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Minimum System Design for Identifying Drunken Drivers to Prevent Road Accidents

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Abstract: The main factors causing the majority of road accidents are fatigue and vertigo. Currently, the most important method to prevent any road accidents, perhaps globally, is the detection of drivers who are dizzy. The human body naturally experiences fatigue for a variety of reasons. Most of the drivers using heavy transport vehicles, trucks and buses are facing life threat because of this. Therefore, creating a strong alarm system is necessary to anticipate and prevent the major mishaps. In this paper an IoT-based drowsiness monitoring technique is implemented to avoid these mishaps. In this paper an alarm system for sleepy drivers has been developed using various sensors and IOT technology. In order to detect drowsiness, the Eye Aspect Ratio (EAR) and Lip Aspect Ratio (LAR) are computed. When the EAR falls below the threshold value, it is regarded as eye blinking. If the system notices more than three blinks of the eyes, buzzer will give sound to alert the driver.

Keywords: IOT, Eye Aspect Ratio (EAR), Lip Aspect Ratio (LAR), Road Accidents.

1. Introduction

Emerging nations have seen a steady increase in the number of motor vehicles over the past ten years. According to official traffic accident investigation records, a significant percentage of accidents are caused by risky driving behaviours, such as driving while intoxicated or sleepy. As mentioned earlier [1], many sleep-related car accidents happen between the early hours of 2:00 am and 6:00 in the morning and 05:00 and 07:00 in the evening, and it's often acknowledged that night shift workers are especially vulnerable. Traffic accidents kill 1.3 million people every year and leave 50 million people disabled around the world. Fig 1 has shown the Road accidents in India.
One nation where an unsettlingly high number of deaths are caused by automobile accidents is India. Not only can traffic accidents result in fatalities, but they also cause serious injuries to a great number of people each year, many of whom end up disabled. With just 1% of the vehicles worldwide, India has the highest percentage of road accident mortality worldwide (11%), despite having only 1% of all automobiles worldwide in terms of vehicular pollution. In India, there are more than 4.5 lakh road accidents annually, with about 1.5 lakh fatalities. This indicates that there are about 53 road accidents nationwide per hour, with one fatality every four minutes.

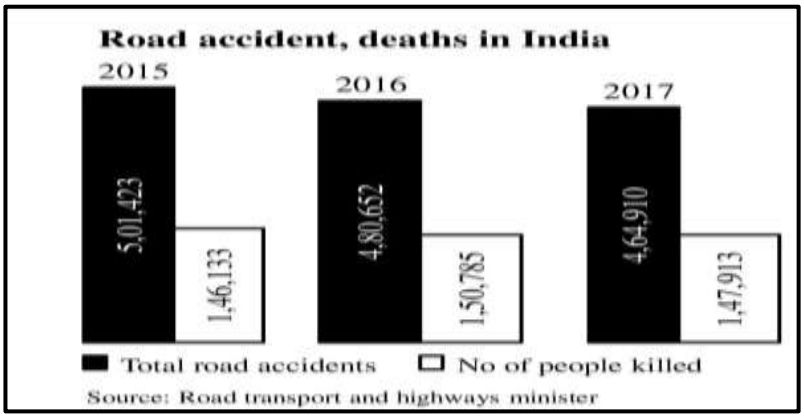

Fig 1. Road accidents in India

2. Literature Survey

These days, research is moving towards the creation of remote access models for the detection of driver tiredness. K S Tiwari [1] proposed IOT Based Driver drowsiness and health Monitoring System where the driver fatigue and light headedness was analysed. Even though GPS tracking was also incorporated, the system is expensive. Feroz Ahmed and Yugal Singh [2] pioneered the use of an alcohol sensor for driver fatigue monitoring. Arun Sahayadhas [3] et.al proposed the driver dizziness detection using EEG signals.
Using PERCLOS and facial data, Junaedi, Suhandi, and Habibullah Akbar established the concept of driver dizziness [4]. Wai Chong Chia [5] et.al suggested a mobile driver safety system that detects tiredness by analysing a single-channel EEG signal. Ramesh [6] developed dizziness identifying mechanism using multiple IR sensors. The hardware device that R. Khannan [7] proposed is entirely dependent on infrared light and can be utilised to address the issues of drunken drive. S. Gupta [8] and O. Khunpisuth [9], developed accident prevention technique using drowsiness detection by considering eye closure and yawning. U. Budak and V. Bajaj [10] proposed a model based on driver's EEG variations.

3. Proposed System

Sensors play a vital role in developing models for various solutions in IoT [11]. The proposed technology detects the driver's tiredness and sounds an alarm to warn them. Face detection is used using a camera to identify faces. The primary goal is to detect tiredness by monitoring the mouth and eyes. The car is halted and mail is sent to the authorities if alcohol or yawning is noticed.

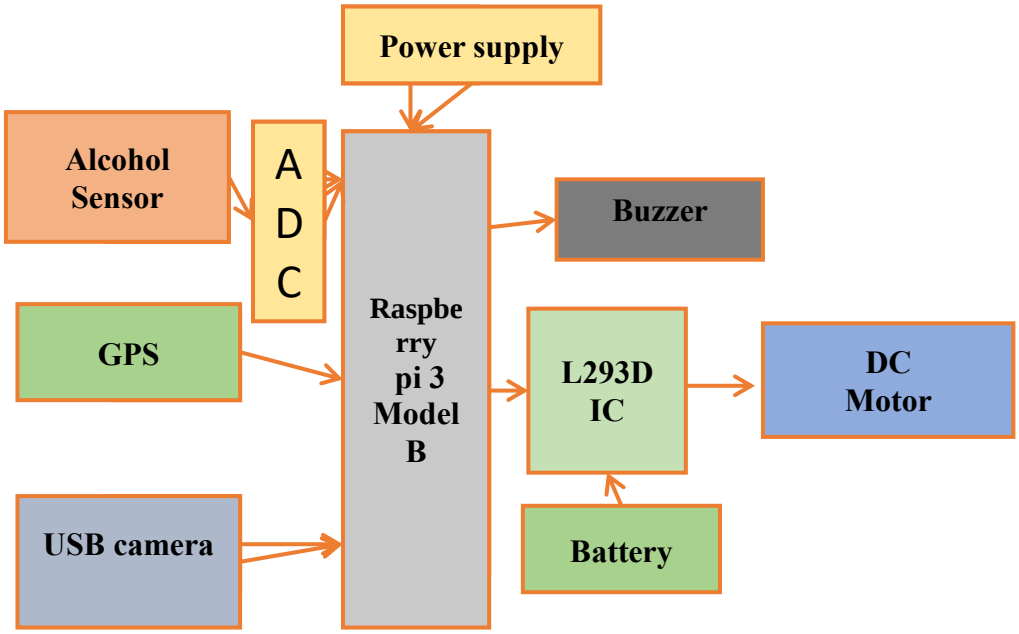

Fig 2. Proposed system

The block model of IOT based minimum system design of sleepiness detection system for preventing traffic accidents is displayed in Fig. 2. It consists of a Raspberry Pi 3 Model B, a DC motor, a USB camera, GPS, an alcohol sensor and buzzer. An initial alcohol sensor will measure the driver's blood alcohol content. The car is not started if the alcohol content is higher than the threshold; otherwise, the car is started. The driver's face is continuously recorded by the Pi- camera type V2 when it is successfully integrated with the RaspberryPi . The proposed study measures the severity of the incident with a particular focus on driver behaviour. A USB camera uses OpenCV to continuously scan the driver face; the Raspberry Pi receives this data. Then, using dlib, the mouth and eyes are separated.
In order to detect drowsiness, we compute the Eye-Aspect-Ratio (EAR) and Lip-Aspect- Ratio (LAR) in this instance. When the EAR falls below the threshold value, it is regarded as eye blinking. The normal LAR is 0.1 and the normal EAR is 0.3. Whenever a driver blinks their eyes over three times in a row, a buzzer will sound to inform him.

The way this alcohol sensor measures the amount of alcohol on your breath is similar to that of a breath analyzer. Based on alcohol, the sensor generates both digital and analogue resistive outputs, and it responds quickly. Here, we employed a sensor of the MQ-3 kind shown in the below figure 3.

Fig 3. Alcohol Sensor

A USB webcam shown in Fig 4 is a type of camera that can be attached to a Raspberry Pi by simply plugging it into a USB port on the device. The video is sent to the Raspberry Pi, which is equipped with software that lets you view and share the photos online. The transfer rate of USB technology is 480 Mb/s. Fig 5 shown below is the buzzer, Piezo crystals are positioned between two conductors to form its structure.

Fig 4. USB Camera

Fig 5. Buzzer

4. Results

The design developed is of low cost and is a minimum design incorporating few components readily available and prototype has shown in Fig 6 and image showing drowsiness of driver has shown in Fig 7.

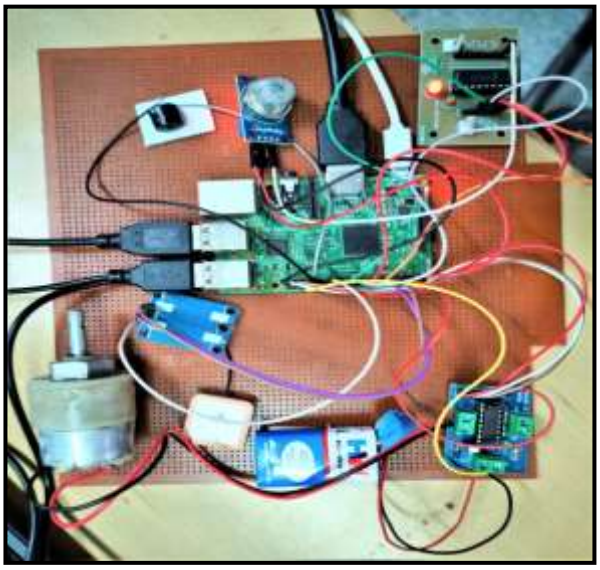

Fig 6. Prototype

Fig 7. Image showing Drowsiness of driver

5. Conclusion

This work aims to evaluate and build a system with minimum components and low cost for detecting driver tiredness. The main goal of this technology is to identify driver fatigue and notify them in order to lower the high rate of traffic accidents.

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