



IJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 Issue: V Month of publication: May 2023

DOI: <https://doi.org/10.22214/ijraset.2023.52096>

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An Automatic Driver's Drowsiness Alert System

Prof. J.R. Rokade¹, Miss. Hase Pravara², Miss. Hase Vaishnavi³, Mr. Krushna Jadhav⁴, Mr. Nitin Jondhale⁵
Department of Electrical Eng., Amrutvahini College of Eng., Sangamner, Maharashtra, India

Abstract: *The Automatic Driver's Drowsiness Alert System (ADDAS) using a PIC microcontroller is a technological solution that aims to prevent accidents caused by drowsy driving. This system uses a combination of sensors and algorithms to detect the driver's level of alertness and sends a warning when the driver is experiencing drowsiness or fatigue. The system is based on a PIC microcontroller that processes the data obtained from the sensors, which include an eyeblink sensor, a temperature sensor, a Heartbeat sensor, GSM (Global System for Mobile Communication) module and GPS (Global Positioning System). The eyeblink sensor monitors the driver's eye movements, the temperature sensor measures the driver's temperature, heartbeat sensor measures the pulse rate of driver, alcohol sensor measures alcohol intake of driver. The data is processed using an algorithm that analyses the driver's behaviour and physiological parameters to determine the level of alertness. If the driver is found to be drowsy or fatigued, the system sends a warning to alert the driver, such as an audible alarm. This system is efficient, reliable, and cost-effective, making it an ideal solution for preventing accidents caused by drowsy driving. It promotes safer roads and reduces the risk of fatalities, making it an essential tool for enhancing driver safety*

Keywords: *Microcontroller, Eyeblink Sensor, GSM Module, Heart Beat Sensor*

I. INTRODUCTION

The Automatic Driver's Drowsiness Alert System is a safety mechanism designed to prevent accidents caused by driver fatigue. This system incorporates a PIC microcontroller, eyeblink sensor, temperature sensor, alcohol sensor, heart beat sensor, and GSM module to detect signs of drowsiness in the driver. The heart beat sensor monitors the driver's heart rate, based on eye blink sensor output, which increases when they are sleepy and triggers the system to send an alert message to a designated emergency contact via the GSM module [1]. This system ensures the driver's safety and provides an efficient way to notify their loved ones in case of an emergency [2]. The Automatic Driver's Drowsiness Alert System is a modern-day solution to prevent road accidents caused by driver fatigue. It is a sophisticated system that utilizes a PIC microcontroller, a heart rate sensor, and a GSM module to detect the early signs of drowsiness in drivers [3]. The idea of developing a drowsiness alert system for drivers was first introduced in the late 1990s. However, the initial systems were bulky and expensive, and they required complex wiring and setup [4]. Over time, with the advancements in technology, the system has become more compact and affordable, and the implementation of microcontrollers and wireless communication modules has made it more efficient and user-friendly [5]. The heart rate sensor plays a crucial role in the functioning of this system. When a person is drowsy, their heart rate slows down, and the sensor detects this change. The PIC microcontroller is programmed to receive and analyse the signals from the sensor [6]. If the heart rate falls below a certain threshold, it triggers an alarm, and a warning message is sent to the driver through a speaker or display unit. The GSM module is another critical component of the system. It is used to send alert messages to the emergency contacts of the driver [7]. When the driver's heart rate falls below the set threshold, the PIC microcontroller activates the GSM module, and an SMS alert is sent to the designated contact number. The message contains the driver's location, and the contact can take appropriate action to ensure the driver's safety. The development of this system has been a collaborative effort between engineers and researchers from various fields [8]. The system has been tested extensively in different driving conditions, and the results have been promising. Several studies have shown that the use of drowsiness alert systems significantly reduces the risk of accidents caused by driver fatigue [9]. The Automatic Driver's Drowsiness Alert System using PIC microcontroller, heart rate sensor, and GSM module has made a significant contribution to road safety by providing an early warning system for driver fatigue. It helps prevent accidents caused by drowsy drivers by continuously monitoring their heartbeat and alerting them when they are at risk of falling asleep behind the wheel [10]. The system's integration with a GSM module enables the driver's emergency contacts to be notified in case of an emergency, thus improving their chances of getting timely help.

This system's contribution to road safety is crucial, and it has the potential to save lives by preventing accidents caused by driver fatigue, making it an essential technological innovation in the field of transportation [11].

II. RESEARCH OBJECTIVE

Drowsy driving is a major safety concern that leads to a significant number of accidents and fatalities on the roads. Therefore, there is a need for an effective and reliable solution to prevent these accidents. Traditional methods of detecting drowsy driving, such as monitoring have limitations and are not always accurate. Therefore, an Automatic Driver's Drowsiness Alert System using a PIC microcontroller is proposed as a solution that can accurately detect driver drowsiness using a combination of sensors and algorithms. This system aims to reduce the number of accidents caused by drowsy driving, promote safer roads, and enhance driver safety. In order to minimize chances of accident system incorporates with two stages of working. Such that in primary stage system will give a warning alert by turning on buzzer, if driver still not responds to system, then system will take secondary action in which system will turn off car's engine and slow down the speed of vehicle in order to stop the vehicle and using GPS sends current location of vehicle via GSM.

III. PROPOSED APPROACH

The proposed approach for the Automatic Driver's Drowsiness Alert System using a PIC microcontroller involves a combination of sensors and algorithms to accurately detect driver drowsiness. The system uses an eyeblink sensor to monitor the driver's eye movements, a temperature sensor to measure the driver's temperature, and a heartbeat sensor to measure pulse rate of driver, alcohol sensor to measure alcohol consumed. These sensors are connected to a PIC microcontroller that processes the data obtained from the sensors. The data is analysed using an algorithm that takes into account the driver's behaviour and physiological parameters to determine the level of alertness. If the driver is found to be drowsy or fatigued, the system sends a warning to alert the driver, such as an audible alarm notification on the dashboard. Overall, this approach is efficient, reliable, and cost-effective, making it an ideal solution for preventing accidents caused by drowsy driving.

A. Block Diagram And Description

- 1) **Sensors:** The system uses four sensors, including an eyeblink sensor, a temperature sensor, and a heartbeat sensor, alcohol sensor to detect the driver's status of drowsiness.
- 2) **PIC Microcontroller:** The sensors are connected to a PIC microcontroller, which processes the data obtained from the sensors and takes further required action according algorithm.
Algorithm: The system uses an algorithm that takes into account the data obtained from the sensors to determine the driver's level of alertness. The algorithm processes the data and sends warning signals if the driver is found to be drowsy.
- 3) **Warning Signals:** If the driver is found to be drowsy or fatigued, the system sends warning signals, such as an audible alarm notification on the dashboard, to alert the driver.
- 4) **Power Supply:** The system requires a power supply to operate, which can be obtained from the car's battery or an external power source.
- 5) **Health Monitoring System:** The system collects data from various sensors and uploads it on cloud server in order to perform health monitoring system.

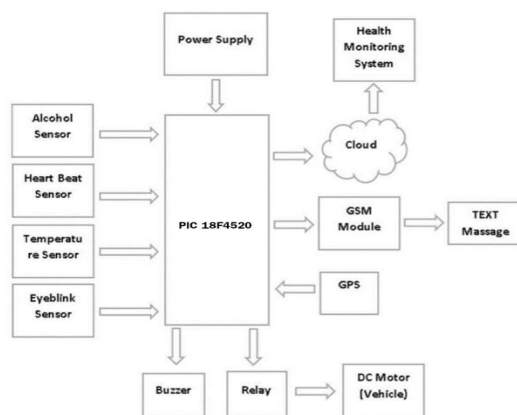


Fig: - Block Diagram

Figure 1. Block Diagram

Overall, the block diagram shows how the system integrates sensors, a PIC microcontroller, and an algorithm to accurately detect driver drowsiness and prevent accidents caused by drowsy driving.

B. Working

The Automatic Driver's Drowsiness Alert System using PIC microcontroller, eye-blink sensor, alcohol sensor, heartbeat sensor, temperature sensor and GSM module, GPS module works by continuously monitoring the driver's eye status with to detect early signs of drowsiness. The heart rate sensor measures the driver's heart rate, eyeblink sensor sense the eye blinking motion and based on collected data from sensor and according to program algorithm it sends signals to the PIC microcontroller for analysis. The PIC microcontroller has a pre-set threshold for detecting driver's drowsiness and if the threshold is crossed, it activates the alarm and sends a warning message to the driver through a buzzer. If the driver does not respond to warning sound, then system will take further action. The PIC microcontroller activates the GSM module to send an SMS alert to the designated emergency contacts. The SMS contains the driver's location and reason of SMS, which enables the contacts to take appropriate action and ensure the driver's safety. The system's working principle is since a driver's eye status when they are drowsy, and this change can be detected using an eyeblink sensor. The use of a PIC microcontroller ensures efficient signal processing, and the integration of a GSM module enables remote communication for emergency situations. The analysis of the system's working shows that it is an effective and reliable mechanism for preventing accidents caused by driver fatigue. The continuous monitoring of the driver's eye motion ensures that the system detects drowsiness at an early stage, and the integration of the GSM module ensures timely communication in case of an emergency.

IV.FLOW CHART

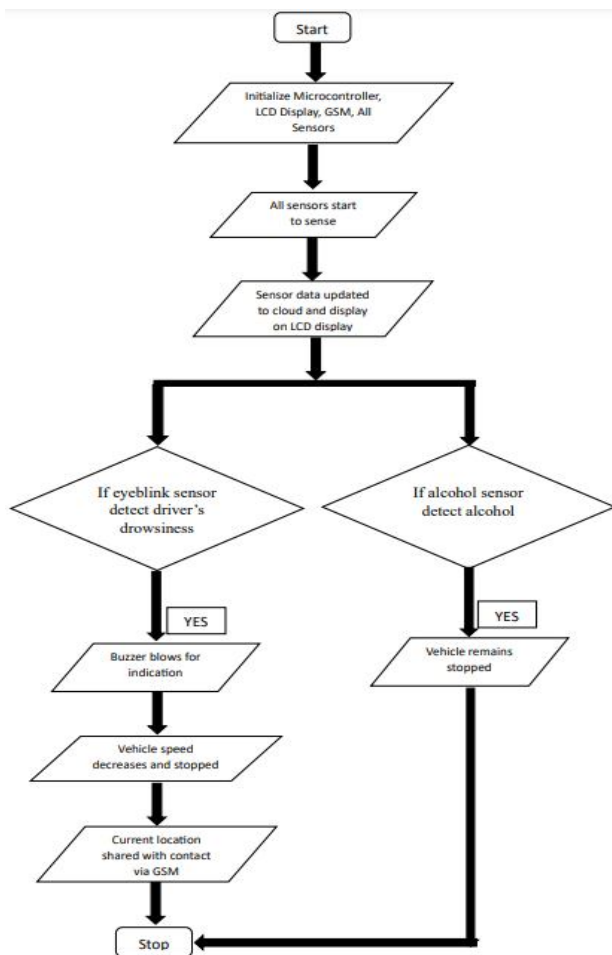
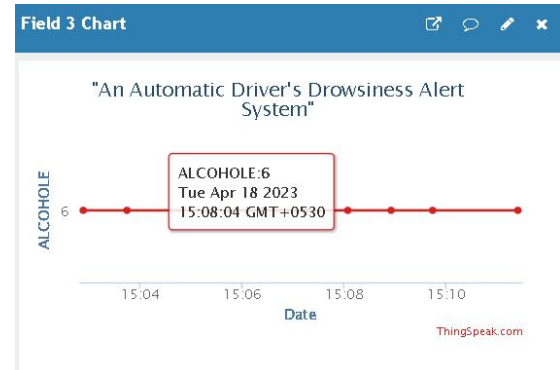
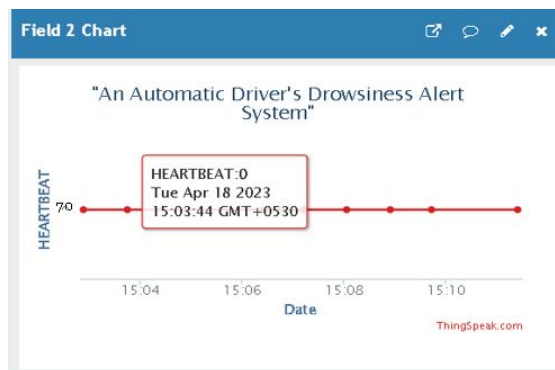
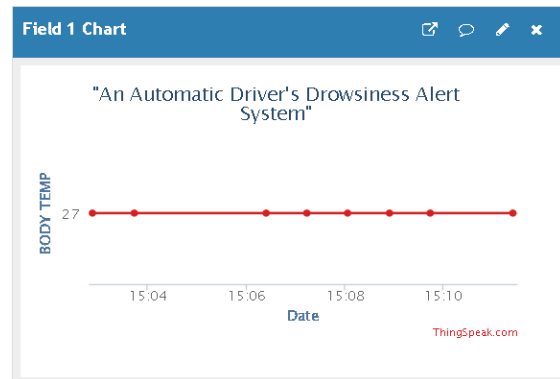
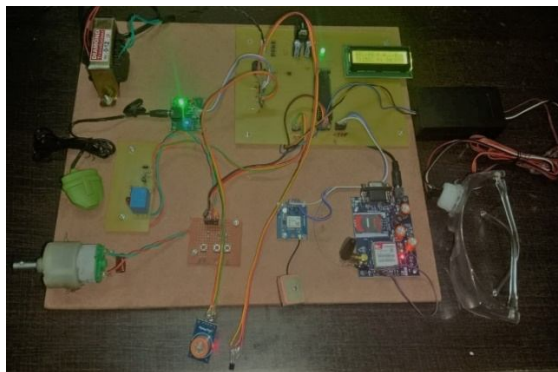


Figure 2. Flow Chart of the System Working

V. VALIDATION

The block diagram of the Automatic Driver's Drowsiness Alert System using a PIC microcontroller can be illustrated using an image, as follows:



The image shows four sensors, including an eyeblink sensor, a temperature sensor, and an alcohol sensor, heartbeat sensor connected to a PIC microcontroller. The microcontroller processes the data obtained from the sensors and if it seems to be drowsiness of driver, then sends warning signals to alert the driver after 2 seconds. if still driver do not responds to warning and drowsiness is still detected, then system approaches secondary action to reducing speed of vehicle in order to stop and send SMS to register contact number with specific location of vehicle This secondary action plays an important role in system as in case of an emergency situation of accident immediate medical help can be provide. An algorithm is used to analyse the data obtained from the sensors to determine the driver's level of alertness. If the driver is found to be drowsy or fatigued, the system sends warning signals, such as an audible alarm notification. The system also collects data on the driver's behaviour and physiological parameters to create a driver profile, which can be used to customize the warning thresholds for individual drivers. Here we used an open-source cloud server for uploading data for health monitoring system, which is used for future reference. A power supply is required to operate the system, which can be obtained from the car's battery or an external power source. Overall, the image provides a clear and concise representation of the system's functionality and components.

VI. CONCLUSION

This paper designed and implemented an Automatic Driver's Drowsiness Alert System using a PIC controller. It is capable of detecting drowsiness of the driver and alerting them through audio signal to avoid potential accidents. System incorporates with eyeblink sensor, temperature sensor, heartbeat sensor, alcohol sensors to monitor the driver's eyes movement, body temperature, pulse rate and alcohol content. The designed System process the data from these sensors and trigger the audio alerts under primary action and further after buzzer warning if driver does not responds to system, then system will take secondary action which consists of stalling the vehicle by reducing the speed and using GPS through GSM for sending SMS. This SMS contains GPS location of vehicle in order to avail emergency help. The proposed system is easy to apply with minor modifications to any type of electric vehicle. This article focused on PIC microcontroller based automated technology that saves the life of the driver.

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