International Journal of Modern Trends in Engineering and Research
www.ijmter.com
e-ISSN No.:2349-9745, Date: 2-4 July, 2015

Smartphone Wireless Controlling and Brain Thought Monitoring System.

Mangesh G. Tuplondhe[1], Rajesh K. Agrawal[2]

[1]*Department of E&TC Engineering, S.N.J.B's KBJ COE, Chandwad, tuplondhe.mangesh25@gmail.com*
[2]*Department of E&TC Engineering, S.N.J.B's KBJ COE, Chandwad, rkdhule@yahoo.co.in*

Abstract- Most of the mobile operate and control by using keypad, touch screen, speech recognition system etc. but we have one innovative idea to avoid using any physical interface for controlling the mobile. For controlling mobile through the brain we invented "Smartphone Wireless Controlling and brain thought monitoring System". We use Wireless EEG headsets are used to acquire the brain wave frequency signals directly from the brain and after signal processing it is given to the mobile. For controlling the mobile application by using brain wave frequency for that purpose we develop "brain Mobile control Application". When user wants to open particular application he just thinks about this application. When user see this particular application icon on the mobile screen his brain produce P300 brain wave signal. When mobile receive this P300 brain wave signal then it stop this application icon on screen. After that user open this application by wink his eyes. Simultaneously "Brain thought monitoring Application (BTM apps)"displays the status of different brain wave frequency on the mobile screen.

Keywords- Brain computer interface (BCI); brain-mobile controlled application (BMC apps); Brain thought monitoring Application (BTM apps); P300; and EEG headsets.

I. INTRODUCTION

Most of the mobile operate and control by using keypad, touch screen, speech recognition system etc. but we have one innovative idea to avoid using any physical device physical interface with mobile. We use Wireless EEG headsets are used to acquire the brain wave frequency signals directly from the brain and after signal processing it is given to the mobile.

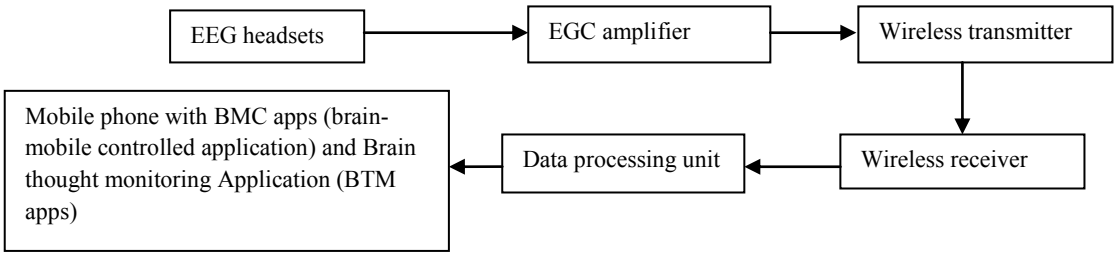

Figure 1. Block diagram of smartphone Wireless controlling system using brain wave frequency signal

Human brain can produce different brain wave frequencies such as alpha, gamma, theta etc. but the frequency of that wave very less .it about less than 50Hz. So in our system we use EEG headsets to sense this frequency from human brain and through Bluetooth this frequency given to the mobile phone. In mobile phone we implemented BMC apps (brain-mobile controlled application). This application is run when our mobile connected to EEG headsets though the Bluetooth. When mobile receive less than 50Hz frequency. This frequency is called gamma frequency. When brain frequency controller apps receive this frequency, it flashes different applications icons sequentially on the screen one by one. At time only one application icons is flash on the screen mobile phone for 2 seconds. When user want to open adobe reader application when adobe reader applicationicons flash on screen the user brain produced the P300 brain wave signal. P300 Positive peaks in the brain waves due to infrequent visual, auditory or somatosensory stimuli. These peaks elicited about 300 ms after attending to an oddball stimulus among several frequent stimuli. When mobile receive this signal form EEG headsets, it automatically stop adobe reader application icons on the screen. EEG headsets continuously monitor the brain wave frequency. When user winks his eyes then this application automatically open. Similarly we can open different mobile application.

II. SYSTEM AND ARCHITECTURE

In this section we provide details description about hardware and software of our system. In our system we use different device for sensing, wireless transmission of signal and controlling.

2.1 EEG Headsets

[2]When humans perform any activity such as move, smile or even think, some nerve cells are activated and generate short electrical signal called action potentials (Wolpaw et al., 2012). These potentials are transferable between cells through synapses. EEG data is typically recorded by small electrodes. There are different types of electrodes available: disposable electrodes, metal cup electrodes, needle electrodes (invasive), and gelled electrodes cups. The metal and gelled electrodes are currently used for BCI applications (Stieglitz et al., 2009). Despite that, some researchers are attempting to develop user-friendly dry electrodes to minimize the preparation time required (Liao et al., 2012).Although studies use different numbers of electrodes according to the mental tasks analyzed; EEG electrodes are generally placed at particular locations on the scalp.

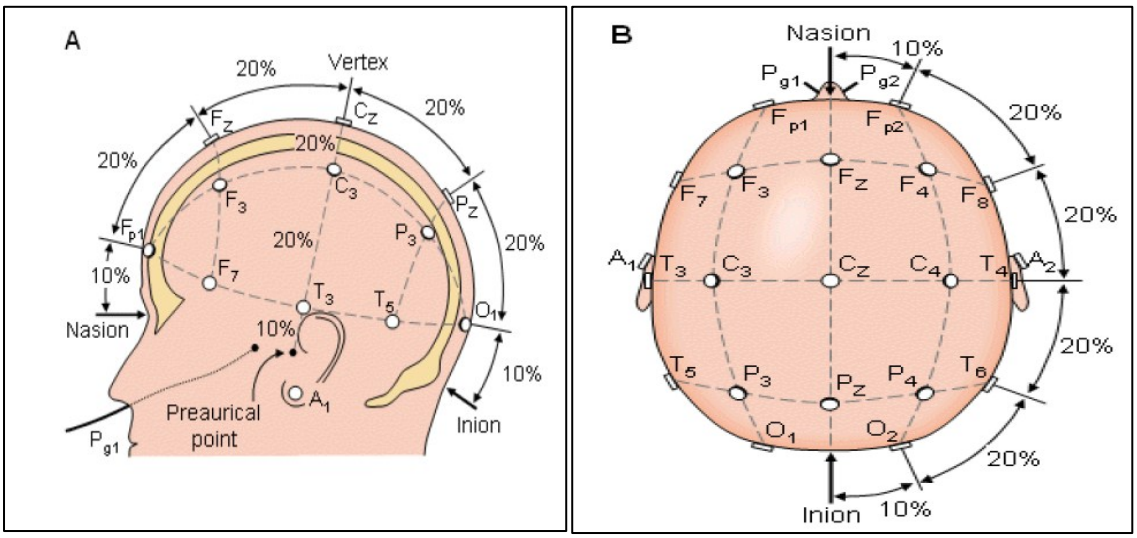

Figure 2. The electrodes " positions and the channels" names in the 10-20 international EEG replacement system (Fernando et al., 2009, p. 1217).

EEG data is typically recorded by small electrodes. There are different types of electrodes available: disposable electrodes, metal cup electrodes, needle electrodes (invasive), and gelled electrodes cups. The metal and gelled electrodes are currently used for BCI applications (Stieglitz et al., 2009). Despite that, some researchers are attempting to develop user-friendly dry electrodes to minimize the preparation time required (Liao et al., 2012).

2.2 BMC Apps (Brain-Mobile Controlled Application)

For controlling the smartphone through the brain wave frequency we implement the BMC apps (brain-mobile controlled application) that work on brain wave frequency. When we connect EEG headsets to the mobile through the wireless device such as Bluetooth. Then it automatically flashes the different icon on the mobile screen one by one. We demonstrate a brain-mobile controlled application, which works on similar principles to a P300-speller [7] brain-computer interface: the phone flashes a sequence of icons of different application and a P300 brain potential is elicited when the flashed icon matches the application that the user wishesto open. We also demonstrate a version of the same app whichdetects the much larger and more easily detectable EEG signals triggered by the user winking their eyes when the target application icon appears. [1]This "wink"-triggered application controlling works robustly in noisy conditions. The P300, or "think"-triggered, dialeris very promising but at present less reliable. One could arguethat other "hands off" types of actuation such as voicerecognition is more suitable an interface to mobile applications.However, our goal is to best understand how firing neurons can drive mobile applications and what the current limitations in the state of the art are when using off-the-shelf wireless EEG headsets and phones.

2.2.1 Algorithm For Mobile Controlling System Through Brain

1. Start
2. Connect EEG to the mobile trough Bluetooth
3. When mobile is connected to the EEG
4. If mobile do not receive gamma wave itsearch gamma wave.
5. If mobile receive gamma wave
6. Brain frequency mobile controller application flashes different icon of different application on the screen one by one for 2second delay.
7. If mobile receive P300 brain wave then Mobile stops this application icon on mobile screen.
8. When user winks his eyes then selected application will be open.

2.2 Brain Thought Monitoring Application (BTM apps)

When EEG headset send Brain wave frequency signal to the mobile through the wireless device such as Bluetooth. When mobile receive this signal Brain thought monitoring Application (BTM apps) automatically display the status of different brain wave frequency signal on upper sidebar of mobile screen. When mobile receive this brain wave frequency from EEG headsets then its display this frequency on mobile screen upper sidebar and simultaneously display the

2.2.1 Delta(1-3 Hz) :. When mobile receive this brain wave frequency from EEG headsets then its display this frequency on mobile screen upper sidebar and simultaneously display the "sleeping" status on mobile screen.[2] This wave has high amplitude but low frequency. It is seen in young children normally, and also in adults when they are sleeping.

2.2.1Theta (4-7 Hz): When mobile receive this brain wave frequency from EEG headsets then its display "4-7 Hz" frequency on mobile screen upper sidebar and simultaneously display the

"medications, relaxation and creative status" status on mobile screen.[2] This signal is normally seen in young children, it could be as well generated in older children and adults in arousal or drowsiness. It is also associated with medications, relaxation and creative status.

2.2.3 Alpha(8-13 Hz): When mobile receive this brain wave frequency from EEG headsets then its display "8-13 Hz" frequency on mobile screen upper sidebar and simultaneously display the "mental exertion" status on mobile screen.[2] This is the first type of wave discovered in the human brain. It has high amplitude. It emerges with eyes closing and relaxation, and attenuates with opening the eyes and mental exertion.

2.2.4Beta (14-30 Hz): When mobile receive this brain wave frequency from EEG headsets then its display "14-30 Hz" frequency on mobile screen upper sidebar and simultaneously display the "anxious thinking " status on mobile screen.[2] Beta wave can be also called sensorimotor rhythm, as it accrues when arms or hands idle. It could be associated with drugs and anxious thinking. It is generated from the frontal lobe, and is widely used for motor BCI applications. In the case of cortical damage this wave could be absent.

2.2.5Gamma (>30Hz): When mobile receive this brain wave frequency from EEG headsets then its display ">30Hz" frequency on mobile screen upper sidebar and simultaneously display the "alertness, working and motor movements" status on mobile screen.[2] This pattern is associated with alertness, working and motor movements .

2.2.6Algorithm For Brain Thought Monitoring System.

1. Start
2. EEG monitors the different brain frequencies
3. EEG sends this frequency to Mobile through Bluetooth
4. Mobile receives these brain frequencies and mobile application do classification
5. When mobile receive the Delta 1-3 Hz frequency then Mobile display "sleeping" status.
6. When mobile receive the Theta 4-7 Hz frequency then Mobile display **"**medications, relaxation and creative" status.
7. When mobile receive the Alpha18-30 Hz frequency then Mobile display **"**anxious thinking" status
8. When mobile receive the Gamma>30 Hz frequency then Mobile display **"**medications, relaxation and creative" status.

III. RESULTS

Figure 3 shows the target and non-target stimuli of single channel EEG waveform it can be noted that the potential raises at around 300 to 350 ms i.e. the response to the target will be accurate during this time period and that is why it is termed as P300 Event Related Potential (P300 ERP).

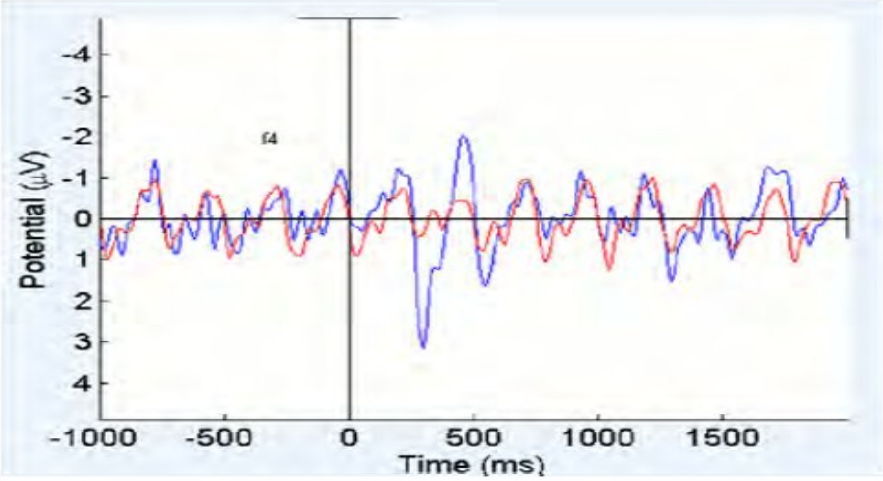

Figure 3 The EEG pattern of target and non-target waveform for single channel.

IV. CONCLUSIONS

In this paper we had put forward the emerging Smartphone Wireless Controlling and brain thought monitoring System for the purpose of fast mobile operation without any physical interface and monitoring the human thought for improving the thinking of human. When any person use this brain thought monitoring system he gets the real time information about its thought. So by using brain thought monitoring system human can control there thought.

REFERENCES

[1] NeuroPhone: Brain-Mobile Phone Interface using a Wireless EEG Headset Andrew T. Campbell, TanzeemChoudhury, Shaohan Hu, Hong Lu, Matthew K. Mukerjee!, Mashfiqui Rabbi, and Rajeev D. S. Raizada Dartmouth College, Hanover, NH, USA

[2] Real-time Detection of P300 Brain Events: Brain-computer Interfaces for EEG-based Communication Aids Rehab Mahdi Alkhater

[3] Portable Brainwave Monitor Submitted by: Team 3517 – AmjadChatila, Jason Van Asdlan, Joseph Bitz, Henry

[4] NeuroPhone: Brain-Mobile Phone Interface using a Wireless EEG HeadsetAndrew T. Campbell, TanzeemChoudhury, Shaohan Hu, Hong Lu,Matthew K. Mukerjee!, Mashfiqui Rabbi, and Rajeev D. S. Raizada Dartmouth College, Hanover, NH, USA

[5] Brain enabled mechanized speechsynthesizer using Brain Mobile InterfaceG.N.Jayabhavani, N.R.RaajanSchool of Electrical and Electronics Engineering, SASTRA University, Thanjavur, TamilNadu, India

[6] Brain enabled mechanized speech synthesizer using Brain Mobile Interface G.N.Jayabhavani, N.R.Raajan School of Electrical and Electronics Engineering, SASTRA University, Thanjavur, TamilNadu, India

[7] Development of a Real-Time Wireless Embedded Brain Signal Acquisition/Processing System and its Application on Driver's Drowsiness Estimation Hung-Yi Hsieh, Sheng-Fu Liang, Li-Wei Ko, May Lin, and Chin-Teng Lin, Fellow, IEEE

[8] D. E. J. Linden. The P300: where in the brain is it produced and what does it tell us? Neuroscientist, 11(6):563–76, Dec 2005.

[9] Real-Time non linear Bio-signals detection using fuzzy logic For wireless brain computer interface. Ganesan 1, G. Vijayalakshimi 2 and Dr.T. Aruldoss Albert Victoire.

