Giving paralysed people control and independence

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Credit: Sharefaith from Pexels

A device that offers paralysed individuals - including those in the most severe 'locked-in' state - better control and communication has been developed and improved, thanks to a project funded by the European Research Council (ERC).

The ODORSPACE ('Predicting odor perception from odorant structure and neural activity in the olfactory system') project has developed technology that works by measuring pressure changes in the nose, or sniffing, and converting them into electrical signals.

Noam Sobel, Professor of Neurobiology at the Weizmann Institute of Science in Israel, received a starting grant from the ERC worth EUR 1.5 million for this project, which ended in 2013.

With an additional ERC 'Proof of Concept' grant of about EUR 150 000 SNIFFCONTROL ('Sniff-Controlled Devices') continued the work, which runs until the end of 2013. Prof. Nobel and his team aim at optimising this technology and investigating its commercial potential.

Most people retain the ability to sniff, even after suffering severe brain damage such as that resulting from a stroke. SNIFFCONTROL, which builds on their previous work, focusses on developing a sniff-controlled device that is both cost-effective and user-friendly.

"Whereas our original version of the device was based on a tube nestled at the nostril opening and connected to a transducer, the current version communicates by Bluetooth rather than a tube," explains Prof. Sobel. "Thus, our current version is more aesthetic."

Sniffing is regulated by the soft palate, the tissue at the back of the throat that directs the flow of air through the mouth and nose. The soft palate is controlled by nerves that do not pass through the spinal cord. This means that spinal damage - a common cause of paralysis - does not affect these nerves. Control of the soft palate is similarly unaffected by brain damage, unless such damage is located in the specific part of the brain that controls this organ.

"In our ERC starting grant project (ODORSPACE), we uncovered the

speed, accuracy, and robustness of human sniffing behaviour," says Sobel. "This led us to hypothesise that we could use sniffs as control signals."

The project team devised a means of enabling patients to dictate text on to a computer screen using coded patterns of sniffing. This system was then linked up to an electric wheelchair, giving individuals complete control. For example, two inhaling sniffs move it forward, while two exhaling ones move it into reverse.

This so-called sniff-controller provides paralysed individuals with something able-bodied people take for granted - independence. It allows them to move, to write and to surf the internet, and even drive an electric wheelchair. Nonetheless, the SNIFFCONTROL project still faces a number of obstacles.

While the innovation is a proven success in terms of its functionality, no company has yet licensed the technology. "We are in the frustrating position of having a cheap and simple solution that has not yet been made readily available," says Sobel.

The potential applications are there. The sniff-controller has already dramatically improved the lives of the small number of individuals who participated in SNIFFCONTROL's studies. Furthermore, able-bodied individuals could also use the sniff-controller to manipulate a computer with similar speed and accuracy as that obtained using a mouse or joystick.

"Developing a device that helps the severely disabled is incredibly rewarding," says Sobel. "The moment a paralysed woman used our device to communicate with her children for the first time in seven months since the onset of her paralysis was the best moment of my career."

More information: SNIFFCONTROL www.snifflogic.org

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