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## Step-by-Step Prompts Put the Blind on Track

By **THOMAS J. FITZGERALD**

AN interactive personal navigation system developed at the University of Florida could someday guide blind people through corridors and along busy city sidewalks.

The system combines off-the-shelf hardware, software and a voice-controlled interface of the students' own design. It communicates wirelessly with widely available but little-known databases of detailed geographic information that can quickly be updated to reflect changing conditions.

The project began as a master's thesis project for Steve Moore when he was a computer science student at the university's Gainesville campus.

When the user gives voice commands to ask for directions, the system responds with verbal instructions, giving distances in feet and providing corrective guidance along the way.

"Right now we have it down to feet, but we're working on calibrating it with your stride length," Mr. Moore said. "There are so many little things to work on, and there are only a few of us."

The system can reroute users around trouble spots that may develop on short notice, like construction sites or big crowds, and can describe points along routes.

Mr. Moore began the project in 1999 and has since enlisted two other students, Balaji Ramachandran and Lisa Ran, to add expertise in geographical information systems and indoor navigation.

Mr. Moore's father, Theral, an associate professor of mathematics on the same campus, helped test the system. Professor Moore, who is totally blind, said he does not ordinarily walk around on the busy campus without an escort. But when testing the system, he said, he felt much better about trying. "I could actually head out to go to another building and feel comfortable," he said.

The system is named Drishti, for vision in Sanskrit, and the students expect that it can be configured to work in cities, in airports and on other campuses. Features like its voice-controlled interface and dynamic capabilities distinguish it from navigation systems available for the blind today.

The heart of the system is a wearable computer about the size of a thick paperback book, which is worn on the user's waist, runs Windows 98 and is voice-controlled with an interface that uses I.B.M.'s ViaVoice software. The computer is connected to a Global Positioning System receiver carried on the user's back, which keeps track of the latitude and longitude. It also gets data from the university's geographical information system, or G.I.S., a dynamic layout of the Gainesville campus that can be updated by campus officials as they learn about trouble spots like construction sites.

As the user navigates the route given by the computer, the system compares data from the G.P.S. receiver with data from the G.I.S. to refine the route and warn if the user is straying off course or even away from the center of the sidewalk.

Professor Moore said the system designed by his son could greatly benefit the visually impaired, although he would prefer that the equipment were less bulky. "You can't demand luxuries when you're in a predicament like mine, so I can tolerate it," he said. The professor overseeing Drishti, Sumi Helal, said the next step would be to seek grant money, recruit more students for the effort and refine it with smaller technologies and enhancements.

One improvement on which they are now working is indoor navigation. In the current system, the G.P.S. receiver loses the satellite signal inside buildings. But by placing ultrasonic transmitters on the building's ceilings and receivers on the computer, Professor Helal said, the system could continue to provide directions, guiding the user up stairways, along corridors and to rest-rooms, classrooms and other locations stored in the university's database.

The system could be expanded to cities or other campuses by reconfiguring it to draw on the G.I.S. databases of those entities. These geographical databases are growing in popularity among municipalities and institutions, and Mr. Moore said that Drishti could pull information from many of them over the Internet. ESRI, a leading maker of G.I.S. software, said that many of them are already shared across the Internet.

Drishti has already attracted outside interest. Voxit, a Swedish software company that is seeking to develop a similar system, is negotiating with the University of Florida to obtain a replica of Drishti in the hope of testing a version along footpaths and roads in the Swedish city of Borlange.

"We intend to test the prototype with a group of people with different kinds of visual impairment," said Leif Bergman, project manager for Voxit, which makes speech-recognition software.

Mr. Moore estimated that it would be about two years before a Drishti-like product became commercially available, with the big hurdle being gaining access to public and private G.I.S. databases.

"It should not be too far away," he said.