Virtual maps for the blind

September 10 2009

The blind and visually impaired often rely on others to provide cues and information on navigating through their environments. The problem with this method is that it doesn't give them the tools to venture out on their own, says Dr. Orly Lahav of Tel Aviv University's School of Education and Porter School for Environmental Studies.

To give navigational "sight" to the blind, Dr. Lahav has invented a new software tool to help the blind navigate through unfamiliar places. It is connected to an existing joystick, a 3-D haptic device, that interfaces with the user through the sense of touch. People can feel tension beneath their fingertips as a physical sensation through the joystick as they navigate around a virtual environment which they cannot see, only feel: the joystick stiffens when the user meets a virtual wall or barrier. The software can also be programmed to emit sounds -- a cappuccino machine firing up in a virtual café, or phones ringing when the explorer walks by a reception desk.

Exploring 3D virtual worlds based on maps of real-world environments, the blind are able to "feel out" streets, sidewalks and hallways with the joystick as they move the cursor like a white cane on the computer screen that they will never see. Before going out alone, the new solution gives them the control, confidence and ability to explore new streets making unknown spaces familiar. It allows people who can't see to make mental maps in their mind.

Dr. Lahav's software takes physical information from our world and digitizes it for transfer to a computer, with which the user interacts using

a mechanical device. Her hope is that the blind will be able to explore the virtual environment of a new neighborhood in the comfort of their homes before venturing out into the real world.

A touchy-feely virtual white stick

"This tool lets the blind 'touch' and 'hear' virtual objects and deepens their sense of space, distance and perspective," says Dr. Lahav. "They can 'feel' intersections, buildings, paths, and obstacles with the joystick, and even navigate inside a shopping mall or a museum like the Louvre in a virtual environment before they go out to explore on their own."

The tool transmits textures to the fingers and can distinguish among surfaces like tiled floors, asphalt, sidewalks and grass. In theory, any unknown space, indoors or out, can be virtually pre-explored, says Dr. Lahav. The territory just needs to be mapped first — and with existing applications like GIS (geography information system), the information is already there.

A new road to independence

The tool, called the BlindAid, was recently unveiled at the "Virtual Rehabilitation 2009 International Conference," where Dr. Lahav demonstrated case studies of people using the tool at the Carroll Center for the Blind, a rehabilitation center in Newton, Massachusetts. There, a partially blind woman first explored the virtual environment of the center — as well as the campus and 10 other sites, including a four-story building. After just three or four sessions, the woman was able to effectively navigate and explore real-world target sites wearing a blindfold.

The virtual system becomes a computerized "white cane" for the blind,

says Dr. Lahav. "They get feedback from the device that lets them build a cognitive map, which they later apply in the real world. It's like a high-tech walking cane," she says. "Our tool lets people 'see' their environment in advance so they can walk in it for real at a later time."

Today the blind and visually impaired are very limited in their movements, which necessarily influences their quality of life. This solution could help them find new options, like closer routes from train or bus stations to the safety of home. "Ultimately, it helps the blind determine their own paths and gives them the ability to take control of their lives," says Dr. Lahav, who first began this research at Tel Aviv University, under Prof. David Mioduser, where she now works. She then further developed it with her MIT colleagues Dr. Mandayam Srinivasan and Dr. David W. Schloerb.

Source: Tel Aviv University (news : web)