Real Time Monitoring for Drowsiness Detection using EEG System

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Abstract**—** Now a day's driver drowsiness effect severe accidents. Normally many factors are there for detecting drowsiness such as analysis of physiological signals Electroencephalogram (EEG), Electrocardiogram (ECG) etc., Driver behavior monitoring. The reliable detection of drowsiness is an important factor in this system. An accurate Real time monitoring of driver's drowsiness by warning system to driver, is implemented in this paper. Wireless and wearable EEG Dry electrode used for recording EEG signal. If a person mentally sleeping with eyes open for few seconds, then the level of brain signal will get change than the normal level. EEG is used to detect the abnormal conditions related to the electrical activities of the brain. Eye blinking level can be monitoring by eye blink sensor such as open or close status of eye. Object sensor used for detecting any obstacles are there, in front of the vehicle. Simulation result exposed in PROTEUS VSM Software using PIC microcontroller. The signal values are transmitted through ZigBee module. When implement, monitoring the bio-signals and driver performance like eyelid movement will increase the accuracy of drowsiness detection system. These methods are very sufficient for this drowsiness detection system.

Index Terms**—** Electroencephalogram, Eye blink sensor, Object sensor, ZigBee, Drowsiness.

I. INTRODUCTION

Drowsiness means the transition between the states of awaken and sleep during which one's abilities to observe strongly reduced. When combining the monitoring of bio signals like brain and monitoring eye blinking, have high efficient for drowsiness detection system then other methods. According to the National Highway Traffic Safety Administration (NHTSA) many crashes, injuries statistics were reported. The crashes that occur due to driver drowsiness have a number of characteristics:

- Occur late at night (0:00 am–7:00 am) or during mid-afternoon (2:00 pm–4:00 pm)
- Involve a single vehicle running off the road
- Driver is often alone
- Blood alcohol level below the legal driving limit
- Vehicle ran off the road or onto the back of another vehicle
- Vehicle has no mechanical defect
- Good weather conditions and clear visibility

II. EXISTING MODEL

The wet Electroencephalogram (EEG) system incorporates the use of a wireless and wearable EEG device to monitor EEG signals. Additionally, the system can process EEG recordings and translate them into the vigilance level. The wireless and wearable EEG device transmitted its recorded data through blue tooth interface to user's device. The device should be able to operate accurately and reliably in both day time and night time illuminations conditions.

FEATURES

The EEG signal was measured with a composition of four spoon electrodes located on the vertex zone of the cranium and attached to the head surface with colloid. Once the subjects are seated and connected to the acquisition systems, they were asked to drive for around 8 hours on a real highway or a mountain route stopping during at least 10 minutes every two hours of continuous driving or every time they felt drowsy. Regardless of the type of measurement, one of the chief problems of drowsiness detection studies is the difficulty of carrying out experimental tests to validate the techniques.

DRAWBACKS

- Measuring EEG signals using wet EEG electrodes in hairy region is a critical factor.
- Behavioral lapses of human operators occur in attention critical settings.
- Using Bluetooth transmission can be sent the date to short distance only.
- No autonomous vehicle control.

III. PROPOSED MODEL

To implement parallel real time monitoring for drowsiness detection of driver's and to develop increasing the efficiency using additional parameters like eye blink sensor.

In proposed system it uses two wireless sensors such as eye blink sensor and biomedical sensor. The eye blink sensor is used to calculate the eye blinking rate and biomedical sensor is to calculate the pulse rate or brain waves. The object sensor is used to detect the obstacles. A wireless transmission is used to receive the sensor signals through ZigBee.

Finally a warning signal is given to alert the driver, if he feels fatigue. Peripheral Interface Controller (PIC) 16F877A Microcontroller is a standalone unit, which can perform functions on its own without any requirement for additional hard ware like I/O ports and external memory.
It is also called as _computer on chip‘.

IV. METHODOLOGY

A. BLOCK DIAGRAM

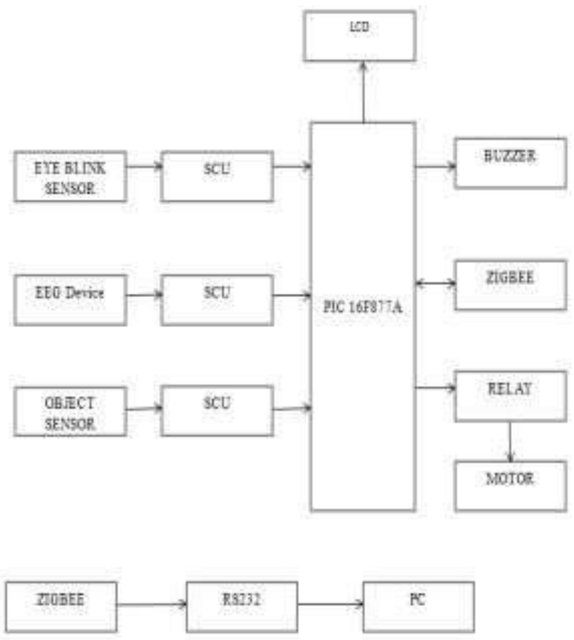

Figure Block Diagram of drowsiness detection circuit

B. BLOCK DESCRIPTION

1. OBJECT SENSOR

This is a multipurpose infrared sensor which can be used for obstacle sensing, color detection, fire detection, line sensing, etc. and also as an encoder sensor. The sensor provides a digital and an analog output. The sensor outputs a logic one (+5V) at the digital output when an object is placed in front of the sensor and logic zero (0V), when there is no object in front of the sensor.

An onboard LED is used to indicate the presence of an object. The sensor outputs an analog voltage between 0V and 5V, corresponding the distance between the sensor and the object at the analog output.

The analog output can be hooked to an ADC to get the approximate distance of the object anybody loses conscious and indicate through alarm from the sensor.

2. EYE BLINK SENSOR

This paper involves measure and controls the eye blink using IR sensor. The IR transmitter is used to transmit the infrared rays in our eye. The IR receiver is used to receive the reflected infrared rays of eye. If the eye is closed means the output of IR receiver is high otherwise the IR receiver output is low. This to know the eye is closing or opening position. This output is given to logic circuit to indicate the alarm. This involves controlling accident due to unconscious through Eye blink.

3. ANALOGTODIGITALCONVERTER MODULE

The Analog-to-Digital Converter module has five inputs for the 28-pin devices and eight for the 40/44-pin devices. The conversion of an analog input signal results in a corresponding 10-bit digital number. The A/D module has high and low-voltage reference input that is software selectable to some combination of VDD, VSS, RA2 or RA3. The ADC has a unique feature of being able to operate while the device is in Sleep mode.

4. DROWSINESS DETECTION FUNCTION

Physiological signals (i.e., ECG, EEG, eye blinking, breathing, etc) have been commonly used to study drowsiness and sleep disorders. A conventional clinic measurement system requires the electrodes to be in contact with the human body by use of coupling gel. This not only interferes with the normal driver operation, but also is not feasible for long term monitoring purposes. The innovation of this paper is a non-contact sensing system that monitors these physiological signals of drivers. The system sensing principle is based on accurately detecting the bioelectricity associated with neural activities. The system can be deployed in a vehicular environment to provide driver assistance. While drowsiness detection was the primary goal of this paper, such a system can also be utilized.

V. SIMULATION RESULTS

The followings are some simulation result diagrams.

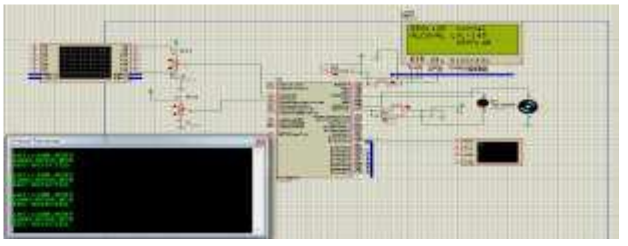

Figure EEG Monitoring Normal Output

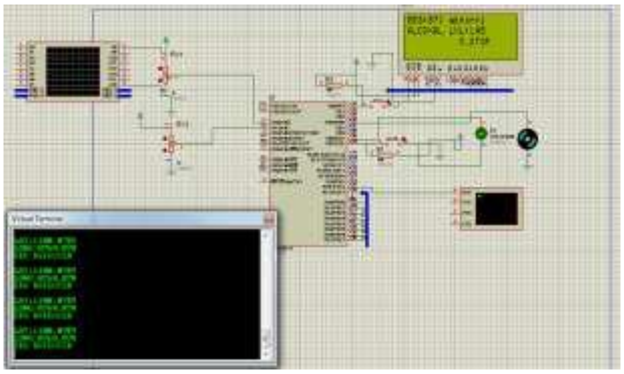

Figure EEG Monitoring Abnormal Output

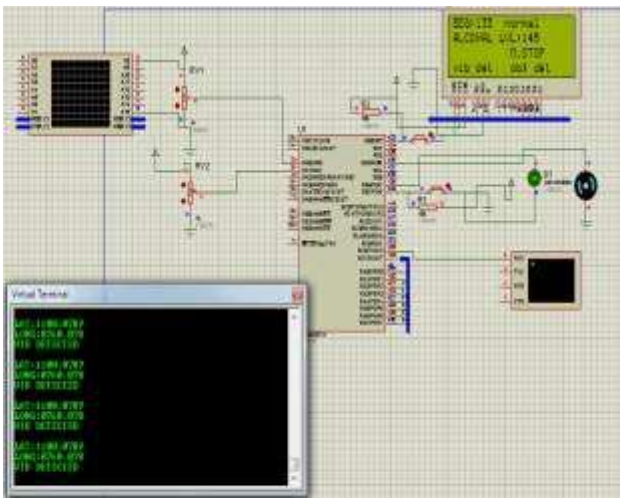

Figure Output of Object Sensor

VI. CONCLUSION

The vehicle accident prevention control System is a unique vehicle safety system designed to stop vehicle accidents due to driver sleepiness / drowsiness. A method to monitor driver safety by analyzing information related to fatigue using two distinct methods: eye movement monitoring and bio-signal processing. As the behavior of drowsy eye can be recognized, monitoring the eye could allow a car to respond adequately on the case, with activation of an ‗autopilot', if any. Eyelid movements are monitored and on their drooping below interactively determined threshold limits, the automated brake system is activated. A robust real- time embedded platform to monitor the loss of attention of the driver during day and night driving conditions. A drowsiness detection system using both brain and physical activity is presented in this paper. The brain activity is monitored using a single electroencephalographic (EEG) device. EEG is the physiological signal most commonly used to measure drowsiness. And monitoring the bio-signals using EEG sensor for detecting the drowsiness of the driver. If driver is abnormal indicate the alert. Then object Sensor are used to detect the obstacles. If there obstacles detect means this de-activates the accelerator even when the driver presses the accelerator pedal. This implementation will revolutionize the safety of vehicles and avoid significant loss of life and property.

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