Feeling the way: Robotic device can help visually impaired people

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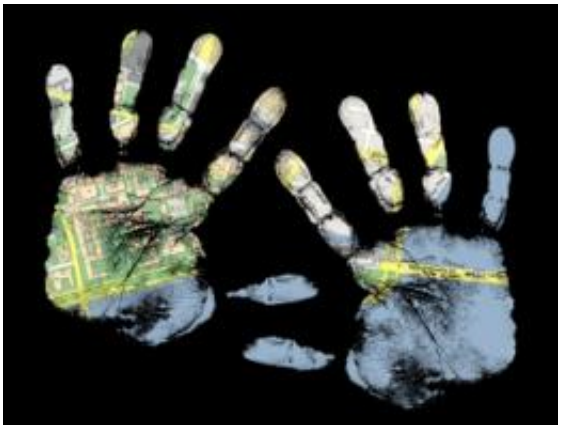

Graphic: Christine Daniloff

(PhysOrg.com) -- For many people, it has become routine to go online to check out a map before traveling to a new place. But for blind people, Google maps and other visual mapping applications are of little use. Now, a unique device developed at MIT could give the visually impaired the same kind of benefit that sighted people get from online maps.

The BlindAid system, developed in MIT's Touch Lab, allows blind people to "feel" their way around a virtual model of a room or building, familiarizing themselves with it before going there.

Mandayam Srinivasan, director of the Touch Lab and affiliated with the Research Laboratory of Electronics and the Department of Mechanical

Engineering, is working with the Carroll Center for the Blind in Newton, Mass., to develop and test the device. Preliminary results show that when blind people have the chance to preview a virtual model of a room, they have an easier time navigating their way around the actual room later on.

That advantage could be invaluable for the visually impaired, says Joseph Kolb, a mobility instructor at the Carroll Center. He notes that one of the toughest challenges a visually impaired person faces is entering an unfamiliar environment with no human or dog to offer guidance.

“You don’t know where you are, you don’t know what’s around you, and there may or may not be people around to help you,” he says.

A cane for virtual navigation

The BlindAid system builds on a device called the Phantom, developed at MIT in the early 1990s and commercialized by SensAble Technologies. Phantom consists of a robotic arm that the user grasps as if holding a stylus. The stylus can create the sensation of touch by exerting a small, precisely controlled force on the fingers of the user.

The BlindAid stylus functions much like a blind person’s cane, allowing the user to feel virtual floors, walls, doors and other objects. The stylus is connected to a computer programmed with a three-dimensional map of the room. Whenever a virtual obstacle is encountered, the computer directs the stylus to produce a force against the user’s hand, mimicking the reaction force from a real obstacle.

Srinivasan’s team has tested the device in about 10 visually impaired subjects at the Carroll Center, a non-profit agency that offers education, training and rehabilitation programs to about 2,000 visually impaired people per year.

To successfully use such a system, the visually impaired person must have a well-developed sense of space, says Kolb. For those people, "this offers the prospect of being able to preview an environment and have a sense of what's in the environment, the shape of it, and where landmarks are located," he says.

During the testing, Kolb realized that BlindAid could also help mobility instructors evaluate the exploration strategies the subject is using — whether he or she has an organized approach or tends to get stuck in a certain area.

Orly Lahav, a former postdoctoral associate in the Touch Lab, and David Schloerb, a research scientist in MIT's Research Laboratory of Electronics, did much of the work to develop BlindAid. Lahav presented the work at the Virtual Rehabilitation 2009 International Conference in Israel this summer.

Once Srinivasan obtains additional funding, he hopes to incorporate the BlindAid system into the Carroll Center's training program, which will yield user feedback that should help him refine the system for commercial production. In the long term, he believes BlindAid could be used to help blind people not only preview public spaces such as train stations, but also plan and travel by public transportation using virtual route maps that they can download and interact with through touch.

In October, Srinivasan presented the system at an event at New York's Metropolitan Museum of Art, called "Art Beyond Sight," sponsored by an organization of the same name, which promotes ways to help blind people experience visual arts. In museums, visually impaired people can experience art through verbal descriptions and touch, and devices such as BlindAid could allow them to find out how to navigate the museum before visiting.

“There is a big difference between going to a totally unknown place and a place for which you have a mental map,” says Srinivasan.

Provided by Massachusetts Institute of Technology (news : web)