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Drowsy Driver Detection and Accident Prevention System using Bio-Medical Electronics

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ABSTRACT: The traditional vehicle-based and vision based drowsy detection become apparent only after the driver starts to sleep, which is often too late to prevent an accident. In this proposed project a buzzer with low power consumption, is placed near the driver which would wake up the driver while he falls asleep while driving. The EEG-sensor senses the brain signals and also the eye blink of the driver using ADS1299, and the entire device is operated using an Op-amp TLV 2760. The EEG signal is converted to digital using ADS1299 Analog front end and the output is acquired using MSP430G2553. The speed of the car will be varied according to the EEG signals. If the car slows down the indication is displayed at the back of the car using a LED display. Thus a sensor able to detect the activities and components of brain is important for comprehensive care and analysis of body conditions. The Low cost embedded drowsy driver detection system determines the sensor result and if it is below or above the optimum value it will indicate by the buzzer and the LED indication at the back of the car will help others viewing the vehicle slowing down**.**

KEYWORDS: MSP 430, ADS1299, TLV 2760, Motor, Drowsiness, etc.,

I.INTRODUCTION

Electromyography is the few important indicators of biomedical signals for computing and health monitoring [1]. The substantial germaneness of electro encephalography (EEG) signal is to review the oscitancy and vigilance level of subject those who forced to do uninteresting, but mind debate on jobs such as driving [2]. Now a day's lot of heavy accident happens due to inevitable drowsiness and tiredness, so it is necessary to have a real time system that supervises driver's drowsiness continuously. There are so many technical alertness system is existing already for drowsy detection. They are, drowsy detection using image processing by complete monitoring of eye open and close [3]. Boverie developed the same system using their eyelid movement [4]. Grace developed new gadget using PERCLOS calculation and giving external noise using buzzer to wake up the subject [5]. Lin proposed a new design of drowsy detection by the combination of EEG power spectra estimation and fuzzy neural network [6]. Wavelet method of identifying drowsiness [7].In 2008 another method was introduced based on EEG to estimate vigilance states and used temporal series information to supervise EEG data clustering [8].

In this research paper we have designed a new instrument which reads the subject brain waves continuously and gives feedback in the form of led signal. In previous protocols, researchers concentrate on only drowsiness but they are not gives important while driving. Some of them have done this research using real car [1][7][8]. But these protocols feedbacks only after the subject slept. So in order to rectify these problems we designed new protocol which identifies subject drowsiness before he is going to sleep. Also to decrease the death rate which increase year by year according to table.1 which is given below.

Table.1 Accidental death due to unsafe driving survey from 2009-2014

Year	Accident	Increased Death Rate %
2009	3,34,766	1.2
2010	3,59,583	1.5
2011	3,67,194	2.1
2012	3,72,022	5.2
2013	3,94,982	7.4
2014	4,13,786	8.9

In the proposed system, an alarm with low power consumption is placed near the driver which will wake up the driver while he falls asleep during driving. The EEG-sensor senses the brain signals of the driver and if he falls asleep it will send the signal to the embedded system for further processing. The signal is sent to the amplifier and the amplified signal is given to the comparator that compares the input signal (amplified brain wave signal) with the threshold voltage that is set according to different sensation states of the driver. According to the output given from the comparator the LED glows indicating the state of the driver. Then the LED is connected to the MSP430 controller circuit through a flexible wire that controls the LCD, Buzzer and Engine of the vehicle. The LCD in our project is used to indicate that the driver is at drowsy state to the other vehicle driver which is coming behind. The buzzer is used to wake up the driver if he is in the drowsy state. Embedded drowsy detection system is the combination of brain wave sensing sensor that is the electrode with an in-built copper plate that extracts the signal and passes it to the amplifier which is then given to the MSP430 circuit for controlling the operation. Driver fatigue is a significant factor in a most of the vehicle accidents. The improvement in the technology for detection or prevention of drowsiness is a major challenge in the accident prevention systems. Because of this hazard that drowsiness is present while driving, methods need to be developed for counteracting its affects. The system to be designed needs to be a low cost drowsy detection system. Preventing drowsiness during driving requires a method for accurately detecting a decline in driver alertness and a method for alerting and refreshing the driver. The traditional detection system takes a long period to detect whether driver is falling asleep or not. To reduce the time of detection, the bio-medical signal from the driver's brain is sensed by a Brain-wave sensing sensor. This senses the brain activities continuously and provides the signals to the TLV2760 amplifier and is passed to comparator to control LED. To increase the sensitivity, accurate control of the apparatus by MSP430 controller is being proposed. Embedded C is used to program the controller.

The electrode which is used here is a special kind of brain signal sensing electrode. Mind Machine Interface (MMI) has been developed to address this challenge. BCIs are systems that can bypass conventional channels of communication (i.e., muscles and speech) to provide direct communication and control between the human brain and physical devices by translating different patterns of brain activity into commands in real time. The usefulness for this warning platform as a miniaturized sensor and flexible designs with the ability of real-time detection of drowsiness becomes the vital part of the system. Now-a-days drowsy driving is one of the largest contributors to fatal victims in traffic accidents, either as a direct cause of falling asleep or as a contributing factor in lowering the attention and reaction time of a driver in critical situations. These findings suggest that a driver sleepiness warning system could become an important safety measure to reduce the number of accidents on the road due to sleepiness.

There are many systems which are used for detecting the drowsy driving based on different methods. Although these systems have advantages, there are some disadvantages from the sensitively detecting ability for the changeable ambient environments and the system needed to be calibrated at the beginning on each day. A recent survey shows that various attempts have been made to produce an effective low cost and high sensitivity drowsiness detecting system with the help of Digital Circuit. Another way to increase sensitivity is accurate control of apparatus by both software and the hardware controller. The drowsy detection system inside the car consists of the brain wave sensing EEG electrode that forms the Brain-Computer Interface (BCI) in the opposite of the driver.

This sensor keeps on sensing the brain activities of the driver. If the frequency obtained from the EEG electrode is between 4-8Hz it means that the driver is in drowsy state then it will give an alarm to wake up the driver and an LCD indication to the driver who is coming behind to indicate the driver being in drowsy state. The signal taken from the

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(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 11, November 2015

driver is the input for the amplifier and then to the comparator it is then given as input to the 17 rows of LED. When the last row of LED glows, the Theta waves are detected constantly and then the voltage from the LED is given as the operating voltage to the MSP430 microcontroller that controls the buzzer, LCD and motor. Embedded C coding is written into MSP430 controller. Then after this, the alarm will be given and LCD will be displayed and the motor will be controlled based on the output of the microcontroller. This projects the implementation of sensor for the Drowsy Detection system with high sensitivity and low cost.

II. MATERIALS AND METHODS:

There are two other techniques related to Drowsy Driver Detection system. They are discussed in this section. This section explains about the various existing systems and their disadvantages. Also in this section the existing systems has been enclosed in which they use different technologies to detect apnea(Abnormal breath) but they are hard to be implement in real time applications and they are very expensive. This section also includes the analysis and output results of the existing system. The following are the existing systems: A.WCD breath detection system [9]. B.Carbon Nano Tube sensor based apnea detection [10].

III. WCD BREATH DETECTION SYSTEM

The existing system proposed by Minoru Sakairi was designed to develop the safety measures to prevent drowsy driving which is a major technical challenge for the car automation field. This is a system which involves the water cluster-detecting (WCD) breath sensor. The WCD breath sensor detects breath by measuring electric currents of positively or negatively charged water clusters in breath that is separated by using an electric field. Furthermore, the WCD breath sensor can detect breath from about 50 cm and can also test the level of alertness of a subject sitting in the driver's seat of a car. This is done by measuring the point of time at which the breathing changes from conscious, such as in pursed-lip breathing, to unconscious, such as when the driver becomes drowsy [9].The safety measure to prevent drowsy driving requires the driver to actively provide a breath sample through a mouthpiece. An additional issue that must be addressed if ignition interlocks are to be used more widely is the prevention of circumvention (e.g. ambient environment).The expired gas includes both positively and negatively charged water clusters and that a person's breath can be easily detected using this information. The WCD breath sensor detects the electrical signals of both breath and alcohol in the breath. According to the recent discovery the water clusters in expired gas can be easily separated into positively and negatively charged clusters by applying an electric field. Therefore, these charged water clusters in the breath of a person can be easily detected by blowing between parallel plate electrodes comprising a counter electrode, to which a voltage is applied, and a detection electrode connected to a Pico ammeter. Fig 2.1 shows the WCD breath alcohol sensor. The small charged water clusters are easily deflected by using an electric field to collide with the detection electrode to generate electric currents. This sensor is much more compact than the mass spectrometer used for detecting the electric current of ions.

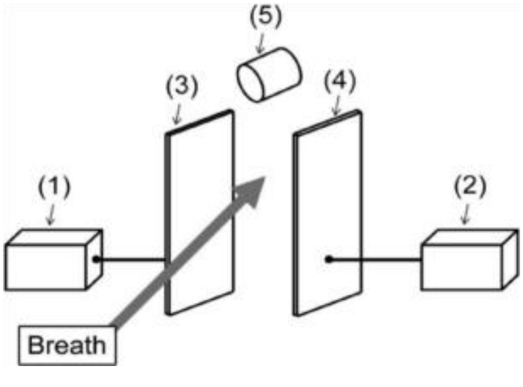

Fig.1.Diagram of WCD breath-alcohol sensor

(1) Pico ammeter, (2) power supply, (3) detection electrode, (4) counter electrode, and(5) Breath sensor head

The alcohol sensor head, which is based on a solid-state sensor, is installed just above the counter and detection electrodes in the breath sensor unit. With this configuration, breath and alcohol peaks for one exhalation of air can be

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Vol. 4, Issue 11, November 2015

simultaneously detected. In the experiments carried out here, solid state sensors were used as the alcohol sensor because they respond faster than fuel cell sensors. The analysing region between the detection electrode and the counter electrode was pumped by a diaphragm pump (5 L/min) from underneath. This was very effective for achieving high time resolution of breath peaks. The experimental fact is that total current of breath is almost zero and the currents of positively and negatively charged clusters produced by applying voltage are almost the same.
In Fig.1 the condition that a diaphragm pump is not used, charged water clusters can be approximately analysed by measuring the motion of charged water clusters in the direction of the gravitational force (air resistance, buoyant force, and gravitation) and at right angles to that direction (force by electric field and air resistance).

In Fig.2 Lg is the distance between the position of the charged water cluster existing between the two electrodes and the bottom of the detection electrode in the direction of gravitational force, and Lr is the distance between the position of the charged water cluster between the two electrodes and the detection electrode at right angles to the gravitational force direction

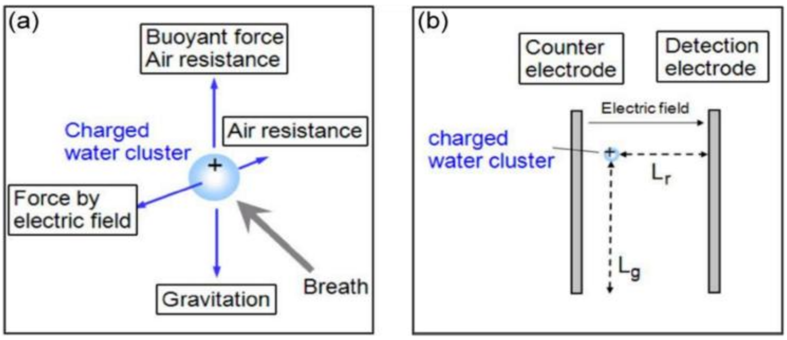

Fig.2. Principle of WCD (a) Forces acting on charged particles and (b) simple detection principle

IV. RESULTS AND DISCUSSION

The following result shows the serial measurements of a test subject's breath based on conscious breathing (pursed-lip breathing) by the WCD breath sensor at a distance of about 50 cm. When conscious breathing becomes unconscious breathing as a result of drowsiness, the breath peaks disappear at the time points indicated. Fig.3 shows the graphical output. In addition, yawns result in the frequency change of detecting breath peaks.

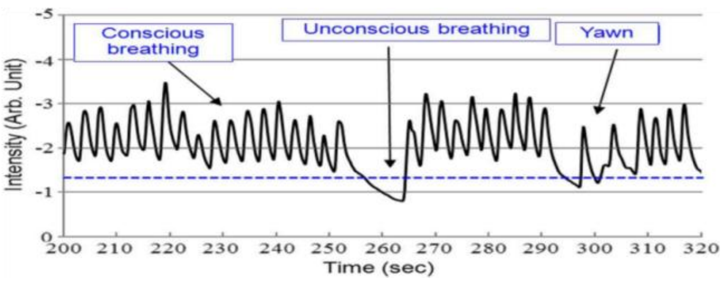

Fig.3. Serial detection of breath

V. CNT SENSOR FOR APNEA DETECTION

This existing system has been developed for the real-time detection of Apnea using the Carbon Nano Tube sensor in Nano Electro Mechanical System [10]. This system involves the use of inter-digitized electrodes as the sensor's base. An experimental platform with above CNT-based nano electromechanical system (NEMS) was designed for detecting performances of variable simulated human breaths. The mini-sensor is mounted in a connecting tube and equipped to a programmed microchip processor. Breath detection was carried out in a testing tube which the temperature, pressure, and relative humidity could be checked conveniently.

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The CNT-based sensor, as an airflow transformer, was mounted on the inner top of the small tube and its miniaturized detection plane of the CNT networks was set parallel to the exhaled breath flow. Then the sensor was connected to the Microchip processor through a flexible wire. The presentations of breathing activity were transformed to digital changes of resistance or voltage through processing of KEITHLEY 2000 multi-meter. The data were transmitted to the computer for recording with an average drafting rate of 5 points/sec. The processor with amplification of the warning signals, when breath rate was abnormal, was programmed by C programming language. Fig.4 gives the overall setup of the system.

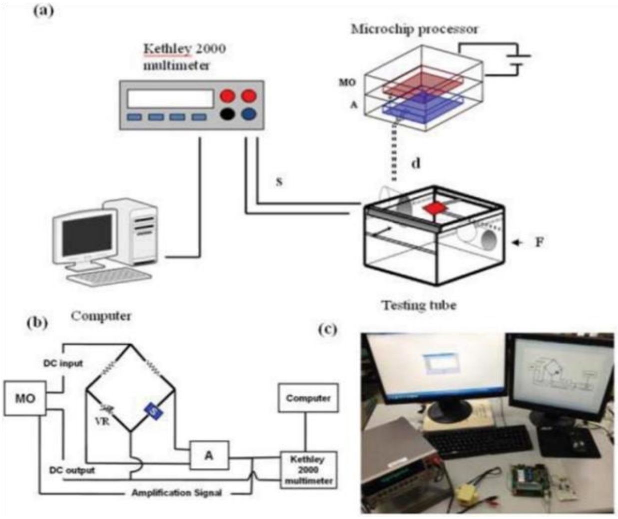

Fig.4. Experimental Setup of MWCNT sensor

(a) Components of electromechanical system (b) CMOS circuit for the testing platform (c) the practical configuration of experimental NEMS

According to the setup, exhaled breath from the person is taken as the input for the system. The current device set the cut-off point of warning signals on when breath rate was less than six per minute. Warning function for high frequency was not done in this study because of the unclear definition for high breath rate and less medical contributions in clinical aspects. Because the maximal electric voltage of the working system was set on the upper limit of 5 volts, calibration of the integrated system with the 20 K-ohms variable resistance (VR) were done in order to adjust the starting baseline around or below the mid-portion (2.5 volts) of highest voltage.

During tests, the surface of Si base was grounded to prevent charge accumulation. We measured the responses of the sensor to breaths through monitoring output electronic parameters, resistance (R) or voltage (V) as a function of time (t), i.e. R-t and V-t patterns. A comparison table 2 gives the relevant details about Patterns of simulated tests for breaths.

Table.2. Patterns of simulated tests for Breaths

Patterns/Items*/B. Time	1st minute	2nd minute	3rd minute
1	Normal	Normal	Normal
2	Apnea	Apnea	Apnea
3	Normal	Apnea	Apnea
4	Randomly abnormal	Randomly abnormal	Apnea

*Normal: 7/12 times/min; **Apnea**: ≤6 times/min; **randomly abnormal**: >12 times/min.

The results of this testing platform showed that this new NEMS can work sensitively as a breath monitor. The representative performance of the CNT networks to breath flow. The changes of electric properties on the CNT networks reflected that the responses of the sensor to the exhaled flow were more apparent compared to those of stochastic ambient noises and compressed air flows. The performances showed its anti-interference ability and functional works for detection of breathing under an open system. CNT sensor had the unique properties with strong reaction to exhaled flows but no or less responses to the inhaled flows, which indicated its favorable detection in the expiratory phase.

The CNT sensor for breaths got the similar results both on the same day and different day. According to individual performance parameters, each recorded wave showed unique moving changes of characteristic compositions, such as strength, flow rate, and exhaled components. That meant that no two waves created by different breaths, same or different volunteer, were recorded with the same moving data due to different breathing parameters and components. The changes of electric properties on the CNT networks reflected that the responses of the sensor to the exhaled flow were more apparent compared to those of stochastic ambient noises and compressed air flows. This unique presentation of the MWCNT sensor indicated that this sensor could work as like a fingerprinting recorder to breaths. Table.1 gives the breath rate of volunteers subjected to test.

VI. PROPOSED WORK

The proposed works are briefly described in this section. The system hardware consists of the signal acquisition module. The EEG signal is captured through the EEG electrode; the inbuilt amplifier will amplify the captured EEG signals. The EEG signals is then passed to the High Pass Filter which is capable of filtering 60Hz. Then it is given to the Low Pass Filter which is capable of filtering up to 5Hz. At the same time the amplified EEG signals is given to the LM339 comparator, the acquired voltage is compared with the reference voltage. From the obtained voltage ,the various states of the driver is indicated using LED whereas the red LED represents the active state of the driver, the yellow indicates the normal state of the driver and the green represents the drowsy state of the driver. The program for the whole module is dumped into the microcontroller. Whenever the drowsy state is detected, the microcontroller enables the motor to slow down and the drowsy state of the driver is indicated using LCD display and the alarm starts to ring.Fig.5, Shows the overall block diagram of the proposed system.

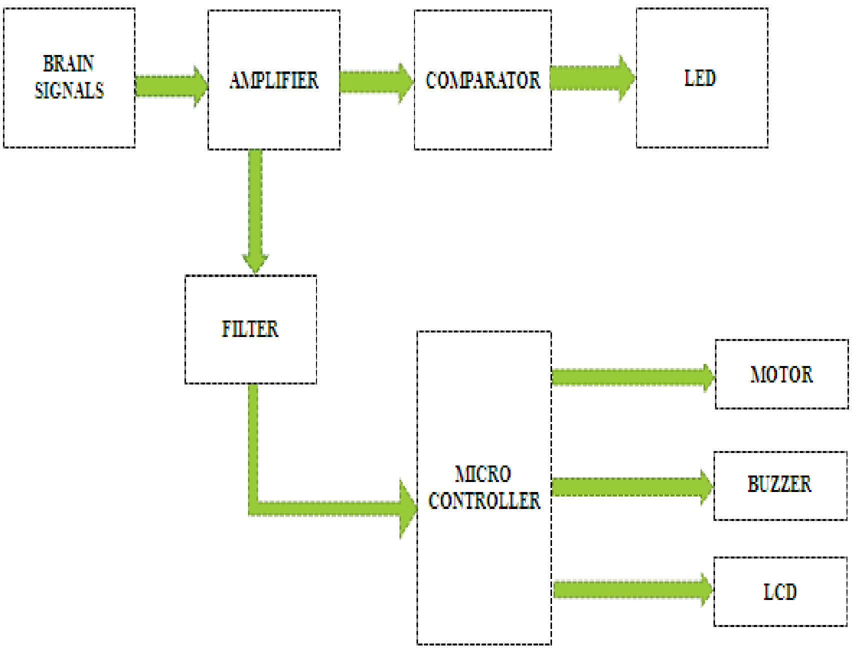

Fig.5. Overall block diagram

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International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 11, November 2015

The Fig.6, shows the hardware work flow of the proposed system

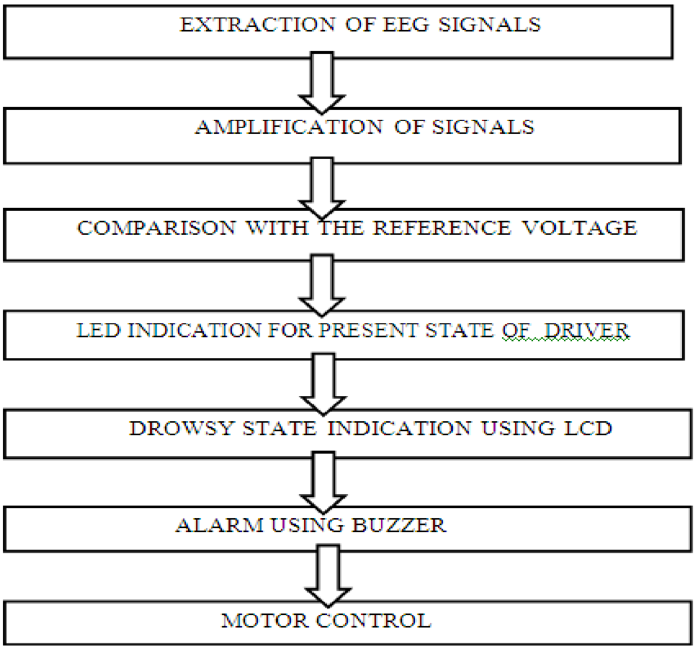

Fig.6. Hardware Work Flow

The proposed system is separated into three modules each module is discussed in this section. The modules are as follows

VII. EXTRACTION OF BRAIN SIGNALS

The electroencephalogram (EEG) is a record of the electric signals generated as the result of brain activity. EEG provides important and unique information about the sleeping brain. While EEG signals have advantage in making accurate and quantitative assessment of alertness levels.EEG signal will be obtained from the Brain wave Sensor. EEG signal is quite small, ranges from 1Hz to 100Hz and amplitudes vary from 1µV to 100µV.

Fig.7. Brain Wave Sensor Components

The above Fig.7 is headset device is used to extract the EEG signals from the human brain. A pair of electrodes is affixed inside the headset which is responsible for the extraction of brain waves.
The overall block diagram of extraction of EEG signals is shown in the Fig.8.

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(An ISO 3297: 2007 Certified Organization)

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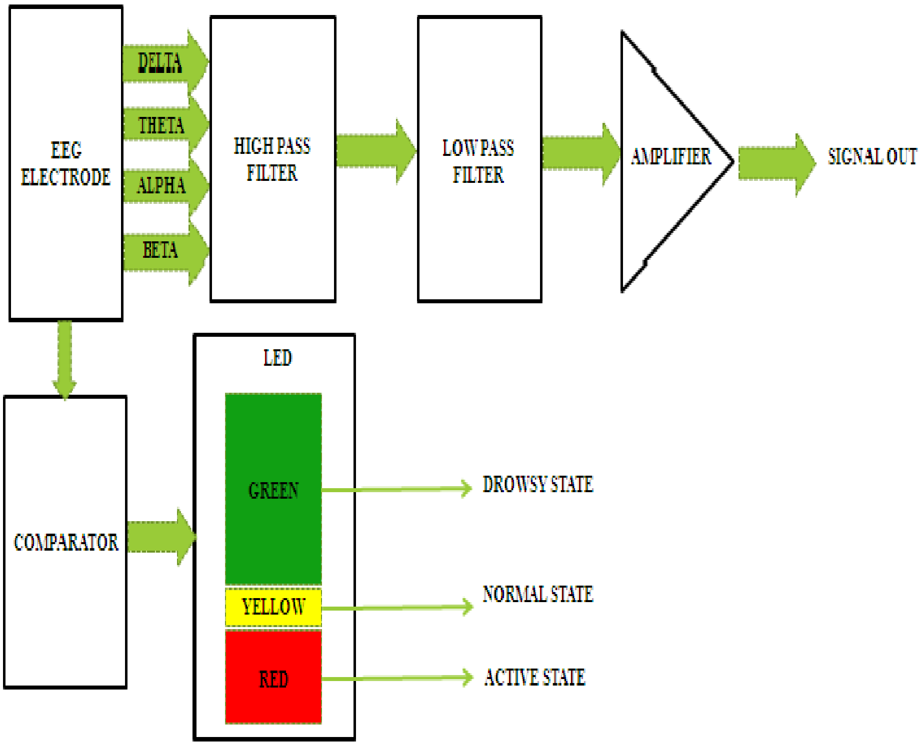

Fig.8. Block diagram for extracting EEG signals

In this project EEG signals is obtained from the EEG Electrode. The electrode is in the form of mobile headset and the device consists of a headset with USB cable is shown in Fig.7 the EEG electrode is resting on the forehead above the eye. The headset transfers signal to the circuit board. It analyzes your brain waves to identify rhythms that reflect a calm meditative state and those that reflect an alert attentive state. The brainwave visualizing unit is used to understand how it 'feels' to pay attention and how it 'feels' to meditate so that you can better control your focus and attention
The human brain generates electrical signal called EEG signal that have been classified into 4 categories as follows,

Table.3. EEG Signals with frequency ranges

S.NO	SIGNALS	FREQUENCY
1	Delta	0.3 – 4 Hz
2	Theta	4 – 8 Hz
3	Alpha	8 – 13 Hz
4	Beta	Above 13 Hz

Table.3 shows different levels of EEG signal has been shown in the. For the drowsy state detection the alpha and theta waves are very important. Our brainwaves change according to what we’re doing and feeling. When slower brainwaves are dominant we can feel tired, slow, sluggish, or dreamy.

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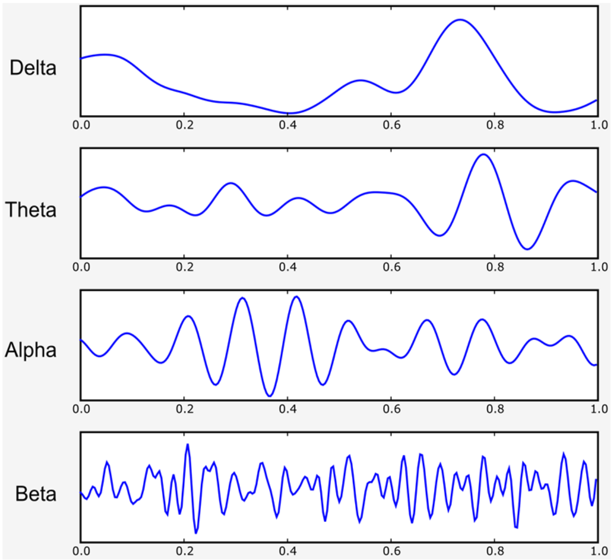

Fig.9. EEG signal – Classification

The four types of waves from the EEG electrode are given inside high pass filter and then low pass filter to extract the required signal that is used to detect the drowsy state of the driver that is to extract the Theta wave. Then the output of the filter is given inside the amplifier to amplify the signal as required for further processing. The four waves from the EEG electrode are fed into the comparator and the LED is controlled. There are three types of LED they are green indicating the drowsy state of the driver, yellow indicating the normal state of the driver and red indicating the active state of the driver.

This EEG electrode keeps on sensing the brain activities of the driver. If the frequency obtained from the EEG electrode is between 4-8Hz it means that the driver is in drowsy state then it will give an alarm to wake up the driver and an LCD indication to the driver who is coming at the back that the driver is in drowsy state. The signal abstracted from the driver is the input for the amplifier and then to the comparator, it is then given as input to the 17 rows of LED when the last row of LED glows when the Theta waves are detected constantly then the voltage from the LED is given as the operating voltage to the MSP430 microcontroller that controls the buzzer, LCD, motor.

PROGRAMMING

This section describes about the programming part that is to be dumped into the microcontroller. Through the EEG signals are captured from the skin of the driver. The tapped input is given to the amplifier. That data is extracted and processed for further process. That input data is passed to MSP430 microcontroller through the CCS coding and the process is carried out. The fig.10 shows the flowchart of the program

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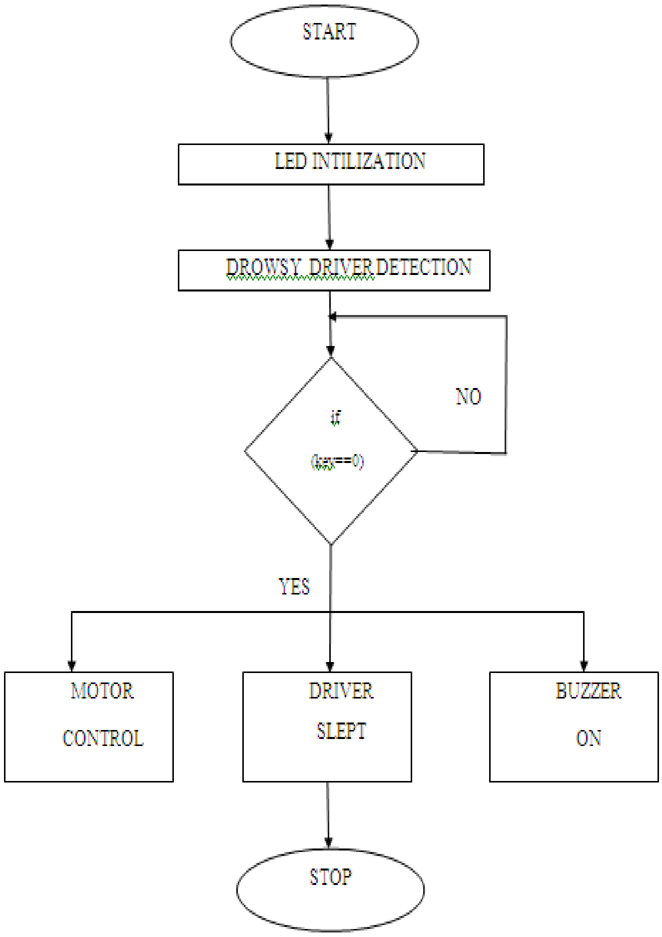

Fig.10. Flowchart for program

INTERFACING CONTROLLER WITH OUTPUT UNIT

This section describes about the controlling part that is interfaced with the output unit.

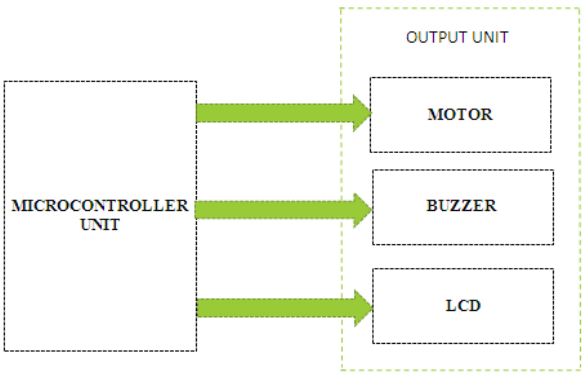

Fig.11.Interfacing controller with output unit

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International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

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Vol. 4, Issue 11, November 2015

As soon as the frequency obtained is between 4 to 8 Hz from the amplifier, the drowsy state of the driver is being detected and input voltage of 5volts is given as input to the microcontroller MSP430.As the microcontroller is being interface with the output unit containing Buzzer, motor and LCD is controlled. As soon as the drowsiness of the driver is detected buzzer that helps to wake up the driver, motor gets slows down and the LCD indicating that the driver is at the drowsy state. In this paper, focusing of the electrode to acquire the accurate bio signal from the subject is achieved. After signal accusation, the signal is amplified with the help of preamplifier and then the amplified signal is given to the suitable controller which has both system interface and sensor interface features. Each blocks of this implementation is explained below in detail.

VIII. DISCUSSION

This section deals with the total hardware description of the drowsiness detection system. It describes the overall working process of the system. The hardware components are chosen with care so that the complete system can fit in a car. The components are also chosen on the basis of specifications, features and cost. According to the coding written, the input is processed and act based on the standard values.

Whenever the drowsiness is detected the speed of the motor will be reduced, the message will be displayed on the LCD display to indicate the vehicle coming behind and the buzzer which is placed near the seat will ring. The processed signal is given to the high pass filter followed by the low pass filter and to the amplifier for the proper extraction of signals. Fig.12 shows the amplifier circuit.

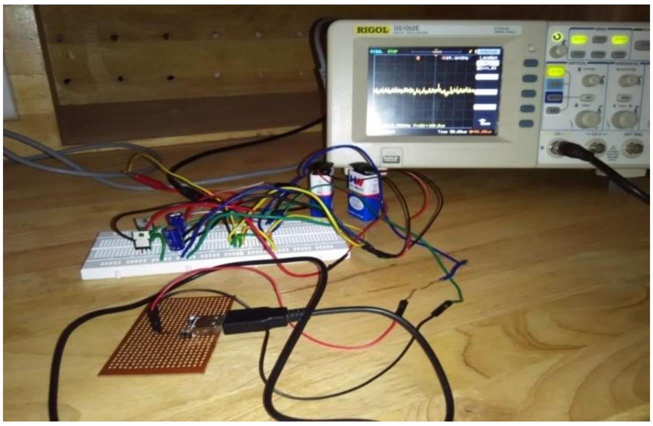

Fig .12 Amplifier circuit

The EEG signals are given to the comparator. The comparator compares the acquired voltage with reference voltage. The output voltage denotes the various state of the driver that is depicted using LED. Fig.13 indicates the active state of the driver which is depicted using red LED. Fig.15 indicates the normal state of the driver which is depicted using yellow LED. Fig.16 indicates the drowsy state of the driver which is depicted using green LED.

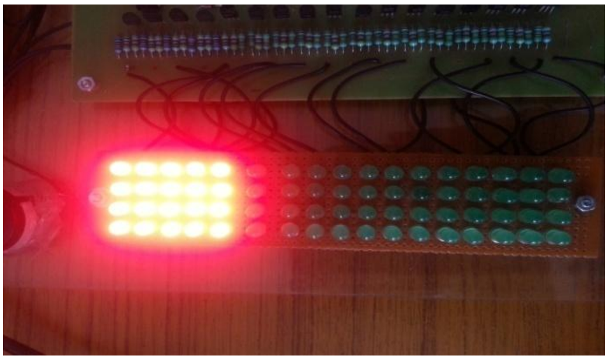

Fig .13 LED Indicating active state of a driver

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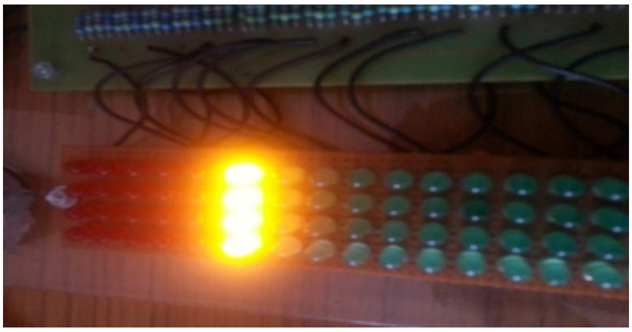

Fig .14 LED Indicating normal state of a driver

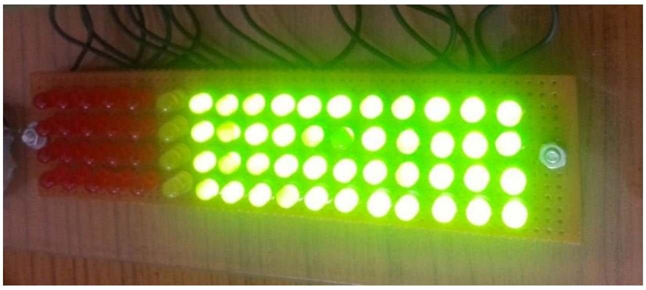

Fig.15 LED Indicating drowsy state of a driver

For each and every variation in the state of the driver, different rows of LED begin to glow. Whenever the last row green LED glows the speed of the motor will be reduced. At the same time a message will be displayed on the LCD which is to indicate the vehicle coming behind and the alarm starts to ring. Fig.16 shows the LCD output during the drowsy state of the driver

Fig.16 LCD output during drowsy state.

Fig.17 Snapshot of the complete unit

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Vol. 4, Issue 11, November 2015

Whenever the drowsy state is detected the controller will enable the motor to slow down which is connected with a relay. At the same time an alarm is given using a buzzer to the driver to make him awake and the state of the driver is displayed in the LCD screen which is to be placed at the back of the car to indicate the person coming behind.

IX. CONCLUSION AND FUTURE ENHANCEMENT

The traditional vehicle based and vision based drowsy detection is apparent only when the driver fell asleep. This is often too late to prevent accident. Therefore the existing systems have been proven not so effective till date. The vast possibilities of mind machine interface (MMI) have been utilized to overcome the above mentioned drawbacks of drowsy detection system in this project. A low power consumption alarm system along with a EEG sensor system is employed. The sensors are set with high sensitivity aided with low cost and high reliability. This has a real time application in day to day life as the number of accidents that are fatal as well as not, are increasing in an alarming rate. The activity of the brain is taken as the input and fed to comparator (LM339) circuit, processed with microcontroller. The normal and abnormal rate is set according to the authentic and preferred standards available. Software module is employed in microcontroller to control the motor, LCD and buzzer. A high frequency alarm is used to wake up the sleeping driver which is placed near his seat. Number of speakers is varied according to the requirements. This experiment varies from the previously implemented projects as the sensitivity and range is successfully increased. In this module we integrated the drowsy detection and alerting system with car automation. As the driver is still unconscious even after the alarm set off, the car will halt in the leftmost side. To make this happen, we used some essential alteration in steering system of the car. As the driver will be unconscious when the car is getting halted by it, making the system aware of the nearby cars and will help to take a safe distance. When it accidentally collides with any vehicle, the vibration sensors will get noticed and will help to change the course accordingly. Steering and braking system is always connected to navigate the car with less collision.

REFERENCES

[1] Vince Stanford "Biosignals offer potential for Direct Interfaces and Health Monitoring" Pervasive Computing, IEEE, VOL.3, and Issue: 1 March 2004.

[2] Kurt MB, Sezgin N, Akin M, Kirbas G, Bayram M. The ANN-based computing of drowsy level. Expert Syst Appl. 2009; 36:2534–42.

[3] Ueno H, Kaneda M, Tsukino M. Development of drowsiness detection system. In Proc. of 1994 vehicle navigation and information systems Conference, Yokohama, Japan, IEEE. 1994:15–20

[4] Boverie S, Leqellec JM, Hirl A. Intelligent systems for video monitoring of vehicle cockpit. In The 1998 international congress and exposition ITS: Advanced Controls and vehicle navigation systems. 1998:1–5.SAE international; SAE Technical Paper 980613 doi: 10.4271/980613.

[5] Grace R. 2001. Drowsy driver monitor and warning system. In International driving symposium on human factors in driver assessment, training and vehicle design, Aspen, CO; pp. 201–208. citeseer.

[6] Lin CT, Chen YC, Wu RC, Liang SF, Huang TY. Assessment of Driver's Driving Performance and Alertness Using EEG-based Fuzzy Neural Networks, ISCAS 2005. IEEE International Symposium on Circuits and Systems. 2005; 1:152–5.

[7] Subasi A. Automatic recognition of alertness level from EEG by using neural Network and wavelet coefficients. Expert Syst Appl. 2005; 28:701–11.

[8] Yildiz A, Akin M, Poyraz M, Kirbas G. Application of adaptive neuro-fuzzy inference system for vigilance level estimation by using wavelet-entropy feature extraction. Expert Syst Appl.2008; 36:7390–7399.

[9] Minoru Sakairi,"Water-Cluster-Detecting Breath Sensor and Applications in Cars for Detecting Drunk or Drowsy Driving" IEEE SENSORS JOURNAL, VOL. 12, NO. 5, MAY 2012

[10] Hung-Chang Liu, Wen-Chien Huang, Yu-Jen Chen, Chih-Cheng Lu, and Jung-Tang Huang, "An Electromechanical System Based on Carbon Nanotube Sensors to Detect Apnea" IEEE SENSORS JOURNAL, VOL. 13, NO. 7, JULY 2013

[11] Luzheng Bi, Member, IEEE, Xin-An Fan, and Yili Liu, Member, IEEE, EEG-Based Brain-Controlled Mobile Robots, "IEEE TRANSACTIONS ON HUMAN-MACHINE SYSTEMS", VOL. 43, NO. 2, MARCH 2013

[12] Kohji Murata, Etsunori Fujita, Shigeyuki Kojima, Shinitirou Maeda, Yumi Ogura, Tsutomu Kamei,Toshio Tsuji, Member, IEEE, Shigehiko Kaneko, Masao Yoshizumi, and Nobutaka Suzuki,"Noninvasive Biological Sensor System for Detection of Drunk Driving" IEEE TRANSACTIONS ON INFORMATION TECHNOLOGY IN BIOMEDICINE, VOL. 15, NO. 1, JANUARY 2011

[13] Alfredo Burgos, Alfredo Go˜ni, Arantza Illarramendi, and Jes´us Berm´udez, "Real-Time Detection of Apneas on a PDA" IEEE TRANSACTIONS ON INFORMATION TECHNOLOGY IN BIOMEDICINE, VOL. 14, NO. 4, JULY 2010

[14] U.S. Dept. of Transportation, "Traffic Safety Facts 2006: A Compilation of Motor Vehicle Crash Data from the Fatality Analysis Reporting System and the General Estimates System," tech. report DOTHS 810 818, Nat'l Highway Traffic Safety Administration, 2006.

[15] Y. Liang, "Detecting driver distraction," Ph. D thesis, University of Iowa, 2009.

[16] Martini, Frederic; Bartholomew, Edwin (2001). Essentials of Anatomy & Physiology. San Francisco: Benjamin. p. 263. ISBN 0-13-061567-6.

[17] Carlson, Neil (2013). Physiology of Behavior. New Jersey: Pearson Education, Inc. ISBN 978-0-205-23939-9.

[18] Leslie Cromwell, Fred J.Weibell and Erich A. Pfeiffer, "Biomedical Instrumentation and measurements, 2nd Edition, Printice Hall India Pvt. Ltd., 2001.

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[19] Lin, Y. Leng, H. Yang, G. Cai, H.: An Intelligent Noninvasive Sensor for Driver Pulse Wave Measurement. Sensors Journal, IEEE

[20] http://ncrb.nic.in/CD-ADSI-2012/accidental-deaths- 11.pdf

[21] F. Nasoz, O. Ozyer, C. L. Lisetti, and N. Finkelstein, "Multimodal affective driver interfaces for future cars," in Proc. ACM Int. Multimedia Conf. Exhibition, 2002, pp. 319–322.

[22] Mai Suzuki, Nozomi Yamamoto, Osami Yamamoto, Tomoaki Nakano, y Shin Yamamoto: Measurement of Driver's Consciousness by Image Processing-A Method for Presuming Driver's Drowsiness by Eye-Blinks coping with Individual Differences - 2006 IEEE International Conference on Systems, Man, and Cybernetics

[23] F. Ruijia, Z. Guangyuan, C. Bo, "An on-Board System for Detecting Driver Drowsiness Based on Multi-Sensor Data Fusion Using Dempster-Shafer Theory," In Proceedings of the International Conference on Networking, Sensing and Control, Okayama, Japan, 2009.

[24] H. Uno, "Detection Decline in Arousal Level Using Combined Physiological and Behavioral Measures," JARI Research Journal Vol.25 No.8, 2003.