Walk-up Keyboard: An Efficient Low Overhead Interface For Transient Workers

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ABSTRACT

A situation that traditional PC centered computing does not serve well is that of transient workers; workers who are required to move from place to place frequently, yet still be able to interact with their data. We used intra-body signaling to construct a system that allows workers to carry wearable computers and interact with them through a standard keyboard and monitor. The system has low overhead when changing terminals as the association between terminal and wearable occurs automatically when the user comes into contact with the terminal. Although the system is still under development, an initial implementation has verified that the desired functionality is obtainable.

Keywords

Wearable interfaces, skin communication

INTRODUCTION

One situation that traditional PC centered computing does not serve particularly well is that of transient workers. Transient workers are people whose work forces them to move about constantly throughout their day. For example, researchers in a laboratory must often move from station to station in a lab working at various tasks. Another, more common, example is a nurse or doctor in a hospital, they must constantly move from room to room checking in on patients and making rounds. These workers generally need to refer to, or record data as they go about their work in diverse locations, but they cannot rely on a non-portable PC; they often resort to writing on paper and then either not entering the information into a computer at all, or transcribing it from their notes later, which leads to extra work and potential transcription errors. These Workers need an interface to their computational resources that allows them to enter and read data quickly, and one that has low overhead when they change locations.

Low overhead means that when a user comes to a new location, she can immediately begin entering data or commands. If users must perform even a mildly complex task every time they change location, it is likely the system will slow their work excessively. Their productivity would be particularly hampered if they are trying to remember work related information, or measurements they have just taken while they initiate the interaction, since short term memory can store information for only about 15 seconds, and probably less if they are forced to change the focus of their concentration [1].

One possible solution to this would be to simply place networked workstations at every location, a user could simply log in when she wanted to perform a task. Logging in takes time however, and the user would be forced to shift her concentration from what she was doing to enter authentication information or wait if the login was automatically initiated, not to mention the expense deploying and maintaining the workstations and network infrastructure. Another possible solution would be distributing PDAs to workers, allowing them to carry their data everywhere, and requiring them to interact with their data through the user interface their PDA provided. The problem with most PDAs, however, is that portable user interfaces, such as handwriting recognition and chording keyboards, are often much slower than traditional keyboards. Also, the user would still have her concentration interrupted by having to extract the PDA. Neither of these options have all the qualities of an ideal solution, those qualities being low overhead to initiate an interaction, fast data entry and retrieval, and low cost in hardware and infrastructure.

To address this situation we are developing a system that allows standard keyboards and monitors to serve as input and output for wearable computers. These keyboards and monitors would be placed in key locations about the workplace, allowing any user to simply walk up and begin entering or reviewing data immediately.

IMPLEMENTATION

In developing our system prototype we used intra-body signaling transceivers to connect a wearable computer to a standard PC that was acting as a simple terminal. Intra-body signaling systems, such as that proposed by Zimmerman [2], use the human body as a communications medium, any enabled object you come into physical contact with, or even very close proximity in some cases, becomes part of your personal network. Using intra-body signaling is important because it allows us to immediately associate a terminal with a user who comes into contact with it, avoiding any logon or other overhead that could break a users concentration. Also, because it uses electrostatics, it has extremely short range that means that several people working close together would not interfere with each other, which is important in hospitals and other similar environments where many users could work together to accomplish tasks.

We used an Intrinsyc CERF board computer running Linux as our wearable. The intra-body signaling system uses capacitive coupling to communicate through the body, two plates are required for each transceiver, one to couple to the body, and another to couple to earth-ground. The wearable and one intra-body signaling transceiver was attached to a special shoe that had plates on the bottom and inside. On the PC side, one plate was placed inside a keyboard wrist rest; a second plate was not needed because the terminal is meant to be stationary and so can be connected directly to ground.

When a user approaches a PC, she can immediately begin typing on the keyboard of the PC as if the keyboard were attached directly to the wearable, and the output is displayed directly onto the monitor of the PC. The data from the keyboard of the PC is then transmitted through the body to the wearable, and the output of the wearable is transmitted back to the PC, again through the skin, to be displayed on the PC's monitor. In fact no PC is necessary, a dumb terminal would work equally well since the PC is just acting as a host to the IO devices. The PC and the wearable communicated over serial lines with the intra-body signaling system. The connection between the PC nd the wearable was half-duplex and operated at 9600 baud.

Although the system is still under development, we have been able to interact with the wearable's Linux shell through the body, using a PC as a terminal.

DISCUSSION

This system will allow users to interact with their data while moving from place to place frequently. A user can begin a transaction, cross the room, and pick up exactly where she left off at another location. The use of intra-body signaling ensures that no login or any other overhead is required to begin interactions; users can simply walk up to a terminal and immediately begin entering data. In addition the short range of intra-body signaling allows us to avoid the conflict problems that would likely arise if we were to use a radio-based system instead. Also, this system presents a significant cost advantage over systems, such as those developed by some medical centers, where networked computers are placed in every room; dumb terminals are significantly less expensive than PCs, and our solution requires no network infrastructure. Also, a brief time out could be used to wipe the users work from the screen after a short time, and since the intra-body signaling system has such short range, no sensitive data would broadcast for potential snoopers to receive.

FUTURE WORK

The next step for this project is to complete development and begin a user study to determine empirically the benefits of this system over the other solutions such as PDAs and networked terminals. It is especially important to determine the importance of low overhead for very transient workers.

Also, the electronics need to be improved to allow higher data rates and better recognition of touch events. Higher data rates will allow us to use graphical user interfaces instead of only text based applications, we have already achieved 56k(audio rates) and believe one megabit may be attainable. Touch events will inform wearable computers when they are connected to an interface and when they are not, this information will allow a richer interaction between the user and her wearable, and, more immediately, they will be crucial to allow graphical interfaces to react to every touch.

REFERENCES

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