

Real Time Drowsiness Detection and Health Monitoring Using DataFusion Technique

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Abstract: Fatal Road accidents can be easily avoided by understanding the psychological condition of drivers. Majority of road accidents occur during night driving due to the state of drowsiness. Existing system uses EEG signals which has low spatial resolution by which there is a serious time delay between the neuron signals and actions generated by it. This makes the system tough for the real time prediction. The above problem can be resolved by using data fusion technique where an eye blink and heart rate monitoring system that alerts the driver during the state of drowsiness. With the aid of a eye blink sensor, when the driver closes his eyes for more than 5 seconds ,the driver's data along with the heart rate variability is sent to the cloud. The driver is monitored and the wake-up message is translated to speech and sent to the driver. Health care system monitors the health and psychological condition of driver from departure of the vehicle. Genuine follow-up of the driver will also be monitored with robust GPS.

Keywords: Data Fusion, Cloud Data Analysis, GPS, Reliable Data Management.

I. INTRODUCTION

Internet of Things (IoT) plays a important role in the modern technological world ,it makes life easier for the people from urban cities to the people in rural parts of world. Transmission of data through internet makes the process reliable and free from data redundancy. The compilation of IoT technique into the automobile driving makes the driver and surrounding environment free from miserable accidents. In the year 2016 Ministry of Road Transport and Highways, India reported that 1 million accidents and 25,000 deaths occur due to state of drowsiness. Various research has been done on the topic of drowsiness pattern and driver's state during the drowsiness. A variety of techniques have been employed for the detecting driver's drowsiness with a technique involving the eye blink sensor where the number of eye blink count exceeds or if system couldn't measure any count for certain milliseconds it makes the system to predict the driver is drowsy[1].Another technique involving detection through respiratory signal and electroencephalography(EEG) by placing electrodes in contact with the driver and passing collected data through certain filter cycles to detect the drowsiness .Research in the above states that intrusive nature of the system also makes too much distraction for driver to drive further[2,3].In contrary to the intrusive technique ,A non-intrusive technique using image processing is implemented with use of camera but low light conditions makes it harder for it to detect during the state of drowsiness[4].Proposed system involves both intrusive and non-intrusive approaches for the detection of drowsiness using datafusion technique which yields more accurate results.With Health Care Monitoring the driver could ensure the safety of himself and the passengers too .Emergency button makes the nearby community informed about the health condition of the driver. IoT technology could be of enormous significance by bringing in safe and secure travel. IoT is a technological advancement that will transform the lives of people.

II. EXISTING SYSTEM

Existing system uses EEG signals by which the data collected from it passes through FIR filter where it filters out gamma and delta waves which are mainly related to deep sleep and arousal effects and these signals are used with power spectrum analysis to form an wavelet transform where if it finds the delta signals are greater than gamma signals then it is predicted that the driver is drowsy .Whenever driver feels sleepy, directly an alert message will be sent to driver through the alarm in the system. Intrusive nature of the system makes it complicated for the driver by causing distractions.

III. PROPOSED SYSTEM

Proposed system involves hybrid computation technique with eye blink sensor and heart rate variability, thus if the system finds the eyelids closed for more than 5 seconds ,then driver's heart rate data along with other collected data is passed to cloud where it is computed whether the driver is drowsy or not. If the system attempts to find the driver is drowsy it alarms the driver and if driver the dosen't responds then the system informs the nearby driver community for rescue. Driver's health condition and other sleeping patterns are recorded and viewed on the android device.

Emergency button on system sends current latitude and longitude position location to the emergency services during disambiguation.

IV. SYSTEM ARCHITECTURE

The device is designed to detect somnolence in the driver and to monitor his health. The primary function of the device is to track the physiological parameters of the driver, such as heart rate, temperature, etc., using sensors and transmitted to a smartphone using Cloud. In this proposed method, the healthcare monitoring unit is designed as a wearable device, such as a wristband where physiological sensors and transmitters are built into it. The driver is tracked and the wake-up message is translated into speech and sent to the driver. The architecture diagram shows the components that are used to design the smart wrist band and also how the data is getting stored in the cloud such that it can be accessed anywhere and at any time. The components include a power supply, heart rate sensor, emergency switch, ESP32 microcontroller, GPS module and temperature sensor. The data collected from the sensors is stored in the cloud that can be accessed anywhere and at anytime through the user's smart phone application.

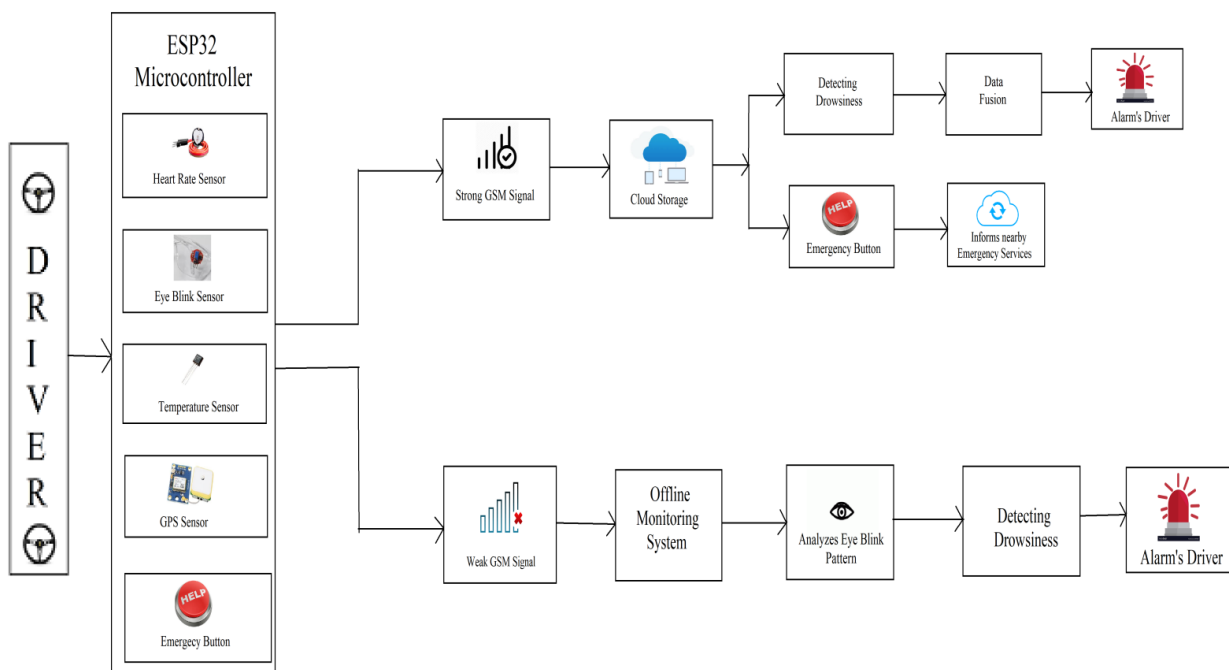


Fig. Architecture of proposed Drowsiness Detection System

V. SYSTEM IMPLEMENTATION

A. Evaluation Module

Heart beat sensor is designed to given digital output of heart beat when it is placed on sympathetic nerves .When the heart beat detectoris working, the beat LED flashes in unison with each heartbeat. This digital outputcan be connected to microcontrollerdirectly to measure the Beats Per Minute(BPM) rate. It works on the principle oflight modulation by blood flow through sympathetic nerves at each pulse. The eye-blink sensor works by illuminating the eye and eyelid area with infrared light, then monitoring the changes in the reflected light using a phototransistor and differentiator circuit. The exact functionality depends greatly on the positioning and aiming of the emitter and detector with respect to the eye.

B. Positioning Module

The working/operation of Global positioning system is based on the 'trilateration' mathematical principle. The position is determined from the distance measurements to satellites. From the the four satellites are used to determine the position of the receiver on the earth. The target location is confirmed by the 4th satellite. And three satellites are used to trace the location place. A fourth satellite is used to confirm the target location of each of those space vehicles. Global positioning system consists of satellite, control station and monitor station and receiver. The GPS receiver takes the information from the satellite and uses the method of triangulation to determine a user's exact position.

C. Cloud Analyzer Module

When eyes are closed for 5 seconds ,the system transmits drivers pshycological conditions such as heart rate,temperature to the cloud data.By using the heart rate variability and eye blink rate the machine constructs average



score for the condition. By comparing it with the trained datasets from the cloud the machine predicts that whether the user is drowsy or not. And if it is found that the driver is drowsy, then alarm is signaled. If any Emergency situations occurs, then by using the realtime longitude/latitude locations the cloud informs the nearby driver community for rescue purposes.

D. Alarm Module

The data that is collected from the sensors is sent to the cloud which is then sent to the android application. As soon as the driver closes his eyes for more than 5 seconds the driver is alerted through a message in the form of speech. This wakes up the driver from feeling Drowsy. Blynk is an open source android application that is used to collect the data from the cloud and alert the driver regarding his drowsiness.

VI. APPLICATIONS

1. Cloud Monitoring
2. Fatigue Management
3. GPS Positioning
4. Smart contacts Syncing
5. IoT Healthcare
6. Emergency Button
7. Offline Alarming System
8. Reliable Data Management

VII. CONCLUSION

Although, the potential of IoT is widely claimed to be at par, automobile firms need to understand the key features of the technology and how it can solve the current safety issues of drivers, internet enables exchange of data to a larger area while the cloud plays in feature of computation and data processing. The main role of the system is to detect the drowsiness and prevent the accidents from happening and hence, there is a need of faster data acquisition and quick decision making of embedded computing system for real time applications for making vehicles safe, automatic, responsive and intelligent. This will allow them to understand the technology, assess the risk, and enable them to attain solutions to their specific obstacles.

VII. FUTURE ENHANCEMENTS

In future, the proposed system can be embedded with the NVIDIA DRIVE AGX using which the vehicle automatically slows down during the state drowsiness and maintaining a constant speed throughout the drive until driver wakes up or through journey. If time exceed for more than specific minutes system informs to the nearby community for rescue.

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