Neurotechnology

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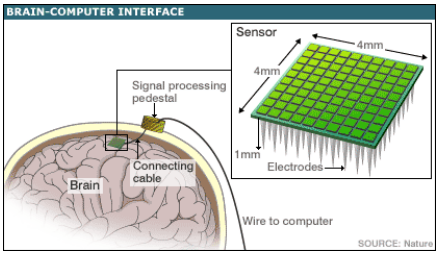
Damage to the nervous system is a tragic experience that can mean severe loss of motor control. However, scientists are currently developing ways to allow humans to regain control over their limbs through neurotechnology.

One such development is neuromotor prostheses (NMP). An NMP is a small 4 millimeter by 4 millimeter sensor that contains an array of tiny electrodes. This is implanted into the respective area of the primary motor cortex. The sensor is connected to a pedestal that protrudes from the top of the skull. A cable is then connected from the pedestal to a computer. When the electrodes are stimulated, the patient sends his or her brain signals simply by imagining a limb moving to a targeted spot. These "motor intentions" are interpreted and translated into cursor movements that allow the patient to control the cursor of the computer, much like a hand controls a computer mouse. This medical device, called BrainGate Neural Interface System, is currently being developed by Cyber-kinetics ™ and has not yet been approved. However, they have performed a very successful experiment with promising results.



In 2001, 25 year-old Matt Nagle was stabbed in the neck five times and left paralyzed below the shoulders. Three years later, a sensor containing 96 electrodes was implanted in the area of his cortex responsible for arm movement. He then imagined moving his arm to do a variety of simple tasks, like draw a circle, change the channel of a television, and play the computer game Pong. Though his control over the computer cursor was not completely flawless, and in some cases took more time than intended, the end results were impressive. Essentially, he was using his thoughts to directly control a physical device.

This experiment was significant in a few ways. Though three years had passed since the damage was done, the neural activity in Nagle's cortex was mostly normal and the neurons were still active. This showed that though axons from the region to the spinal cord had been severed, brain signals were still being generated even though they had stopped being sent to the body three years ago. Another significance is that no training is involved using this system. The patient simply has to be asked to imagine moving a hand to the targeted area. A non-invasive EEG (Electroencephalography**)** system could take weeks or months of training to use. Also, once the patient was able to perform the most basic task, he was immediately able to perform other computer-based tasks.

Before this system can be produced and introduced to the public, many things must be further researched and developed. As of now, the electrode's ability to detect brain signals starts to weaken after a number of months. Also, many people who suffer spinal cord injuries are still young, and will have to use this technology for decades. Having a large permanent hole in the head is risking infection, and carrying around an external computer is obviously a huge inconvenience.

References

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