ISBN: 978-93-83758-09-8

UBIQUITOUS COMPUTING- An application of wireless networking and sensors

[1]Neha Pahwa, [2]Shreya Pahwa
[1] Geeta Engineering College, Kurukshetra University
[2]RPIIT, Karnal, Kurukshetra University

[1]pahwa.neha@yahoo.co.in, [2]shreyapahwa93@gmail.com

Abstract: Ubiquitous computing has the goal of enhancing computer use by making many computing available throughout the physical environment and thus providing the technical and conceptual means for enabling anytime, anywhere, anyhow computing. The technical realization of this vision has become feasible owing to recent advances in miniaturization and embedded computing technologies, which enable the integration of diverse computing capabilities into manifold everyday objects and devices.
The multitude and diversity of computerized entities that are part of ubiquitous computer systems imply a number of technical challenges. On one side, the differences in form factors, functionality and technical capabilities result in a great level of diversity of hardware and software and a distinct heterogeneity in capabilities. Further, ubiquitous computer systems in general are often highly decentralized, featuring an exceptionally high volatility of cooperative relationships and topologies due to mobility, spontaneous interaction and wireless ad hoc communication on behalf of system components. On top of that, a particularly significant characteristic of ubiquitous computing is its unprecedented degree of user-centricity. Ubiquitous computing systems are no longer distinct entities separable from human user, but instead explicitly designed to embrace and support people in everyday life settings and situations.

In the face of technical issues and the strong user-centricity, coping with the dependability of ubiquitous computer systems and infrastructures constitutes a crucial challenge, especially since these systems are set to pervade and reshape people's everyday life environment and the way they complete their daily chores. The goal of this dissertation is to provide a systematic study of critical dependability challenges in the context of ubiquitous computing, with particular consideration of needs of the end-user, which to this point in time has not been investigated deeply in the research community. In doing so, we focus on two fundamental areas of ubiquitous computing: human-computer interaction and context-aware computing.

Keywords: **Ubiquitous computing, ubiquitous computers, ubi-tech. and Ubi comp**

I. INTRODUCTION

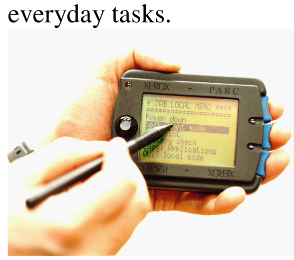
IJERT

The Computer, in contrast, is far from having become part of the environment. More than 50 million personal computing have been sold, and nonetheless the computer remains largely in a world of its own. The arcane aura that surrounds personal computing is not just a "user interface" problem. The idea of a "personal" computer itself is misplaced, and that the vision of laptop machines, dynabooks and "knowledge navigators" is only a transitional step toward achieving the real potential of information technology. Such machines cannot truly make computing an integral, invisible part of the way people live their lives. Therefore we are trying to conceive a new way of thinking about computing in the world, one that takes into account the natural human environment and allows the computing themselves to vanish into the background. Such a disappearance is a fundamental consequence not of technology, but of human psychology. Whenever people learn something sufficiently well, they cease to be aware of it. When you look at a street sign, for example, you absorb its information without consciously performing the act of reading.. Computer scientist, economist, and Nobelist

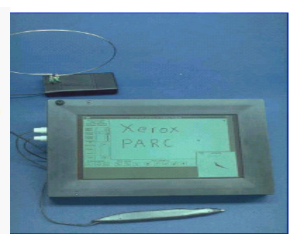
ISBN: 978-93-83758-09-8

Herb Simon calls this phenomenon "compiling"; philosopher Michael Polanyi calls it the "tacit dimension"; psychologist TK Gibson calls it "visual invariants"; philosophers Georg Gadamer and Martin Heidegger call it "the horizon" and the "ready-to-hand", John Seely Brown at PARC calls it the "periphery". All say, in essence, that only when things disappear in this way are we freed to use them without thinking and so to focus beyond them on new goals.
The idea of integrating computing seamlessly into the world at large runs counter to a number of present-day trends. "Ubiquitous computing" in this context does not just mean computing that can be carried to the beach, jungle or airport. Even the most powerful notebook computer, with access to a worldwide information network, still focuses attention on a single box. By analogy to writing, carrying a super-laptop is like owning just one very important book. Customizing this book, even writing millions of other books, does not begin to capture the real power of literacy.
The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it.
Consider writing, perhaps the first information technology: The ability to capture a symbolic representation of spoken language for long-term storage freed information from the limits of individual memory. Today this technology is ubiquitous in industrialized countries. Not only do books, magazines and newspapers convey written information, but so do street signs, billboards, shop signs and even graffiti. Candy wrappers are covered in writing. The constant background presence of these products of "literacy technology" does not require active attention, but the information to be conveyed is ready for use at a glance. It is difficult to imagine modern life otherwise.
Silicon-based information technology
Indeed, the opposition between the notion of virtual reality and ubiquitous, invisible computing is so strong that some of us use the term "embodied virtuality" to refer to the process of drawing computing out of their electronic shells. The "virtuality" of computer-readable data -- all the different ways in which it can be altered, processed and analyzed -- is brought into the physical world.
How do technologies disappear into the background? The vanishing of electric motors may serve as an instructive example: At the turn of the century, a typical workshop or factory contained a single engine that drove dozens or hundreds of different machines through a system of shafts and pulleys. Cheap, small, efficient electric motors made it possible first to give each machine or tool its own source of motive force, then to put many motors into a single machine.

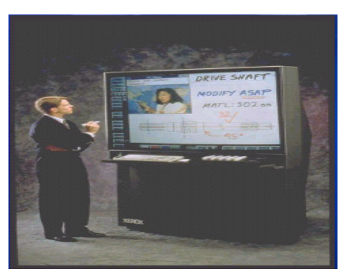
Most of the computing that participate in embodied virtuality will be invisible in fact as well as in metaphor. Already computing in light switches, thermostats, stereos and ovens help to activate the world. These machines and more will be interconnected in a ubiquitous network. As computer scientists have focused on devices that transmit and display information more directly. We have found two issues of crucial importance: location and scale. Little is more basic to human perception than physical position, and so ubiquitous computing must know where they are. (Today's computing, in contrast, have no idea of their location and surroundings.) If a computer merely knows what room it is in, it can adapt its behavior in significant ways without requiring even a hint of artificial intelligence.
Ubiquitous computing will also come in different sizes, each suited to a particular task.
Scientists have built tabs, pads and boards: inch-scale machines that approximate active Post-It notes, foot-scale ones that behave something like a sheet of paper (or a book or a magazine), and yard-scale displays that are the equivalent of a blackboard or bulletin board.
How many tabs, pads, and board-sized writing and display surfaces are there in a typical room? Look around you: at the inch scale include wall notes, titles on book spines, labels on controls, thermostats and clocks, as well as small pieces of paper. Depending upon the room you may see more than a hundred tabs, ten or twenty pads, and one or two boards. This leads to our goals for initially deploying the hardware of embodied virtuality: hundreds of computing per room.
Hundreds of computing in a room could seem intimidating at first, just as hundreds of volts coursing through wires in the walls did at one time. But like the wires in the walls, these hundreds of computing will come to be invisible to common awareness. People will simply use them unconsciously to accomplish everyday tasks.



Tab



Pad



Liveboard

IJERT

ISBN: 978-93-83758-09-8

Tabs are the smallest components of embodied virtuality. Because they are interconnected, tabs will expand on the usefulness of existing inch-scale computing such as the pocket calculator and the pocket organizer. Tabs will also take on functions that no computer performs today. For example, Olivetti Cambridge Research Labs pioneered active badges, and now computer scientists at PARC and other research laboratories around the world are working with these clip-on computing roughly the size of an employee ID card. These badges can identify themselves to receivers placed throughout a building, thus making it possible to keep track of the people or objects to which they are attached.

In experimental embodied virtuality, doors open only to the right badge wearer, rooms greet people by name, telephone calls can be automatically forwarded to wherever the recipient may be, receptionists actually know where people are, computer terminals retrieve the preferences of whoever is sitting at them, and appointment diaries write themselves. No revolution in artificial intelligence is needed--just the proper imbedding of computing into the everday world. The automatic diary shows how such a simple thing as knowing where people are can yield complex dividends: meetings, for example, consist of several people spending time in the same room, and the subject of a meeting is most likely the files called up on that room's display screen while the people are there.

Roy Want has designed a tab incorporating a small display that can serve simultaneously as an active badge, calendar and diary. It will also act as an extension to computer screens: instead of shrinking a program window down to a small icon on the screen, for example, a user will be able to shrink the window onto a tab display. This will leave the screen free for information and also let people arrange their computer-based projects in the area around their terminals, much as they now arrange paper-based projects in piles on desks and tables. Carrying a project to a different office for discussion is a simple as gathering up its tabs; the associated programs and files can be called up on any terminal.

The next step up in size is the pad, something of a cross between a sheet of paper and current laptop and palmtop computing. Bob Krivacic at PARC has built a prototype pad that uses two microprocessors, a workstation-sized display, a multi-button stylus, and a radio network that can potentially handle hundreds of devices per person per room.

Pads differ from conventional portable computing in one crucial way. Whereas portable computing go everywhere with their owners, the pad that must be carried from place to place is a failure. Pads are intended to be "scrap computing" (analogous to scrap paper) that can be grabbed and used anywhere; they have no individualized identity or importance.

Pads, in contrast, use a real desk. Spread many electronic pads around on the desk, just as you spread out papers. Have many tasks in front of you and use the pads as reminders. Go beyond the desk to drawers, shelves, coffee tables. Spread the many parts of the many tasks of the day out in front of you to fit both the task and the reach of your arms and eyes, rather than to fit the limitations of CRT glass-blowing. Someday pads may even be as small and light as actual paper, but meanwhile they can fulfill many more of paper's functions than can computer screens.

Yard

On the other hand, the transparent linking of wired and wireless networks is an unsolved problem. Although some stop-gap methods have been developed, engineers must develop new communication protocols that explicitly recognize the concept of machines that move in physical space. Furthermore the number of channels envisioned in most wireless network schemes is still very small, and the range large (50-100 meters), so that the total number of mobile devices is severely limited. The ability of such a system to support hundreds of machines in every room is out of the question. Single-room networks based on infrared or newer electromagnetic technologies have enough channel capacity for ubiquitous computing, but they can only work indoors.

Present technologies would require a mobile device to have three different network connections: tiny range wireless, long range wireless, and very high speed wired. A single kind of network connection that can somehow serve all three functions has yet to be invented.

Lets see how the world of ubiquitous computing look like:

Sal awakens: she smells coffee. A few minutes ago her alarm clock, alerted by her restless rolling before waking, had quietly asked "coffee?", and she had mumbled "yes." "Yes" and "no" are the only words it knows.

Sal looks out her windows at her neighborhood. Sunlight and a fence are visible through one, but through others she sees electronic trails that have been kept for her of neighbors coming and going during the early morning. Privacy conventions and practical data rates prevent displaying video footage, but time markers and electronic tracks on the neighborhood map let Sal feel cozy in her street.

Electronic mail arrives from the company that made her garage door opener. She lost the instruction manual, and asked them for help. They have sent her a new manual, and also something unexpected -- a way to find the old one. According to the note, she can press a code into the opener and the missing manual

IJERT

ISBN: 978-93-83758-09-8

will find itself. In the garage, she tracks a beeping noise to where the oil-stained manual had fallen behind some boxes. Sure enough, there is the tiny tab the manufacturer had affixed in the cover to try to avoid E-mail requests like her own.

On the way to work Sal glances in the foreview mirror to check the traffic. She spots a slowdown ahead, and also notices on a side street the telltale green in the foreview of a food shop, and a new one at that. She decides to take the next exit and get a cup of coffee while avoiding the jam.

Coming back to her office, Sal picks up a tab and "waves" it to her friend Joe in the design group, with whom she is sharing a virtual office for a few weeks. They have a joint assignment on her latest project. Virtual office sharing can take many forms--in this case the two have given each other access to their location detectors and to each other's screen contents and location. Sal chooses to keep miniature versions of all Joe's tabs and pads in view and 3-dimensionally correct in a little suite of tabs in the back corner of her desk. She can't see what anything says, but she feels more in touch with his work when noticing the displays change out of the corner of her eye, and she can easily enlarge anything if necessary.

Jim Morris of Carnegie-Mellon University has proposed an appealing general method for approaching these issues: build computer systems to have the same privacy safeguards as the real world, but no more, so that ethical conventions will apply regardless of setting. In the physical world, for example, burglars can break through a locked door, but they leave evidence in doing so. Computing built according to Morris's rule would not attempt to be utterly proof against cracker, but they would be impossible to enter without leaving the digital equivalent of fingerprints.

By pushing computing into the background, embodied virtuality will make individuals more aware of the people on the other ends of their computer links. This development carries the potential to reverse the unhealthy centripetal forces that conventional personal.

II. CONCLUSION

Due to the trends of unobtrusive technology and more intrusive information, the next phase of computing technology will develop nonlinearly. He states that, in the long run, the personal computer and the workstation will become practically obsolete because computing access will be everywhere: in the walls, on your wrist, and in 'scrap' computing (i.e., like scrap paper) lying about to be used as needed. The current research on ubiquitous computing is reviewed.

III. REFERENCES

[1] Bowman, M., Debray, S. K., and Peterson, L. L. "Reasoning about naming systems", *ACM Trans. Program. Lang.* 1993, *Syst.* 15, 5 (Nov. 1993), 795-825. DOI= http://doi.acm.org/10.1145/161468.16147.

[2] Ding, W. and Marchionini, G. "*A Study on Video Browsing Strategies*", Technical Report. University of Maryland at College Park. 1997.

[3] Fröhlich, B. and Plate, J. "The cubic mouse: a new device for three-dimensional input", In *Proceedings of the SIGCHI Conference on Human Factors in,* 2000.

[4] *Computing Systems* (The Hague, The Netherlands, April 01 - 06, 2000). CHI '00. ACM, New York, NY, 526-531. DOI= http://doi.acm.org/10.1145/332040.332491.

[5] Tavel, P. ,"*Modeling and Simulation Design*" AK Peters Ltd., Natick, MA, 2007.

[6] Sannella, M. J. "*Constraint Satisfaction and Debugging for Interactive User Interfaces*" Doctoral Thesis. UMI Order Number: UMI Order No. GAX95-09398., University of Washington,1994 .

[7] Forman, G., "An extensive empirical study of feature selection metrics for text classification. *J. Mach. Learn. Res.* 3 (Mar. 2003), 1289-1305.

[8] Brown, L. D., Hua, H., and Gao, C. 2003. A widget framework for augmented interaction in SCAPE. In *Proceedings of the 16th Annual ACM Symposium on User Interface Software and Technology* (Vancouver, Canada, November 02 - 05, 2003). UIST '03. ACM, New York, NY, 1-10. DOI= http://doi.acm.org/10.1145/964696.964697.

[9] Yu, Y. T. and Lau, M. F. 2006. A comparison of MC/DC, MUMCUT and several other coverage criteria for logical decisions. *J. Syst. Softw.* 79, 5 (May. 2006), 577-590. DOI= http://dx.doi.org/10.1016/j.jss.2005.05.030.

[10] Spector, A. Z. 1989. Achieving application requirements. In Distributed Systems, S. Mullender, Ed. ACM Press Frontier Series. ACM, New York, NY, 19-33. DOI= http://doi.acm.org/10.1145/90417.90738

[11] Hansmann, Uwe. Pervasive Computing: The Mobile World. Springer, (2003). "World Haptics Conferences". Haptics Technical Committee. http://www.worldhaptics.org/hapticConferences.htm.

[12] Poslad, Stefan. Ubiquitous Computing Smart Devices, Smart Environments and Smart InteractionISBN, (2009) http://www.elec.qmul.ac.uk/people/stefan/ubicom/index.html.

.

IJERT