Speech without sound

Study headed by cognitive scientist Mike D'Zmura focuses on creating a thought-based communication system; implications of research extend from healthcare to law enforcement

A team of UC Irvine scientists, armed with a recently awarded $4 million Army Research Office grant, is working to develop a new communication system that could help patients suffering from speech loss caused by paralysis to one day "speak" again using a brain-computer interface for thought communication.

photo by Daniel Anderson, UCI Communications

The award supports research into the neuroscientific and signal-processing foundations of synthetic telepathy. The brain-computer interface would use a non-invasive brain imaging technology like electroencephalography (EEG) to let people communicate their thoughts to each other. For example, a person would "think" a message to be transmitted and a computer-based thought recognition system would decode the EEG signals into the English language, allowing the thought to be transmitted either as speech or a text message. EEG signals are also used to determine the intended target of communication, or who will receive the message. The entire process would take place without a single spoken syllable.

"Such a system would require extensive training by anyone who is using it to send messages," says Michael D'Zmura, lead researcher and chair of the UCI Department of Cognitive Sciences. "Communication would initially be based on a limited set of words or phrases that are recognized by the system and would involve more complex language and speech as the technology is further developed."

If successful, the research could lead to the development of a communication system that would have considerable benefits in medical situations and in other settings, including battlefields, computer games, and classrooms.

"Thanks to this generous grant we can work with experts in automatic speech recognition and in brain imaging at other universities to research a brain-computer interface with applications in military, medical and commercial settings," says D'Zmura.

D'Zmura will conduct the research with UCI cognitive science professors Ramesh Srinivasan, Gregory Hickok and Kourosh Saberi. Joining the team are researchers Richard Stern and Vijayakumar Bhagavatula from Carnegie Mellon's department of electrical and computer engineering and David Poeppel from the University of Maryland's department of linguistics.

The contract comes from the Department of Defense's Multidisciplinary University Research Initiative (MURI) program, which supports research involving more than one science and engineering discipline and has the goal of developing applications for military and commercial purposes.