EEG Based Attention Tracking During Distracted Driving

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ABSTRACT *Driving is a skill that requires drivers to direct their full attention to control the cars. Distracted driving might lead to many catastrophic consequences. The operation of automotive electronic devices and mobile devices has been greatly augmented during driving. Some of these technological devices increase safety and reduce the drivers' attention load. However, operating the in-vehicle systems sometimes impairs driver's attention that is taken away from the primary driving tasks. In particular, conversing on the phone while driving is easily distracting, even with hands- free systems. Also drowsiness is becoming a severe issue in case of traffic accidents. Normally, Sleeping can be identified from several factors like eye blink level, yawning, gripping force on the wheel and so on. But all these measuring techniques will check only the physical activities of the human. In some cases, people will mentally sleep with eyes open for a few seconds. This will make very big accidents in driving. In our proposed project work we are analyzing the mental activities of brain using EEG signals based on Brain- Computer Interface (BCI) Technology. Brain-computer interface (BCI), an actively progressing field in brain engineering, refers to a platform that measures the specific intent of the user and issues commands to the computer by using EEG. This kind of interface can be used on various applications.*

Keywords: *BCI, Vehicle Controlling, Brain Signals, EEG.*

Introduction:

Recently, driving safely has received increasing attention of the publics due to the growing number of traffic accidents. Drivers' fatigue has been implicated as a causal factor in many accidents because of the marked decline in the drivers' abilities of perception, recognition and vehicle control abilities while sleepy. Although many governments and vehicle manufacturers try to make policies to prevent such accidents including strategies to address rates of speed, alcohol consumption; promotion of using helmets and seat belts, enhancements of vehicle structures, etc. the knowledge and technologies available today are still not yet enough to prevent the catastrophic incidents resulted from loss of alertness and lack of attentions on drivers intrinsically. Many factors can cause drowsiness or fatigue in driving including lack of sleep, long driving hours, use of sedating medications, consumption of alcohol, and some driving patterns such as driving at midnight, early morning, midafternoon hours, and especially in a monotonous driving environment. Accurate and nonintrusive real-time monitoring of driver's drowsiness would be highly desirable, particularly if this measure could be further used to predict changes in driver's performance capacity. The main aim of this project is to control the device based on electrical signals of brain. The brain-computer interface (BCI), also known as the brain- machine interface (BMI), enables us to interact with computers or machines through the use of electrical signals that occur in the brain after estimate a human intention. BCI is a communication system, which enables the user to control special applications by using only his or her thoughts. Different research groups have examined and used different methods to achieve this. Almost all of them are based on electroencephalography (EEG) recorded from the scalp. The EEG is measured and sampled while the user imagines different things (for example, moving the left or the right hand). Depending on the BCI, particular preprocessing and feature extraction methods are applied to the EEG sample of certain length. It is then possible to detect the task-specific EEG signals or patterns from the EEG samples with a certain level of accuracy Human brain consists of millions of interconnected neurons. This neuron pattern will change according to the human thoughts. At each pattern formation unique electric brain signal will form. If a person is mentally sleeping with eyes open then the attention level brain signal will get changed than the normal condition. This project work uses a brain wave sensor which can collect EEG based brain signals of different frequency and amplitude and it will convert these signals into packets and transmit through Bluetooth medium into the level splitter section to check the attention level. Level splitter section (LSS) analyses the level and gives the drowsy driving alert and keeps the vehicle to be in self-controlled function until awakened state. This can save a lot of lives in road transportation.

BLOCK DIAGRAM:

The Brain wave sensor receives the EEG signals from brain. This signal is given into Bluetooth and converts into Bluetooth packets and sends to the data processing system. The processor i.e. level splitter section analyses the signal. Then that raw data is converted into some meaning full data and transmitted serially to system. The data is received and given to Microcontroller. According to the signal the drowsy mode is detected. Then motor is deactivated and then alarm is buzzed. The vehicle is stopped for certain time and again start on. Now we again receive EEG signals and if it is in still that state then we stopped the vehicle.

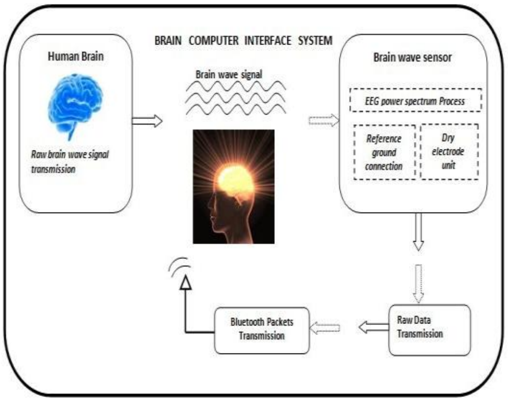


Fig (1) Brain computer interface

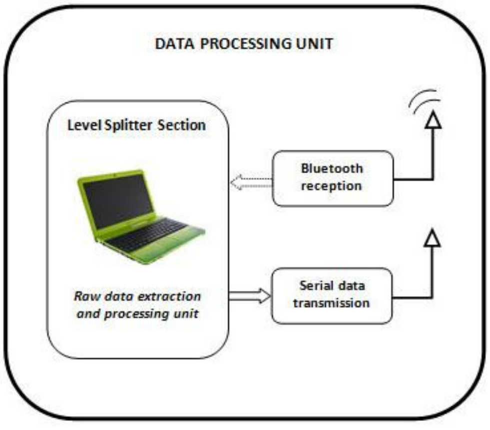


Fig (2) Data Processing Interface

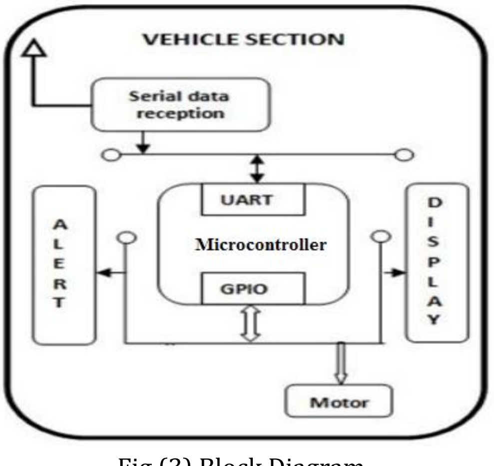


Fig (3) Block Diagram

EEG Data Acquisition and Processing:

The EEG data were acquired with an electrode cap with a 32Ag/AgCl electrodes that were placed according to a modifiedinternational 10–20 system and recorded with a 16-bit quantization level at a sampling rate of 500 Hz (NeuroScan, NeuroScan

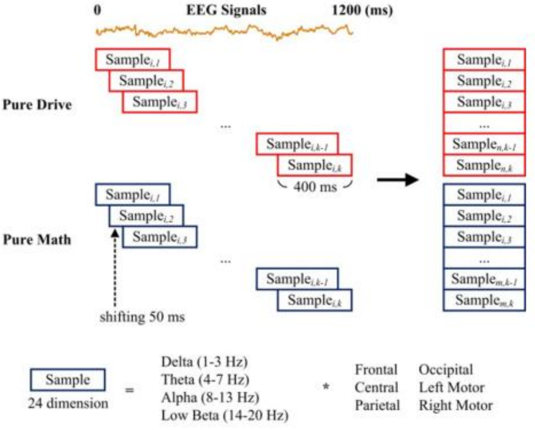
Inc., Herndon, VA, USA). All electrodes were referenced tolinked mastoids (A1 and A2), and a single ground electrode wasattached to the forehead. The contact impedance between theEEG electrodes and the scalp reduced to below 10 k with conductive gel.EEGLAB, an open source toolbox (Swartz Centerfor Computational Neuroscience, La Jolla, CA, USA;http://www.sccn.ucsd.edu/eeglab), was utilized to process EEGdata. All EEG data were down-sampled to 250 Hz. Next, alow-pass filter with a cutoff frequency of 50 Hz and high-passfilter with a cutoff frequency of 0.5 Hz were applied to remove

the line noise and the DC drift, respectively. Because the fiveconditions were randomly displayed throughout the experiment, the recorded EEG signals related to each condition wereextracted from the continuous data. The EEG signals with incorrect reactions were removed from further analyses since thenumber of incorrect responses was too few to obtain consistentEEG features. The filtered EEG signals weredecomposed into independent brain sources by independentcomponent analysis (ICA) [27], [28]. Since two reference electrodes (A1 and A2) were excluded, 30 independent components

(ICs) were separated by ICA from the 30 channels of the EEGsignals.ICA recovers the ICs from the recorded data that are considered to be a linear mixture of activities arising from different

brain and non-brain signals. Each brain and non-brain IC isidentified with an activity time course (its "activation") and itsprojection to the recording electrode (its "scalp map"). ICs accounting for eye blinks are usually highly spatially stereotyped.

ICs accounting for muscle activities are also usually well modeled by ICA. Muscle component scalp maps are vary dependingon the muscle they represent. The component scalp maps typically exhibit a sharp polarity reversal at the muscle's point ofinsertion into the skull, and the spectra of muscle component.



Typicallyis high power at frequencies above 20 Hz [29]. Furthermore, muscle tension is typically not maintained throughoutan entire experiment. Once a component has been identified asart factual, it may be removed from the data by reversing the

ICA linear unmixing process [28]. Art factual components accounting for eye blinks, eye movements, muscle activity, andbad channels are isolated and removed [28]. Non-artifact IC

scalp maps often strongly resemble the projection of a singledipole, allowing the location and orientation of the best-fittingequivalent dipole (or other source model) to be easily determined [29]. The activities from the frontal, central, parietal, occipital, left motor, and right motor areas were selected for further

analyses.

CONCLUSION

Brain signals reflect the handled activities and controlling behavior of the brain or the influence of the received information from other body parts either sensing or internal organs. Brain Computer Interfacing provides a channeling facility between brain and external equipment. BCI applications have attracted the research community. Several studies have been presented in this paper regarding the growing interest in BCI application fields such as medical, organizational, transportation, games and entertainment, and security and authentication fields. It also demonstrates the various devices used for capturing brain signals.

REFRENCES

1. *Dajeong Kim, Hyungseob Han, Sangjin Cho and UipilChong (2013)' Detection Of Drowsiness With Eyes Open Using EEG based Power Spectrum Analysis ' IEEE journal.*
2. *Singh HimaniParmar, MehulJajal, Yadav Priyanka Brijbhan(2010) ' Drowsy Driver Warning System Using Image Processing', International Journal Of Engineering Development And Research, pp no. 78-83*
3. *S. F. Liang, C. T. Lin, R. C. Wu, Y. C. Chen, T. Y. Huang, and T. P. Jung(2005), 'Monitoring Driver's Alertness Based on the Driving Performance Estimation and the EEG Power Spectrum Analysis' Engineering in Medicine and Biology 27th Annual Conference Shanghai, China, P.P No 5738- 5741*
4. *M.VenkataSubash, P.Suresh, (2014)' Detection Of Somnolence With Eyes Open Exploitation With Eeg Power Spectrographic Analysis', International Journal Of Reviews On Recent Electronics And Computer Science Volume-2, P.P No 2497- 2504*
5. *Abhi R. Varma, Seema V. Arote, Chetna Bharti, Kuldeep Singh (2012), 'Accident Prevention Using Eye Blinking and Head Movement', International Journal of Computer Applications P.P NO 18- 22*
6. *G.N. Keshava, Murthy and Zaved Ahmed Khan(2013), 'Smart Alert System for Driver Drowsiness Using EEG and Eyelid Movements' Middle-East Journal of Scientific Research P.P NO 610- 619.*