

In future, everything will be a computer

Does 'pervasive computing' present privacy risk?

Mark Medley

National Post

Saturday, May 19, 2007

In the future rush to get to work, the day's tasks will be checked using a personal robotic butler, the misplaced car keys will be located by entering the word "keys" into a cellphone and getting a call back saying "bedroom." The children will be monitored by sensors that detect their every movement. At work, the office map uses the same kind of sensors to track down staff members for a meeting. The work day is interrupted by a break to play with the cat remotely over the Internet. After work, the ads on the shopping mall wall reconfigure to suit each person passing by, so when there is a sign for a concert, you buy a ticket by waving your cellphone over the billboard. At home that night, the phone programs the dishwasher and washing machine to run while the family sleeps.

This is the vision outlined by researchers from around the world who gathered in the basement of a downtown Toronto hotel this week to talk about the third wave of computing.

There was a time when computers were massive devices, mainframes housed in entire rooms and operated by many people simultaneously. Then came a reduction in size; computers in the home, in the office, even small enough to rest comfortably on your lap. This next wave involves computers so small they hardly seem like computers at all -- liberated from the desktop and pervading every facet of our lives, from phones to household appliances to the very clothes that we wear.

This next wave, the experts say, is coming faster than you think. What is science fiction one year is reality the next in the new world of pervasive computing.

"Pervasive computing is the idea of technology designed in such a way that it is literally just everywhere," says Khai Truong, a professor of computer science at the University of Toronto. It can be on your person or part of the physical environment -- from cellphones and pocket PCs to smart homes and appliances.

"Everything could be a computer, and could be used or adopted for a purpose by any individual."

Mark Weiser, the Xerox technologist who came up with the notion of ubiquitous or pervasive computing, described the phenomenon this way: "The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable."

It is this vision of the future that brought together more than 250 researchers, computer scientists, academics, innovators and futurists in Toronto this week for the fifth annual conference on pervasive computing. It was the first time the conference was held outside Europe, attracting delegates from Europe, Asia, North America and Australia. In seminars, tutorials, research papers, displays, and product demonstrations, these international experts outlined a vision of the future that combined the gee-whiz allure of gadgetry and gizmos with a hint of the challenges that accompany such rapid technological advancement.

At its core is this profound dichotomy: The illusion of the technology being tailored to the individual may come at the expense of personal privacy as we join this ever-expanding and increasingly invisible network.

In the downstairs lobby of the Marriott Eaton Centre Hotel, Jorg Muller of the University of Munster leads a demonstration on the latest in digital signage advertising.

The screen can broadcast a different ad depending on the time of day or the person walking past. If the person is interested, he explains, they can take a picture of the ad using their camera phone, take it to the store, and use it as a coupon for the product being advertised. Prototypes are to roll out in Germany next month.

"We think they will be everywhere soon," Mr. Muller says excitedly. He has reason to be pleased. It is no wonder that earlier in the afternoon, advertising was described as one of the "killer applications" of pervasive computing: Mr. Muller tells me the market for digital signs will be worth US\$3.7-billion by 2011.

The conference is a showcase for such innovative ideas. There is a virtual butler and a "feline fun park" that allows people to keep tabs on their cat while away from home.

Researchers in Japan are working on "dynamic book recommendations" so that simply picking up a paperback in the bookstore will prompt the sending of reader reviews and related titles to the cellphone. A team from Germany presented "sensor-equipped kitchen environments and contextaware tools," so a knife can detect what kind of vegetable is being sliced and sensors track which pots and pans are used to prepare dinner.

Johannes Schoning showed off an incredible application that uses a camera phone like a magic magnifying glass, so that the path to the nearest hotel, for example, would appear in the display after merely gliding the phone over a paper map. Another presentation focused on operating household appliances, such as the coffee maker, using a cellphone.

A student from the University of Sydney gave a lecture on efashion that focused on basketball jerseys "equipped with electroluminescent wires and surfaces" that tracked the number of fouls the wearer had picked up, identified the leading scorer, and which team was winning.

If all of this seems to be marching forward without asking any questions, consider the advice of Adam Greenfield. The author of *Everyware: The Dawning Age of Ubiquitous Computing*, the first work on this topic for a general audience, warns that once new technology is released into the world, "less than happy consequences" can arise other than what the designers originally envisioned. He worries there could be unforeseen, "unpredictable and undesired emergent behaviours" in this technology. To combat this, he has devised a set of five guidelines to be followed as pervasive computing becomes more commonplace: It must default to harmlessness, it must be self-disclosing, it must be conservative of face, it must be conservative of time, and it must be deniable. Otherwise, it threatens to bury us. If all of this sounds like a 2001: A Space Odyssey-like scenario with users unable to control a technology run amok it is not accidental. "It's more than a possibility," says Mr. Greenfield. "I think it's already an issue."

Apu Kapadia is a post-doctoral research fellow at Dartmouth College in New Hampshire and one of the few here at the conference presenting the side of problematic issues that some of this technology creates. His paper is called, "Virtual Walls: Protecting Digital Privacy in Pervasive Environments."

"I'm particularly concerned about this Big Brother problem," he says, explaining that the "digital footprints" we are leaving, will only grow larger in the future.

Witness the double-edged possibility opened up by the map Darren Leigh of Mitsubishi Electric Research Laboratories has on display. It shows his lab facilities in Cambridge, Mass., with flashing lights denoting people as they move down the halls and dart in and out of rooms of the facility. Sensors stuck around building, small enough to fit in the palm of his hand, tracked people as they walked.

While Mr. Leigh highlighted the positive real-world applications for such technology, including searching for survivors after an earthquake, he admits it raises troubling privacy issues.

Police and government surveillance could go beyond wiretapping to body-tapping; big business could track a person's spending and shopping habits; on the criminal front, the sensors could enable better stalking, kidnapping, and theft now that our every location is broadcast to the world.

"The only way we're going to be able to have privacy in the future is to have it legislated," says Mr. Leigh. "People are gathering data right now. It's shocking how people gather data on us: financial transactions, going to the grocery store....People want our data."

Mr. Greenfield believes that the only bastion for privacy in this technological future may be in the home: "I think in public space, the battle is already over, and the forces of privacy have lost."

It is impossible to anticipate all the possible negative uses of this technology, say experts like Mr. Kapadia: "I think the potential for something bad happening in a environment like this in the future, when we have a pervasive system where information is being shared on what you're doing, the risk of something bad happening is very large."

It is best to prepare for any possibilities now. Mr. Greenfield recounted how a similar presentation

he gave last year used prototypes whereas now he can use commercial shots.

"What was speculative in 1990 is a daily reality in 2007," he told the delegates.

When questioned about what the world might look like in the near future, many of the delegates at the conference cited the 2002 film *Minority Report*. There is a scene in which the Tom Cruise character finds himself in a mall while on the lam from police. He is trying to not draw attention, but advertisements recognize and try to sell him a myriad of products, from credit cards to beer. It's an unnerving scene, but not far at all from the realm of possibility.

"Basically [Steven] Spielberg went to a whole bunch of researchers in this community and said: What is interaction going to look like in 2045? And

they gave him their best guess," explains Mr. Greenfield.

One of the designers involved in the film, John Underkoffler of MIT, was retained by Raytheon defence systems to develop something called the common tactical blackboard, a gestural interface system a lot like the one Mr. Cruise uses in the film.

"That's how the imaginary winds up getting dragged kicking and screaming into everyday life," Mr. Greenfield says.

Mr. Kapadia says *Minority Report* doesn't seem that far-fetched any more. "I do think we're going to get to that kind of environment at some point. To me it seems inevitable."

Jim Young, a graduate student at the University of Calgary who created the remote pet tracker, says the technology is evolving faster than even he can keep up.

"I think it's silly to even pretend," he says. "Ten years ago I couldn't imagine half the things I can see now."

NATIONALPOST.COM

Check out the links to the key players at the conference and supertech advances on our home page under Today

- - -

GADGET GLOSSARY

Pervasive/Ubiquitous Computing The idea that computers will soon be integrated into all facets of everyday life. Everything and anything could

become a computer.

Context-Aware A system that determines circumstances and then reacts accordingly. For example, you walk into your office and the speakers automatically play music you like. Or advertisements that change depending on the time of day: during lunch the ads promote food, at night they tout new movies.

e-fashion The merger of clothing and

computing. Examples of e-clothing include Oakley's Thump Sunglasses, which have an MP3 player built into the frame, and Philip's Lumalive technology, which weaves coloured lightemitting diodes into the fabric.

Smart Homes A home wired so that many of the tasks normally requiring multiple controls -- turning on the TV, adjusting the air conditioning, turning off the lights, setting the alarm --are all done through one centralized device, such as a cellphone.

RFID Radio frequency identification. A prevalent source of data

transmission in pervasive computing. An RFID tag sends out radio waves to a transceiver, so, for example, a set of lost keys appended with an RFID tag could conceivably broadcast their location to a person's phone.

Digital Footprint Data left by us in pervasive environments, it can range from where you were at a given time to how you were feeling.

GPS Global Positioning System. It's a satellite-based navigation system comprised of 24 satellites. Lost? Use your GPS tracker. It's already quite

common in cars, but more cellphones are coming equipped with GPS. It raises the spectre of lack of privacy.

Calm Technology Technology that stays in the background of our lives, without intruding or getting in the way until we need to use it.

Bluejacking has become the spam of pervasive computing. Bluejackers use Bluetooth technology to locate other Bluetooth users within a short distance, then send them unsolicited messages anonymously. It's akin to prank calls, but can be used for advertising purposes.

Mark Weiser He is considered the father of ubiquitous computing, a term he coined. A technologist at Xerox PARC (Palo Alto Research Centre), he passed away in 1999.

PDA Personal digital assitant. Think cellphone, Palm Pilot, pocket PC, electronic organizers.

SMS Short message service. The ability to text message on cellphones.

NFC Stands for near-field communication, "a short-range wireless technology mainly aimed at usage in mobile phones."

© National Post 2007

CLOSE WINDOW

Copyright © 2007 CanWest Interactive, a division of [CanWest MediaWorks Publications, Inc.](#) All rights reserved.