iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

AUTOMATIC BRAKING SYSTEM THROUGH ALCOHOL DETECTION AND WIRELESS CONTROL

AMNA SHAIKH, SHAFI SHAIKH, LAXMAN DHOTRE
DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING.
STES'S Sinhgad Academy of Engineering, Pune - 411048

GUIDE
PROF. PALLAVI SHAHANE
STES'S Sinhgad Academy of Engineering, Pune - 411048

ABSTRACT
This project introduces an intelligent braking system designed to enhance road safety by automatically detecting alcohol in a driver's breath and responding appropriately. Utilizing the MQ303A alcohol sensor, the system identifies unsafe blood alcohol levels and prevents the vehicle from operating. Additionally, it incorporates an ultrasonic sensor for obstacle detection to enable real-time braking in hazardous situations. Controlled by a PIC16F72 microcontroller, the system processes sensor inputs and activates essential components like the DC motor-driven brakes, buzzer alerts, and wireless communication modules. GSM technology is employed to send alerts to concerned parties when alcohol is detected, while Bluetooth facilitates short-range system monitoring. This integrated design aims to reduce traffic accidents by offering an affordable and efficient embedded safety solution for vehicles.

Keywords:
Alcohol Detection, Automatic Braking, PIC16F72 Microcontroller, Ultrasonic Sensor, DC Motor, L293D Motor Driver, MQ303A Sensor, GSM Module, Bluetooth, Road Safety, Drunk Driving Prevention, Wireless Control System.

INTRODUCTION
In recent years, there has been a growing emphasis on vehicle safety systems to address the rising number of traffic accidents, many of which are caused by impaired driving and delayed braking responses. Driving under the influence of alcohol is a leading factor in road fatalities, prompting the need for preventive technologies that can detect such risks in real-time. Simultaneously, failure to apply brakes promptly due to driver distraction or unforeseen obstacles also contributes significantly to collisions.
This project proposes a solution that combines alcohol detection with an automatic braking system to improve vehicular safety. The system uses an MQ303A sensor to monitor alcohol levels near the driver and an ultrasonic sensor to identify obstacles ahead of the vehicle. If unsafe alcohol levels or nearby objects are detected, the system activates a braking mechanism controlled by a DC motor through an L293D driver. The entire setup is managed by a PIC16F72 microcontroller, which processes sensor data and controls the corresponding responses. To further enhance functionality, the system incorporates GSM technology for sending emergency alerts and Bluetooth for short-range wireless control and monitoring. This integration of sensing, control, and communication technologies aims to provide a reliable and cost-effective safety mechanism suitable for both personal and commercial vehicles.

LITRATURE REVIEW
Numerous studies have contributed to the development of technologies related to alcohol detection, wireless vehicle control, and intelligent transportation systems. The following research works provide a strong foundation for the current project.

1. **Mohd Yusuf, Mohd Yunus, Mohammad Arshad, and Ankita Khare (Issue-3/2023)** designed a smart vehicle system integrated with GSM to minimize road accidents. The system incorporates sensors like accelerometers to detect crashes and immediately sends SMS alerts with the vehicle's location to emergency contacts. This approach can significantly reduce response time in emergencies. However, the study also raised concerns about user privacy due to continuous tracking and potential

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

unauthorized access to location data. These findings underline the necessity of incorporating robust data protection measures in vehicle safety systems alongside alcohol detection and wireless control.

2. **Dr. Pavan Shukla et al.** presented a system titled *"Automatic Engine Locking System Through Alcohol Detection"* that employs an alcohol sensor linked to an engine locking mechanism. This setup prevents a vehicle from starting if alcohol is detected in the driver's breath, thereby reducing the risk of impaired driving. Despite its effectiveness, the research points out challenges related to legal compliance, as regulations in some jurisdictions may restrict the use of automatic engine locking systems. This highlights the importance of aligning technical innovations with regional regulatory frameworks.
3. **Fadwa Al-Hilali, Raj Dilipkumar Luhar, and Mohammad Murtuza Jamaal (2019)** developed a GPS and GSM-based vehicle tracking solution. The system offers real-time tracking and geo-fencing alerts that notify users when a vehicle moves in or out of designated areas, enhancing security and surveillance. A limitation identified in the study is signal interference—environmental factors such as dense urban areas, tunnels, or bad weather can degrade GPS accuracy. This indicates the need for alternative or supplementary positioning methods to ensure reliable tracking.
4. **Baby D. Dayana, Shipra Sinha, Apurv Jha, and Padmini Yadav (2018)** proposed a car control panel with integrated alcohol detection and automatic engine locking functionality. The system deactivates the engine if alcohol levels exceed the set limit, effectively preventing the vehicle from being driven by an intoxicated person. However, the researchers noted that continuous sensor operation could lead to high power consumption, potentially draining the vehicle's battery. This suggests that future designs should prioritize energy efficiency to maintain long-term system performance.
5. **Batra, A., Pandey, A. R., Kumar, S., and Ansari, G. (April 2018)** introduced a wireless speed control mechanism aimed at accident prevention in high-risk areas like highways and mountainous roads. The system operates using RF signals to control vehicle speed, offering a cost-effective and scalable solution. While the concept is promising, the study acknowledges that RF signal failure and environmental exposure could hinder performance, indicating the need for protective enclosures and signal redundancy for reliable operation.

OBJECTIVES

- **To Promote Road Safety through Automation**
  The main goal of this project is to create an automated braking system capable of detecting alcohol intake by the driver and initiating safety actions to stop or prevent vehicle operation under hazardous conditions.
- **To Monitor Alcohol Levels Using MQ303A Sensor**
  The system utilizes the MQ303A sensor to analyze the alcohol concentration in the driver's breath. If the measured value exceeds the safe limit, it triggers the necessary safety protocols to prevent accidents.
- **To Implement an Automated Braking Feature**
  A motor-controlled braking mechanism, managed by the L293D motor driver and a DC motor, is used to stop the vehicle automatically when either alcohol presence or an obstacle is detected.
- **To Detect Obstacles Using Ultrasonic Sensing**
  An HC-SR04 ultrasonic sensor is deployed to measure the distance between the vehicle and nearby objects. If an object is within a critical range, the braking system is activated to prevent a collision.
- **To Utilize a Microcontroller for Centralized Control**
  The PIC16F72 microcontroller is responsible for interpreting sensor inputs and coordinating system responses, including motor control, alert activation, and communication management.
- **To Enable Wireless Alerts and Controls**
  The system includes a SIM800L GSM module for sending alert messages to registered contacts when alcohol is detected. Additionally, Bluetooth communication supports local monitoring and manual control via smartphone.
- **To Develop a Cost-Effective and Practical Prototype**
  The project aims to deliver a reliable, low-cost embedded system solution that can be adapted for real-time use in vehicles to improve driver safety and accident prevention.

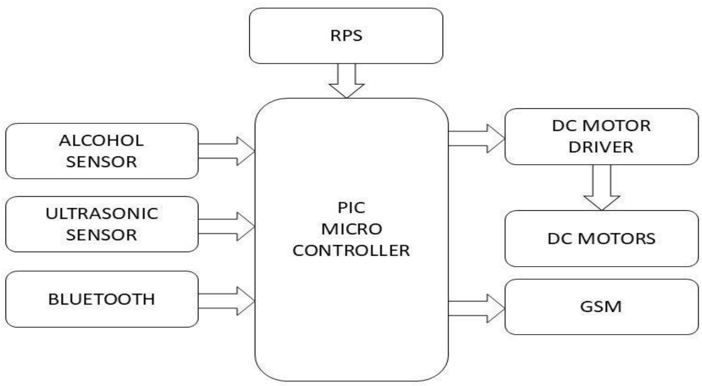
iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

METHODOLOGY

The design and implementation of the "Automatic Braking System Through Alcohol Detection and Wireless Control" follow a structured process that integrates embedded electronics, sensor technology, and wireless communication. At the core of the system is the PIC16F72 microcontroller, which serves as the central controller, managing inputs from various sensors and controlling the output devices accordingly.

1. **Power Supply Configuration**
   The system is powered by a Regulated Power Supply (RPS), which converts alternating current (AC) into a stable direct current (DC) voltage. This ensures reliable operation of the microcontroller, sensors, and modules.
2. **Alcohol Detection Mechanism**
   The MQ303A alcohol sensor is strategically placed near the driver's seat to monitor for alcohol vapors. When the detected alcohol concentration surpasses a set threshold, the sensor sends a signal to the microcontroller, prompting actions like sounding a buzzer and halting the vehicle.
3. **Obstacle Detection via Ultrasonic Sensor**
   The HC-SR04 ultrasonic sensor is positioned at the front of the vehicle. It emits ultrasonic pulses and calculates the distance of nearby objects based on the time it takes for the echo to return. If an object is detected within a predefined safety range, the system activates the braking function to prevent an impact.
4. **Automatic Braking System**
   A DC motor, connected to the braking system, is controlled using an L293D motor driver. Upon receiving signals from the microcontroller—triggered either by alcohol detection or an obstacle—the driver activates the motor to engage the brakes automatically.
5. **Wireless Communication for Alerts and Control**
   Two types of wireless modules are incorporated:
   - The **SIM800L GSM module** sends SMS alerts to predefined emergency contacts when unsafe conditions like alcohol detection or unauthorized vehicle movement are identified.
   - The **Bluetooth module** enables local wireless control and monitoring via a smartphone or similar device, enhancing user accessibility.
6. **Microcontroller Operation**
   The PIC16F72 microcontroller processes data from both the alcohol and ultrasonic sensors. Based on programmed logic, it decides when to activate the buzzer, initiate braking, or send alerts. The system software is written in Embedded C, allowing real-time control and handling multiple inputs simultaneously.
7. **System Assembly and Testing**
   All hardware components are assembled on a prototype board and connected to function as a unified system. The system is then tested under simulated conditions to validate its response to alcohol detection, obstacle proximity, and communication triggers.

BLOCK DIAGRAM



iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

HARDWARE SPECIFICATIONS

The hardware framework of this system is primarily driven by the PIC16F72 microcontroller, which handles input from sensors and controls various output devices. The MQ303A alcohol sensor is placed near the driver to detect alcohol levels in the surrounding air. When alcohol vapors are sensed above a defined limit, the sensor sends a signal to the microcontroller.For obstacle detection, an HC-SR04 ultrasonic sensor is mounted on the front side of the vehicle. It calculates the distance of nearby objects by emitting ultrasonic waves and analyzing the returning echo. Based on this data, the system can identify potential collision risks.A DC motor is mechanically linked to the braking mechanism of the vehicle and is operated using an L293D motor driver IC. The motor driver receives commands from the microcontroller and engages the brakes automatically when unsafe conditions are detected.The system includes a buzzer to provide audible warnings. For communication, a **SIM800L GSM module** is used to send SMS notifications to emergency contacts. Additionally, a Bluetooth module allows wireless interaction over short distances for control and configuration. A regulated power supply ensures consistent voltage across all components for smooth and stable performance.

SOFTWARE DESIGN

The software is developed in Embedded C using the MPLAB Integrated Development Environment (IDE). The microcontroller is programmed to continuously monitor sensor inputs and execute predefined actions based on specific conditions.

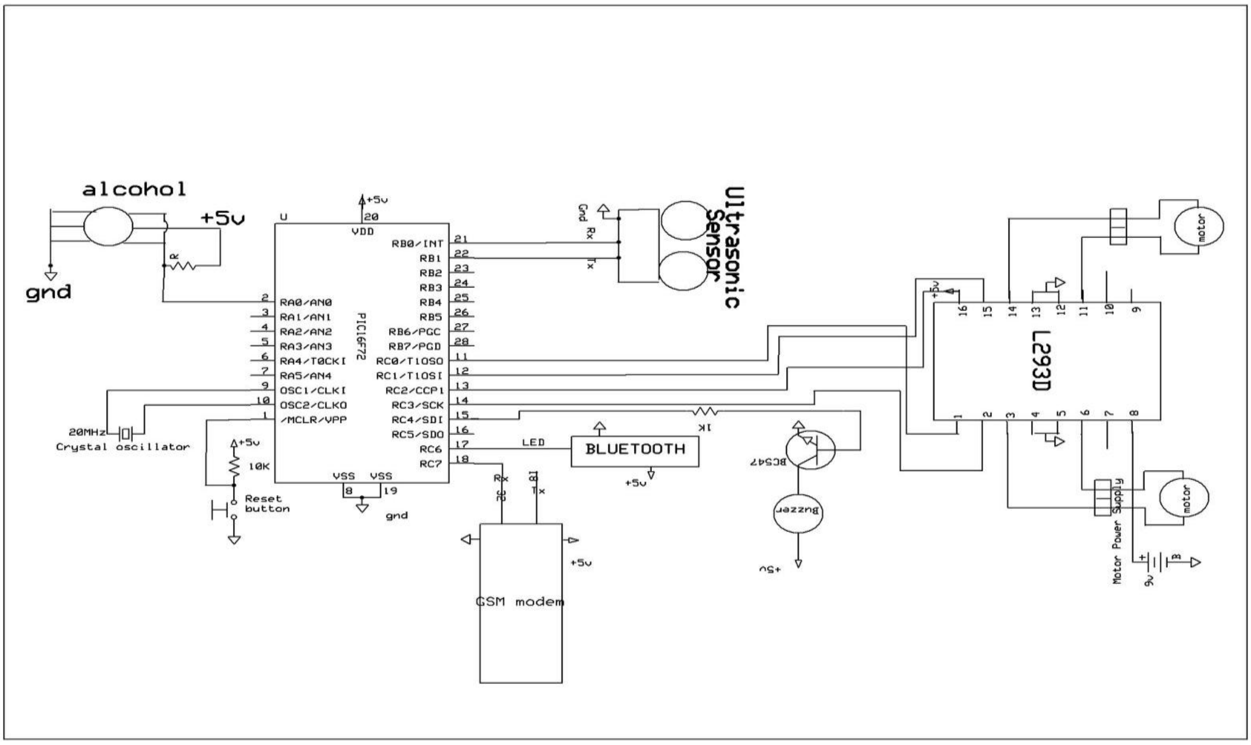
When the alcohol sensor detects intoxication or when the ultrasonic sensor senses a nearby obstacle, the program triggers safety measures such as activating the buzzer, applying brakes through the motor, and sending alerts via the GSM module. Bluetooth communication is managed using UART (Universal Asynchronous Receiver-Transmitter) protocol, which facilitates real-time interaction with mobile devices. The code includes logical decision-making algorithms and utilizes interrupts to ensure immediate response to critical inputs. Through efficient coding and real-time processing, the software ensures that the system remains responsive and accurate under varying operational conditions.

WORKING

The working of the “Automatic Braking System Through Alcohol Detection and Wireless Control” is based on real-time monitoring and response using sensors, a microcontroller, and wireless communication modules. The system is powered through a regulated power supply, which ensures all components receive the required voltage for stable operation. At the heart of the system lies the PIC16F72 microcontroller, which continuously receives inputs from the alcohol and ultrasonic sensors and executes decisions based on those readings. When the vehicle is powered on, the MQ303A alcohol sensor begins monitoring the air in the vicinity of the driver’s seat. This sensor detects the presence of alcohol vapors. If it senses alcohol levels above a certain predefined limit, it immediately sends an electrical signal to the microcontroller. Upon receiving this input, the microcontroller triggers several actions simultaneously. It activates a buzzer to alert those nearby about the driver's impaired state. At the same time, the motor driver circuit (L293D), which controls a DC motor connected to the braking system, receives a signal to stop the vehicle or prevent it from moving. In parallel, the GSM module (SIM800L) is activated to send an SMS alert to a pre-stored emergency contact number, informing them of the detected alcohol level and potential danger.In addition to alcohol detection, the system also incorporates obstacle avoidance through an ultrasonic sensor (HC-SR04), placed at the front of the vehicle. This sensor emits ultrasonic waves and measures the time taken for the echo to bounce back, calculating the distance to any object ahead. If the sensor detects an obstacle within a dangerous range, it notifies the microcontroller, which again sends signals to the motor driver to apply the brakes automatically, thereby preventing a collision. Moreover, the system includes a Bluetooth module for local wireless control and monitoring. Through a smartphone or compatible device, users can interact with the system to receive data or make basic adjustments if needed. All of these processes are governed by logic programmed into the microcontroller using embedded C, ensuring that the system operates efficiently and with minimal delay.

Volume-09 Issue 05, May-2025 ISSN: 2456-9348
Impact Factor: 8.232

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/



SYSTEM PERFORMANCE AND EVALUATION

The implemented prototype successfully fulfilled its intended objectives by combining alcohol detection, automatic braking, and wireless alert mechanisms. During testing, the MQ303A sensor reliably identified alcohol presence in the driver's vicinity. Upon detection, the system instantly activated the engine locking feature, effectively preventing the vehicle from starting. This simulates a real-world scenario aimed at reducing incidents of drunk driving.

The HC-SR04 ultrasonic sensor accurately measured the distance between the vehicle and nearby obstacles. When an object was detected within a critical range, the microcontroller triggered the braking system using the DC motor and L293D driver IC. This demonstrated the system's ability to perform emergency stops and avoid potential collisions.

The integrated GSM module (SIM800L) functioned efficiently, sending SMS alerts to registered emergency contacts when alcohol was detected or unauthorized access was attempted. The Bluetooth module facilitated short-range monitoring and manual control using a mobile application, enabling seamless interaction with the system.

Testing under both lab and controlled field environments confirmed the system's reliability and response speed. However, further development may be necessary for practical deployment, including ensuring legal authorization for engine locking mechanisms, improving sensor resilience in variable environmental conditions, and managing power consumption for extended operations.

ACKNOWLEDGEMENT

We, the undersigned students — **Amna Shaikh, Shafi Shaikh, and Laxman Dhotre** — would like to express our sincere gratitude to all those who supported and guided us throughout the successful completion of our project titled **"Automatic Braking System Through Alcohol Detection and Wireless Control"**, carried out in the academic year **2024–25**.

We extend our heartfelt thanks to our respected guide, **Prof. Pallavi Shahane**, for her constant support, valuable guidance, and timely feedback, which helped us stay focused and motivated during every phase of this project.

We also wish to express our appreciation to **Prof. R.B. Kakkeri**, Head of the **Department of Electronics and Telecommunication Engineering**, for providing the necessary departmental resources and encouragement to undertake this work.

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

We are equally grateful to our Principal, **Dr. K.P. Patil**, of **STES's Sinhgad Academy of Engineering, Pune–411048**, for fostering a positive academic environment and offering us the infrastructure required to carry out this project efficiently.
Finally, we acknowledge the collective support of the department's faculty members and technical staff for their assistance and cooperation during the execution of our project.

CONCLUSION

The project on **Automatic Braking System Through Alcohol Detection and Wireless Control** demonstrates a practical solution to enhance road safety by integrating smart technologies. By combining alcohol detection with automated engine locking and obstacle detection using ultrasonic sensors, the system addresses two major risk factors—drunk driving and collisions due to delayed braking.
The addition of GSM and Bluetooth modules provides real-time alerts and local wireless control, improving both responsiveness and user accessibility. Overall, the system offers a functional prototype for intelligent vehicle safety applications.
With further optimization in areas like sensor calibration, power management, and regulatory compliance, this design can be adapted for use in private vehicles, public transport, and commercial fleets, contributing to safer road environments.

REFERENCES

1. Automatic Engine Locking System Through Alcohol Detection May 2020
https://www.ijert.org/automatic-engine-locking-system-through-alcohol-detection
https://www.researchgate.net/
2. AUTOMATIC CAR SPEED CONTROL WITH WIRELESS RF CONTROL Akash Batra*1, Anirudhh Ranjan Pandey2 , Shashank Kumar3 & Ms. Ghazala Ansari4 *1,2&3B. TECH, Department Of ECE, SRMIST 4Assistant professor, Department Of ECE, SRMIST [Batra * et al., 7(4): April, 2018] Impact Factor: 5.164 IC Value: 3.00 CODEN: IJESS7
3. https://ijana.in/papers/72.pdf An IOT Based Alarm System in Car for Traffic, Alcohol and Drowsiness Detection and Accident Prevention
4. https://www.academia.edu/35721844/Alcohol_Detection_and_Automatic_Drunken_Drive_Avoiding_System
https://www.academia.edu/35721844/Alcohol_Detection_and_Automatic_Drunken_Drive_Avoiding_System
5. https://www.researchgate.net/publication/341876799_Automatic_Engine_Locking_System_Through_Alcohol_Detection
6. https://www.researchgate.net/publication/364096248_Automatic_Alcohol_Detector_Car_Control_Panel