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**Summary of Some computer Science issues in ubiquitous computing**

Ubiquitous computing is the method of enhancing computer use by making many computers available throughout the physical environment, but making them effectively invisible to the user. This paper explains what is new and different about the computer science in ubiquitous computing. Computing environment in which each person is continually interacting with hundreds of nearby wirelessly interconnected computers. However the computer today is isolated and isolating from the overall situation, and fails to get out of the way of the work. In other words, rather than being a tool through which we work, and so which disappears from our awareness, the computer too often remains the focus of attention. The challenge is to create a new kind of relationship of people to computers, one in which the computer would have to take the lead in becoming vastly better at getting out of the way so people could just go about their lives. Virtual reality (VR) is the closest to the principles of Ubiquitous computing. Ubiquitous computing work begins with just three different sizes of devices: enough to give some scope, not enough to deter progress. The first size is the wall-sized interactive surface, analogous to the office whiteboard. The second size is the notepad the third size is the tiny computer, analogous to tiny individual notes. This then is phase I of ubiquitous computing: to construct, deploy, and learn from a computing environment consisting of tabs, pads, and boards.

**Hardware Prototypes**

**Tab**

It has a pressure sensitive screen on top of the display. Hardware design problems in the pad are size and power consumption. We have included software that keeps power usage down. A key part of our design philosophy is to put devices in everyday use. Tab architecture is carefully balanced among display size, bandwidth, processing, and memory.

**Pad**

The ScratchPad, plugged into a Sun SBus card and provided an X-window-system-compatible writing and display surface. Three things always drive us to continue to design our own pad hardware. First, we need the right balance of features. Second apart from balance are the requirements for particular features e.g. connection to research environments like UNIX, and communication emphasis. The third thing is the ease of expansion and modification.

**The CS of Ubicomp**

Ubicomp is not yet a coherent body of work, but consists of a few scattered communities. The point of this paper is to help others understand some of the new research challenges in ubiquitous computing, and inspire them to work on them. This is more akin to a tutorial than a survey, and necessarily selective.

**Issues of hardware components**

Three new kinds of hardware devices are: very low power computing, low-powerhigh-bits/cubic-meter communication, and pen devices.

**Low Power**

The need for high performance has dominated the need for low power consumption. The key approach is to reduce power consumption is to reduce the clocking frequency of their chips by increasing pipelining or parallelism. Then, by running the chips at reduced voltage, the effect is a net reduction in power, because power falls off as the square of the voltage while only about twice the area is needed to run at half the clock speed.

**Wireless**

A wireless network capable of accommodating hundreds of high speed devices for every person is well beyond the commercial wireless systems planned even ten years out. In 1989 we built spread-spectrum transceivers at 900 MHz, but found them difficult to build and adjust. In 1990 we built direct frequency-shift-keyed transceivers also at 900 MHz, using very low power. In 1991 we designed and built our current radios, which use the near-field of the electromagnetic spectrum. The near-field has an effective fall-off of r6 in power, instead of the more usual r2, where r is the distance from the transmitter.

**Pens**

Electronics and Imaging lab at PARC devised a new infrared pen. A camera-like device behind the screen senses the pen position, and information about the pen state of buttons is modulated along the IR beam.

**Network Protocols**

Common media access methods in wired domains are collision detection and token-passing. These do not work in a wireless domain because not every device is assured of being able to hear every other device. The key idea of MACA is for the two stations desiring to communicate to first do a short handshake of Request-To-Send-N-bytes followed by Clear-To-Send-N-bytes. This exchange allows all other stations to hear that there is going to be traffic, and for how long they should remain quiet. Collisions, which are detected by timeouts, occur only during the short RTS packet. MACA requires stations whose packets collide to backoff a random time and try again. If all stations but one backoff, that one can dominate the bandwidth. By requiring all stations to adapt the backoff parameter of their neighbors we create a much fairer allocation of bandwidth. Networking research at PARC with ubiquitous computing implications are gigabit networks and real-time protocols. One hundred 256kbps portables per office imply a gigabit per group of forty offices, with all of PARC needing an aggregate of some five gigabits/sec. This has led us to do research into local-area ATM. With the ubiquitous use of packet-switching, even for telephony using ATM, the need for real-time capable protocols has become urgent if the packet networks are going to support multi-media applications. Changing the device name dynamically depending on location is no solution: higher level protocols like TCP assume that underlying names won’t change during the life of a connection, and a name change must be accompanied by informing the entire network of the change so that existing services can find the device.

**Interaction Substrates**

One possible method of interaction can be of voice recognition but when other people are present voice will often be inappropriate. As one possible solution, we developed a method of touch-printing that uses only a tiny area and does not require looking. As drawbacks, our method requires a new printing alphabet to be memorized, and reaches only half the speed of a fast typist. We have developed methods of location-independent interaction by which even complex interactions can be popped up at any location. Christian Jacobi at PARC has implemented a new X toolkit that facilitates window migration. Applications need not be aware that they have moved from one screen to another; or if they like, they can be so informed with an upcall.

**Applications**

Two examples of applications are locating people and shared drawing. In ubiquitous computing we continue to extend this work, using it for video annotation, and updating dynamic maps. Early morning, and the individual faces are the locations of people. This map is updated every few seconds, permitting quick locating of people, as well as quickly noticing a meeting one might want to go to.

**Privacy of Location**

The traveling pattern of a frequent cellular phone user can be deduced from the roaming data of cellular service providers. One solution, a central database of location information, means that the privacy controls can be centralized and so perhaps done well. Our initial designs were all central, initially with unrestricted access, gradually moving towards controls by individual users on who can access information about them. A key problem for location is how to provide occasional location information for clients that need it while somehow preventing the reliable accumulation of long-term trends about an individual. In the computer science lab we are trying to construct systems that are privacy enabled, that can give power to the individual. But only society can cause the right system to be used.

**Concluding remarks**

As we start to put tabs, pads, and boards into use, phase I of ubiquitous computing should enter its most productive period. With this substrate in place we can make much more progress both in evaluating our technologies and in choosing our next steps.

**Answers to the questions:**

**Q1:** The purpose of the paper is to explain what is new and different about the computer science in ubiquitous computing. This paper helps to understand some of the new research challenges in ubiquitous computing, and inspire to work on them.

**Q2**-No hypothesis is being tested in the paper the main focus of the paper is to set the ground for future ubiquitous computing.

**Q3-** The standard experimental computer science methods has been used: construction of working prototypes of the necessary infrastructure in sufficient quantity to debug the systems in everyday use, using robust testing methods.

**Q4-**The good about the experimental setup is that they construct the working prototypes and test them this minimize the chance of error and the errors user can make in ever day work can be manage at the developmental stage. The bad about the experimental setup is the robust testing methods which is not an efficient use of resources.

**Q5**-The result has been carried out pretty well but they have not brought the research towards some conclusion as they have presented the idea of ubiquitous computing but they have only defined the 1st phase to achieve ubiquitous computing through the mobile devices e.g. tabs and pads but they have not defined the latter stages.

**Q6**-No results have been presented are only with the accordance with the first phase, latter stages have not been defined so this research work seem quite incomplete to me.

**Q7-**As I might have proposed a new ideology and view of computing I might have elaborate and decide all the stages first rather than defining only 1st stage and start achieving the goals of first stages I might have defined all the stages first and would have developed prototypes to achieve these stages.

**Q8-** The lesson I have got from this paper is that there can be different angles and point of views from where you can analyses come existing technology and you can provide a new dimension or new definition to something existing accord to you interpretation your point of view.