RESEARCHERS USE BRAIN SIGNALS TO SPUR MOVEMENT

Getting the ball into the goal is the first test of a technology that ultimately could relay commands from the mind to a device. Here's how it works in experimental research conducted on children with epilepsy.

1. A signal from the brain …

Researchers take signals from electrodes that rest on the surface of the brain near a feature called the central sulcus. In the front of this area is the motor cortex, where signals that generate movement of the body arise.

2. Signal is separated into frequencies …

The signals are recorded, and researchers do what is called a spectral analysis, which separates the brain signal into various frequencies. A frequency band is selected and attached to a video game.

3. Patient tries to control …

Brain signals to create movement. If the amount of the selected frequency increases, a command is sent to move right. If the amount of the selected frequency decreases, a command is sent to move left.

The command is sent to the video game (shown right), where the ball moves steadily from one end of the field to the other. If the patient can control the brain signals, the ball can be moved to line up with the goal so that the ball can pass through it.

Source: Arizona State University research.

The research is partly funded by a three-year grant of nearly $500,000 from the Arizona Biomedical Research Commission.

Adelson said some patients are alert during the experiment and generate a high degree of motor activity. Others are tired and less active in manipulating the video-game device. Still, those less-active patients provide valuable information. Researchers can measure sensory information such as how they respond to vibration, temperature or soft touch, Adelson said.

Researchers are trying to figure out how to relay sensory information back to a person using the prosthetic limb. For example, a person would be able to pick up a cup of coffee, but a prosthetic hand would not be able to send signals back to the person's brain to inform them that the coffee was hot or cold.

Tillery said there are practical reasons for refining the technology. Consid-
er a artificial hand developed by scien-
tists at John Hopkins University. The hand can grab an egg, for example, but users cannot control whether to use a strong or gentle grip. Think of the Terni-
mator crushing an egg.

Another limitation is reaching for items a user cannot see. So if a person wants to grab a file from a briefcase while sitting at a computer screen, the existing technology does not allow a per-
son to make such a transfer.

Tillery said another important develop-
ment will be refining wireless technol-
ogy so users are not tethered by wires. This would allow someone with an im-
plantable device to seamlessly control an arm or a leg and feel that the prosthetic limb is a natural extension of their body.

Brain Power

Lizbeth Dasti, 8, was perfecting a picture in her doctor's office wall when the hit hit. Her eyes rolled. Her arms, legs and head twisted back and forth. Her mother cupped her ears with both hands, gently held her head and whis-
ppered, “Are you OK?”

Lizbeth, 8, had battled epileptic seizures for three years. Over that time, the seizures had become more intense and prolific with as many as four dozen each day.

She underwent surgery more than two months ago in an attempt to limit the se-
zeas.

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By Ken Alltucker
The Arizona Republic

The computer-brain interface technol-
ogy could one day be used to help peo-
ple with limited mobility and the re-
searchers, said David Adelson, a Pho-
enix Children's Hospital neurosurgery-
not such a big thing function, Adelson said.

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Research intensifies

The research field into such brain-
controlled prosthetics is multibillion-
ary, with both university scientists and pri-

cy businesses investing in the field.

One year ago, the University of Cal-
ifornia-Berkeley and the University of Cal-
ifornia-San Francisco launched the Center for Neural Engineering and Pro-
theses.

ASU is collaborating with a Los安
geles-based company, SynTouch, which has developed an artificial finger.

"The technology is getting ripe," Tilly-

er said. "The costs are a little high now, but within five years, some of these things will be available for purchase."

Need for volunteers?

Arizona's contribution to the technol-

gy, however, will hinge on patients such as Lizbeth who are willing to participate.

Since the September surgery, Lizbeth has been seizure-free. She has slowly be-

gun to talk more and interact with oth-
er children.

Lizbeth, who lives in Mesa, also is back at school and striving to catch up in math and reading. She fell behind even before the surgery, as the seizures struck more often.

"This is what we were hoping for," said Yosica Aguilar, Lizbeth's mother. "She is back to her normal activities, riding bikes and scooters."

It is the second surgery that Lizbeth has had for her seizures, and Aguilar hopes it is the last time.

"Hopefully it's done and over with and that she comes back to her normal happy, confident self," Aguilar said.

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