Stanford: Monkeys' thoughts moves cursor

David Perlman
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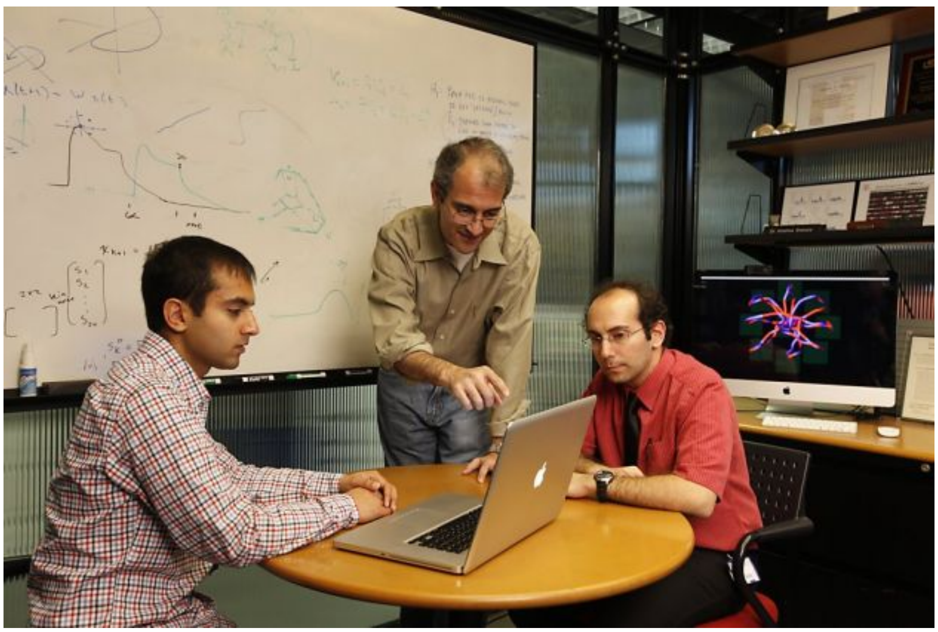

Stanford researchers Vikash Gilja (left), who developed the algorithm that allows the monkeys' thoughts to be translated, Krishna Shenoy and Paul Nuyujukian have been working on the project for years. Photo: Joel Simon, Stanford University / SF

With an ultimate goal to help paralyzed patients achieve a degree of independence, Stanford brain researchers report they have taken a promising step forward in efforts to link nerve centers in the human brain with computers controlled by only a person's thought.

In their latest development, the Stanford scientists have successfully enabled a pair of rhesus monkeys to move a virtual cursor across a computer screen merely by thinking about their response to human commands.

The monkeys' ability to manipulate a cursor without using a mouse is based on a powerful new algorithm, a mathematical computing program devised by Vikash Gilja, a Stanford electrical engineer and computer scientist.

Four years ago, neurosurgeons at Brown University and Massachusetts General Hospital had demonstrated a simpler version of an algorithm that enabled completely paralyzed humans with implanted sensors in their brains to command a cursor to move erratically toward targets on a computer screen.

But with Gilja's algorithm, called ReFit, the monkeys showed they could aim their virtual cursor, a moving dot of light, at another bright light on a computer screen, and hold it steadily there for 15 seconds - far more precisely than the humans four years ago. With the new algorithm, they were able to perform their thinking tasks faster and more accurately as they sat comfortably in a chair facing the computer.

The development is "a big step toward clinically useful brain-machine technology that has faster, smoother, and more natural movements" than anything before it, said James Gnadt of the National Institute of Neurological Disorders and Stroke.

The idea behind the research is to empower quadriplegics years or decades from now with the ability to operate computers that respond to a virtually endless repertoire of thought commands - far more flexibly than the programmed voice commands that now exist.

In the Stanford experiments, tiny sensors were implanted in the motor cortex of the two monkeys' brains. That motor cortex, a region of the brain's outer layer, has long been associated with planning, controlling and executing voluntary muscle movements.

As the monkeys think through specific tasks, the implanted sensors pick up electrical signals from nearby neurons, and in Gilja's advanced algorithm, the signals are then translated into movements of the computer's cursor, just as if the monkeys' hands were using a mouse or a touch pad.

Gilja, who has been working on the project for years with team leader Krishna Shenoy, an electrical engineer and neurobiologist, and graduate student Paul Nuyujukian, report in the current issue of Nature Neuroscience that the monkeys have repeatedly performed the algorithm tests with the same degree of success for as long as four years.

Volunteers sought

Stanford is now among several institutions enrolling quadriplegic patients in the first national clinical trials of a system known as BrainGate2 to research thought-controlled computers, robotic arms and other assistive devices. Details can be found at

nptl.stanford.edu.

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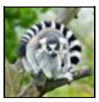

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