The Government Is Serious About Creating Mind-Controlled Weapons

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DARPA, the Department of Defense's research arm, is paying scientists to invent ways to instantly read soldiers' minds using tools like genetic engineering of the human brain, nanotechnology and infrared beams. The end goal? Thought-controlled weapons, like swarms of drones that someone sends to the skies with a single thought or the ability to beam images from one brain to another.

This week, DARPA (Defense Advanced Research Projects Agency) announced that six teams will receive funding under the Next-Generation Nonsurgical Neurotechnology (N3) program. Participants are tasked with developing technology that will provide a two-way channel for rapid and seamless communication between the human brain and machines without requiring surgery.

"Imagine someone who's operating a drone or someone who might be analyzing a lot of data," said Jacob Robinson, an assistant professor of bioengineering at Rice University, who is leading one of the teams. [DARPA's 10 Coolest Projects: From Humanoid Robots to Flying Cars]

"There's this latency, where if I want to communicate with my machine, I have to send a signal from my brain to move my fingers or move my mouth to make a verbal command, and this limits the speed at which I can interact with either a cyber system or physical system. So the thought is maybe we could improve that speed of interaction."

That could be crucial as smart machines and a tidal wave of data threaten to overwhelm humans, and could ultimately find applications in both military and civilian domains, Robinson said.

Advancing mind control

While there have been breakthroughs in our ability to read and even write information to the brain, these advances have generally relied on brain implants in patients, allowing physicians to monitor conditions like epilepsy.

Brain surgery is too risky to justify such interfaces in able-bodied people, however; and current external brain-monitoring approaches like electroencephalography (EEG) — in which electrodes are attached directly to the scalp — are too inaccurate. As such, DARPA is trying to spur a breakthrough in noninvasive or minimally invasive brain-computer interfaces (BCIs).

The agency is interested in systems that can read and write to 16 independent locations in a chunk of brain the size of a pea with a lag of no more than 50 milliseconds within four years, said Robinson, who is under no illusion about the scale of the challenge.

"When you try to capture brain activity through the skull, it's hard to know where the signals are coming from and when and where the signals are being generated," he told Live Science. "So the big challenge is, can we push the absolute limits of our resolution, both in space and time?"

Genetically tweaking human brains

To do this, Robinson's team plans to use viruses modified to deliver genetic material into cells — called viral vectors — to insert DNA into specific neurons that will make them produce two kinds of proteins. [Flying Saucers to Mind Control: 22 Declassified Military & CIA Secrets]

The first type of protein absorbs light when a neuron is firing, which makes it possible to detect neural activity. An external headset would send out a beam of infrared light that can pass through the skull and into the brain. Detectors attached to the headset would then measure the tiny signal that is reflected from the brain tissue to create an image of the brain. Because of the protein, the targeted areas will appear darker (absorbing light) when neurons are firing, generating a read of brain activity that can be used to work out what the person is seeing, hearing or trying to do.

The second protein tethers to magnetic nanoparticles, so the neurons can be magnetically stimulated to fire when the headset generates a magnetic field. This could be used to stimulate neurons so as to induce an image or sound in the patient's mind. As a proof of concept, the group plans to use the system to transmit images from' the visual cortex of one person to that of another.

"Being able to decode or encode sensory experiences is something we understand relatively well," Robinson said. "At the bleeding edge of science, I think we are there if we had the technology to do it."

Talking to drones

A group from the nonprofit research institute Battelle is taking on a more ambitious challenge. The group wants to let humans control multiple drones using their thoughts alone, while feedback about things like acceleration and position go directly to the brain.

"Joysticks and computer cursors are more or less one-way devices," said senior research scientist Gaurav Sharma, who leads the team. "But now we're thinking of one person controlling multiple drones; and it's two-way, so if the drone is moving left, you get a sensory signal back into your brain telling you that it's moving left."

The group's plan relies on specially designed nanoparticles with magnetic cores and piezoelectric outer shells, which means the shells can convert mechanical energy to electrical and vice versa. The particles will be injected or nasally administered, and magnetic fields will guide them to specific neurons.

When a specially designed headset applies a magnetic field to the targeted neurons, the magnetic core will move and exert stress on the outer shell to generate an electrical impulse that makes the neuron fire. The process also works in reverse, with electrical impulses from firing neurons converted into tiny magnetic fields that are picked up by detectors in the headset.

Translating that process into controlling drones won't be simple, admits Sharma, but he's relishing the challenge DARPA has laid out. "The brain is the final frontier in medical science," he said. "We understand so little of it, which is what makes it very exciting to do research in this area."

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