

A study on the significance of brain to brain communication

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Abstract

“Brain-Computing Interface” technology is used by the scientists that allow computer to analyze brain signals. This new technology in the field of research and development will bring a great benefit to the people who cannot speak and even blink. B2B Communication is a burning topic of research. This will be first technology that would allow people to send words, images and thoughts directly to the minds of others, particularly people with a disability.

Earlier we’ve looked at a system to allow people to control a robotic wheel chair with the power of thought. Similarly B2B communication technique will be used to transmit thoughts from one person to another via internet. This paper outlines on component used and working of b2b communication. We have also discuss its advantages and limitations.

Keywords: communication, brain, technology

Introduction

A BCI is a communication and control system that does not depend in any way on the brain’s normal neuromuscular output channels. The user’s intent is conveyed by brain signals (such as EEG) rather than by peripheral nerves and muscles, and these brain signals do not depend for their generation on neuromuscular activity. (Thus, e.g., a device that uses visual evoked potentials to determine eye-gaze direction is not a true BCI, for it relies on neuromuscular control of eye position, and simply uses the EEG as a measure of that position.)

Furthermore, as a communication and control system, a BCI establishes a real-time interaction between the user and the outside world. The user receives feedback reflecting the outcome of the BC’Is operation, and that feedback can affect the user’s subsequent intent and its expression in brain signals. For example, if a person uses a BCI to control the movements of a robotic arm, the arm’s position after each movement is likely to affect the person’s intent for the next movement and the brain signals that convey that intent.

Thus, a system that simply records and analyzes brain signals, without providing the results of that analysis to the user in an online interactive fashion, is not a BCI. A brain-computer interface (BCI) or brain-machine interface (BMI) activates electronic or mechanical devices with brain activity alone. BCIs and BMIs allow direct brain communication in completely paralyzed patients and restoration of movement in paralyzed limbs through the transmission of brain signals to the muscles or to external prosthetic devices.

The two types of BCIs: Invasive BCIs use activity recorded by brain implanted micro- or macro electrodes, whereas noninvasive BCIs use brain signals recorded with sensors outside the body boundaries. A technique called “Brain-computer interfacing” is used by scientist which allow computer to analyze brain signals. Without the use of keyboards, mouse, telephone, mouth thoughts can be transmitted from one person to another person’s mind miles away, but through internet.

A brain-computer interface (BCI), sometimes called a direct neural interface or a brain-machine interface, is a direct

communication pathway between a brain and an external device. BCIs are often aimed at assisting, augmenting or repairing human cognitive or sensory-motor functions.

History

Electrical signals produced by brain activity were first recorded from the cortical surface in animals by Richard Caton in 1875 (Caton, 1875) and from the human scalp by Hans Berger in 1929 (Berger, 1929). Hans Berger, who discovered the human EEG, speculated in his first comprehensive review of his experiments with the “Elektronephalogramm” (1929) about the possibility of reading thoughts from the EEG traces by using sophisticated mathematical analyses. In the 75 years since Berger’s first report, electroencephalographic (EEG) activity has been used mainly for clinical diagnosis and for exploring brain function. In between many scientist proceed the work and now Dr. Christopher James from the University’s Institute of Sound and Vibration Research with a aim to expand the current limit of BCI technology and show that brain-to brain communication is possible. According to Dr. James, BCI is no longer a new thing and person to person communication via the nervous system was shown previously in work by Professor Kevin Warwick from University of Reading.

Components used in B2B communication

- i) **Brain Computer Interfacing:** A brain-computer interface (BCI), sometimes called a direct neural interface or a brain-machine interface (BMI), is a direct communication pathway between the brain and an external device. BCIs are often aimed at assisting, augmenting or repairing human cognitive or sensory-motor functions.
- ii) **Electrodes:** An electrode is an electrical conductor used to make contact with a nonmetallic part of a circuit (e.g. a semiconductor, an electrolyte or a vacuum)
- iii) **EEG:** Electroencephalography is the recording of electrical activity along the scalp. EEG measures voltage fluctuations resulting from ionic current flows within the neurons of the brain. Electroencephalography (EEG) is the

most studied potential non-invasive interface, mainly due to its fine temporal resolution, ease of use, portability and low set-up cost. But as well as the technology's susceptibility to noise, another substantial barrier to using EEG as a brain-computer interface is the extensive training required before users can work the technology.

iv) LED lamp: A light-emitting-diode lamp is a solid-state lamp that uses light-emitting diodes (LEDs) as the source of light. Since the light output of individual light-emitting diodes is small compared to incandescent and compact fluorescent lamps, multiple diodes are used together. LED lamps can be made interchangeable with other types. Most LED lamps must also include internal circuits to operate from standard AC voltage. LED lamps offer long life and high efficiency, but initial costs are higher than that of fluorescent lamps.

v) Internet: Dr. James said that his innovation was the transmission of the signals to another person through the Internet.

vi) Personal Computer: Pc is used to pick up the stream of binary digits and also it can decipher whether a zero or one was transmitted.

Working Principle

This system will allow people to send thoughts, words and images directly to the minds of others, particularly people with a disability. According to Dr. Christopher James, During the transmission two people were hooked up to electrodes that measure activity in specific parts of the brain. While attached to an EEG amplifier, the first person generates a series of zeros and ones, imagining moving their left arm for zero and right arm for one.

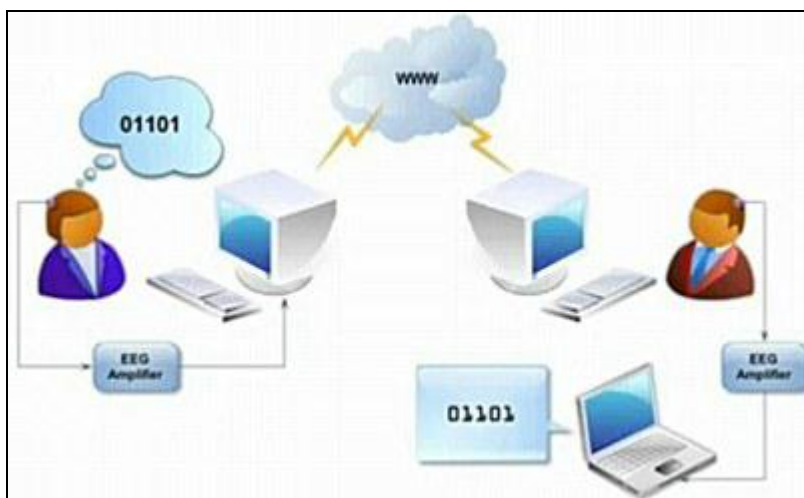


Fig 1

The first subject's computer recognizes the binary thoughts and sends them over the internet to the second person's computer. A LED lamp is then flashed at two different frequencies for one and zero. The second person's brain signals are analyzed after staring at this lamp and the number sequence is picked up by a computer. There is no conscious thought forming in one person's head and another conscious thought appearing in another person's mind.

Application Areas

- i) Gaming and Entertainment:** The future gamers will be able drive cars and steer just by thinking "go left" or "go right" or "brake". BCI also can be used to enjoy your home theater by handling an entertainment system with your thoughts which will make a remote control obsolete.
- ii) Communication and control:** BCIs provide options for communication and control for people with devastating neuromuscular disorders (such as amyotrophic lateral sclerosis, or ALS, brainstem stroke, cerebral palsy, and spinal cord injury).
- iii) Military defense system:** DARPA (Defense Advanced Research Projects Agency) has been interested in Brain-Machine-Interfaces for a number of years for military applications like wiring fighter pilots directly to their planes to allow autonomous flight from the safety of the ground.

Advantages

Help people with severe debilitating muscle wasting diseases, or with the so-called 'locked-in' syndrome, to communicate. Help in direct brain communication in completely paralyzed patients. Help to those who suffers from disorders like ALS (Amyotrophic lateral sclerosis), Brainstem stroke, brain or spinal cord injury.

Limitation

- i) Electrodes:** Electrodes to be attached inside the skull or even implanted in the brain. Dr James admitted that this opened up many ethical problems.
- ii) Liability:** Most people would agree that, under normal circumstances, we are fully responsible for our actions. However, if our intent was effected by a brain-computer interface, incorrect actions may be produced simply by incorrect detection of correct intent.
- iii) Privacy:** The capacity to induce information into the brain may provide us with the ability to base our actions on a better assessment of the environment. Because this information is provided by a computer, it could be accessed and modified by third parties, which may allow them to influence our actions. In terms of the speed, accuracy and robustness of the technology, there is long way to go.

Future

It will provide a new way to communicate without the need for keyboards and telephones. According to Dr Ian Pearson, “In 30 years, you’ll think of a message and it will appear on your wife’s mobile phone”.

Conclusion

Brain-to Brain communication will help people who suffers with “Locked –In” syndrome, with severe debilitating muscle wasting diseases and also can be used in our military defense system. One person can chat brain-to-brain at speed of thoughts with the person miles away. The technology will cut down the verbal communication in coming era. A broadband connection, however, would be essential.

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