Earplug provides steer-by-tongue control

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A device that detects ear-pressure changes – to determine how a person is moving their tongue – should let people with extremely restricted movement control a wheelchair or computer more easily.

A US company called Think-A-Move plans to release a wheelchair that can be controlled using the device towards the end of 2007. But its creator believes it could prove useful in other areas as well.

Engineers Ravi Vaidyanathan and Lalit Gupta of Southern Illinois University, US, suspected that tongue movements could be detected using ear pressure, because the way the Eustachian tube connects the middle ear to the back of the mouth.

"Our results validated that idea extremely well," Vaidyanathan, now at Southampton University, UK, told **New Scientist**. "We can identify different movements with 97% accuracy."

Hygienic system

In initial tests, eight people were asked to perform four basic tongue movements – up, down, left and right – one hundred times each. While making these gestures, they wore a custom earplug containing a microphone pointing into the ear. This microphone can pick up subtle pressure changes inside the ear caused by the tongue forcing air around, like when a person blows on a microphone. Each movement creates a distinctive signal that can be mapped to a computer command or a wheelchair control.

Think-a-move has refined its wheelchair control system to cope with swallows and coughs, although users must train it to recognise their tongue movements the first time they use it. The company's wheelchair will be primarily aimed at quadriplegics who must currently use steering devices that go inside the mouth and are operated by sucking and blowing, or controlled by movement of the tongue.

"This system avoids the hygiene and irritation problems they cause, and also keeps the mouth free for talking," Vaidyanathan says.

Military tool?

"It seems like a very usable idea that is much less intrusive than current devices," says Helen Petrie, who researches technology for disabled people at York University, UK.

The system could significantly improve quality of life for quadriplegic users, Petrie believes, although its full usefulness will only be known after long-term tests. She warns: "You need to know whether it works accurately in all kinds of real situations."

But Vaidyanathan thinks his invention could have other uses. "I am hoping that this idea can reach everyone," he says. The device could keep a user's hands free, so it might be useful for fire fighters or soldiers.

However, some improvements are needed before tongue movements can be detected when a person is

active. "If you are running or moving around, the bones of your skull conduct too much noise," says Vaidyanathan, "but I think improving the design of the earplug and the mathematical signal processing could address that in future."

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