

Public
Space
For
Ambient
Intelligence^{*}

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U♦bi♦qui♦tous adjective (y-'bi-kwe-tus)
1. Being present everywhere at once.

Introducing the Invisible

“The transformation toward communication between things.”¹

There is every indication that the act of communication is evolving at a pace beyond the imagination of the average individual. What used to be an action which took place from person to person is fast developing into communication between person to object; even object to object. What was once silent and inanimate will be communicating and interacting - either indiscreetly or out-right - with people in their everyday lives. In some forms, it's already happening.

This is a future of Ubiquitous Computing.

¹ Hideyuki Tokuda, Kengo Kuma, Jun Aoki, Ryue Nishizawa. “NTT DoCoMo, Inc.: Public Space for Ambient Intelligence”
<http://www.japan-architect.co.jp/> (accessed January, 2007).

History

“Ubiquitous computing names the third wave in computing, just now beginning. First were mainframes, each shared by lots of people. Now we are in the personal computing era, person and machine staring uneasily at each other across the desktop. Next comes ubiquitous computing, or the age of calm technology, when technology recedes into the background of our lives.”

- *Mark Weiser*

For centuries cities have been planned and constructed based on visual cues. Maintaining co-ordinates and location relied heavily on the unobstructed views created by a rational grid system in such cities as New York, Chicago and Toronto; towering landmarks in cities like Rome or even Cambridge. It is our architectural language that allows us to travel freely through the use of these patterns and visual markers. The progressive technology behind such combinations as Global Positioning Systems (GPS) and the average cell phone has brought us to a state where “we can use ubiquitous technology to monitor where we are and where we want to go”² rendering visual architectural cues all but archaic in their conception and use.

² Ibid.



Figure 1 - Mark Weiser

The rationale behind ubiquitous computing was first introduced in the late 1980s when researchers at Xerox's Palo Alto Research Center (PARC) began to view the computer less as the focus of our daily attention and more as a dissolved element within the background of our lives. Termed by PARC as 'UbiComp', the goal was invisible technology which would allow man to pursue life beyond the computer screen – though not discard it entirely. It wasn't until 1988 when Mark Weiser (fig. 1) - the man who coined the term 'ubiquitous computing', stated that the ultimate purpose of ubiquitous computing was to 'liberate us from the constraints of desktop computing [and] free us from equally isolating immersive and simulated virtual reality environments.' This assertion would eventually validate such companies as PARC in their efforts to merge technology, culture and society in ways never imagined.

What propelled Weiser into ubiquitous computing stardom was that while his peers were focusing their research solely on the technological aspects of computing, Weiser was examining its effects on the social and cultural aspects of everyday life. His 1988 forecasting in which he envisioned “computers embedded in walls, in tabletops, and in everyday objects, each invisibly embedded in the environment and wirelessly communicating with each other”³ made clear his progressive vision. This was brave foreshadowing in a relatively infantile time for then main-stream computing technology. In his some of his early introductions of ubiquitous computing, Weiser outlined what he believed were a set of key principles which have become an serious mantra for contemporary ubiquitous devotes:

1. The purpose of a computer is to help you do something else.
2. The best computer is a quiet, invisible servant.
3. The more you can do by intuition the smarter you are;
The computer should extend you unconscious.
4. Technology should create calm.

Unfortunately, the progress of ubiquitous computing as a social tool stalled in the late 1990s due to the Weiser’s untimely passing from cancer. His legacy will forever be [in]visible when virtual technology no longer forces humans to conform to its ‘world’ but instead forces computers to conform to ours.

3 Rhodes, B. J., Minar, N, Weaver, J. Wearable Computing Meets Ubiquitous Computing: The Proceedings of The Third International Symposium on Wearable Computers. ISWC '99 (1999): 141-149

Early 'Ubiquity'

Mark Weiser may be the 20th century's ubiquitous computing king but the earliest credited creator of ubiquitous design is the 19th century's Jeremy Bentham (fig. 2). This lowly English philosopher designed and constructed the Panopticon – a 'ideal' prison "organized around the gaze of a central authority – something or someone just slightly less omniscient than God – that could see without being seen."⁴



Figure 2 - Jeremy Bentham

⁴ Hideyuki Tokuda, Kengo Kuma, Jun Aoki, Ryue Nishizawa. "NTT DoCoMo, Inc.: Public Space for Ambient Intelligence"
<http://www.japan-architect.co.jp/> (accessed January, 2007).

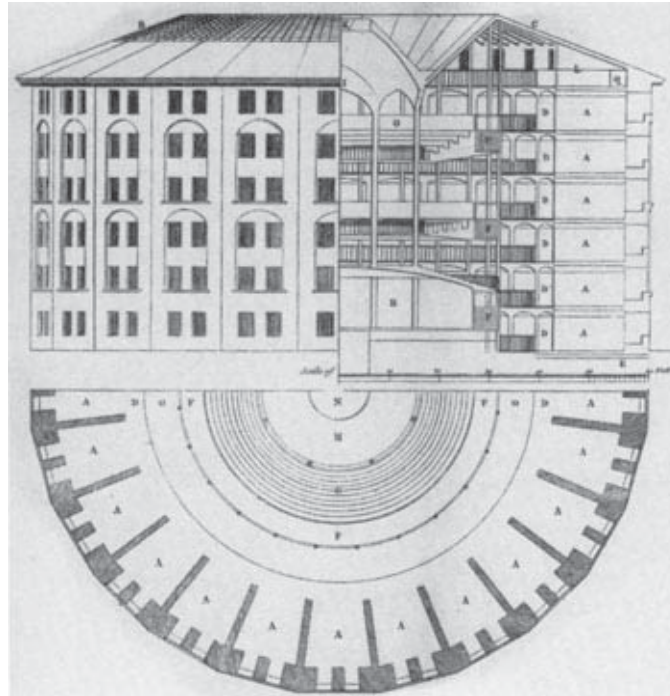


Figure 3 - The Panopticon Penitentiary

Not only was Bentham's utilitarian ideology reflected within the plans of the prison (fig. 3), but its siting atop a hill where it could serve as a constant visual reminder of the threat of confinement to the surrounding community provided a similar feeling of being constantly under surveillance. Bentham's theories assumed that if people know they're being watched, they're more likely to behave. This idea is still promoted to this day through one of the most famous examples of ubiquitous technology - the European CCTV video surveillance network.

Contemporary 'Ubiquity'

The Latin definition of ubiquitous fittingly refers to the omnipresence (of gods)⁵ but since the early theories of Bentham, contemporary terminology has added synonymous terms including Ambient Technology, Everywhere and Pervasive Computing.

'Everywhere' was coined to more accurately describe Weiser's vision of processing power which would be distributed throughout the environment to the extent that computers would effectively disappear. It is an idea where the information which we commonly search for through our cell phones or personal computers will soon be accessed just about anywhere, at anytime, and is delivered in a manner appropriate to our location and context. A street; a room; even the clothes on our backs are predicted to become sites of negotiation which provide (or gather) information about ourselves or the external world at any moment, day and night. "Powerful informatics [will] underlay the apparent simplicity of the experience, but they [will] never breach the surface of awareness...instead, this daily dance between us and technology of Everywhere will "feel natural, spontaneous, human."⁶

5 Ibid.

6 Ibid.

A rather entertaining example of Everywhere can be found in the former residence of Mark Weiser. Upon entering a room, Mark wanted his own theme music to play. Implementing an “automation system in the form of a theme-music agent [that] whenever a wearable user enters a room, this agent tries to find a DJ agent that turns on a computer hooked up to a stereo for that room. If it finds one, and if the DJ isn’t currently playing music, it sends the URL of an MP3 file containing the user’s personal theme music.”⁷ Mark’s sense of humour helped demonstrate the early excitement of ubiquitous computing.

More often than not, current technological response to human use is through some type of physical intervention; meaning that computers would do what we would tell them to do. The reality today is that technology can be responsive to actual environmental conditions on its own accord. For example, by gathering and analyzing two types of information – physical location and user identity – ubiquitous computing can begin to exist completely in the background of our lives. The Global Positioning System (GPS) is a veteran example of responsive computing. Based on an individual’s input and more importantly, the surrounding environment, Global Positioning systems respond to a world beyond pure human interaction.

⁷ Rhodes, B. J., Minar, N, Weaver, J. Wearable Computing Meets Ubiquitous Computing: The Proceedings of The Third International Symposium on Wearable Computers. ISWC '99 (1999): 141-149

Tejp



Figure 4 - A Tejp Ubiquitous Device



Figure 5 - Tejp Guerrilla Installation

Tejp ('Tape') is a ubiquitous computing project created and designed by Margot Jacobs, Lalya Gaye and Lars Holmquist of Play Studio and Future Applications Lab. It was an experiment initiated to "explore the potential of ubiquitous computing as an expressive means of personalizing public space."⁸ Focusing on aspects of physical interaction, the project designers intended to observe how user behaviours would be effected by invisible low-tech interventions within a give public realm. Their project goal was to begin defining "design implications that [would] allow for a heightened degree...of personal expression in ubiquitous computing."⁹ A series of low-tech prototypes (fig. 4) were designed and fabricated to blend into urban settings and would either provide ambient sounds or record aspects of the surrounding environment. Inspired by the pre-existing street culture Tejp placed their recording and playback devices in guerrilla fashion and hoped to discover a coherent application with people's use and understanding of public places (fig.5). Tejp was ultimately looking for ways to enhance public space with this invisible technology and is only a minute fraction of the existing groups currently experimenting with public spaces and pervasive computing.

8 Jacobs, M. & Gaye, L. "Tejp"
<http://www.tii.se/> (accessed February, 2007).

9 Ibid.

Gorbet Design Inc.



Figure 6 - Gorbet's Leilo Light Fountain

Toronto based Gorbet Design Inc. Fronted by Matt, Susan and Rob Gorbet have been designing ubiquitous installations for social environments. Though their projects have yet to reach the large scale spectrum of public space, their work has introduced the unique social atmosphere which can be the result of the seamless merging of technology and culture (fig. 6). "We design experiences that create a connection between our clients and their customers. By using technology in unexpected ways, we create interactive experiences that make people stop and say: Wow..."¹⁰

The team at Gorbet Design is comprised of three unique backgrounds. The mix of architectural, psychological and computer science knowledge has allowed the firm to explore people's experience and reactions of space which is being unknowingly altered by technology. Their projects have inspired wonder and awe from passersby who are more often than not unable to break the child-like curiosity growing inside them as digital installations materialize out of thin air.

¹⁰ Gorbet, Matt, et. al. "Gorbet Design Inc."
[http:// www.gorbetdesign.com/](http://www.gorbetdesign.com/) (accessed April, 2007).

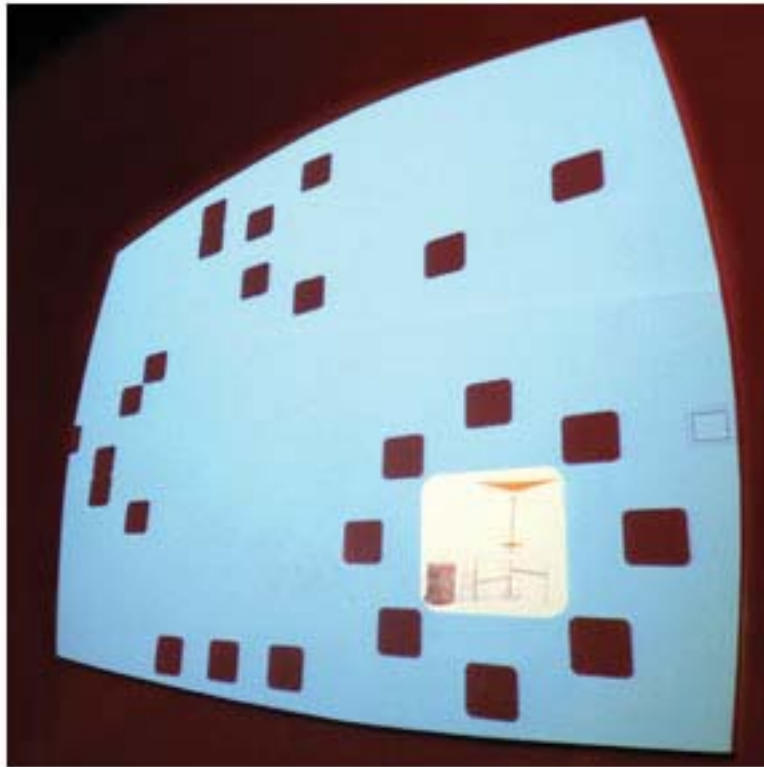


Figure 7 - Gorbet's RED for Herman Miller

Distributor of world renowned furniture - Herman Miller - commissioned Gorbet Design to design a way to directly link their successful web site to a newly established Manhattan store. Finding the web site more lucrative and quite frankly, much busier than their physical business, Herman Miller became interested in the potential of maintaining both worlds in a single environment. Gorbet's resulting project helped to reinforce the physical and virtual connection Herman Miller was looking for. In a way which only those who were aware of its 'language' could understand, the installation provided visual cues to the web sites traffic by way of an ambient information display (fig. 7). Though this installation was not exactly an architectural intervention, it was able to demonstrate the ambient nature and subtle language of ubiquitous computing (fig. 8).



Figure 8 - Gorbet's RED for Herman Miller

Such collaborations as Tejp and Gorbet Design Inc. Are becoming more commonplace thanks to the growing interest in ubiquitous technologies. There is certainly much beauty and discussion attributed to projects such as those previously mentioned but underlying the positive applications of ubiquitous computing lay alarming possibilities concerning the demise of important aspects of mankind's very existence: the death of the physical community and an individual's privacy.

[In]Visible Problems and an [Un]Anticipated Future

Because of the number of powerful intellectual institutions around the globe making substantial investments into the upcoming technology, the eventual exposure of it throughout the entirety of our day is unquestionable yet the average citizen – the person who will ultimately be the most effected by it – isn't even aware of its existence. Like a termite infestation in a home, the only way you realize they're there is when the walls begin crumbling around you. Our modern concepts of "self and other, citizen and society"¹² and of course space, will transform and effect humanity's existence in ways which have yet to be realized.

What might be the largest stigma held by society against ubiquitous technology is the potential for the dissolution of privacy as we know it. When presented with unlimited access to the most intimate details of a person's life in return for increased convenience, many will without a doubt accept it without a second thought. In today's age it seems that sometimes convenience outweighs commonsense. Through the dream-like vision of a world greatly improved by ubiquitous technology, an "inherent, unsettling potential for panoptical surveillance, regulation and rationalization"¹¹ will certainly diminish all of the benefits presented.

¹¹ Hideyuki Tokuda, Kengo Kuma, Jun Aoki, Ryue Nishizawa. "NTT DoCoMo, Inc.: Public Space for Ambient Intelligence"
<http://www.japan-architect.co.jp/> (accessed January, 2007).

A growing number of people have begun to express skepticism towards a society where strangers would be able to avoid physical contact all together. Virtual communities are not a new concept. Many exist and function today. Many are extremely popular and have millions of members. Some may argue these 'communities' are an extreme fantasy fabricated by a group of anti-social introverts, but this is far from the truth. They are virtual replicas of our physical communal environments where people can socialize amongst others with common interests – the true definition of a 'community'. After all, communities are created by people who go to, come from, and enjoy the same places as we do. Concern remains though, for the virtual world's physical counterpart. Will advancing technology threaten the very existence of physical communities as we know them?

Ubiquitous computing research focuses a great deal of energy on exploring mobile, wearable and networked devices and how they interact with their surroundings. Because of its temporality and commonly context-specific uses, expanding the research of ubiquitous computing into the broader realm of society's cultural context has been left relatively unexplored. Despite the growing implications on the built fabric of cities – and for this competition, for public space – architects have been noticeably absent from a majority of pervasive technology discussions.

The fact that the fundamental characterization of ubiquitous computing is that it is designed to be invisible elements woven into our daily lives, presents a challenge when associating ubiquitous computing with the public realm. The very essence of public space is to make visible the invisible and expose the everyday – a seemingly direct contradiction to what is commonly being hypothesized as the next inevitable step in so-called 'ambient technology'. But perhaps there is a way in which ambient computing can facilitate public space in its fundamental task? Can invisible technology not only continue to allow public space to perform as it historically has but also elaborate and perhaps, reveal more?

12 Ibid.

A Ubiquitous Competition

What public spaces will appear when forms of ubiquitous communication blend into an existing society?



Figure 9 - St. Mark's Square, Venice, Italy

Throughout history public space has facilitated communication between people. From Venice's St. Mark's Square (fig. 9) to a public corner in the most remote village at the end of the earth, public space has always been an instigator for social entanglement. As far as these spaces and places go, not much has changed over thousands of years. People still cross paths; still engage one another and still make use of the space and the things in it as they will. But it is when these urban 'things' around us are eventually incorporated into a network condition that architectural 'space' reveal the unseen and forever alter the public realm. This was the concept explored by our competition proposal. The vision: *the inevitable infiltration of ubiquitous technologies into public space will create unique opportunities to enhance social interaction by providing opportunity to physically transformation of the immediate environment.*

Public Space: A Definition

Public PLACE is accessible to any and everyone regardless of economic or social status.

Public SPACE is defined by the social interactions between people as well as the surrounding environment. It too, is everyone's space.

Public space is a venue for some of the most essential social functions. It is where people interact with each other and with the surrounding environment or remain introverted in thought. It is where people with diverse opinions and values intermingle. Where a person's opinions take shape or transform completely. And it is when created in a vibrant and dynamic way, can give rise to "vibrant and dynamic communities."¹³

¹² Vogt, PJ. "The McGill Daily: Public Space"
<http://www.mcgilldaily.com> / (accessed March, 2007).

Some argue that the growth in popularity of virtual communication [i.e. the iPod or cellphone] is destroying the public fabric and that the steadily increasing incorporation of technology into the public realm will only cause more damage to our physical society. But the original purpose of ubiquitous computing is to enhance such spaces and therefore create newer and better opportunities for people to engage.

Our competition entry focus on the ambiguity of public space. Often left up to the devices of its users, a typical public space conforms to no one. It is the ultimate definition of a democratic environment. Our question then became: What if public space – in conjunction with ubiquitous computing – could reconfigure itself according to its users (fig. 10) and therefore enhance the physical environment?



Figure 10

The scheme evolved into a hypothetical landscaped grid whose terrain and material qualities were able to respond to its user's desires or demands. Sometimes a vast and unassuming space – no matter how 'public' it may be defined – is an intimidating zone to visit. The lack of personal configuration has the ability to create a cold and uncomfortable environment which is unable to make any specific person feel welcome [see: Dundas Square, Toronto]. Our project proposes an environment which is able to house a multitude of individuals and be able to adapt one's immediate surrounding space to their specific wants or needs. Public space would therefore offer a level of comfort and security never before available to seemingly unplanned spaces.

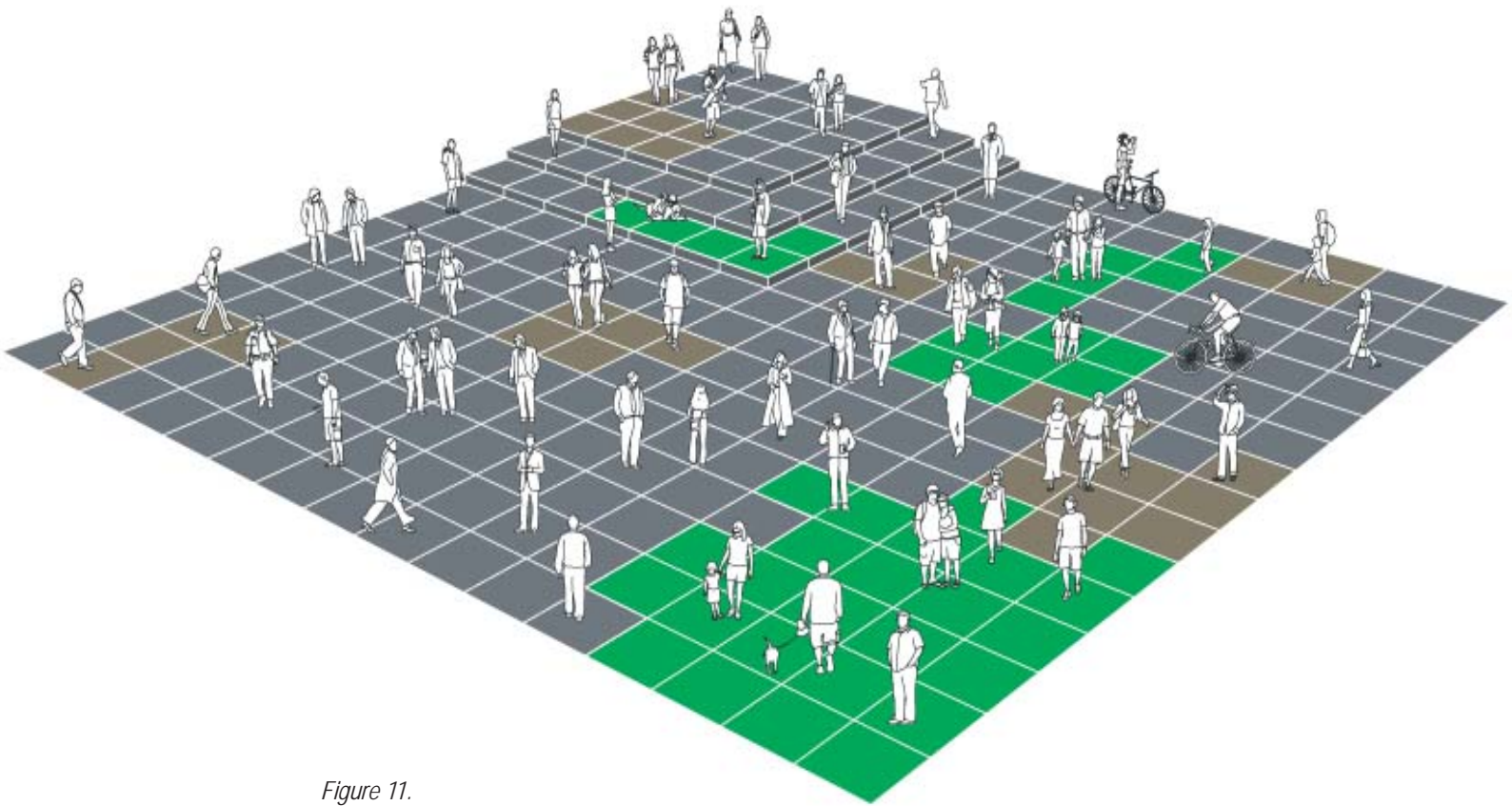


Figure 11.
9AM The Commute

User-specific data is recognized via sensors within the terrain which alters the landscape accordingly. As people near one another, the terrain must intertwine and the mixing of their specific uses translate into a unique physical environment. At different times of day a space will host different types of people and thus create an entirely new space. The forever changing public space would enhance the comfort level for the individual in that it is catering directly to their specific desires - the personalization of space has always created an element of calm and with the intervention of ubiquitous computing, public spaces can transform from ominous entities into enjoyable spaces.

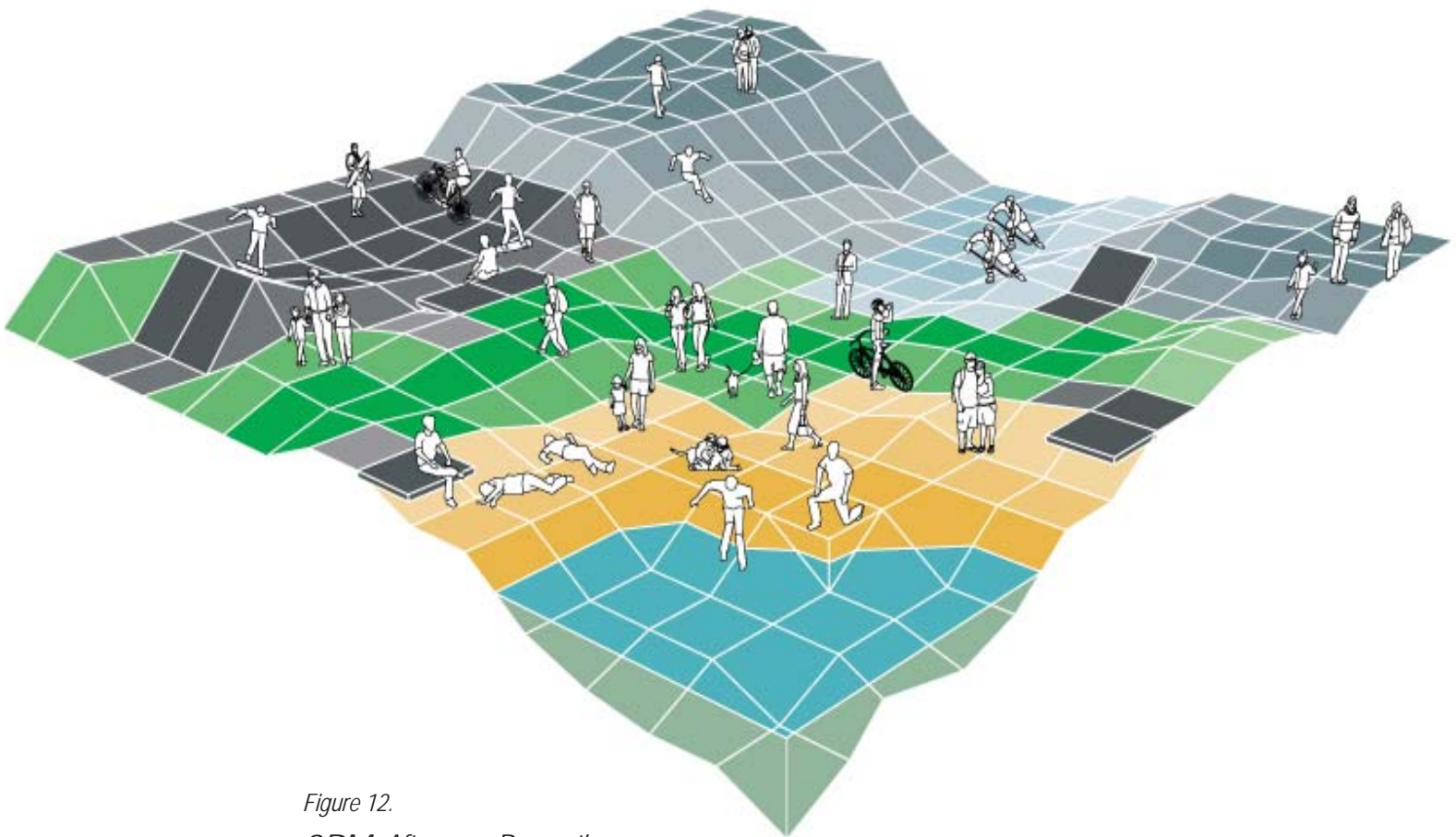


Figure 12.
3PM Afternoon Recreation

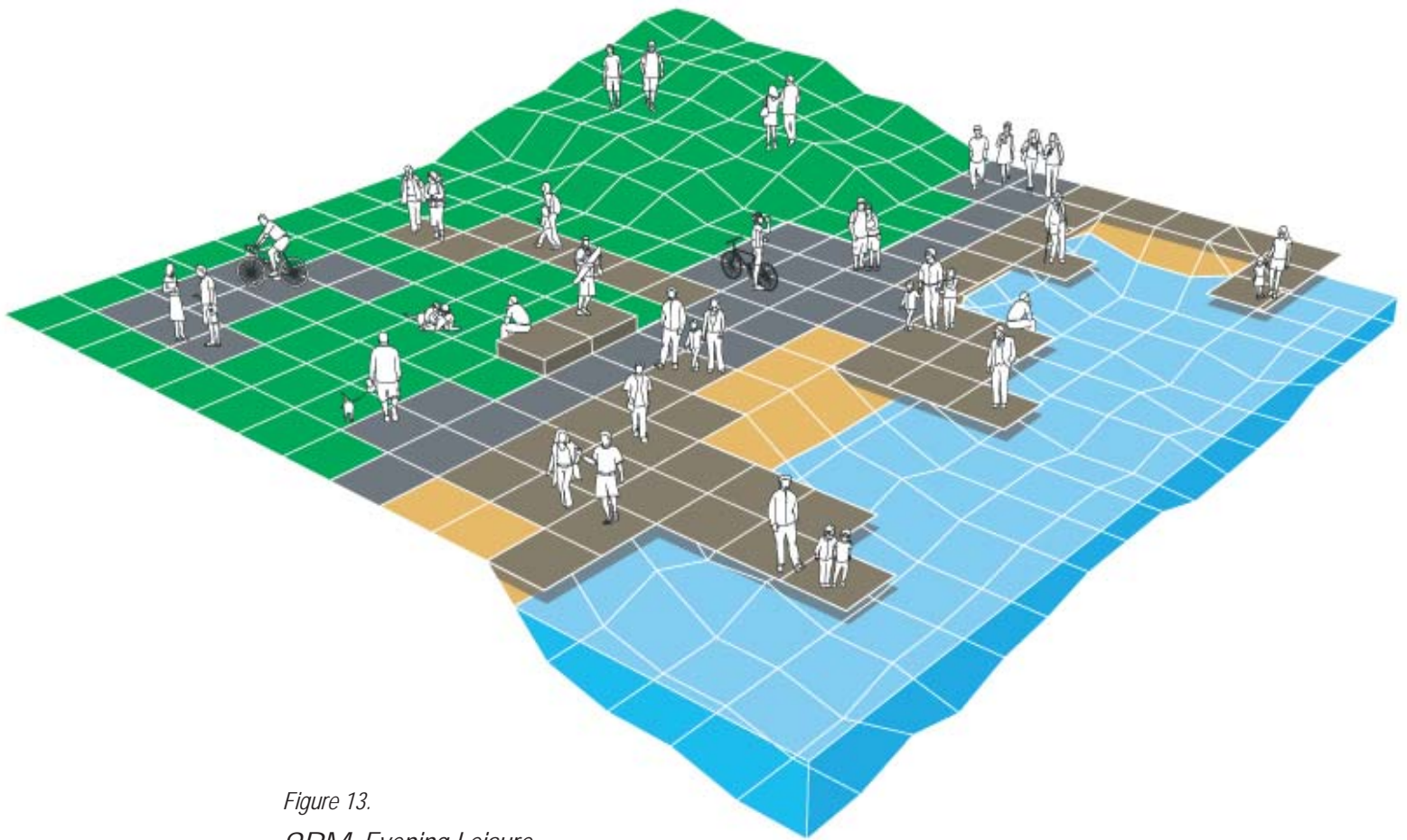


Figure 13.
9PM Evening Leisure

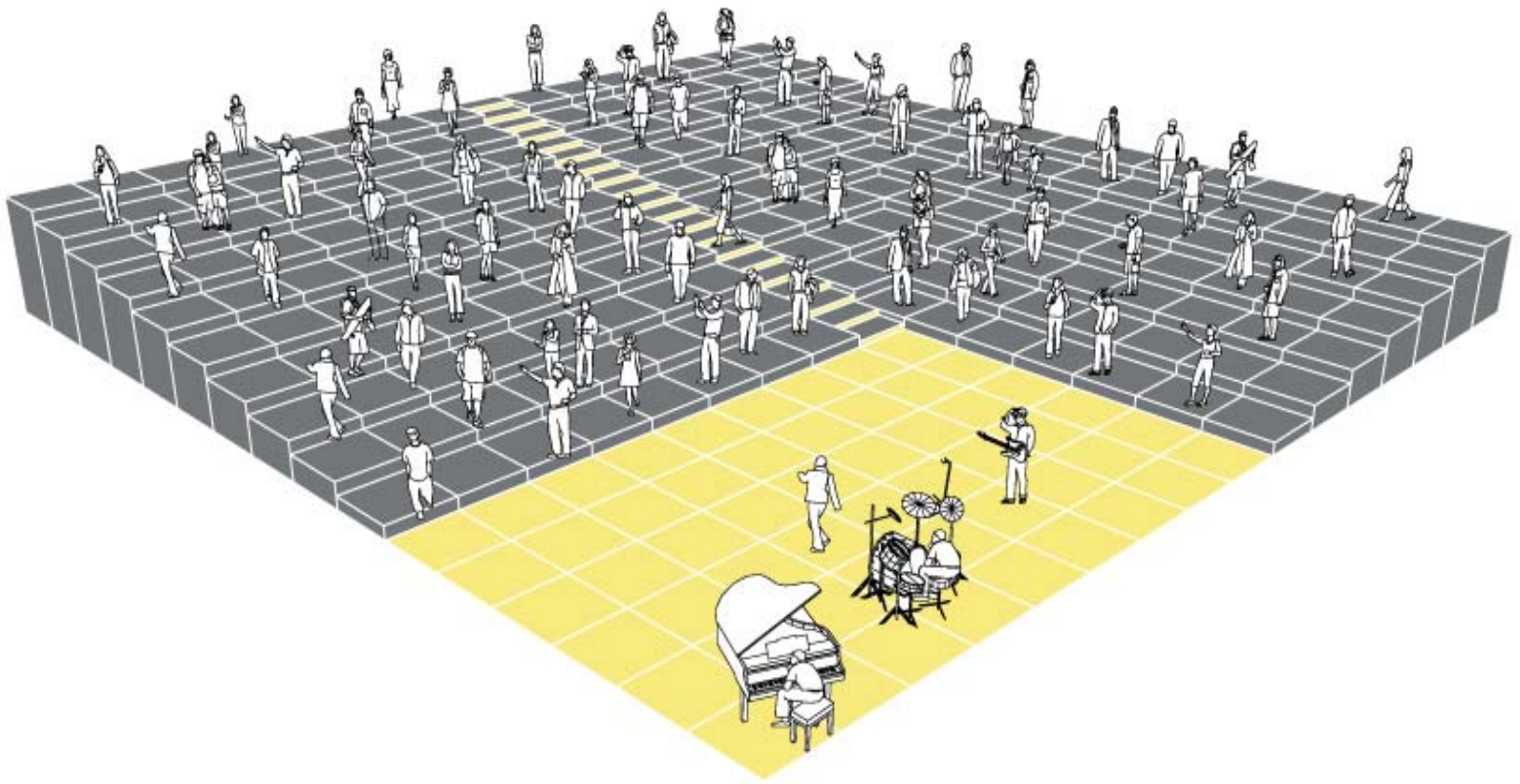


Figure 14.
Special Events Concert

Unplugging

“Ubiquitous computing is not virtual reality...it is not a personal or intimate computer with agents doing your bidding. ...[it] endeavours to integrate information displays into the everyday physical world. It considers the nuances of the real world to be wonderful, and aims only to augment them. [Ubiquitous computing envisions a world of fully connected devices, with cheap wireless networks everywhere...it postulates that you need not carry anything with you, since information will be accessible everywhere. ...ubiquitous computing envisions computation primarily in the background where it may not even be noticed. Whereas the intimate computer does you bidding, the ubiquitous computer leaves you feeling as though you did it yourself.”¹⁴

Currently, ubiquitous computing can[not] be seen in a number of variations including mobile devices, various installations, architectural materials and even some wearable clothing. Still far from reaching its full potential, research behind ubiquitous computing continues to gain support and momentum. Following closely the work of Mark Weiser, Universities and research laboratories from around the globe are investigating the relationships within human-computer interactions and are slowly beginning to focus more closely the cultural and social aspects of such an integration.

¹⁴ Rhodes, B. J., Minar, N, Weaver, J. Wearable Computing Meets Ubiquitous Computing: The Proceedings of The Third International Symposium on Wearable Computers. ISWC '99 (1999): 141-149

From Bentham's Prison concept and design to the current CCTV 'big brother' mass installation throughout Europe, ubiquitous computing has manifested into a debatable mingling between technology and our daily lives. Whether it's a promising direction or dangerous one, technology is forging ahead regardless. There is great potential however, in uniting public spaces with ubiquitous technology to enhance the experience provided by commonly tepid zones of public interaction. What were once anonymous places for people to roam about could potentially transform into subconscious electronic displays of our desires for the space.

There is however, a danger with such information traffic. Democracy and privacy become a definite issue. Who would ultimately own this gathered information and what could they do with it? Automated systems recording exuberant amounts of data regarding our everyday actions, travels and preferences always hold the potential for this information to be leaked and inappropriately used. After all, we may not even realize our paths are being so clearly traced.

Humanity required to question the risks associated with ubiquitous computing applications seeing as this invisible technology will eventually be even more integral to our everyday lives. One of the greatest aspects of urban living is that the city is ultimately one's to explore at their own free will. Venturing through the city and its urban spaces has historically been dictated by the material and physical world surrounding us. We've been free to choose where we go, when we go. The ability to be spontaneous and surprised are two of the most valued aspects of life and the ability to personally experience a city through one's own terms is a powerful gift. The capacity for people to make and share comments and observations almost immediately with people around the globe may in fact, only enhance the shape of the urban spaces

Despite the novelty associated to ubiquitous computing, consideration of current relationships and the resultant effects between them that must be brought into focus. Materials and ideas, industry and business, government and law, individuals and groups, are all assemblages within society whose current interactions and boundaries would be greatly effected by the inclusion of ubiquitous computing and who should all be wondering: *What will tomorrow bring and will we even notice it's there?*

I shall be watching
To see that you're working
Day and night
You must be toiling,
Sweating to serve
Your invisible Lord
Who can watch you unseen
And spy on his subjects
You are my slaves now and for ever.
Wagner, Das Rheingold



Figure 15 - CCTV, Everywhere

Bibliography

Books

- Foucault, Michael. *Discipline & Punish: The Birth of the Prison*.
NY: Vintage Books, 1995.
- Galloway, Anne. *Technosocial devices of everyday life: Architecture & Situated Technologies*.
NY: [Unknown], 2006.
- Simple, Janet. *Bentham's Prison: A Study of the Panopticon Penitentiary*.
NY: Oxford University Press Inc., 1993.
- Van Loon, Joost. *Risk and Technological Culture: Towards a Sociology of Virulence*.
NY: Routledge, 2002.

Electronic Documents

- Greenfield, Adam. "Everyware: The Dawning Age of Ubiquitous Computing." *A List Apart*, no. 214 (2006)
<http://www.alistapart.com/articles/everyware> (accessed October 2006).
- Galloway, Anne. "Resonances and Everyday Life: Ubiquitous Computing and the City." (2003)
http://www.purselipsquarejaw.org/mobile/cult_studies_draft.pdf (accessed November 2006)

Journal Articles

- Bradley J. Rhodes, Nelson Minar and Josh Weaver. "Wearable Computing Meets Ubiquitous Computing."
The Proceedings of The Third International Symposium on Wearable Computers,
San Francisco, CA. (October, 1999): 141-149.
- Emigh, Jacqueline. "Space Invaders." *Architectural Record*
Vol. 190, No. 3 (March 1, 2002): 56-58.
- Want, Roy. "Are We There Yet?" *Pervasive Computing*
October-December (2006): 4-6

Web sites

- [Author Unknown] "Architecture and Situated Technologies." *Situated Technologies* (June 2006).
<http://www.situatedtechnologies.net> (accessed January 2007).
- [Author Unknown] "House_n." (Date Unknown).
http://architecture.mit.edu/house_n/ (accessed February 2007).

[Author Unknown] "Interactive Art & Design: Creating delightful experiences for exceptional spaces." *Gorbet Design Inc.* (Date Unknown).

<http://www.gorbetdesign.com/index.html> (accessed January 2007).

Weiser, Mark. "The Computer for the 21st Century." (Date Unknown).

<z://www.ubiq.com/hypertext/weiser/SciAmDraft3.html> (accessed February 2007).

Tokuda, Hideyuki, and Kuma, Kengo, and Aoki, Jun, and Nishizawa, Ryue. "What does 'ubiquitous' mean?" *u-Japan* (Date Unknown).

http://soumu.go.jp/menu_02/ict/u-japan/index.html (accessed October 2006)

Imagery

1. Mark Weiser.
<http://www2.parc.com/csl/members/weiser/mw-portrait1.jpg> (April 2007).
2. Jeremy Bentham.
Discipline & Punish: The Birth of the Prison.
3. Ibid.
4. Tejp Ubiquitous Device.
http://www.viktoria.se/%7Elalya/posters/tejp_poster.pdf
5. Ibid.
6. Gorbet's Leilo Light Fountain
http://www.gorbetdesign.com/images/lileo_big3.jpg
7. Gorbet's RED for Herman Miller.
http://www.gorbetdesign.com/images/hmred_big3.jpg
8. Gorbet's RED for Herman Miller.
http://www.gorbetdesign.com/images/hmred_big1.jpg
9. St. Mark's Square, Venice, Italy.
http://farm1.static.flickr.com/93/275623667_707ba5c8ff.jpg?v=0
10. [Untitled]
Property of the Author
11. 9AM
Property of the Author
12. 3PM
Property of the Author
13. 9PM
Property of the Author
14. Special Occasion
Property of the Author
15. CCTV @ Flickr
http://farm1.static.flickr.com/20/71846409_b7caa26126.jpg?v=0