Intellicrash Vehicle Safety System

Dr. Neelesh Kumar Gupta and **Lakhya Dubey**
Department of Electronics Communication Engineering, Ajay Kumar Garg Engineering College,
27 Km stone, Delhi-Meerut Expressway, Ghaziabad 201015 UP India
guptaneelesh@akgec.ac.in, dubeylakshya1@gmail.com

Abstract -- **This paper addresses the critical issue of individuals left without assistance after accidents by utilizing electronics circuitry such as an Arduino microcontroller, GPS Receiver and GSM module. The GPS Receiver determines the vehicle's direction, while the GSM module sends precise directions and a Google Maps link via SMS to the assigned contacts. Additionally, it integrates advanced technologies for fatigue monitoring, an ultrasonic sensor for emergency braking, and an alcohol sensor for impairment detection, reducing the risk of accidents caused by exhaustion or impairment. Therefore, a novel idea can be proposed that will incorporate ultrasonic sensors for distance measurement and alcohol detection to prevent accidents and ensure pedestrian safety.**

Keywords: Ultrasonic sensor, GSM module, GPS Module, Arduino, Road accidents, Responsible driving

I. INTRODUCTION

IN TODAY's fast-paced world, road safety remains a major issue of concern, with countless lives at stake due to accidents and unforeseen emergencies. To address this concerning issue, we introduce the Smart Accident Detection System, a ground-breaking idea leveraging the power of technology to enhance road safety and save lives.

At the heart of our system lies the Arduino Uno microcontroller, a versatile and programmable platform renowned for its flexibility and ease of use. Paired with multiple sensors including GSM, GPS, ultrasonic, alcohol, and the MPU 6050 accelerometer and gyroscope module, the system represents a comprehensive approach to accident detection and response.

The integration of these advanced sensors empowers our system to detect various types of accidents and critical events on the road. The GSM sensor enables real-time communication by sending instant alerts to designated contacts in the event of an accident, ensuring prompt assistance and intervention [1]. Meanwhile, the GPS sensor provides accurate location data, facilitating swift response from emergency services and support teams.

Moreover, the ultrasonic sensor enhances the system's capabilities by detecting obstacles and facilitating emergency braking, thereby minimizing the risk of collisions and mitigating potential accidents. The inclusion of the alcohol sensor serves as a vital tool in preventing accidents caused by drunk driving, detecting alcohol levels and issuing warnings to the driver when necessary.

Additionally, the MPU 6050 module enables sophisticated motion tracking and analysis, allowing the system to detect anomalies in vehicle movement indicative of accidents or roll-overs [2]. This comprehensive suite of sensors, coupled with the Arduino Uno's robust processing capabilities, forms the backbone of our Smart Accident Detection System.

Through this idea, we aim to revolutionize road safety by leveraging technology to proactively detect and respond to accidents, thereby reducing the loss of lives and mitigating the impact of road accidents on communities. With the Smart Accident Detection System, we envision, a future where road travel is safer, more secure, and devoid of unnecessary risks, ultimately saving countless lives and fostering a culture of responsible driving.

II. LITERATURE SURVEY

Existing research on accident detection systems highlights both sensor-based and image processing approaches. Traditional sensor-based systems rely on data from accelerometers and gyroscopes but may suffer from limitations such as false alarms. Recent studies advocate for image processing techniques, leveraging real-time visual data captured by cameras for more accurate detection. Methods such as image processing using technologies enhances the performance of Accident detection system, also it is more accurate and robust.

In summary, while traditional sensor-based approaches have provided valuable insights, the shift towards image processing techniques offers significant potential for improving the accuracy and reliability of accident detection systems [3]. Continued research efforts are essential to address remaining challenges and further enhance the performance of image-based approaches in diverse operating conditions.

The existing system is divided in different aspects, this is one stop solution that includes prevention and detection of road accidents. Novel solution can be incorporated with a vehicle airbag system that prevents vehicle occupants from striking interior objects such as the steering window.

III. METHODOLOGY

Intellicrash vehicle safety system, an Arduino UNO serves as the control unit, reading accelerometer data to monitor vehicle speed and detect sudden drops. If significant speed changes are detected, the Arduino retrieves the current GPS location and sends it via SMS using a GSM module, accompanied by a buzzer activation for alert. We have used ultrasonic sensor for distance measurement used for emergency breaking for the safety of drivers as well as pedestrians along with that MQ3 sensor is used to detect alcohol and triggers alarm.

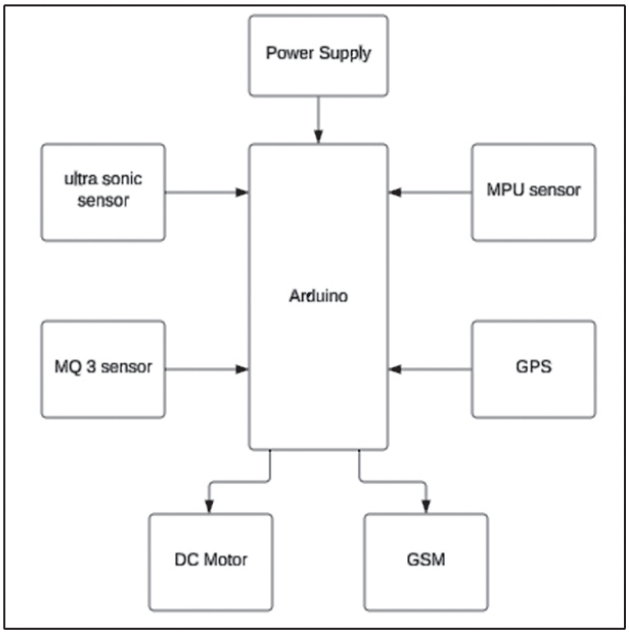

Figure 1. Block diagram of the proposed model.

Intellicrash is used to detect accidents as well as prevent them. It is a combination of different sensors and software working together. The system is mainly focused on driver and passenger safety via Software and Hardware used.

Intellicrash uses Arduino as the main control unit. Firstly, the structure for the idea is made which is a box. It is used to prevent and detect accident remotely allowing driver and passengers to be safe. A chargeable battery is used so that it can be used as the power supply for the microcontroller and sensors in the idea. A buck converter is used to regulate the voltage going in the Arduino and motor driver, as both the devices work on low voltage. For the movement of the boat, DC gear motors are used. The motor driver is interfaced with the Arduino to sync the movement of the boat. Sensors such as MQ3, ultrasonic, and MPU 6050 are interfaced to detect accident. MATLAB is used for image processing to detect driver drowsiness; all the sensors collect data and send to the Arduino which processes this data and determines whether it is an accident or not.If accident is detected, alert is sent through SIM900A module and location is fetched through NEO 6M.

IV. HARDWARE/SOFTWARE

The list of software required is as under:

SOFTWARE REQUIRED	SPECIFICATIONS
ARDUINO IDE	Arduino Integrated Development Environment (IDE) is a cross-platform application [4] that is written in functions from C and C++.
MATLAB	It is a high-level programming language and interactive environment primarily used for numerical computation, visualization, and algorithm development.

The list of hardware required is as under:

HARDWARE REQUIRED	SPECIFICATIONS
ARDUINO UNO	It is an electronic board based on the ATmega328P. It has 14 input/output pins, 6 analog inputs, a 16MHz ceramic resonator and an operating voltage of 5 volts [5]
SIM900A	The SIM900A is a compact GSM/GPRS module used in embedded systems for communication applications,
NEO 6M	The NEO-6M is a small, low-power GPS module commonly used in embedded systems for accurate positioning.
L293D	The L293D is designed to provide bidirectional drive currents of up to 600 mA at voltages from 4.5 V to 36 V.
16x2 LCD Display	A 16x2 LCD is a type of alphanumeric display commonly used in electronics projects and devices [5].
SENSORS	The sensors are devices that detect and respond to some type of input from the physical environment [6]. The input can be light, heat, motion, moisture, pressure or any environmental phenomena.

V. RESULTS AND DISCUSSION

The system detects accident from vehicle and sends message through GSM module. The message is received by another GSM module. Google map module displays Google map which shows exact location of accident and its details. For prevention of such accidents, we are using the ultra-sonic sensor, applies

emergency brakes if any object is detected just in front of vehicle for pedestrian safety.The MQ3 sensor is used for alcohol detection for the driver to prevent any accident.

TABLE 1-- THRESHOLD VALUES

Sensor	Threshold
Ultrasonic	10 cm
MQ3	400
MPU 6050	Z axis < 150 unit

Table 1 represents threshold values on the basis of real time applications & monitoring.

VI. CONCLUSION

In conclusion, the development of a Smart Accident Detection System, presents a significant stride towards enhancing road safety and emergency response mechanisms. Through the integration of sophisticated sensors, efficient communication modules, and Image processing software such as MATLAB. This system aims to promptly identify and alert relevant parties in the event of a vehicular accident. The algorithmic processing of accelerometer data, gyroscope data, and GPS data ensures accurate accident detection, while the implementation of a user-friendly interface facilitates system configuration and real-time monitoring by adhering to considerations such as accuracy, reliability, regulatory compliance, and data privacy, this idea endeavours to offer a comprehensive solution to the challenges associated with road safety. Furthermore, the emphasis on power efficiency, scalability, and integration with emergency services underscores the system's commitment to effective and sustainable operation.

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Prof. (Dr.) Neelesh Kumar Gupta is a seasoned professional with an illustrious career spanning over 23 years of teaching. He obtained Ph.D degree in Electronics and Communication Engineering (ECE) from Rajiv Gandhi Technical University (RGTU), Bhopal, MP India. Presently, he is working as Professor & HoD in ECE Department & IQAC Coordinator at Ajay Kumar Garg Engineering College, Ghaziabad, UP, India. Earlier he served in TRUBA Institute of Engineering and Information Technology, Bhopal as Professor & HoD, ECE. Obtained B.E. in ECE from Rajiv Gandhi Prodhyogiki Vishwavidyalaya, Bhopal in 2002 and M.Tech from Maulana Azad National Institute of Technology, Bhopal, MP India in 2007 with specialization in 'Microwave and Millimeter Waves'.

His area of expertise is Signal Processing, Communication Systems and Microwave Engineering. He published five Patents including two Design Patents. He has published over 35 research papers in SCI, SCOPUS Indexed journals and over 61 publications in conference proceedings published by *IEEE Explore* and Springer etc. Guided 35 M.Tech scholars and many UG students.

He is the reviewer and editorial member of several international journals of repute and chaired technical sessions in many international conferences. He organized conferences, FDPs, technical seminars and workshops at the institute level.

He is co-author of the book, *Fundamentals of Electronics Engineering*, published by Tech-Max Publication, Pune in June 2015.
His video lectures have been broadcast on *Swayam Prabha* Channel-15 and AKTU Digital Education Portal. Received 'Guru Faculty Award'; the 'Best Teacher Award' during Srijan 2015 and honored by IETE on Teachers Day.

Lakhya Dubey, graduated from AKGEC Ghaziabad, UP, India in Electronics & Communication Engineering.

He is a dedicated and enthusiastic graduate, with a keen interest in technology, problem-solving and innovation. Throughout his academic journey, he gained knowledge in automation, digital electronics, signals, microprocessors and microcontrollers, communication systems and many more, which helped him to develop his analytical thinking and a structured approach to upcoming challenges. He did his internship in automation, from AKGEC Skills. He is presently associated with Digit Insurance in a professional capacity.

Apart from his technical background, he enjoys studying about new researches and technologies, which allow him to be active in his day-to-day life. He believes in continuous learning and seeks opportunities to enhance his skills and knowledge.