

Driver Safety System using Arduino

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Abstract

The most frequent cause of auto accidents is poor driving. This occurs frequently when a driver is intoxicated or sleepy. Driver fatigue is often acknowledged as a significant factor contributing to collisions as 20% of the accidents occur only due to drowsy driving or tiredness. It is hoped that the technological advancements can at least partially, avoid these thanks to technological improvements. The research put forth utilizes an IR sensor, to measures and regulates eye blinking. The infrared waves that reach the eyes are sent using an IR transmitter. The reflected infrared rays from an eye are picked up by the IR receiver. If the eye is closed, the result is to raise the alarm. Also, the pulse sensor is used to alert people by sending SMS in case of any health issues to the driver. In this study, eye blink of the driver is monitored to prevent accidents during drowsy driving. Here, a single eye blink sensor is installed in a vehicle to alert the driver during fatigue. A Global Positioning System (GPS) is also used in the proposed design to send location alerts.

Keywords: Heart rate monitoring system, eye blink sensor, LCD, Location tracking GPS, auto reply SMS GSM.

1. Introduction

When a motor vehicle collides with another vehicle, a stationary object, a pedestrian, or an animal, it is known as a "vehicle accident," "traffic collision," or "motor vehicle accident." "While some car accidents just cause property damage, others cause serious injuries

or even fatalities. Vehicle collisions can result from a variety of circumstances, and occasionally these collisions have legal repercussions.

To explore this concept, consider the following vehicle accident definition. When a car, truck, bus, or other motorized vehicle collides with a person, another car, or an object like a tree or power pole, an accident occurs. Vehicle accidents can have serious repercussions, such as property damage, injury, and death, all of which are likely to be very expensive. In the US, someone who causes a car accident may be held accountable for the losses and harm the collision causes[1]. A person may be held responsible for any damages or injuries that result from a vehicle accident in the United States. Traffic laws differ from jurisdiction to jurisdiction, and a driver who causes an accident by breaking any of these laws is typically found to be held accountable for damages and held responsible for the accident. The Driver Safety System seeks to identify early indications of sleepiness and warn the driver, preventing accidents brought on by brief distractions. The device can detect tiredness by tracking the driver's eyeblink patterns and react appropriately[2-4]. Additionally, real-time tracking and communication are made possible by the integration of GPS and GSM, allowing an emergency assistance that can be provided right away[5-7].

The eyeblink sensor, which precisely measures the frequency and length of a driver's eyeblinks, is the main part of the Driver Safety System. Eyeblink rate decreases when someone is sleepy, according to research. The device can recognise abnormal eyeblink behaviour, a crucial sign of driver weariness, by continuously analyzing the eye patterns. The Driver Safety System can activate a number of warning systems to notify the driver and reduce dangers whenever drowsiness is identified. The Driver Safety System, which combines the capabilities of an eyeblink sensor, GPS, and GSM technology, provides a substantial improvement in traffic safety. This comprehensive solution not only accurately identifies tiredness but also offers vital assistance via real-time communication and position tracking. The Driver Safety System can contribute to safer roads for all users by warning drivers and important parties in the case of an accident that could be caused by driver fatigue[8-10].

2. Related Work

2.1 Automatic Detection and Remote Alert System for Traffic Accidents

In this study, Wang Wei and Fan Hanbo introduce an autonomous alarm system for traffic accidents. Within two seconds, it can automatically identify a traffic collision, locate the scene, and alert the first aid centre with the essential information about the accident's location, timing, patient conditions etc. To save the injured as quickly as possible, first aid responders can use satellite navigation systems to properly find the location with a maximum error controlled by 10 meter.

2.2 Heart Rate Estimation Using an Ensemble of Brain Waves

T V Adithya et al. The suggested method that produces mean errors for the heart rate and mean R-R interval of 1.4% and 1.7%, respectively. The outcome shows that the suggested method can be utilised to extract an ECG from a single channel EEG and be used in clinical diagnostics, such as estimation for studies on classification of sleep stages, exhaustion, and stress. Moreover, this technique does away with the requirement for additional synchronous ECG during the ECG signal extraction procedure. An accuracy range 55.8 to 75.1% and a performance score of 83.2% accuracy for stress recognition was achieved.

2.3 Use of a Hidden Markov Model on Vehicle Sensors to Detect Drunk

NaseemDaher et al. chose a collection of metrics that are easily accessible via on-board vehicle sensors to identify drunk driving behaviors. Hidden Markov Model (HMM) technique was used to gather these time series data. Each measurable variable's prediction accuracy was calculated and examined.

3. Proposed Solution

The reserch work put forth measures and controls eye blinking using an infrared sensor. The infrared waves that are transmitted to the eyes by the IR transmitter. The IR receiver output is high when the eye is closed; otherwise, it is low.

The movement of the eye is determined and this output is forwarded to the logic circuit to raise alerts to the driver. The goal of this study is to prevent accidents brought on by drowsiness utilizing eye blinks. The GPS, in the proposed design determines the location of

the car and the context in which drowsiness is being identified. Driving in a busy metropolis may imply a lower likelihood of drowsiness than if the car is on a long, monotonous route, for example. To increase accuracy, the algorithm can take this location information into account along with other information's sensed.

Real-time warnings: When a driver's tiredness is detected, the driver drowsiness detection system can use GSM to deliver real-time notifications to specified recipients, including emergency contacts or fleet managers. These warnings can be communicated to relevant parties immediately by SMS (Short Message Service) or phone calls. When drowsiness is detected, an LCD display can show the driver visual alerts. To alert the driver of their drowsy status, the display can provide warning signs, text messages, or graphical indicators. These visual indicators offer the driver a direct and quick channel of communication.

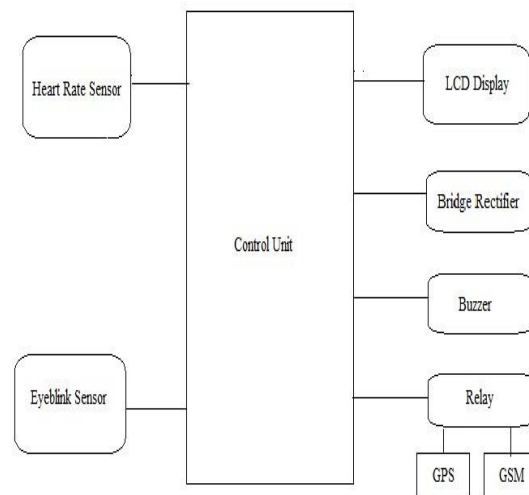


Figure 3.1. Proposed Block Diagram

3.1 Eyeblink Sensor

The eye blink sensors monitor the movement of the eyes and indicates with a high output when the eye is closed and a modest output when the eye is open.



Figure 3.1. Eye Blink Sensor

3.2 Arduino ATmega328



Figure 3.2. Arduino AT Mega 328

The majority of the microcontroller's I/O pins are accessible on the Arduino board for usage by other circuits. Six of the 14 digital I/O pins on the Diecimila, Duemilanove, and contemporary Six analogue inputs on Uno can also be used as digital I/O pins, and Uno can generate pulse-width modulated signals. These pins are connected to female 0.10 inch (2.5 mm) headers on the top of the board. There are also a number of plug-in application shields that are bought commercially. The ArduinoNano, Bare Bones Board, and Boarduino boards may contain male header pins on the underside that can be connected to solderless breadboards. There are numerous boards that are compatible with and derived from Arduino. These can be used interchangeably and are functionally equivalent to an Arduino. Many people improve the basic Arduino by adding output drivers, frequently for use in educational settings at the secondary school level to make building buggies and small robots easier. Others change the form factor while maintaining electrical parity, sometimes maintaining compatibility with shields and other times not. Several variations employ processors that are entirely distinct and have varied degrees of compatibility.

3.3 LCD – Liquid Crystal Display



Figure 3.3. LCD Display

Liquid crystal displays (LCDs) are made of materials that combine the properties of crystals and liquids. The liquid crystal material is sandwiched between two glass panels that make up an LCD. Transparent electrodes that define the characters, symbols, or patterns to be displayed are deposited on the inner surface of the glass plates. When the LCD is turned off, the two polarizers and the liquid crystal rotate the light rays so that they exit the LCD with no orientation, giving the LCD its translucent appearance.

3.4 GPS

Based on the Ublox NEO-6M, this is an entire GPS module. For the best positional information, this device uses the most recent Ublox technology and has a larger built-in 25 x 25mm active GPS antenna with a UART TTL connector. Additionally, a battery is supplied to help you get a GPS lock more quickly. With the ardupilot mega v2 you can utilise this updated GPS module. To improve performance with your Ardupilot or other Multirotor control platform, this GPS module provides the best position data possible. The Ublox NEO-6M GPS engine on this board is decent and produces binary data with great precision. An internal battery for backup power and an EEPROM for configuration data storage are both included in the UBLOX NEO-6M GPS Module. Because the GPS antenna is connected to the module by a U.FL RF cable, there are numerous ways to attach it to guarantee that it always has a good view of the sky for optimum performance

3.5 SIM800L GSM Module Micro Sim Card Board

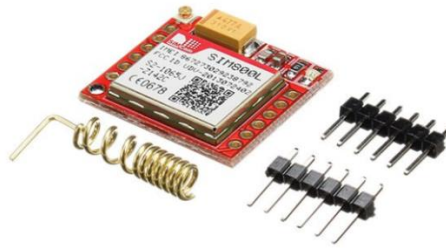


Figure 3.5. SIM 800L

Sim800L is a low-cost, small-footprint GSM breakout board that includes all the same functionality as the larger SIM900 GSM module and shields. A quad-band TTL serial port is located in the middle of the microSIM card on the smallest SIM800L GPRS GSM module. This GPRS GSM module, which is a GSM GRPS Quad-Band module, is based on the SIMCom SIM800L.

3.6 Heart Rate Sensor

The BPM sensor in a driver safety system is a sophisticated and compact device designed to measure the driver's heart rate accurately and continuously during the course of a journey. It employs cutting-edge technology to detect subtle variations in heart rate patterns, which can serve as early indicators of drowsiness or fatigue. By seamlessly integrating with other components like facial recognition and steering behavior analysis, the BPM sensor provides a comprehensive assessment of the driver's condition. When the sensor identifies signs of drowsiness, it promptly triggers an alert, warning the driver to take necessary action or a break, thereby preventing potential accidents. The data gathered by the BPM sensor is processed in real-time, enabling the system to adapt its sensitivity and responsiveness based on the driver's individual baseline heart rate. This adaptability ensures reliable and accurate detection, even in diverse driving conditions. Ultimately, the BPM sensor's role is crucial in enhancing road safety by proactively addressing the risks associated with drowsy driving, making it an indispensable feature in modern vehicles.

4. Result

Buzzer sound will occur when the driver gets drowsy. LCD display gives title message and information message and it is helpful to track location in GPS and GSM. Pulse rate also monitored in this research.

Result 1: If the BPM level is ranges between 60 to 100 consider as the driver is sleeping and it also displayed in the LCD



Figure 4.1. BPM level Display

Result 2: It will notify in the LCD as sleeping and also the SMS will be sent to the Guardian. After the SMS is sent it will display as SMS SENT in the LCD.



Figure 4.2. BPM Level Alert

Result 3: If Pulse is not calculated in the BPM sensor it will display as LCD (No Finger).



Figure 4.3. Emergency Alert

Result 4: The message will be sent as " EMERGENCY " to the registered guardians mobile number.

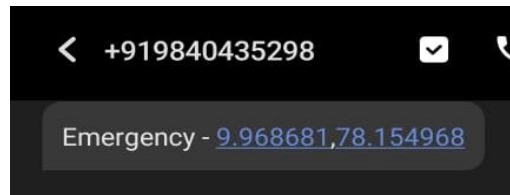


Figure 4.4. SMS Alert

Final Prototype

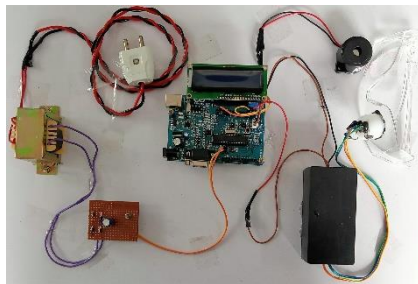


Figure 4.5. Final Prototype

Driver Safety System is this. Once the driver is inside the vehicle, the eye blink and heartbeat sensors begin to gather data by monitoring the driver's eye blinks and pulse rates, and the GSM transmits the location of the vehicle. The most reliable measure for determining the degree of tiredness is the time between eye blinks.

5. Conclusion

The implementation of the idea, accident prevention by eye Blinking Sensor, was effective. Because to its simplicity of integration into automobiles, this gadget offers much more modern amenities in today's society. Hence, road accidents associated to sleepiness could be decreased using the proposed device. These types of detectors are quite relevant because accidents happen frequently. Also, it can be used in workplaces, schools, universities, hospitals, libraries, and other public spaces.

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