Ubicomp Hypotheses and the Experimental Game

In the field of experimental game design, and increasingly in the professional game development industry, playtesting is an important part of crafting the experience of a new game.[4] In “Play as Research”, Zimmerman defines playtesting as “an iterative process [in which] design decisions are based on the experience of the prototype in process… You have as many people as possible play the game. In each case, you observe them, ask them questions, then adjust your design and playtest again”—until the game is ready to be released in a final form to the public (176-7). The goal of playtesting, according to Zimmerman, is simple: “It will help you design more successful play” (184).

Playtests in ubicomp games research, however, appear to serve a very different purpose. While Zimmerman describes playtests as a means to “a more robust and successful final product,” ubicomp games rarely are delivered to the gaming public outside of the initial playtests (177). *Smart Playing Cards*, for example, does not exist outside of the conditions of a playtest; there are no decks of smart playing cards in the hands of the public. Computer-augmented *Whist* is played only when an entire room is temporarily modified with the ubicomp infrastructure necessary for the game program and game props to perform. Likewise, *Pirates!* was playable only during controlled demonstrations; it required significant environmental intervention to create a technological space and social context in which its vision of ubiquitous gameplay could be enacted. And while the project websites for both *CatchBob!* and *Treasure* invite the public to download photos or videos of gameplay as well as the academic publications in which their brief existence as “real games” is documented, neither page makes available a downloadable game program, preventing the documented play from being replicated in everyday life.[5] What is missing from the ubicomp playtesting cycle, then, is the game

[4] For a thorough examination of the increasing role of playtesting in experimental and professional game design, see the 2004 text *Game Design Workshop: Designing, Prototyping and Playtesting Games* by Tracy Fullerton, Christopher Swain and Steven Hoffman.
[5]

release that ordinarily represents the end goal of designing the game in the first place. These ubicomp games are gesturing to a future possibility of play, but they do not typically seek to actualize the possibility for a broad spectrum of players. Indeed, the only game that I discuss in this chapter that has been released to the public is Seamful Games' *Feeding Yoshi*, which requires minimal ubicomp infrastructure in comparison with most ubicomp games. No sensing or networking infrastructure is required other than ordinary Wi-Fi signals and unmodified PDAs. Unlike the vast majority of ubicomp games research, then, *Feeding Yoshi* was not designed for ubicomp of the future, but rather ubicomp of the present. Therefore, it is able to exist as a "real game" downloadable from multiple PDA gaming sites. Because of its attachment to the present and its lesser emphasis on imagining and emulating the future, of all the games discussed here, it performs the least work as a "smart" and "persuasive" game even as it creates the most real play. In this regard, it is the exception to the rule.

If ubicomp playtests are not being employed as a means to actualized better and more widespread play, then what is their function? Here, it helps to consider Jon McKenzie's notion of *performance tests*, a process with many structural similarities to playtests, but a decidedly different objective. McKenzie observes:

> Technologies… are made to perform through a circular process of hypothesis and measurement, prediction and evaluation. Engineers and other applied scientists set out with a hypothesis concerning a discrete technological performance. They then design an application to meet particular performance specifications and criteria and conduct a series of experiments and tests whose results are measured and evaluated. Then, in

> the vast majority of cases, the entire process starts again, as the test results are fed back to create new predictions, new designs, new tests, and new results (110).

The parallels to Zimmerman's notion of playtesting are clear. Both testing methods are described as an iterative process, and both investigate the ability of a prototype to meet the designers' expectations. However, whereas the purpose of traditional playtests is to optimize game design, performance tests seek to optimize a different value: technological effectiveness. As such, each focuses on a different object of analysis. In playtests, it is the players who are under scrutiny—"because the experience of a player can never be completely predicted" (Zimmerman 176). In performance tests, however, it is the technologies, rather than the users, that are said to have experiences. McKenzie writes: "The ongoing comparison of predictions and performance generates what engineers refer to as an *experience base* composed of data relating to a technology's performance history" (107).

The second iteration of the *Smart Playing Cards* infrastructure is an excellent example of a ubicomp playtest focused more on the technology experience base than the player experience base. In the initial 2002 paper, Römer and Domnitecheva identify the current stage of the project as "a first prototype" (2). Four years later, a second pair of computer scientists working in the same research group picks up where the original team left off. In a 2006 paper titled *Smart Playing Cards: Enhancing the Gaming Experience with RFID*, Christian Floerkemeier and Friedemann Mattern use the feedback from the first playtest to develop a new prototype. In their paper for International Conference on Pervasive Computing, Floerkemeier and Mattern do not report on any changes to the project's game design. The interaction patterns and user experience is not altered; however, the software and network implementation undergo significant revision. Quite tellingly, Floerkemeier and Mattern never mention the name of the computer-augmented card game (*Whist*), nor do they describe any gameplay elements in this full-length article. They refer only generically to "the card game", dedicating the entire piece to technical details. And when they present the results of their second prototype's playtesting, they do not describe the play produced. Instead, all attention is paid to the performance of the technological system. It is worth quoting at length to underscore the characteristic absence of play from ubicomp discussion of playtests.

> The smart card game has been extensively tested on a number of occasions. This includes two days of testing at an open day at the university. The tests illustrated the reliable and fast operation of the entire system. The evaluation showed that it takes only a fraction of a second before a card placed in the current trick also appears on the display of the mobile phone. The system also worked reliably over long periods of time. There were very few missed reads and most resulted from cards that were placed far away from the centre of the table. The central antenna which monitors the cards placed in the current trick was then not able to detect these cards. The Bluetooth communication and the software on the mobile phones also worked reliably and the delay the players experienced was minimal (5-6).

The *Smart Playing Cards* playtest is at heart a technological test, as much about testing a technological hypothesis as a game design hypothesis, if not *entirely* about the technological performance and only marginally about the game design. Ubicomp games research, it would seem, has invented a hybrid of Zimmerman's playtest and McKenzie's performance test. In this new iterative process, play is the medium in which visions of ubiquitous computing's future are rehearsed and its technologies are challenged to perform. Games become the platform for discovering the weaknesses of a technological system so that it can be re-designed and re-engineered—not for better play, but for better computing.

Technologies, as McKenzie notes, are often tested in their intended real-world contexts. Therefore, "the spatial difference of lab and field may be blurred… The world has become a test site" (113). Indeed, in ubiquitous computing research, playtests are conducted *on site*; they are field tests as much as they are play tests, for they are evaluating hypotheses about a proposed environment or context for computing. In the case of ubiquitous computing, then, we might say that the spatial difference of lab and field must *by necessity* be blurred. McKenzie observes that "while we may be shocked at the notion that everything's become performative, that the whole world's been framed as a high performance test site, future researchers will merely be shocked at our shock. 'How could this have surprised them? They're the ones who took performance to the ends of the world—and beyond" (268). For McKenzie, those who take performance to the ends of the world and beyond are participating in an intentional scaling effort, charting new technological territory on an increasingly large scale until everything is claimed in the name of performance.

We discover a similar process at work in the playtesting of ubicomp games. Consider the *Pirates!* project in its broader context. Although the game was originally designed and tested in a game space the size of a single room, lead designer Björk has suggested a classification system for such games that could take ubicomp gaming to the ends of the world and beyond. Björk's proposed naming conventions for ubicomp gaming express their expansionist aspirations. *GameSpy* reporter James Hill comments: "To my knowledge, *Pirates!* is the first game in a new genre: 'Networked mobile gaming in a physical world setting.' Do you have a better official name for this new genre?" Björk, at first demonstrating the interchangeable approach to genre names that I observed in Chapter Two as so common in this design space, replies: "Local location based games? Pervasive games? Ubiquitous games?" (Hills 2). Björk then suggests that among these options, the first may offer the most naming power. He demonstrates this power by expanding it to include sub-categories: "Local location based games is a classification I invented. Sub-categories are Room Area Game, Floor Area Game, Building Area Game, Campus Area Game and Metropolitan Area Game" (2). Here, Björk's informally proposed classification scheme offers a series of progressively scaled playing areas. A game that is originally tested in a room may be subsequently deployed over more ambitious terrain until it is ready to turn an entire floor, building, campus and ultimately the whole city into a game board. Such efforts become plausible, presumably, as ubiquitous computing technologies become capable of fully penetrating larger and larger spaces. Although Björk and his team do not attempt to scale *Pirates!* in actual playtests, they suggest a genre classification system that imagines a future in which such scaling possible. In doing so, they articulate a manifest destiny for ubiquitous computing that could be achieved through imagined playtests at increasing scale—to the ends of the city and beyond.

Latour has argued: “For the world to become knowable, it must become a laboratory” (45). In this section, I have argued that ubicomp playtests represent researchers’ attempt to make the world knowable in a specific way: knowable as potential computing terrain. Each playtest seeks to make a specific site function as laboratory. The experimental game design of ubicomp gaming, then, is experimental in a *scientific* sense, rather than a *formal* sense. It is not about playing with the conventions and limits of mainstream design practice. Rather, ubicomp game design is about the investigation of an infinitely variable hypothesis: Ubicomp could go here, and here, and here, and here… and so on, until the cumulative ‘here’s comprise and define the ultimate ‘there yet’ to which ubicomp aspires.

3.6 Making Invisible Computing Visible

The role of ubicomp games as a platform for conducting scientific experiments brings us to another important function of the ubicomp playtest. The playtest addresses one of the fundamental problems of ubiquitous computing research: How can invisible computing be made visible?

But perhaps a better place to start is the question: *Why* does invisible computing need to be made, at least temporarily, visible? In 1996, Mark Weiser delivered a lecture on the theme of “Computer Science Challenges for the Next Ten Years”, in which he addressed precisely this paradox. Of the five top challenges Weiser identifies for future computer science, the first is striving for a greater *visibility* of computer systems and the last is striving for greater *invisibility* of computer systems. Invisibility, of course, has been a central concern of Weiser’s since he first coined the term ‘ubiquitous computing’. In this particular lecture, he reiterates the need for calm technology that stays out of the way as its many nodes, applications and platforms proliferate. But creating computer systems that operate under cover, Weiser suggests, makes it more difficult for the science of ubiquitous computing to be received and advanced by the public and other researchers. He argues that "the foundation of science is communal seeing"—the ability to collectively and cognitively visualize what others have discovered, devised or engineered ([7]). Scientific techniques for communal seeing include direct visual evidence that is shared, like observations made through microscopes and telescopes, as well as visual representations, such as charts, graphs, and diagrams. For this purpose, Weiser notes, contemporary science has conferences and journals—to create contexts and venues for the communal seeing of new scientific concepts, models and techniques. But for Weiser, even though computer science has created abundant conferences and journals, the need to communicate visually the underlying science and goals of the field poses a problem for systems that are designed to be engaged, but not seen. "Seeing the systems we build," Weiser, suggests, will be a major challenge for ubiquitous computing ([7]).

Indeed, in *Smart Playing Cards*, the authors note that the mechanics of their ubicomp augmentation were largely inscrutable to players. Römer and Domnitecheva write of their first playtest: "During those demonstrations we just started to play the game, without explaining the technical setting at first. The first reaction was always a great surprise of the spectators, since it is not obvious how the actions on the display are technically linked to the physical game play" (5). The players were unable to *see* the computing in the playtest, both literally—the technology was hidden—and figuratively—the system was invisible, therefore the technological processes were not discernable. And Albrecht Schmidt notes in an essay for *Pervasive Computing* that it is not just the public who has difficulty visualizing ubicomp installations and insights. In a section titled

"Understanding envisioned systems," Schmidt argues that communal seeing is unusually difficult in the ubicomp space. "Developing complex systems isn't a new problem. However, when looking at ubicomp systems, understanding the full complexity is often different and more difficult than in areas of more bounded scope" (16). He attributes this difficulty to "our envisioned systems' high-level complexity, the implementation challenges of using many small and distributed devices, the multidisciplinary questions involved, and the need to understand and evaluate the full impact of the systems we build" (15).

If future users can't detect or discern the interaction patterns in demonstrations of ubiquitous computing, how will they be persuaded to embrace the field's vision for the future of technology? And if other computer scientists have trouble visualizing the construction and intent of the computing systems, how will the research community collectively become smarter about the design and deployment of ubiquitous computing? Ubicomp playtests help reconcile the paradox between Weiser's two seemingly incompatible challenges, that ubiquitous computing should be both visible and invisible. Playtests make *dramatically* manifest, first to user-witnesses and subsequently to readers, potential, viable paths toward computing opportunities everywhere.

In *Science on Stage*, an authoritative analysis of how scientists persuade the public of their findings, sociologist Stephen Hilgartner characterizes science communication as a fundamentally performance-based practice. "They even stage spectacular public demonstrations, displaying results dramatically and visually in a carefully arranged 'theater of proof'" (19). Here, Hilgartner refers to Latour's theory of how laboratory experiments strive to enable what Weiser calls the communal seeing of scientific theories and claims. In an essay titled “From Fabrication to Reality”, Latour describes experimental practice in science as “the making of something visible” (139). What scientific experiments make visible, according to Latour, is a kind of protagonist—a force, a phenomenon, a molecule, a virus, a process—that, once brought to light, can be understood as having an independent life, work and mission outside of the artificial laboratory conditions. Latour writes: “In his laboratory [the scientist] is *designing* an *actor*…. Why is the actor defined through trials? Because there is no other way to define an actor but through its action” (122). For Latour, this act of definition is not a fabrication of the actor, but rather a fabrication of the conditions under which the actor can perform its true self. Indeed, ubicomp researcher Steve Benford, a collaborator on the Seamful Games project, describes playtests as revealing performances, arguing that such an “orchestrated trial” is the only way to discover the true nature of ubicomp culture (“Staging and Evaluating Public Performances” 85). He writes: “One only witnesses the true behavior of a technology (and its users) when it is used in a real situation. A public performance can provide a more realistic setting than a laboratory” (81).

In their HCI paper, the designers of *Pirates!* also describe their playtests in terms of a kind of real-world stagecraft. “*Pirates!* turns the physical world into a game board, a stage where players and the game can meet” (Björk, et al 6). But ultimately, it is neither the player nor the game that performs in the *Pirates!* or Seamful Games’ theaters of proof. Instead, it is a newly defined technological actor, the location-based game *system*, taking center stage. Latour describes the experiment as “staging an artificial world in which to try out a new actor” (122). This notion of an artificially staged world recalls, of course, what Ciarletta describes as the “fake it” environments and missions of so many ubicomp tests. Indeed, in ubicomp games, what Latour calls the staged, artificial world is what I have described as the imagined, and emulated, future of ubiquitous computing, staged in the present so that users and researchers can effectively visualize the techno-culture they are trying to create.

Performance, of course, is ephemeral. The playtest cannot continue indefinitely. When it ends, what traces are left behind? What enables the theories and claims produced through an experiment to continue being recognized as valid outside what Latour calls “the artificial stagecraft of the experiment”? (122) To solve this problem, Latour introduces the notion of the “circulating reference” (122). According to Latour, the goal of all scientific experiments is to create a sufficiently vivid moment of action and a sufficiently interesting actor that both are likely to be referenced repeatedly in the literature. “Through the artifice of the laboratory, the [defined actor] becomes articulable. Instead of being mute, unknown, undefined, it becomes something that is being made up of many more items, many more articles—including papers presented at the Academy!” (143) The identity of the new scientific actor increases its visibility as the references circulate. “There are, quite simply, more and more things to say about it, and what is said by more and more people gains credibility” (144). Latour concludes, “The more articulation there is, the better,” and ubicomp games research certainly seems to have adopted this mantra (143).

The need to customize existing everyday spaces and hardware has prevented most ubicomp games from being deployed on more than a handful of occasions. But with at least 273 known citations of *Pirates!* in the scientific literature, I cannot help but wonder: What would we know if *Pirates!* could have been not just cited but also *played* 273 times, instead of just once before publication and twice thereafter? What would we discover if *Pirates!* could have been tested in 273 *locations*, instead of just three? But emulating the future—staging the artificial worlds of scientific demonstration—requires significant resources, and research departments therefore by necessity must limit their scope of production. Because ubicomp games research is primarily a scientific practice, rather than an art or game design practice, it is ultimately the number of circulating references, rather than the number of players, that serves as the metric of the project's success.

The scarcity of play in the ubicomp games culture has not interfered, however, with its primary objective: to articulate the possibility space of ubiquitous computing. Earlier in this chapter, I discussed ubicomp research as a mapping endeavor, and prototypes as a kind of silicon flag planting. I want to return to these related ideas now, by way of understanding the *communal seeing* function of playtests as they are reproduced within a larger network of citations. The expanding network of citations, I will suggest, *is* the master map for the future colonizing efforts of ubiquitous computing. The potential terrain for computing must be charted site by site and bit by bit, before it can be actually inhabited. In this way, the map *precedes* the territory.

In the case of the *Smart Playing Cards* project, for example, the first step is not to populate the real-world environment with smart card rooms. Rather, the first step is to locate card rooms as tractable terrain on the map of ubiquitous computing. The published research paper provides the coordinates for this one specific ubicomp site, instructing other researchers and developers precisely how to locate and reconstruct the territory, which is now *known* and officially claimed as viable ubicomp grounds. Here, it is important to note, the silicon flag-planting of ubicomp games is a *provisional* conquering, intended to be more instructive than effective. It is not the actual world-at-large that the research group is exploring and staking out, but rather a representational space of the world. Full-fledged development and population of that territory is left for the future. The network of original, published playtests serves, then, as a provisional conqueror's map, an authoritative record of the technologies' success in achieving, incrementally, more and more credible evidence of its manifest (through play) destiny. Researchers only have to plant the flag once, the proliferating citations ensure that the map forever reflects the fact that it was conquered.

Performance theorist Richard Schechner has argued that all maps perform. "Maps are not neutral. They perform a particular version of how the world ought to be" (32). The map created through playtests performs a vision of the how the computing world of the future ought to be. Schechner points to the seminal sixteenth-century Mercator projection maps as an example: "Mercator's map enacts the world as the colonial powers wished to view it" (33). The charted terrain of ubiquitous computing, we might say, enacts the technological world as the colonizing ubicomp objects wish to view it. Alford Korzybski, the founder of general semantics, has famously stated, "A map is not the territory it represents, but if correct, it has a similar structure to the territory, which accounts for its usefulness" (58). Ubicomp games, by charting the future of computing, have reverse-engineered the relationship Korzybski describes here. The structural map created by the connections created across scientific articles shapes the structure of the imagined ubicomp territory.

3.7 The Play Values of Ubicomp Games

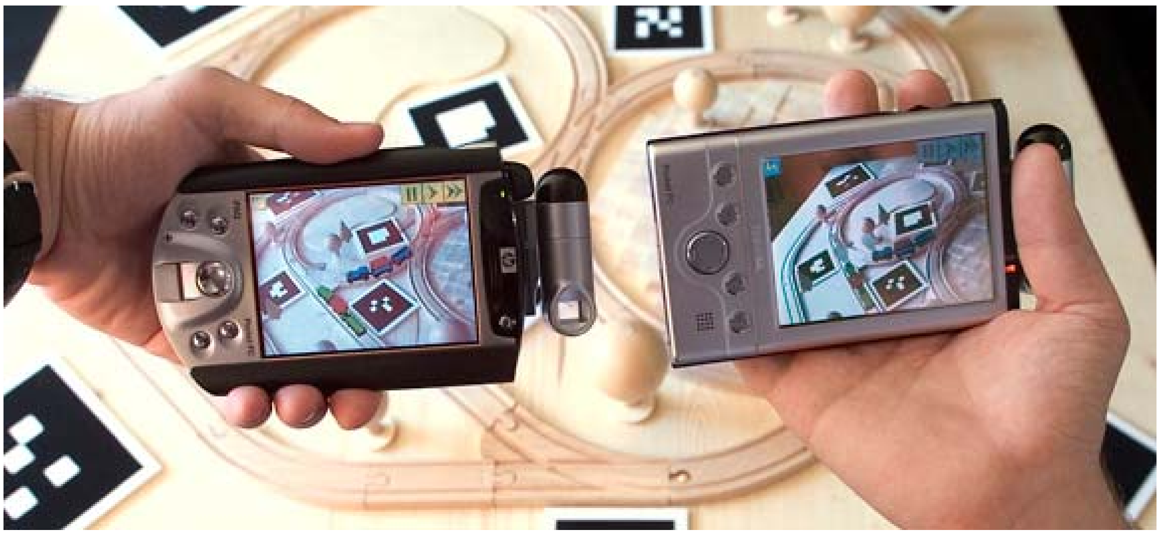
So far, I have explored the intersection of ubicomp research and game design from a particular perspective: How do experimental games help make ubiquitous computing more actually and effectively ubiquitous? Now, I turn to examine the intersection from an adjacent angle. What does it mean to make computer gaming more ubiquitous? While play itself may not be the primary aim or object of study of these experimental ubicomp games, play nevertheless arises as the prototypes are put to the test. What are the particular qualities of play that ubicomp games produce? And what kinds of players do they shape? Here, I will consider how games produced as part of the ubicomp research program have been influenced by the intrinsic qualities and agenda of ubiquitous computing.

In game studies, the concept of "play values" has two distinct, but related, meanings. In "Play as Research", Zimmerman defines *play values* as "the abstract principles of play that the game design would embody" (177) Here, he refers to the specific kinds of social interaction and playful experience that a game designer chooses to create—a competitive spirit versus a collaborative effort, the satisfaction of a frustrating challenge or the simple delight of a highly responsive entertainment system, the explosive energy of a noisy and rambunctious game or the focused energy of a quiet and contemplative one. Another way of understanding this kind of play value, then, is to ask the question: What particular qualities of play does this game designer value most? In *Rules of Play*, however, Zimmerman and his co-author Katie Salen observe a different relationship between play and values. They write: "Games reflect cultural values… the internal structures of a game—rules, forms of interaction, material forms—mirror external ideological contexts"

(516). In other words, a game is often in dialogue with the larger cultural values of the community for which the game is designed. "The structures of a game are reflections of the culture in which it is played" (516). Another way to understand this definition of play value is to ask the question: What real-world social norms and ideals are players required to perform during the game?

With these two definitions of *play values*, we can consider the following: What kinds of play do ubicomp game designers seem to value, and how do ubicomp games reflect the values of ubicomp culture at large? In "Open House", a 1996 essay for New York University's Interactive Telecommunications Program Review, Weiser claims: "The defining words of ubiquitous computing will not be 'intelligent' or 'agent', but rather 'invisible' and 'calm' and 'connection'" (1). How do these three computing values manifest as play values ubicomp games research? Do we find games and gamers that are more invisible, calm, and connected? Here, I want to examine two particularly evocative ubicomp games, both of which take up these three ubicomp values in explicit but complicated ways.

The first of these games is *The Invisible Train*, which poses a playful philosophical conundrum: What happens when a *virtual* toy model train crashes on *real* model railroad track? A simple multi-player game, *The Invisible Train* allows players to discover the secret virtual life of a seemingly barren model landscape. To everyone else in the room, the railroad track is perfectly still—there are no trains, no activity on the tracks whatsoever. However, players equipped with wirelessly connected PDAs share an alternate perspective on the space. By pointing their PDA's built-in camera at the real track, they create an "augmented" reality, in which their PDA screen displays multiple virtual trains running across the real-time streaming images of the track (see figure 3.7). The screen also reveals a series of virtual track switches that they can use to change the course of the trains. Players are challenged to use their PDA stylus pen to steer these virtual trains over the real terrain of the wooden miniature railroad track, changing the trains' speed and the tracks' switches. Whenever a collision occurs, the game ends.



3.7 Gameplay demonstration of *The Invisible Train*. Individual player's PDAs show live video capture of the real, empty toy train platform overlaid with virtual trains and track switches. (The Handheld Augmented Reality Project, 2004)

The Invisible Train, created by Daniel Wagner, Thomas Pintaric, Florian Ledermann and Dieter Schmalstieg, was developed as part of the Handheld Augmented Reality (AR) research initiative at the Vienna University of Technology. Augmented reality systems overlay virtual computer graphics and text on real-world environments. They are not necessarily considered a part of ubiquitous and pervasive computing because of the often unwieldy hardware involved in constructed an AR system. Handheld AR represents the first significant research effort to make augmented reality technologies more mobile, more discreet, more pervasive and more massively networked—in other words, more like ubiquitous computing. The stated goal of the initiative makes explicit these ubicomp aspirations: "AR anytime, anywhere" (Wagner et al 11).

3.8 *The Invisible Train* Playtest. PDA-equipped players enjoy the game (right), while those without the devices seem significantly less engaged (left). (The Handheld Augmented Reality Project, 2004)

The play designed as the means to this technological end offers interesting insights about the values of ubicomp games. Is the gameplay produced by *The Invisible Train* connected, invisible, and calm? The popular technology blog *Gizmodo* describes the project: "It's like your PDA is a 'magic mirror' into fantastic world where trains really do exist" ("Invisible Train" [3]). The specific language of this review recalls Rich Gold's notion of ubicomp as an enchanted village where toys "really do sing and dance when I turn out the lights" (27). In *The Invisible Train*, the platform secretly comes to life, through a live digital rendering that allows only four players at a time to interact with the invisible toys. Here, we discover the first play value of *The Invisible Train*: connectivity, through secrets. The four simultaneous players are *connected* to each other socially through the sharing of a vision and an interactive experience that is denied to others nearby. In a room that could be full of bystanders, only the four players are privy to the hidden game (see figure 3.8). Only they are empowered to act in the fantastic world.

John Seely Brown, one of the original ubicomp researchers at Xerox PARC, and Paul Duguid argue in *The Social Life of Information* that digital flows of information form social networks. Relationships arise among those who share the same data flows. *The Invisible Train* creates a temporary version of such an information-based social network by connecting players through special access to an otherwise protected worldview. If anyone and everyone could see the trains, these powerful knowledge relationships would not be created. The game props must be invisible to everyone else in order for the players to be meaningfully connected.

Invisibility of live play, and not just invisibility of the game props, is another value of *The Invisible Train*. Bystanders are unable to see not only the virtual trains, but also the player manipulations of the virtual switches, the game state changes (have they won or lost?) and the interaction occurring between the players and the game system (who switched which track, when?). The ubicomp interface shrinks the visible physical play to a matter of PDA-stylus twitching, an action that looks no different than ordinary PDA use. What are the social and experiential consequences of making play invisible? Here, it helps to consider what the gameplay would be like *without* ubicomp infrastructure. What if the train were *visible*?

Imagine the same game design, without the augmented reality technology. Up to four simultaneous players would be charged with keeping *real* trains on a track from crashing. Instead of pointing a PDA at the platform, the players would run around the platform, leaning over to turn actual (not virtual) switches, racing through physical space to beat the trains to critical junctions. In this rush to keep the game going, players might crash into each other. And since real-physical space takes longer to traverse than a PDA screen, making it impossible for a single player to be everywhere at once, they might shout instructions across the platform at each other. Such play would be loud, physical, tactile, cooperative, and legible to onlookers. The players would make noise. Their bodies would move playfully and rambunctiously through real space, and there would be material contact both between players and game props and among the players. Players would have to coordinate their actions; and perhaps most importantly, all of this action would not only be visible to onlookers, but it would *make sense*. Watchers would be able to correctly read the relationship between players' actions and the state of the game.

In contrast to these qualities, a game with invisible trains values and produces play that is quiet, still, lacks a tactile component, encourages conspiring rather than cooperating, and is fundamentally illegible to those not playing. To begin, compared to game that would involve running around, bumping into other players, shouting instructions across a platform, *The Invisible Train* is a significantly calmer experience. It requires less energy to play and causes no real disruption to the space in which it is played. Clearly this calmness is reminiscent of Weiser's warning that ubicomp technologies will have to stay out of the way; this ubicomp game certainly stays out of the way of non-players.

The gameplay's invisibility also has a strong effect on the tactility of the experience. For Gold, the objectness of the ubicomp toys was paramount; ubicomp is about interfacing with things of hidden computational potential. But here, the things have literally disappeared. The toy trains have no objectness; they have only *dataness*. In *The Invisible Train*, players touch only their data processors, that is to say their handheld ubicomp devices. Tactile experience is thereby reduced to a technological interface—and so we discover that in its attempt to make gameplay as invisible as the ubicomp infrastructure, the project has actually inverted a core ubiquitous computing value. Rather than embedding secret computing opportunities in ordinary objects so that they seem to playfully come to life, *The Invisible Train* embeds secret gaming opportunities in ordinary computing objects. The technologies are made more playful, but the objects themselves have disappeared.

By transforming the toy trains into data flows, the game also encourages players to share knowledge, or to *conspire*, without requiring them to coordinate their gameplay strategies, or to *collaborate*. Because the real platform is shrunk in its digital rendering to the size of a handheld PDA screen, a single player is quite capable of managing the entire game space single-handedly. It does not require superhuman speed or stamina to move a stylus from virtual switch to virtual switch. As such, and as documented in archived video of the gameplay, players rarely talk to one another during the game ("Invisible Train Promotional Video" October 2004). They do not attempt to maximize their collective ability to save the trains. Each individual player seems focused, instead, on maximizing his or her individual performance. In this respect, the subjective qualities of the connections established by the game are revealed to be more about collectively witnessing than collectively acting. In all of these ways, we see that making a train *invisible* has a profound range of effects on other sensory and social aspects of gameplay.

I have argued that ubicomp technologies tend to map their social organization back onto their users. How is this shaping of the player community apparent in *The Invisible Train*? Next, I will consider the second kind of ubicomp *play values*—the ways in which players are made to embody the desired cultural values of a longed-for ubicomp society.

3.9 Close-up of *The Invisible Train* playtest. Multiple users share a single PDA to see the invisible train game display. (The Handheld Augmented Reality Project, 2004)

In images of gameplay documented by the Handheld AR researchers, we can observe an interesting social network architecture forming among those gathered around the train platform. In figure 3.9, for example, we see seven people leaning over a single ubicomp device, attentively plugged in to the play depicted on the PDA screen. As the game designers note: "Others would learn the gameplay by looking over another player's shoulder while awaiting their turns" (11). In this sense, the non-players seem to spontaneously form connections—not to each other, but to a single game player. These connections resemble a *client-server* network architecture, in which all data is routed through a central connection point. By plugging into the secret world of the game, the non-players are able to partially subvert the special dark-play connections made by the four players. However, only the four players can interact with the secret world; the onlookers are relegated to spectatorship. Here, then, the foundation of the special relationship shared by players shifts subtly, from knowledge to power. The temporary social network is defined by their ability to impact the game state, while others can only passively witness the players' exercise of this power.

The designers also note, however, that "visitors would pass around the PDAs while explaining the game to each other. Most participants would play at least a single game (averaging roughly 60 seconds) before handing their PDA to the next visitor" (11) Across multiple instances of play, then, we see a different kind of spontaneous connection being made between player and non-player. This network resembles a *peer-to-peer* (P2P) architecture, in which *ad-hoc* connections are possible between any two system nodes. Here, ubicomp devices become props that enable the transfer of social currency and techniques. It is not digital data that is being transferred as one person hands *The Invisible Train* PDA to another. Instead, the connecting device provides a platform for face-to-face verbal exchange. While a single instance of the game connects only four players at a time, in repetition within a single space, infinitely many connections are possible. This is a much more scalable (social) network model, one that reflects the increasing popularity of using P2P architectures as the basis for ubicomp infrastructure.[6] Arguably, it is also the social network best suited for achieving the goals of the ubicomp games genre. The P2P architecture enables a learning culture around the game installation that literally, in the case of *The Invisible Train*, gets ubicomp devices into the hands of more people, a feat that is one of the most frequently iterated objectives of ubicomp games research. In this

[6] See, for example, Jussi Kangasharju's 2005 *Lecture Notes in Computer Science* article "Peer to Peer and Ubiquitous Computing".

way, and to this end, *The Invisible Train* does indeed configure its users after its technological platform.

Of course, ubicomp connectivity is not just about connecting embedded computers to one another. It is also about connecting the computers with the physical environment. To what extent is this value represented in *The Invisible Train*? The aesthetic of invisibility, I would argue, surprisingly works against this desired ubicomp attribute, as evidenced by the emergent perceptual techniques of players documented in gameplay video. Although the researchers do not discuss the players' gazing practices in their article, videos of the playtests show that players repeatedly toggled between looking at the PDA display and the real-world train platform ("Invisible Train Promotional Video" October 2004). Clearly, the players are attempting with this visual technique to reconcile the cognitive dissonance of seeing two different realities represented simultaneously. Unlike traditional augmented reality systems, where large head-mounted displays preclude easy toggling, ubicomp AR promotes a rapid back-and-forth comparison. What I want to suggest is that there is a problematic *friction* created between the computer-enhanced version of reality and the ordinary reality of the empty train platform. Rather than creating a meaningful connection between the two, they are disconnected through their disparate energies and attractions. To the extent that most players, judging from gameplay video, give up on looking at the unmediated platform and eventually focus exclusively on the digital rendering (not to mention the apparent total lack of physical interaction with the train platform), I question the game design's effectiveness at connecting the computer-enhanced players with their physical environment. They are *in* the environment, to be sure, but they are not interacting with it. And ubicomp, it must be emphasized, is not just about getting computers into things. The computing systems must be integrated with the material life of the environment. It is worth noting that in *The Invisible Train*, the train is in fact only invisible in the real-world. It is perfectly visible in the virtual environment! This distinction creates a clear incentive for virtual participation rather than material engagement.

The *Treasure* playtest produced a similar perceptual technique. In "Gaming on the Edge", the seamful game designers identify a standout aspect of gameplay they characterize as "the spy look" (11).

> Since players' eyes were locked to their PDAs for most of the game, and with limited visibility beyond the open lawn, players mostly judged others' position via the map on the PDA. They would stand still for a couple of seconds, look up and then around as if to see who (if anyone) was nearby, then look down and continue walking. The movement was a scanning of the environment, trying to match the information on the screen to the actual positions of the other players (11).

This so-called 'spy look' is the same gazing practice observed in *The Invisible Train* as a toggling between two often disparate visual realities. I want to make two points about this perceptual toggling in *Treasure*. First, note that the researchers describe players eyes' as "locked to their PDAs for most of the game" (see image 3.4). The digital rendering of the environment thus takes perceptual priority over the actual environment. To the extent that ubicomp values an "escape from the screen", ubicomp games do not seem to have been very successful to date at making that escape (Wellner et al 24). Instead, the experimental games have simply put more screens into more environments and contexts. Second, the researchers describe the players' relationship to the real environment as a kind of "scanning", a visual practice only. Meanwhile, the virtual environment is the recipient of all interactive efforts, as virtual coins are dropped and picked up, and regions on the map are tagged and labeled with their degree of network connectivity. The players' in-game interactions with the physical lawn is no different than ordinary non-game interactions with it—they are simply traversing the space. All unusual, or ludic, activity takes places in the virtual environment only. If ubicomp values material engagement, then the loss of tactile play and the designed relegation of interactivity to the screen together suggest that the colonizing goals of ubicomp research may sometimes preclude its games from effectively embodying the technological values of the field.

I want to turn now to a project that further interrogates the invisibility of ubicomp systems and ubicomp play. *Can You See Me Now?* (*CYSMN*) is a joint effort of the Equator research initiative (which also produced the Seamful Games project), the Mixed Reality Laboratory at the University of Nottingham, and the interactive arts group Blast Theory. First tested in Sheffield, the UK in 2001 and played subsequently in six different cities, most recently Tokyo in 2005, *CYSMN* pits online players (members of the public) against real-world players (performers affiliated with the project) in a game of mixed-reality tag. The project website describes gameplay as follows:

> Can You See Me Now? is a game that happens simultaneously online and on the streets. Players from anywhere in the world can play online in a virtual city against members of Blast Theory. Tracked by satellites, Blast Theory's runners appear online next to your player on a map of the city. On the streets, handheld computers showing the positions of online

> players guide the runners in tracking you down ("Blast Theory – Can You See Me Now?")

While there has been much discussion of *CYSMN*'s technological implementation in other ubicomp papers and of the mixed-reality formula in the game studies literature, little has been said anywhere about the aesthetic framing of the experience. To begin to fill this gap in the discourse about what is perhaps the best-known ubicomp game, I want to perform a close reading of the title question, "Can you see me now?", and of the original tagline of the project, "Is there someone you haven't seen in awhile?", both in relation to the project's game mechanics and play values.

To begin: Who is asking the title question? Who wants to know if they can be seen, and what are the stakes of being so seen? At a pure gameplay level, "Can you see me now?" is a taunt the online players are encouraged to direct at the street performers. To be "seen" is to be tagged in the game. Project director Steve Benford explains: "Online players, members of the public logged on over the Internet, are chased through a virtual model of a city by runners (professional performers equipped with PDAs with GPS receivers and wireless networking) who had to run through the actual city streets in order to catch them" ("Can You See Me Now?" 31). The runners, in other words, are attempting to situate themselves in the real-world location that corresponds exactly with the online player avatar's location on the virtual map (see figures 3.10 and 3.11). However, the language of the game describes this searching as a kind of seeing, rather than a locating practice. The designers explain in a series of frequently asked questions on the project website: "Q**:** What happens when the runner sees me? A: If the runner gets within 5m of your location then you are 'seen' and your game is over. The runner

3.10 ***Can You See Me Now?*** **Playtest.** A performer with Blast Theory plays the part of a street runner in the Rotterdam playtest. (Blast Theory, 2003)

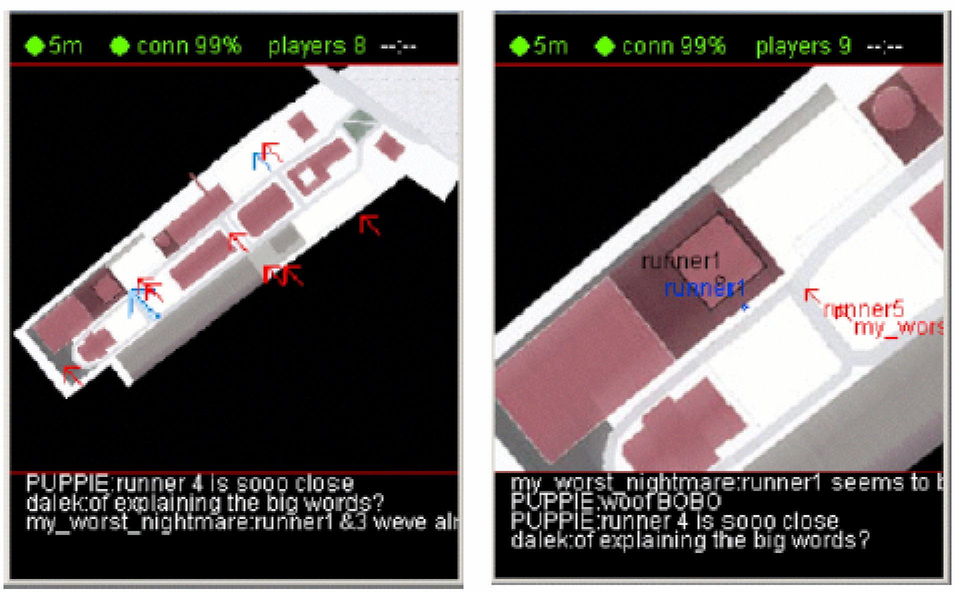


Figure 5: The runner's interface – global view (left) and local view (right)

3.11 Screenshot from ***Can You See Me Now?*** Online players can toggle between local and global views of the game space. (Blast Theory, 2003) announces the sighting and takes a photo of the exact spot where they saw you" ("CYSMN - FAQ" [6]). The term "seen" here stands in for the more traditional "tagged" or "caught" of an ordinary tag game, while the ritual of taking a photograph emphasizes the visual metaphor.

As a catchphrase, however, the title is clearly a play on the popular Verizon Wireless advertising slogan, "Can you *hear* me now?", a question that calls attention to the failure of other wireless networks to provide the more seamless and extensive coverage of Verizon's own mobile phone infrastructure. (Hence, the need to constantly check if the listener can still hear the mobile phone user.) Indeed, like many ubicomp games, *CYSMN* is investigating the failure of current ubicomp technology to be effectively ubiquitous—or effectively invisible, as the ruptures in the network are often what make us notice the otherwise tacit technologies. In this respect, the title functions as a question asked by ubiquitous computing. "Can you see me now, or am I performing as I am supposed to?" But to whom do the technologies address this question? Not to players; the *CYSMN* team reports taking great measures to orchestrate a seamless experience of the game. Therefore, the question must be directed at the researchers themselves, who tracked the moments of visible rupture throughout multiple playtests. The research team since has published a number of technical articles about the moments in the game when the infrastructure became visible to them. Moments in which the game failed to live up to the ubicomp ideal is documented, for example, in the 2003 article "Coping with Uncertainty in a Location-Based Game" and the 2005 paper "The Error of Our Ways: The Experience of Self-Reported Position in a Location-Based Game". "Can you see me now?", then, can be read as an expression of ubiquitous computing's value for structural invisibility.

If a game design tends to reflect culture values, then we may fairly ask: In what sense is the gameplay structured for player invisibility, that is to say, structured so that players embody the central value of the ubicomp infrastructure? Technically, the gameplay mechanics asked players to remain *virtually* invisible only. It was their *digital avatars* that needed to stay unseen in order to win the game. However, this explicit instruction to keep online avatars unseen was accompanied by an implicit instruction to keep the players' real bodies unseen, as well. Consider the asymmetry of *CYSMN*'s mixed-reality design. Only the performers engaged directly with the real-world environment; only the performers were outside, on display, seen by the local community. According to Benford, the Blast Theory performers were highly visible. "Due to their unusual appearance and actions, for example zig-zag running patterns and ritualized taking of photographs of empty spaces (the locations where they caught online players), performers attracted considerable attention from passers by" ("Pushing the Boundaries of Interaction in Public" 57). In media and popular reception of *CYSMN*, the street runners are also highly visible. Press photos on the project website consist only of images of the real-world performers; there are no images of online players.

The *CYSMN* project website archives the photos taken by real-world runners during the seven playtests. The photos are captioned "seen on behalf of [the online player's name]". These captions suggest that the runners are serving as experiential proxies for the players, who remain undocumented by the camera's lens. There are photos of sidewalks, crosswalks, parking spaces, entryways—and these spaces are almost always eerily empty. There are essentially no people in the photos—only empty urban landscapes (see figure 3.12). This catalogue of thousands of photos of nothing begs the question, "Where is the user in the ubicomp landscape?" The *CYSMN* players are made as invisible as ubicomp infrastructure aspires to become.

3.12 Player "Sighting" photo from a Sheffield playtest of *Can You See Me Now?* (Blast Theory, 2001)

According to the published research, many CYSMN online players logged into the system from locations other than where the live, real-world street running was taking place. These remote players, of course, could not be visible on the local game landscape. But even players located in the cities where the game was tested were not invited to play visibly in the exterior, public environment. Instead, the project team created interior gameplay centers with up to twenty PCs simultaneously running the game. From these centers, behind closed doors, the players vicariously experiences the streets through the performers' audio commentary. As the designers explain:

> The audio channel, the real-time walkie-talkie stream from the runners, was an essential part of the experience…. [It] provided a way for players to tune into the runners' actual experience of the city streets, for example hearing them discuss crossing a road through busy traffic or sounding out

> of breath when talking about running up a hill…. The audio stream encourages online players to imagine the runners' experience through their verbal description of the physical world in relation to the virtual model (9).

Denied access to the city as game-space, the online players are dependent on an audio stream to visualize how the urban environment is being transformed into a playground.

Occasional ruptures of this strict separation between virtual and real-world players, as reported by Benford, et al indicate a longing of the players to be more visually connected to the real-world experience. As the researchers observe:

> There was one point at which the online and physical game spaces were visually connected, albeit by accident. In both the Sheffield and Rotterdam experiences the areas in which the public-play consoles were located contained small windows that looked out onto the physical game space. In both cases, some players reported enjoying deliberately positioning or moving their avatars in such a way as to cause runners to move into view. These rare moments of actually seeing a runner chasing their invisible avatar caused great excitement ("Can You See Me Now" 9).

The players' efforts to bring the game into their actual view, as opposed to watching the gameplay unfold entirely via the digital display, demonstrates the players' desire to have a more direct perceptual encounter, and to move from virtual play to actual play.

Like *The Invisible Train* and *Treasure*, this ubicomp game does not give public playtesters a direct experience of computing well-integrated with the physical environment. The *CYSMN* players experience only traditional desktop technologies, playing the game entirely on an ordinary, Internet-connected PC. It is the performers who have a true ubicomp experience. At the same time, the players themselves are configured as a network of twenty invisible, surveillance-capable, chatting co-conspirators, working together to track the runners, anticipate their movements and share collected intelligence. Perhaps, then, the online players have access to an even more vivid ubicomp experience, as they are given the opportunity to embody the techno-social architecture of ubicomp design.

The social network created among the players is not the only kind of connectivity explored through the sight-based *CYSMN* aesthetic. The project also uses the visibility motif to promise social *re*-connectivity. The “Conceptual Background” presented on the project website explains: “As soon as a player registers they must answer the question: ‘Is there someone you haven't seen for a long time that you still think of?’ From that moment issues of presence and absence run through *Can You See Me Now?*” ([5]). The implied promise, of course, is that ubicomp technologies can bring you closer to those with whom you have lost touch. The network can reconnect you and make visible again those who disappeared from your life. (Note that loss of interaction is configured here as a *not seeing*.) Indeed, failure in the networked tag game seems to produce a positive reconnection result. As the Conceptual Background observes: “This person - absent in place and time - seems irrelevant to the subsequent game play; only at the point that the player is caught or 'seen' by a runner do they hear the name mentioned again as part of the live audio feed from the streets. The last words they hear are ‘Runner 1 has seen ______ _______’” ([5]). The semantic architecture of this “game over” message is complicated. The FAQ tell us that the game ends when *you*, the player, are seen.

However, the runners announce that they have, in fact, seen not you, but your missing friend or lost acquaintance. Therefore, it would seem, in the moment of being seen, the old connection is renewed—both player and named loved one are co-located, metaphorically. Except, who has really *seen* the player's missing loved one? It is not, in fact, the player—it is the players' real-world antagonists, who now serve as their perceptual proxies. This slippage of personal identity and the suggested emotional consequences of being replaced in such a potentially meaningful encounter evoke serious questions about the degree to which social relations may not only be mapped onto our technologies, but relegated to, colonized by and ultimately co-opted by them as well. In this way, players may have the opportunity not only to embody the values of ubiquitous computing, but also to critique them as well.

3.8 The Critical Function of Ubicomp Games

I want to close this chapter by examining two examples somewhat outside the domain of the ubicomp gaming mainstream. The first is a futuristic ubicomp game concept called *The SpyGame*; the second, a satirical ubicomp game project called *You're In Control*. Taken together, they demonstrate how ubicomp games potentially open up a more critical conversation about the nature and value of ubiquitous computing—perhaps inadvertently as in the case of *The SpyGame*, while more intentionally as in the case of *You're In Control*. Specifically, these two games allow us to explore how the ubicomp ideal of perfect balance between user-control and computers' autonomy is complicated by the tendency of technologies to map their designed qualities back onto their human counterparts.

*

In February 2002, thirteen researchers from six countries gathered at the IT University at Gothenburg to imagine the future of gaming as it might look in a more fully realized ubicomp world. Over the course of five days, small teams formed to design and to prototype a series of ubicomp games specifically for the year 2010. Their first task was to articulate a detailed vision of the social and technological shape of things to come; their second task, to create a game concept that suited the dominant cultural values and mainstream interactive platforms of that imagined future.

The most provocative concept of the workshop was a relay game dubbed *The SpyGame*, developed by a group that included three members of the original 2001 *Can You See Me Now?* design team.[7] In the report from the workshop, *The Spygame*'s creators describe the coming ubicomp society for which they created their game:

> Our 2010 scenario suggested that there was a wide socio-political gap in a futuristic society that had evolved into two distinct groups. The first group were effectively the ruling class – they were affluent, well educated, had a large amount of money to spend on leisure time, but also not a huge amount of time for leisure, as they were too busy working. This distinguished them from the second group, who were said to be quite the opposite of the first group, in that they were poorly educated, had poor health and housing, and very little money, however as most of them were unemployed, lots of free time (448).

[7] *The SpyGame* team consisted of *Can You See Me Now?* developers Rob Anastasi, Steve Benford, and Martin Flintham from the University of Nottingham's Mixed Reality Laboratory, as well as Dimitris Riggas of the Computer Technology Institute of Greece and Tobias Rydenhag of the IT University, Gothenburg, Sweden.

Their vision of 2010 is, frankly, somewhat dystopian—but nevertheless plausible. And so the team takes the dark inequalities of their future scenario as a serious design constraint.

The researchers set out to create a game that maximizes play opportunities for each of the disparate classes by creating a game network that connects and encompasses both. "It would be good to provide some way of allowing the two groups to interact," they observe, "while at the same time providing the desired segregation between the two groups – the ruling class would not want, we decided, to mix with the other class, and would still want to exercise a certain degree of control over them" (448). To provide this kind of controlled interaction, the designers propose a game model in which the underclass plays in the real-world via mobile ubicomp technologies, while the ruling class plays virtually via more traditional desktop technologies. The virtual, or "remote players", direct and coordinate the actions of the real-world, or "physical" payers.

The final designed gameplay is described as follows:

> One group of people interact on a physical level, but are remotely 'controlled' in some way by a second group of people, to achieve a common objective. The common objective would be the 'delivery' of a parcel, with the remote users receiving more information as to the contents of it, and why it needed delivering…. The physical players only receive limited information, via their controlling equivalents in the first group. The aim is to deliver the package from one physical player to another in a chain, in such a way that the package travels from one side of the game area to another – the game area could be a city, for example. One team is

> trying to make the package travel in one direction, while the other team is trying to make it travel back in the opposite direction" (448).

Consider the tremendous power imbalance created by this game scenario. The physical players not only are required to follow the commands of the online controllers, but also are kept completely in the dark as to the motivation for these commands. What is in the package? Where is it going, and why? The physical players are not privy to this information. The virtual players, on the other hand, have both authority and access to all the data. The game designers summarize this dynamic: "The virtual players make the high level decisions, and control the physical players and the overall flow of the game. The physical players are highly dependent on their virtual minder, while being the mechanism through which the game progresses" (450).

One could argue that as the mechanism through which the game progresses, the physical players arguably exert more ultimate influence on the game result. The virtual players can make any decisions they want, but without the physical players executing those decisions, the game comes to a complete standstill. As such, it is certainly possible to imagine the physical players attempting to exert more influence on the game outcome. What if they stopped following commands and simply started moving the package wherever and whenever they wanted? Could they effectively wrest control of the game away from their controllers?

But in fact, *The SpyGame*'s design cleverly (or perhaps perversely) limits the opportunity for physical players to conspire against their controllers. There is both an implicit and an explicit barrier to such counter-play. First, it very much matters that the physical players and the virtual players are not actually competing with each other. Every physical player shares a particular win-condition goal with his or her controller. A physical player invested in the game, therefore, needs to cooperate even under the conditions of power imbalance. Note also that the physical players are not given the means to connect with each other. The game does not provide them any information about who else is playing in the real world, nor does it establish communication channels among the physical players for coordinating action. On the other hand, "the virtual players can coordinate their use of their own physical players with other virtual players in a virtual chat environment" (448). In this sense, the real-world players are kept less powerful as a group in the game because their ability to collaborate with each other is inhibited.

This power imbalance is intentionally constructed by the game designers to achieve a particular, desirable dynamic between the two groups. Direct interaction is minimized, and control is precariously balanced in favor of the ruling class while still affording a functional autonomy to the underclass. Here, I want to suggest that a similar set of desires and dynamics is at work in the field of ubiquitous computing itself. For in the researchers' description of the complicated ludic interactions between two future classes, I am reminded of one of the most difficult design problems of ubiquitous computing: managing the perceived balance of power between users and the network of invisible, *somewhat* autonomous technologies.

As a team of University of Queensland computer scientists observe in their paper "Balancing Autonomy and User Control", ubiquitous computing inherently threatens to usurp human control of their objects and environments. Bob Hardien, et al, write: "The proliferation of mobile and embedded computing devices requires a change in the nature of interactions between users and computers. One of the goals of pervasive computing is to reduce user interactions with computing applications: i.e., to make applications more autonomous and proactive" (1). The main benefits of granting technologies increased autonomy—the ability to initiate technological operations without explicit instructions or the consent of users—are twofold. First, it frees up users from having to attend to everything. Secondly, it allows networked technologies to make decisions based on more data than a human user is likely to have or be able to process effectively. However, there is an equally significant potential downside to these changes, as well. According to the researchers, the drawbacks include that "users may feel loss of control" and that "autonomous applications may not always behave in the way desired by the user" (1). Indeed, this fear of loss of control is what Rich Gold evokes in his classic ubicomp presentation: "How Smart Does Your Bed Have to Be Before You're Afraid to Go to Sleep at Night?" But while researchers have long been aware of the anxiety produced by ubiquitous computing, Hardien et al note that "the challenge of designing applications to provide appropriate control to users has traditionally taken a back seat to more fundamental problems in context-aware systems, like sensing and interpreting context" (1). In other words, designers have focused on making the systems smart, rather than easing future ubicomp users' concerns about the newly bestowed intelligence.

The SpyGame, it seems to me, represents an eruption of an unease that has been long observed but inadequately addressed by ubicomp designers. By constructing a precariously balanced relationship between two classes of futuristic ubicomp users, the game design effectively performs the anxieties ubiquitous computing has about the balance of power between users and their technologies, displacing these anxieties onto the relationship between the virtual and the physical game players. Here, *The SpyGame* serves an important critical function, whether it intends to or not. The complicated dynamic between virtual and physical players in the imagined game helps draw out some of the potentially more complex aspects of future ubicomp relations.

Consider, for example, how the designers of *The SpyGame* characterize the relationship between the remote and the real-world players as a highly intimate one, even in its dramatic power imbalance. They describe the connection as a kind of *twinning*. "Each virtual player is twinned with a physical player, who they can talk to via mobile phones. The physical player receives instructions on where to go, and what to do, by the virtual player" (448). The language of twinness between the two classes suggests both a *closeness* and a *sameness*, calling to mind two particular complications of ubiquitous computing: the emergence of *intimate computing* and what Latour describes as the inevitable *techno-social exchange*.

Intel researcher Genevieve Bell, a leading proponent of intimate computing, has persuasively argued with colleagues Eric Paulos, Tim Brooke and Elizabeth Churchill that granting ubicomp technologies a degree of autonomy does not make the technologies more independent or distanced from their users. Rather, it actually intertwines the systems more tightly with human users. In a paper titled "Intimate (Ubiquitous) Computing", they write:

> This next era is predicated on a sense that the appliances and algorithms of the future will respond better to our needs, delivering 'smarter' more context-appropriate, computing power. Underlying such a vision is the notion that computers in their many forms will be pervasive and

> anticipatory. Arguably, to achieve this, computing appliances will have to become more intimate, more knowing of who we are and what we desire, (1).

Here, the technologies' abilities to anticipate users' desires and make decisions on their behalf is seen less as threatening, and more as endearing. It creates a closeness precipitated on an intimacy we normally associate with close friends, family and lovers.

Latour, who as I discussed in Chapter One also configures the relationship between users and their technologies as increasingly intimate, furthermore has noted the tendency of distinguishing qualities to slip from one category to the other. That is, technologies develop a social life while their users frequently organize themselves after technological infrastructure. Such a slippage can be observed in the design of *The SpyGame*. In the initial concept description, the physical players are treated almost as ubicomp objects themselves—they receive input, execute commands, and represent the material component of the game, much as ubicomp represents a return to physical reality. For the remote players, there is an instrumentality about the physical players that evokes the typical view of technologies as instruments for our needs and wants. But ubicomp objects are also supposed to be smart and connected, whereas the real-world players are denied intelligence about game objectives and refused the ability to connect with each other. Here, it begins to seem that it is in fact the remote players who are modeled after the ubicomp technologies, as the chattering jungle animals Rich Gold describes as constantly discussing and monitoring their users. It is the remote players who possess the surveillance and communications capabilities of ubicomp technologies. It is the remote players who process the data and make executive decisions, functions that our ubicomp technologies are increasingly designed to carry out.

Even as the two classes are differentiated in power and function, they seem to alternate position as the embodiment of ubiquitous computing. This slippage powerfully demonstrates the back-and-forth mapping of techno-social qualities that Latour describes as the inevitable result of the increasingly intimate relationship between humans subjects and technological objects. Moreover, the fact that a ubicomp game can so clearly structure human relationships after the technologies for which it has been designed provides a vivid glimpse into how that slippage might occur in the future.

Ubicomp games like *The SpyGame* also offer a preview of what it might *feel like* to be entwined in such an intimate technological relationship. Two kinds of uneasiness are likely to arise in *The SpyGame* in reflection of our concerns about ubiquitous computing power dynamics. First, there is the uneasiness likely to be experienced by the real-world players. Bell, et al note: "We already worry about issues of privacy, surveillance, security, risk and trust – the first accountings of what it might mean for individual users to exist within a world of seamless computing" (2) If we understand the remote players to be playing the role of the ubicomp technologies, collectively creating a surveillance and decision-making network akin to the future seamless computing infrastructure, then we can expect the physical players to grapple with a concern for invasion of privacy, the discomfort of being under surveillance, and the security risks of following the commands of players out of the direct line of fire. What does it mean to trust your remote handler enough to go to a physical location at a certain time, and how might remote players abuse that trust? *The SpyGame* provides a concrete scenario to understand the overall anxiety that may arise when digital technologies have an increasingly material impact. The potential physical risk to the real-world players metaphorically represents the power embedded and integrated technologies may come to have over the physical environment. The potential danger *The SpyGame* poses to the technological underclass is the same danger we may face if the ubicomp technologies effectively become, in certain situations or environments, the ruling class over their human subjects.

The unease potentially felt by remote players, on the other hand, can best be described as the problem of unrequited intimacy. Bell, et al describe the relationships created through ubiquitous computing as "cognitive and emotional closeness *with* technology, where the technology (typically uni-directionally) may be aware of, and responsive to, our intentions, actions and feelings. Here our technologies know *us* intimately; we may or may not know them intimately" (2). In *The SpyGame*, is the cognitive and emotional intimacy between the "twinned" players mutual, or uni-directional? The real-world players know exactly what the online players want and need. What do the online players know of the desires of their physical counterparts? While remote players may have objective data about the physical players (such as real-world location), I would suggest that the physical players remain somewhat of an emotional mystery to the remote players. The trust required on the part of the remote players is the trust that the physical players *care*, that when informed of their twin counterparts' wishes, the real-world players will carry them out. Moreover, remote players must trust that their twin counterparts truly understand them well enough to interpret and execute the commands effectively. This required trust is at least as profound and potentially unsettling as the remote players' trust of their handlers' commands. While the real-world players face potential physical danger, the online players risk rejection and the consequences of being misunderstood.

It is also worth noting that *The SpyGame* design borrows from *Can You See Me Now?* the social dynamic of splitting participants into two groups: real-world players and strictly online players. In this way, the uneasy power relations depicted in this futuristic vision of segregated ubicomp gaming seem less outlandish and more directly connected to current, experimental practices. Although *The SpyGame* is only a concept and not a publicly playtested game, it neverthless reveals much about where ubicomp researchers think technology is going, and the challenges users will face when the technology gets there.

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Finally, it is worth exploring one more research project that is at once the perfect embodiment of the manifest destiny of digital games and a satire of the entire ubicomp gaming category. The MIT Media Lab project, *You're In Control (Urine Control)*, takes the genre to its natural if absurd extreme, embedding ubicomp technologies in the environment of a public restroom in order to turn urination into a ludic activity. As described by designers Dan Maynes-Aminzade and Hayes Solos Raffle on the project website, "The *You're In Control* system uses computation to enhance the act of urination. Sensors in the back of a urinal detect the position of impact of a stream of urine, enabling the user to play interactive games on a screen mounted above the urinal."

In regards to its technological implementation and modification of a classic game mechanic, *You're In Control* is a quintessential ubicomp project (see image 3.13). For a public playtest, Maynes-Aminzade and Raffle attached a grid of sixteen sensors to the concave "sweet spot" of a urinal. They routed sensor wires from the grid through the urinal's plumbing fixtures to a circuit board embedded in the wall, where a PC processor reads the state of the sensors from the circuit board. An LCD flat-panel monitor mounted above the urinal displays the game, which is a variant of the classic carnival attraction *Whack-A-Mole*. Cartoon hamsters leap randomly out holes in an animated landscape, taunting the player (see image 3.14). The sixteen sensors embedded in the urinal correspond with sixteen possible hamster locations on the screen. When a player urinates on the right sensor at the right time, the targeted hamster turns yellow, screams and spins out of control, rewarding the player with ten points.

3.13 *You're In Control* (*Urine Control*) *Game Installation*. The complete game installation includes the game display, sensor-enhanced urinal, and harness-styled game controller that the designers describe as a combination of a Nintendo-style controller and a strap-on dildo. (MIT Media Lab, 2003)

3.14 Screenshot from *You're In Control* (*Urine Control*). The on-screen hamster position corresponds with the position of sensors embedded in the bottom of a urinal. (MIT Media Lab, 2003)

Maynes-Aminzade and Raffle presented a short paper on the project at the "Computers Everywhere" session of the 2003 CHI Conference on Human Factors in Computing Systems. While the designers present their work following the standard format of a technical research paper, it is almost impossible not to read their paper as a tongue-in-cheek critique of the colonizing rhetoric of ubiquitous computing and digital games. When the authors write, for instance, that "the parabolic trajectories of the hamsters conceal the grid-like arrangement of sensors, resulting in a fluid transition between input and output," it is hard not to admire the conceptually witty word play prompted by their design (2). Here, the player's *input*, the computer-human interaction term for data submitted by the user, is literally the player's *output*, the medical term for urine produced. And, of course, the transition between the two is *fluid* not only in the sense of being well-integrated, but also in the sense of being a liquid substance (the urine input/output). Such wordplay suggests immediately that the authors are using engaged in a kind of send-up of ubicomp research, one that makes its humorous critique by adopting the research and rhetorical hallmarks of the field.

The paper mimics the conventions of ubicomp game publications perfectly, beginning with its discussion of the social aspects of urination. Many ubicomp games profess an interest in the how computing can enhance social experience; accordingly, the authors attempt to establish the importance of social interaction to public urination. They write:

> While urination fulfills a basic bodily function, it is also an activity rich with social significance. Along with the refreshing release it provides, the act of micturition satisfies a primal urge to mark our territory. For women who visit the bathroom in groups and chat in neighboring stalls, urination

> can be a bonding ritual. For men who write their names in the snow, extinguish cigarettes, or congregate around lampposts to urinate, urination can be a test of skill and way of asserting their masculinity (1).

These examples are surprisingly persuasive of the social aspects of urination. But in their convincingness, they effectively distract us from the question: Why is public urination something we want to make *more* social? In the enthusiasm to get ubicomp into more objects and spaces, the larger social consequences are not necessarily examined.

This failure to ask *why* in the rush to ask *where next* has been common in the genre since the very first ubicomp game experiment. The original *Pirates!* paper argued: "Computers have turned game play into individual and isolated activities. In a typical computer game, the game and its mechanics are inside a stationary computer, and if we interact with fellow game players, we do so through a computer screen, rather than in a face-to-face, co-located situation" (1). *Pirates!,* by co-locating players through the platform of mobile and embedded technologies sought to reverse this trend, to reconnect players physically with each other. *You're In Control* is clearly spoofing the unexamined impulse to create more real-world social connectivity by proposing to make one of the arguably most deservedly individual and isolated activities mores social. Björk describes a playtest of *Pirates!*: "The game was very social in that it made people walk around and talk to other players even if they were total strangers. While you might get this in any other [online] multiplayer game, in *Pirates!* you actually have people *meeting in the flesh*" (Hills 2, emphasis mine). In Björk's discussion, we see an attempt to transform traditional computer gaming in the same way that ubiquitous computing has attempted to transform traditional computing. Weiser has famously stated: "Ubiquitous computing forces the computer to live out here in the world with people" ("Ubiquitous Computing" [4]). In *Pirates!*, just as the ubicomp technology is forced to live out in the world with people, so is the game—and for that matter, so are its players.

But why is this particular future desirable? Why is direct interaction such as walking around and talking to strangers an improvement over what the authors describe as more mediated computer gaming? Why is forcing gamers to play out in the world with other people a worthwhile shift in game design practice? The co-authors of the *Pirates!* paper do not delineate a specific rationale for moving toward same-space, social gaming. Instead, they seem to identify it as the intuitively obvious next-step; as gaming platforms change, so should the games, in precisely the same direction as their technologies. The *Pirates!* team observes that "the notion of ubiquitous computing acknowledges, and supports, the fact that people interact socially"; therefore, presumably, a game for ubicomp platforms ought to support a more social computer-gaming experience. But is it really so intuitive a leap to suggest this kind of mobile-social gameplay? *You're In Control* draws attention to the lack of a shared ubicomp games manifesto or vision statement that articulates why games should take up exactly the same goals as ubiquitous computing, and vice versa. So whereas the *Pirates!* game accepts as self-evident the benefits of more "meeting in the flesh", *You're In Control* forces ubicomp researchers to consider the fleshiest of possible ubicomp encounters, in which genitalia are enlisted in computationally-enhanced play.

In "Intimate Computing", Paulos, et al consider a second kind of ubicomp intimacy—"intimacy as *physical closeness* with technology, both on the body and/or within the body" (2). *You're In Control* takes up this sense of bodily intimacy and asks: What might be the true motivations of such physically intimate applications, and why is a ludic framework necessary for their success? In their CHI paper, Maynes-Aminzade and Raffle mimic the persuasive rhetoric of ubicomp gaming research, articulating a series of serious reasons why an organization or company would want a game embedded in its public restrooms. “We believe that adding interactivity to urination has valuable applications to recreation, hydration, sanitation, and education” (1) Elaborating, for example, on the issue of hydration, the designers note: “By making urination more fun, the *You’re In Contro*l system encourages proper hydration, and could result in increased beverage sales at restaurants and sporting events” (2). Here, we are reminded of projects like *The Drop*, which used ubicomp gaming to create economic incentives for more ubiquitous computing. And on the issue of sanitation, the designers write: “Since our system motivates users to aim properly, it reduces splashing and spillage” (2). They observe that “bathroom sanitation requires a serious focus and conformity. *You're In Control* encourages cleanliness,” by motivating users to aim more strategically into the urinal (2). Here, in the emphasis on conformity, the authors’ discussion of how the game modifies its players’ urination techniques lays bare the underlying irony of the project’s title. It is a common ubicomp tenet that users will be empowered by everywhere technology. A recent ubicomp position paper circulated by developer Ezra Jeoung at the 2004 International Conference on Ubiquitous Computing captures this belief: “The ubiquitous environment will not influence humans, but rather will *adjust* to humans” [2]. However, *You’re In Control* provides a rather effective example of a ubicomp system very much designed influence humans, rather than the other way around. The stated motivations for *You’re In Control* give lie to the power fantasy of its own title. The *technology* is in control, not the user. Instead, the users' most intimate daily practices are monitored, evaluated, scored, and ultimately modified by the novel ubicomp infrastructure.

Bell, et al propose that viewing ubicomp as an intimate computing practice could prevent such an emphasis on conformity. "Intimate computing implies a sense of detail; it is about supporting a diversity of people, bodies, desires, ecologies and niches" (2). However, *You're In Control* provides an effective critique of this belief in the inherent heterogeneity of the intimate computing impulse. The most vivid element of this critique is made online outside the constraints of a formal academic paper, where the designers hint more openly at the subversive nature of their project. Raffle, on his MIT student webpage, writes playfully abut the customized game-controller that allowed both men and women to participate in a public playtest (see figure 3.13). He first describes its construction: "The controller consists of a nylon belt, a formed acrylic pelvic plate, water bottles, tubing, and a flexible garden hose nozzle. It is worn around the waist and the bottles are gripped and squeezed to pressurize a stream of water" ([10]). He then describes its aesthetics: "It is a play on Nintendo-style game controllers, plumbing equipment, and strap-on dildo harnesses. The oversized phallic nozzle is powered by two water reservoirs located to suggest oversized ovaries, making it oddly hermaphroditic" ([10]). Photos and videos from the *You're In Control* playtests show men gleefully squeezing their stand-in ovaries and women confidently aiming their make-believe phallus.

These joyful hermaphroditic game performances make it impossible to ignore ubiquitous computing's potential subjective effects, especially in the context of a ludic framework. Paulos, et al argue that "when at play, humans are more exploratory and more willing to entertain ambiguity in their expectations about people, artifacts, interfaces, and tools. Such conditions may more easily give rise to intimacy" (3). I have no doubt that the game aspects of *You're In Control* did enable playtesters to engage in this socially risky gender play. I also believe it is likely only through play that users would so willingly offer up such a personal practice as urination to so much public scrutiny. *You're In Control* therefore draws critical attention to the power of game design and the power of ubicomp infrastructure to encroach upon the most intimate personal habits.

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I want to make one final observation about the *You're In Control* project. While it presents a rather extreme example of computing anywhere and everywhere, there is nothing about the project other than the authors' tongue-in-cheek writing to distinguish it from any other ubicomp game. In satirizing the genre so effectively that it becomes impossible to differentiate it from actual ubicomp research, *You're In Control* demonstrates that there is no ridiculous extreme built into the ubiquitous computing model. There are no out-of-bounds in a technological worldview that takes all places as its proper terrain.

The ability of a satire of ubiquitous computer gaming to circulate in the same network of scientific literature as serious ubicomp games is a result, no doubt, of the entire genre's tendency to under-produce play. Ubicomp games do not have to pass effectively or extensively as a good idea in real-world contexts for real-world players. Instead, they must simply be persuasive in their conceptual documentation, which requires only limited or even simply imagined deployment. The ability of ubicomp gaming to circulate such extreme, dystopic or satirical ideas alongside more earnest or subtle initiatives, I would argue, is one of ubicomp gaming's greatest strengths as an experimental design practice. Ubicomp gaming may not be particularly productive of play through ubiquitous computing. However, as a flexible platform for rapidly, radically or even ridiculously emulating the future through its temporary contexts and provisional prototypes, ubicomp gaming produces an extraordinarily diverse and instructive range of visions for the future of play both for and through ubiquitous computing.