

New device offers 'sight' through sound

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IT'S not quite bat-style echolocation, but people could soon use sound to help them see. A portable navigational aid that transmits soft, low-pitched beeps directly to the inner ear has been designed to help blind people navigate around cities or guide firefighters through smoke-clogged buildings.

The system guides users with beeps that appear to come from whatever direction the person needs to head in. "We have the user simply walk towards the sound," says Bruce Walker at the Georgia Institute of Technology in Atlanta, who created the device with colleague Frank Dellaert.

To calculate the user's position and the direction they are facing, the device uses a processor in a backpack to combine GPS location readings with data from cameras and motion and tilt sensors attached to a headband or helmet. This information is fed into a virtual 3D model of the streetscape or building the person is navigating to calculate which direction the person should walk towards to reach their destination. The device can then generate a series of beeps to guide them.

To make the beeps appear to come from a particular direction, the system varies the timing and intensity of the vibrations transmitted to each earpiece. For example, to make a beep seem to come from the person's right, the right earpiece will vibrate louder and fractionally before the left, say Walker and Dellaert, who this week announced the development of their prototype, called System for Wearable Audio Navigation (SWAN).

The "earpieces" in fact sit just under each ear lobe and vibrate the skull directly to transmit sounds straight to the inner ear, bypassing the outer ear entirely. "It's a back-door way of getting sound into the user's inner ear," says Walker.

The designers say that this has advantages over existing systems to help blind people navigate, which tend to use speech to impart directions. This can be distracting and imprecise, says Walker. "How do you get someone to turn 57 degrees to the right using words?" As well as being more precise, beeps mean the user can still listen to what else is happening or communicate with others, which could be vital for a team searching for survivors in a burning building, say.

Anne Taylor, director of access technology at the National Federation of the Blind in Baltimore, Maryland, says speech interfaces are intuitive and do not require users to learn a new set of sounds. Also, without a Braille option, people who are deaf and blind could not use the new aid. Even so, Walker and Dellaert plan to recruit volunteers to test their system later this year.

One remaining challenge will be to get hold of detailed maps of buildings and cities. Walker suggests that satellite images such as those provided by Google Earth could be processed by image-recognition software to annotate maps with trees, houses and other obstacles. He also plans to incorporate new navigation aids to help people indoors or near high-rise buildings, where there may be no GPS signal.

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