Brain Computer Interface in Facilitating Communication

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Abstract

The technology evolves from generation to generation and during its development it always help and facilitate human activities. The development of technology offered here is to simplify people to communicate using smartphones, using Brain Computer Interface (BCI), especially electroencephalogram (EEG) techniques where users only need to move one of the part of the body then the desired call will be done, it will be very helpful for a paralyzed person who can't control his body freely.

Keyword—communication; BCI; EEG; smartphone (key words)

I. INTRODUCTION

Today's technological developments have combined different types of sciences, such as the combination of health sciences, computer science and the science of machine, one of which is in the development of human surgery using robots and, and making health check tools and so on. Here will be done a research that makes it easier for human in communication or call someone directly by brain command. So far, if you want to call someone you
need to looking for a smartphone first and search for contact to be called. Then it would be the development in this research, where if the user wants to contact someone, he just need to move one of his body part then it would make a phone call immediately.

This research used Brain Computer Interface (BCI) technology, where the signal from the brain has been recorded before, then the user only need to move one of his body part then the signal will be directly connected to the smartphone that has been set up and make a call, this research is expected to make human in making calls especially for people who are paralyzed or born disabled, and possibly in certain circumstances such as at the time of the accident so by moving a member of the body can call the authorities immediately.

II. MATERIAL AND METHOD

A Brain Computer Interface (BCI), often called a Mind-Machine Interface (MMI), or sometimes called Brain Machine Interface (BMI), is a means of communication directly between a brain and a brain-reading device (BCI) [1]. BCI manage message delivery from the human brain and translated into understandable language. Thus BCI can help people with disabilities to tell and write their opinions and ideas through methods such as in spelling applications, semantic categorization, or direct communication without talking. BCI can also facilitate handsfree applications that provide convenience and comfort to humans through mind-controlling. They just require to insert brain signals to achieve a set of commands and no muscle intervention. The helping robot of BCI can offer support for for users with disabilities in daily and professional life. [2]

BCI has two utilize technique, invasive dan non-invasive.

A. Invasive BCI

The invasive BCI is Neuroprosthetics where the electrodes are placed inside the hole of the brain during neurosurgery and left there permanently. Invasive device Produces the highest quality signal from BCI device because it has the best noise signal ratio on the accuracy of any BCI. Unfortunately invasive BCI is expensive and require a complicated surgery to be implanted. Electrocnagogram (EEG) is one of the invasive BCI. ECoG is promising intermediate BCI modality because it has higher spatial resolution, better signal-to-noise ratio, wider frequency range, and at the same time has lower technical faults, lower clinical risk, and possibly more superior.

B. Non-Invasive BCI

Non-invasive BCI is the most popular technique where the electrodes are placed outside the skull or on the scalp. Non-invasive methods are often susceptible to noise, have poorer signal resolution due to their distance from the brain, and have difficulty recording inner workings of the brain. But they have a cheaper cost overload, Easy to carry and this method does not require special operations. The most widely used non-invasive BCI system is the electroencephalogram (EEG) signal. EEG is the first non-invasive neuron imaging technique to be discovered, this method can measure the electrical activity of the brain. It also includes electrical activity, and nerve activity.
The things that must be considered in applicating BCI are as follows:

- **Hardware in signal acquisition**
  The challenge on this aspect is signal acquisition hardware for the gradations required for development of non-medical BCI application. The EEG sensor should be dry, comfortable, suitable for use, and easily modified because BCI must be used outside the laboratory or hospital.

- **Reliability**
  BCI system has poor reliability for most applications. The BCI system must be able to give and receive responses in real time, and the system must be able to match the central nervous system in order to work properly.

- **Training Process**
  Training the users takes a long time. Users must practice every detail of the BCI process without interlude to get the desired results. [4]

### III. RESULT AND DISCUSSION

In previous research, it has built a way to perform commands using Smart Home Controls as performed by Lee.WT, Nisar.H, Malik.AS, Kim Ho Yeap (2013), where they have developed a thought of a controlled smart home system using Non-invasive BCI. Electroencephalographic (EEG) signals (EEG) recorded from brain activity using EPOCH Emotive Headset are connected with support of a mouse emulator to a GUI on a computer screen. Users will use this GUI to control various devices in smart home. For example, turn off the light of room. So the user will choose the room that will be turned off or turned on the light with eyebrows or a grin, or combination of actions if needed, which led the mouse click of GUI, and the light in the room would be turning on or off [5].

As well as the research conducted by Arjon Turnip, Demi Soetraprawata, Mardi Turnip, Endra Joelianoto, (2016) where they use EEG to move the wheelchair, so with the electrode recorded by user who move his body parts and the wheelchair will move Left, right, forward or backward in accordance to the settings that have been made. [6]

According to the previous research, then it will be possible to make BCI which can facilitate the communication. This research will use Electroencephalographic (EEG) technique because the usage is easier and cheaper than Electrocorticography (ECoG) technique which required to perform complicated operation and very expensive cost.

The first thing to do here is to record the activity of electrodes produced by the brain using Emotive EPOC headsets as shown below:
Then do settings on the smartphone which can respond to signals of Emotive EPOC headset and make calls in accordance to the received signal. For example by pressing the nose or smiling then the smartphone will call the person who is at the top of the contact number on the smartphone. Here is the simple system flowchart:

![Fig. 5. The Simple System Flowchart](image)

**IV. CONCLUSION**

The use of Brain Computer Interface (BCI) is very helpful for facilitate human activities even in all fields. This research will help simplify users with disabilities especially for communicating. And it also can help in a circumstances that do not allow users to move freely as the case of Accident, so with this tool he just need to move a part of his body then it will immediately make a call on the authorities or the intended person.

**REFERENCES**


