# Brain blanket boosts mind control

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With a sheet of electrodes placed over the brain, people can quickly learn to move a cursor around a computer screen using their thoughts. Early trials suggest that this new procedure could overtake more established brain-computer interfaces (BCIs).

The two established techniques involve inserting electrodes into the brain or attaching them onto the scalp

. These approaches have let people control robotic limbs, steer wheelchairs, type messages and walk in virtual worldsusing thought alone.

BCIs will one day transform the lives of people with disabilities and neurological disorders affecting their ability to move or communicate, says neuroscientist Gerwin Schalk at the Wadsworth Center, New York State Department of Health, US.

But which method will be best at doing that is still an open question, he says. "The two established sensor methods have fundamental problems that I think will be difficult to overcome."

## Degrading signal

Electrodes on the scalp can only detect electrical waves that have passed through the skull, producing a weak signal susceptible to interference from mains electricity and other sources.

Electrodes implanted directly into the brain produce much clearer signals, but are not well tolerated by the body. "The brain tries to get rid of [the electrodes] by covering them with a sheet of tissue," explains Schalk. "The signal degrades over time."

Schalk and colleagues at Albany Medical College, Washington University in St Louis, University of Washington, Seattle, and the University of Wisconsin at Madison, all US, think a third approach will face fewer hurdles.

They cover part of the brain's surface with a polymer sheet containing a grid of electrodes 2 millimetres in diameter and spaced 10 mm apart, a method called electrocorticography (ECOG). Such electrode grids are often placed in people with severe epilepsy to identify the focus of seizures within the brain.

"These grids are thin like a sheet of paper," says Schalk. "The electrodes record signals similar to those recorded by electrodes on the scalp, but with much greater fidelity."

## Cursor control

In recent experiments, five patients learned to control a computer cursor in two dimensions on a computer screen using their brain signals.

All five acquired this skill in less than 30 minutes, a performance similar to those achieved using electrodes implanted directly into the brain, says Schalk. Learning to control a cursor like this using a scalp-recorded methods takes weeks or months, he adds.

In other studies, the researchers have shown it is possible to read a person's hand and finger movements from their brain using these types of electrodes.

Dedicated human trials will require electrode grids designed to be implanted permanently. Researchers at Washington University in St. Louis are testing new designs - developed by colleagues at the University of Wisconsin - in monkeys, says Schalk.

## Invasive approach

If those studies work out, their goal is to seek approval from the US Food and Drug Administration for human trials. "Ultimately, these electrode grids could be put in place in a minimally invasive procedure," Schalk told New Scientist.

"Whether electrocortigraphy will become the prime method of choice for clinical BCI research is very open," says Klaus-Robert Müller, who works on scalp-attached EEG brain-computer interfaces at the Technical University of Berlin, Germany.

Achieving 2D control of a cursor within 20 minutes is a significant result, he says, but although simpler than implanting electrodes into the brain, the approach is still invasive. "For some patients ECOG may become the method of choice," says Müller, but he thinks for healthy people a non-invasive approach like EEG would be best.

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