Research Report

A LOOK AT HUMAN INTERACTION WITH PERVASIVE COMPUTERS

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ABSTRACT:

A collection of papers have been gathered in order to look at the pervasive computing trend with a humanistic approach. Is it possible for us to understand what the technological world will be like in the next millenium? These papers will help technologists to share in the successes of others in this field and also to understand problems researchers are having in creating ubiquitous computing environments. Our experiences are conveyed to motivate future work in the area and to envision how you want to create the future. Because pervasive computing is affecting many different kinds of people in any number of disciplines, we took this same approach when picking topics for this issue. There is a mix of education, communication, social implications as well as many others discussed in this issue. Though the means by which people are using to reach for their goals may be different, there are many similarities in their visions of the future.

A Look at Human Interaction with Pervasive Computers

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Abstract

A collection of papers have been gathered in order to look at the pervasive computing trend with a humanistic approach. Is it possible for us to understand what the technological world will be like in the next millenium? These papers will help technologists to share in the successes of others in this field and also to understand problems researchers are having in creating ubiquitous computing environments. Our experiences are conveyed to motivate future work in the area and to envision how you want to create the future. Because pervasive computing is affecting many different kinds of people in any number of disciplines, we took this same approach when picking topics for this issue. There is a mix of education, communication, social implications as well as many others discussed in this issue. Though the means by which people are using to reach for their goals may be different, there are many similarities in their visions of the future.

Introduction

The purpose of this issue is to explore the beginning of the pervasive computing revolution. This revolution has begun to affect our everyday lives in ways we don't even notice. Part of the beauty of pervasive computing is that we won't even realize that it is here, once it has become a necessary part of our lives. It will be invisible and the user interface will be intuitive. The other important part of the story is that it will all be networked. Once you enter in a piece of data, you will never have to do it again but will have it readily available whenever and wherever you need it. Human-Computer Interaction (HCI) has been working towards this type of computing, and now it finally has a name. We will discuss pervasive computing from the HCI perspective. * A note to clarify terminology: The terms pervasive computing and ubiquitous computing are being used exchangeable throughout this issue.

The current phase of pervasive, in which computers will be in lots of places, could be thought of in many ways. The way we choose to look at it is that there are 4 major aspects to pervasive computing which make it appealing to the greater population:
- ubiquitous computing environments including devices spread through our environment
- mobility (using computer technology as we move around)
- information appliance (easy to use AND have specific functionality)
- making communication easier (enables communication between people, between people and things and between things)

We are facing the end of the dominance of the traditional personal computer. Computing will take place in more places than just our desktop computers. We have computers making our cars

better workout. If the user goes through the entire 10 repetitions, the system says, "You've done a great workout. Go over to the vending machine and get yourself a reward."

Not part of the demo but a forseeable future holds biosensing. The exerciser knows how many muscles are working in regard to the person's capacity. It knows how much the person is sweating with respect to a normal workout. An intelligent coach could give feedback of the workout--if you keep working out like this, you'll look like THIS in one year. Or give body fat count, weight or whatever is the best motivator for that person. Also taking into account the person's mood and personality.

A way we could gain this information is from use of the Emotion technology (Ark, Dryer and Lu, 1999). The Emotion technology uses biosensors which are nonintrusive and virtually invisible to the user. These sensors collect physiological information about the user an over a period of time can identify the person's emotional state. Using emotional state information state information plus current task, over a longitudinal period of time, a model of a person's personality can be developed.

Gaze tracking has been another way we've been exploring in order to gain information about a user unobtrusively. We've had ideas about computers with Global Positioning System (GPS). We've also been exploring natural interactions with computers through multi-modal input and output. Our initial efforts toward this model are described by our BlueEyes project (www.almaden.ibm.com/cs/blueeyes). We are exploring the incorporation of gaze tracking, emotion detection, speech recognition and gesture recognition in order to make a "smart" computer.

Our group has been continuously working on new ways of using computers. Demonstrations such as the ones described above have allowed us to explore the field of context or in situ computing. As computers become more of a part of everyone's life, everyone should have a say in how they interact with these computers. So, reading through these papers, questions about security of information, trusting computers and privacy issues should race through your mind. I encourage you to challenge yourself to look at yourself and understand what you want technology to enable for you. This issue is not a review of the pervasive computing field. See it rather as a place to look for provocative possibilities in this area: social, cultural, physical.

Papers in this issue

We wanted to get the full picture on pervasive computing with this issue. It is meant to be a global view of projects in the works. In order to understand the broad spectrum of work in this field, we used broad categories to encapsulate the definition of pervasive computing. The categoies consist of:

1) Products, things, gadgets
     a) education
     b) communication
     c) infrastructure

Some of the places where we will have context based computing will be spaces in which we are having social dialogue. Bill Mark writes about "Turning pervasive computing into mediated spaces." He shows us what SRI International's vision of the future is and what problems they have encountered along the way.

As Bill is writing about the future of pervasive computing, we also need to remember how pervasive computing started. We are honored to have the history of ubiquitous computing at Xerox PARC as written by Mark Weiser. We are thankful to Rich Gold for making the final revisions on the article and to John Seely Brown for the short commemorative note. Enjoy reading his piece. The rest of the journal does justice to add to his two page piece.

Acknowledgments

References

Ark, W., Dryer, D. C., Lu, D. J. (1999) **The Emotion Mouse.** In the Proceedings of the HCI International '99 conference, Munich, Germany.