ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 7, July 2016

Detection of Normal and Abnormal Condition for Disability Peoples by Using Mind Wave Reading System

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ABSTRACT: The purpose of this project is to enable people to communicate that don't have the use of their limbs, and don't have the ability to vocalize speech. With all of the recent attention on ALS (Lou Gehrig's disease), this project is an answer to an internal challenge to provide something with the potential to help existing and future ALS patients, as well as other people with disabilities that don't have enough manual dexterity for touch-based apps and they also don't have the ability to vocalize. Other systems that use eye-tracking are very costly by comparison to the combination of this app and an affordable NeuroSky Mind Wave Mobile headset .

KEYWORDS: NeuroSky Mind Wave Mobile headset, Bio-signal computer command; mind-reading device

I. INTRODUCTION

HCI has been primarily implemented by monitoring direct manipulation of devices such as mice, keyboards, pens, touch surfaces, etc. However, as digital information becomes more integrated into everyday life, situations arise where it may be inconvenient to use hands to directly manipulate a gadget. For example, a driver might find it useful to interact with a vehicle navigation system without removing hands from the steering wheel. Further, a person in a meeting may wish to invisibly interact with a communication device. Accordingly, in the past few years there have been significant activities in the field of hands-free human-machine interface. It is predicted that the future of HCI is moving toward compact and convenient hands-free devices. Notably, in a recent report, IBM has predicted that at least in the next five years, mind-reading technologies for controlling gadgets would be available in the communication market. In the IBM report it is predicted that "if you just need to think about calling someone, it happens…or you can control the cursor on a computer screen just by thinking about where you want to move it." Accordingly, there is a need to make such enablers that could capture, analyze, process, and transfer the brain signals, and command a gadget based on the instructions that a user has in mind. This paper discusses an enabler that is insert-able in a user's ear to record an electroencephalography in the brain as brain signals while the user imagines various commands for controlling a gadget. The ear could provide a relatively inconspicuous location. Indeed, ear is known as a site where brain wave activity is detectable. Certain areas of the ear, such as the area of the ear canal have proven to be better locations for detecting brain wave activity. Particularly, the area of the upper part of the ear, called the triangular fossa has high brain wave activity, especially near the skull. It is considered that the thinness of the skull at this area could facilitate higher reading of the brain wave activities. The proposed enabler of this paper could transmit, for example wirelessly, the brain signals to a processing unit inserted in the gadget. The processing unit decodes the received brain signals by a pattern recognition technique. Based on the decoded brain signals, the processing unit could control applications that are installed in the gadget. The details of the device and system that could facilitate such brain-machine interface are discussed in this paper. This paper addresses the current technologies in mind-reading systems, the deficiencies and limits of the existing technologies, along with possible solutions to have a practical device for brain-computer interaction, and the future plans to achieve such cutting-edge technology.

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LITERATURE SURVEY:

Mind-Reading System - A Cutting-Edge Technology", by Farhad Shir, Ph.D, McGinn IP Law, PLLC ,Vienna, Virginia U.S.A,

In this paper, we describe a human-computer interface (HCI) system that includes an enabler for controlling gadgets based on signal analysis of brain activities transmitted from the enabler to the gadgets. The enabler is insertable in a user's ear and includes a recorder that records brain signals. A processing unit of the system, which is inserted in a gadget, commands the gadget based on decoding the recorded brain signals. The proposed device and system could facilitate a brain machine interface to control the gadget from electroencephalography signals in the user's brain.

Wolpaw, J. R., Birbaumer N., McFarland, D. J., Pfurtscheller, G., Vaughan, T. M., ("Brain-computer interfaces for communication and control. Clinical Neurophysiology"), Vol.113, pp.767-791. Jun.2002.

This paper addresses the current technologies in mind-reading systems, the deficiencies and limits of the existing technologies, along with possible solutions to have a practical device for brain-computer interaction, and the future plans to achieve such cutting-edge technology.

II. ARCHITECTURE OF MIND READING SYSTEM

A transmitting device installed in the enabler produces a radio frequency signal corresponding to voltages sensed by the recorder and transmits the radio frequency signal by radio frequency telemetry through a transmitting antenna. The transmitting device could include the transmitting antenna, a transmitter, an amplifying device, a controller, and a power supply unit, such as a battery. The amplifying device could include an input amplifier and a bandpass filter. The amplifying device receives an electrode signal from the recorder.

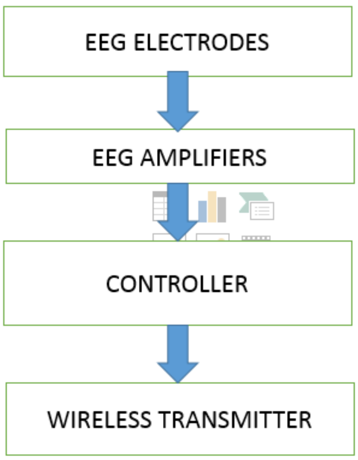

Fig.1 TRANSMITTER NODE

The receiver node to receive the EEG signal as encoding method. Then it will be converted into commanding message signal by using of RS232 converter cable.(see Fig.2). Where, the receiver side wireless receiver,PIC microcontroller are used to receive the analog signal from the transmitter node.

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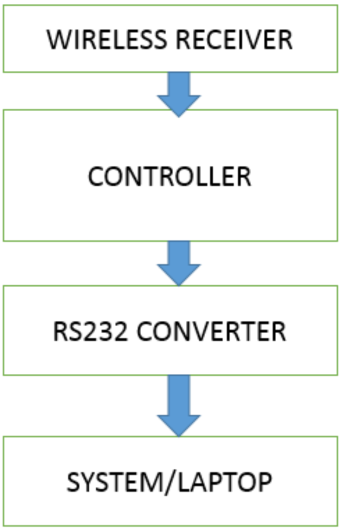

Fig.2 RECEIVER NODE

III. FUTURE PLANS, LIMITATIONS

The electrode signal is a response to changes in the brain electrical activities of the user. The input amplifier could provide an initial gain to the electrode signal, and the bandpass filter could provide an additional gain to the electrode signal resulting in an output signal with an overall gain of much higher than the electrode signal. The controller is electrically connected to the bandpass filter. The output signal from the bandpass filter is inputted to the controller.

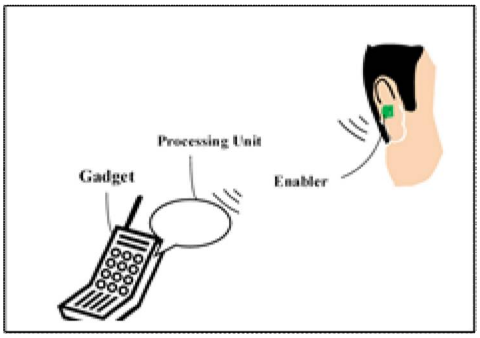

Fig. 3. Mind-reading enabler communicating with a processing unit of a gadget

The last century of neuroscience research has greatly increased our knowledge about the brain and particularly, the electrical signals emitted by neurons ring in the brain. The patterns and frequencies of these electrical signals can be measured by placing a sensor on the scalp. the Mind Tools line of headset products contain NeuroSky think Gear technology, which measures the analog electrical signals, commonly referred to as brainwaves, and processes them into digital signals. The think Gear technology then makes those measurements and signals available to games and applications.

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Fig .4 Brainwave Visualizer

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The decoder decodes the data output using a common algorithm such as pattern classifier. By evaluating frequencies in a wide range from theta to gamma brain signals recorded by the recorder, complex cognitive signals are decodable and are used for controlling the gadget.
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IV. RESULTS AND DISCUSSION

EEG under general anesthesia depends on the type of anesthetic employed. With halogenated anesthetics, such as halothane or intravenous agents, such as protocol, a rapid (alpha or low beta), nonreactive EEG pattern is seen over most of the scalp, especially anteriorly; in some older terminology this was known as a WAR (widespread anterior rapid) pattern, contrasted with a WAIS (widespread slow) pattern associated with high doses of opiates. Anesthetic effects on EEG signals are beginning to be understood at the level of drug actions on different kinds of synapses and the circuits that allow synchronized neuronal activity.

Wave patterns

ALPHA WAVES:

Alpha is the frequency range from 8 Hz to 12 Hz. Hans Berger named the first rhythmic EEG activity he saw as the "alpha wave". This was the "posterior basic rhythm" (also called the "posterior dominant rhythm" or the "posterior alpha rhythm"), seen in the posterior regions of the head on both sides, higher in amplitude on the dominant side. It emerges with closing of the eyes and with relaxation, and attenuates with eye opening or mental exertion. The posterior basic rhythm is actually slower than 8 Hz in young children (therefore technically in the theta range).

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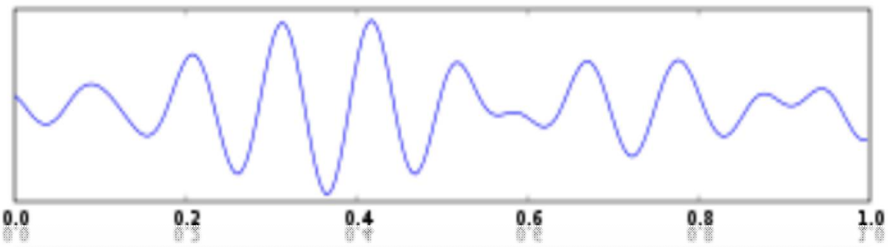

Fig.5 Alpha waves

In addition to the posterior basic rhythm, there are other normal alpha rhythms such as the mu rhythm (alpha activity in the contralateral sensory and motor cortical areas that emerges when the hands and arms are idle; and the "third rhythm" (alpha activity in the temporal or frontal lobes). Alpha can be abnormal; for example, an EEG that has diffuse alpha occurring in coma and is not responsive to external stimuli is referred to as "alpha coma".

BETA WAVES:

Beta is the frequency range from 12 Hz to about 30 Hz. It is seen usually on both sides in symmetrical distribution and is most evident frontally. Beta activity is closely linked to motor behavior and is generally attenuated during active movements. Low amplitude beta with multiple and varying frequencies is often associated with active, busy or anxious thinking and active concentration. Rhythmic beta with a dominant set of frequencies is associated with various pathologies and drug effects, especially benzodiazepines. It may be absent or reduced in areas of cortical damage. It is the dominant rhythm in patients who are alert or anxious or who have their eyes open.

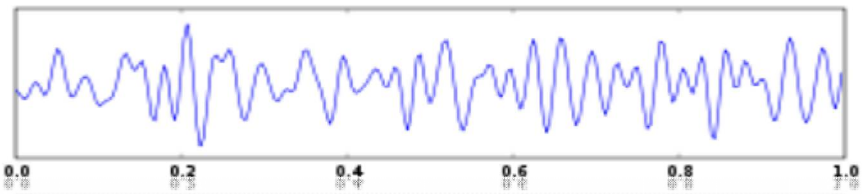

Fig.6 Beta waves

GAMMA WAVES:

Fig.8 Gamma wave is the frequency range approximately 30–100 Hz. Gamma rhythms are thought to represent binding of different populations of neurons together into a network for the purpose of carrying out a certain cognitive or motor function.

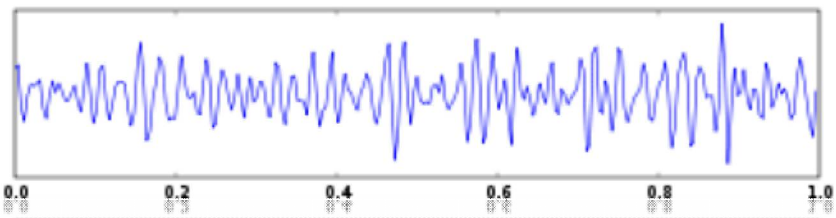

Fig.7 Gamma waves

DELTA WAVES:

Delta is the frequency range up to 4 Hz. It tends to be the highest in amplitude and the slowest waves. It is seen normally in adults in slow wave sleep. It is also seen normally in babies. It may occur focally with subcortical lesions

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and in general distribution with diffuse lesions, metabolic encephalopathy hydrocephalus or deep midline lesions. It is usually most prominent frontally in adults (e.g. FIRDA - Frontal Intermittent Rhythmic Delta) and posteriorly in children (e.g. OIRDA - Occipital Intermittent Rhythmic Delta).

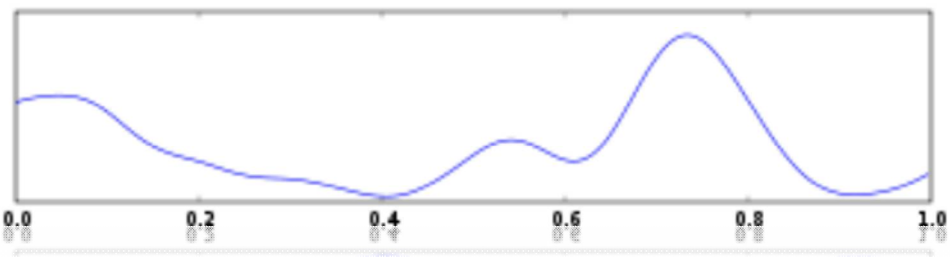

Fig.8 Delta waves

THETA WAVES**:**

Theta is the frequency range from 4 Hz to 7 Hz.Fig.9. Theta is seen normally in young children. It may be seen in drowsiness or arousal in older children and adults; it can also be seen in meditation. Excess theta for age represents abnormal activity. It can be seen as a focal disturbance in focal subcortical lesions; it can be seen in generalized distribution in diffuse disorder or metabolic encephalopathy or deep midline disorders or some instances of hydrocephalus. On the contrary this range has been associated with reports of relaxed, meditative, and creative states.

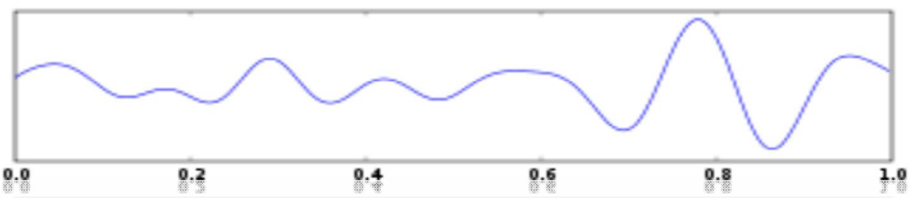

Fig.9 Theta waves

V. CONCLUSIONS

In conclusion, although considerable, rigorous research now demonstrates the potential deleterious effects of negative affective states and stress during pregnancy on birth outcomes, fetal and infant development, and family health, we do not yet have a clear grasp on the specific implications of these facts. Key issues for the next wave of research are as follows: disentangling the independent and comorbid effects of depressive symptoms, anxiety symptoms, pregnancy anxiety, and various forms of stress on maternal and infant outcomes; better understanding the concept of pregnancy anxiety and how to address it clinically; A processing unit of the system commands the device based on decoding the recorded brain signals. The proposed enabler could provide a compact, convenient, and hands-free device to facilitate a brain-machine interface to control the gadget from electroencephalography signals in the user's brain.

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