'Attentive' cubicles help workers focus in busy offices

December 21 2004

An "attentive" office cubicle that blocks noise and visual distractions when you're trying to work, and then opens communication channels when you're ready to socialize, is just one of the innovative new devices developed by Queen's University's Human Media Laboratory (HML).

Inventions of the HML are highlighted in the January issue of Scientific American ("Considerate Computing"), released on-line today.

Headed by Dr. Roel Vertegaal of Queen's School of Computing, the Human Media Laboratory has gained international recognition for its "attentive user interface" paradigm for human-computer interaction.

Now the Queen's research group is taking this concept to another level, which may eventually help people with attentive disorders such as autism.

“The computer can empower the brain to work more efficiently by aiding attentional mechanisms,” says Dr. Vertegaal. “We’re moving toward enhancing brain function by directly tapping into a person’s sensory system. It’s really exciting that these new computer applications will be able to enhance perceptual and thinking abilities.”

The research group focuses on moving computers from the realm of being merely tools, to being “sociable” appliances capable of recognizing and responding to non-verbal cues humans use in group conversations. “We now live in a world with many distractions, often generated by computing appliances that are not considerate to our needs. Consider a cell phone that rings through your conversation.”

One of the main underlying technologies they developed is an eye contact sensor that allows computers to sense what the user is looking at. This allows computers to determine what a user is doing, which helps them focus, rather than fragment, the user’s attention.

Attentive office cubicles

The new “attentive and more considerate” office cubicle helps increase work focus for those who share space with many others. It automatically “mediates audiovisual communications” between co-workers by using information gained about their “social orientation” in an office, says Dr. Vertegaal.

“The cubicle essentially provides a computer-mediated reality. It augments the user’s senses by removing objects that might be distracting,” Dr. Vertegaal continues. “Ultimately, the computer takes over our attention mechanisms, allowing our brain to focus energy where it will be most effective.”

The attentive cubicle’s walls are constructed of a translucent material

called Privacy Glass™ that consists of a glass pane with an embedded layer of liquid crystals. Overhead cameras mounted in the ceiling track the "social geometry" between co-workers. When potential communication partners are detected, the cubicle's walls automatically change from opaque to transparent, allowing for visual interaction.

Attentive cubicle workers also wear noise-cancelling headphones that filter out noise generated by co-workers in other cubicles. The headphones can detect when co-workers are looking at the wearer. When the headphones detect an approaching co-worker, they automatically turn off noise-cancellation to allow workers to communicate normally.

"The attentive cubicle is all about having visual attention mediated through architecture, while headphones cancel out auditory distractions," says Dr. Vertegaal. "You don't hear anything except what the headset presents to you."

The headphones also increase the user's perceptual capabilities, he notes. They can pause or fast-forward live conversations, for example, allowing wearers to listen to two conversations at once. Using speech recognition, the headsets can automatically query Google with key phrases from the conversation.

New treatments for autistic children

Inventions from the Human Media Laboratory to date have been effective in improving social interactions between individuals and groups, and in augmenting people's perceptual capabilities.
The next step, says the HML director, is to develop clinical devices for treatment of attention-related disorders.

The research team is now exploring the possibility of using eye contact sensor glasses to treat children with autistic spectrum disorder. The

glasses detect when an autistic child with this disorder makes eye contact with its parent, and can reinforce that behavior by playing sounds every time eye contact is made. The glasses automatically keep track of progress made by the child.

“We know that certain attentive disorders are tied to the ability of the brain to focus its energy appropriately. One hypothesis is that eye contact increases the energy levels in the brain, thus encouraging communication,” says Dr. Vertegaal. “Encouraging autistic children to use eye contact may be one way to help their brains function more effectively, and help them communicate better.”

Funding support for the Human Media Lab includes the Communications and Information Technology Ontario (CITO) division of the Ontario Centres of Excellence (OCE), the Natural Sciences and Engineering Research Council of Canada (NSERC), the Precarn Institute for Robotics and Information Systems (IRIS) and the Premier’s Research Excellence Awards (PREA). Industrial support is provided by SMART Technologies, Inc. and Microsoft Research.

Source: Queen’s University