

BRAIN GATE

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Abstract

As the power of modern computers grows alongside our understanding of the human brain, we move closer to making some pretty spectacular science fiction into reality. Consider the potential to manipulate computers or machinery with nothing more than a thought! Thousands of people around the world suffer from paralysis and loss of other bodily movement, rendering them dependent on others to perform even the most basic tasks. The mind-to-movement system that allows a quadriplegic man to control a computer using only his thoughts is a scientific milestone. This is the BRAIN GATE system. Brain gate system is based on 'Cyber kinetics' platform technology to- sense, transmit, analyze and apply the language of neurons. A computer chip, which is implanted into the brain, monitors brain activity in the patient and converts the intention of the user into computer commands. It would be a huge therapeutic application for people who have seizures, which leads to the idea of a 'pacemaker for the brain'.

Keywords: BCI (Brain-Computer Interface), motor cortex.

I. INTRODUCTION

The principle of operation of the brain gate neural interface system is that with intact brain function, neural signals are generated even though they are not sent to the arms, hands and legs. These signals are interpreted by the system and a cursor is shown to the user on a computer screen that provides an alternate "Brain Gate pathway". The user can use that cursor to control the computer, just as a mouse is used. A **brain-computer interface (BCI)** which is a direct communication pathway between a human (brain cell culture) and an external device, serves this purpose.

II. WORKING

The Brain Gate device consists of a tiny chip that is surgically implanted in the brain's motor cortex. The chip can read signals from the **motor cortex**, send that information to a computer via connected wires, and translate it to control the movement of a computer cursor or a robotic arm. However, because movement carries a variety of information such as velocity, direction, acceleration and as the BCI is only

reading signals from a small sample of those cells, the initial control of a robotic hand may not be as smooth as the natural movement of a real hand. But with practice, the user can refine those movements using signals from only that sample of cells.

Advantages:

- It's potential to interface with a computer without weeks or months of training.
- It's potential to be used in an interactive environment, where the user's ability to operate the device is not affected by their speech, eye movements or ambient noise.
- The ability to provide significantly more usefulness and utility than other approaches by connecting directly to the part of the brain that controls hand movement and gestures.

Disadvantages:

- The switches must be frequently adjusted which is a time consuming process. As the device is perfected this will not be an issue.
- There is also a worry that devices such as this will "normalize" society.
- The Brain Gate Neural Interface System has not been approved by the FDA, but has been approved for IDE status, which means that it has been approved for pre-market clinical trials.
- Limitation in information transfer rate. The latest technology is 20 bits/min.

III. CONCLUSION

Medical cures are unavailable for many forms of neural and muscular paralysis. Thus, the idea of moving robots or prosthetic devices not by manual control, but by mere "thinking" is a major scientific milestone in the history of mankind!

IV. CURRENT WORK PROGRESS

Brain Gate is currently recruiting patients with a range of neuromuscular and neuron-degenerative conditions for pilot clinical trials being conducted under an Investigational Device Exemption (IDE) in the United States. Cyber kinetics hopes to refine the Brain Gate in the next two years to develop a wireless device doesn't have a plug, making it safer and less visible. And once the basics of brain mapping are worked out, there is potential for a wide variety of further applications.

REFERENCES

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