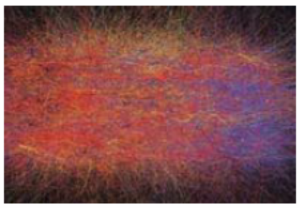

Talking back

A science blog, *sans blague*

Action Plan: Making Brain-Controlled Prosthetics That Can Open a Clothespin

By Gary Stix | January 23, 2013 | 1

Brain-controlled prosthetic

Last year a group of researchers at Brown and Harvard universities reported on a study called Braingate, in which a paralyzed woman picked up a container of coffee with a robotic arm and drank from it through a straw, an action directed by electrical signals from her motor cortex.

Brain-controlled interfaces have advanced dramatically during the past decade. But more work needs to be done before this technology begins to approximate the natural movements of a fully functioning arm or hand. An attempt to replicate the full range of movement—and the cognitive chain of events from thought to action—has now begun as a research collaboration among the California Institute of Technology, Johns Hopkins University Applied Physics Laboratory, the University of Southern California and Rancho Los Amigos National Rehabilitation Center. These institutions are seeking a few recruits to be fitted with a $500,000 robotic limb.

The current project—part of the DARPA-sponsored Revolutionizing Prosthetics—attempts to make a robot limb more like the the real thing. Implants of electrodes will go into the posterior parietal cortex—one set of electrodes to control the hand's grasping and the other a reaching motion. The implants differ from those in Braingate, which placed electrodes in the motor cortex, from where a signal went directly to the spine and then to the limb. The parietal cortex is a center of higherlevel cognition where the initial intention to grasp or reach begins. An implant in this area, located toward the back of the brain, will allow the goal of an action to be conveyed directly to the robotic limb, reducing the number of neural signals needed to control its movement. The Caltech researchers are also working on technology that will supplement this system with sensory feedback piped from the limb itself to the somatosensory cortex, providing feedback that simulates a sense of touch, an essential requirement to make the fine-level adjustments of the robotic hand for proper positioning and movement.

The basic research on the parietal cortex signaling, all performed at Caltech, will be implemented by using perhaps the most sophisticated robotic arm to date, a 22-degree-of-freedom limb developed at the Applied Physics Laboratory—degrees of freedom being engineer-speak for a robot that, in this instance, can use tools, open a clothespin, make the peace sign or play rock, paper, scissors. "The limb can pick up clothespins and put them on a pole," says Richard Andersen, the neuroscientist who leads the project at Caltech. "It can pretty much can do everything a human can do."

Image credit: Johns Hopkins University Applied Physics Laboratory

About the Author: Gary Stix, a senior editor, commissions, writes, and edits features, news articles and Web blogs for SCIENTIFIC AMERICAN. His area of coverage is neuroscience. He also has frequently been the issue or section editor for special issues or reports on topics ranging from nanotechnology to obesity. He has worked for more than 20 years at SCIENTIFIC AMERICAN, following three years as a science journalist at IEEE Spectrum, the flagship publication for the Institute of Electrical and Electronics Engineers. He has an undergraduate degree in journalism from New York University. With his wife, Miriam Lacob, he wrote a general primer on technology called Who Gives a Gigabyte? Follow on Twitter @@gstix1.
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Here is video of the Modular Prosthetic Limb being teleoperated to put clothespins on a pole.
http://www.youtube.com/watch?list=PL542FC32ACC8D2513&v=DjzA9b9T3d8&feature=player_det

Link to his