

# IOT BASED AUTOMATIC ACCIDENT DETECTION AND RESCUE MANAGEMENT SYSTEM

<sup>1</sup>Mrs. S. PRATHYUSHA, <sup>2</sup>R.SRAVANTHI, <sup>3</sup>N.Y.BINDHU SAAHITHI, <sup>4</sup>V.ANUSHA, <sup>5</sup>SD.SALMAN  
SHAREEF

<sup>1</sup>ASSISTANT PROFESSOR, <sup>2345</sup>B.Tech Students

DEPT OF ELECTRONICS AND COMMUNICATION ENGINEERING  
TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

## ABSTRACT

Human loss by road accidents has been a devastating issue, which possess negative implications on the socio-economic development of the societies. Most developing countries are recording higher volumes of fatalities whenever a road accident occurs due to the lack of a proper and quick system that reports accidents to the emergency services for an immediate rescue. Moreover, the chances of survival of any casualty of an accident is mostly dependent on how quick the emergency medical services arrive at the scene and quickly reaches the nearest hospital with the victims for treatment. However, these emergency vehicles are sometimes delayed by heavy traffic en route to and from the accident scene. This paper introduces a robust automatic vehicle accident detection and alert system, which uses Magnetic switch sensor to detect the tilting and the crashing of the vehicle, sends the Global Positioning System (GPS) location of the accident scene to intended security, medical and family contacts. The proposed design achieved a turnaround response, which is faster than conventional rescue system without these features. Hence, saving more lives as possible through technology.

## I.INTRODUCTION

### 1.1 Overview:

In urban areas accidents are most common phenomena where many of such accidents can be taken care easily but some accidents occur during night time when the visibility is quite low, during such cases it will be difficult for an ambulance driver to identify the accident spot with the help of phone calls made by the citizens. If the driving force knows the precise spot of the accident the time period between the spot and the hospital is going to be significantly reduced. The main objective of this paper is to help reduce the time factor in case of accidents. There are many cases where an accident occurs during the night and the person met with the accident is unconscious then it would take hours for someone to find out and inform the authorities about it. So saving such precious time will indeed save lives. In connection with this concept, an experimental setup is constructed that can detect accidents automatically without any human help.

### 1.2 Objective:

To detect the accident automatically without any human assistance.

To get the location of accident occurred to selected contacts.

## II. Literature Survey:

Chunxiao Liao, et. al proposed a "Shrewd Traffic Accident Detection System Based on Mobile Edge Computing" in the year 2017. This paper proposes a savvy car crash location framework dependent on Mobile Edge Computing with vicinity, low idleness and processing, and vehicle recognizable proof. Our framework uses basic cell phones to get increasing speed and speed and distinguishes pictures indicating mishap scenes primarily at servers if there should arise an occurrence of bogus positives, acknowledging computerization of mishap identification and advising environmental factors and divisions like clinics and branches of transportation progressively.

Sanjana. K.R, et. al proposed "An Approach on Automated Rescue System with Intelligent Traffic Lights for Emergency Service" in the year 2015. They proposed a framework which will naturally identify street mishaps utilizing sensors, advise them to close by crisis administrations and family members through GSM. It is completely computerized, finds the mishap spot utilizing Google guide, and controls the traffic lights, assisting with arriving at the emergency clinic in time. This framework can be viably executed in high populated nations like India. Bankar Sanket Anil, Kale Aniket Vilas, Prof. S. R. Jagtap proposed an "Intelligent System for Vehicular Accident Detection and Notification" in the year 2014. This paper presents a system which gives an

idea about what can be done to provide medical help and other facilities after the accident as soon as possible.

Accelerometer can be used to detect an accident, while the location of the accident will be told to desired persons, such as the nearest hospital, police, and owner of the vehicle through SMS sent using GSM modem containing coordinates obtained from GPS along with the time of the accident and vehicle number. The camera located inside the vehicle will transmit real-time video to see the current situation of passengers inside the vehicle. Thus this paper emphasizes the post-accident system for detecting and informing about it. Simulation result on the hyper terminal is also presented in this paper. Najitaaib Said Al wadhahi, et. al proposed "Mishaps Detection and Prevention System to decrease Traffic Hazards utilizing IR Sensors" in the year 2018. This paper is utilizing IR sensors and Arduino Uno innovation. The framework has two stages Accident Detection and Accident Prevention. The recognition eliminate is conveyed utilizing IR sensors that could recognize and alarm the individuals by sending SMS utilizing GSM module that contains predefined numbers and mishap area utilizing GPS module.

Second Phase, Accident counteraction is done utilizing IR sensors by notice the driver about the neighbouring vehicles when the separation between them is past the edge esteem. Reenactment results and Prototype is introduced in this paper. Nicky Kattukkaran et. al proposed an "Intelligent Accident Detection and Alert System

for Emergency Medical Assistance” in the year 2017. This system aims to alert the nearby centre about the accident to supply immediate medical care. The attached accelerometer within the vehicle senses the lean of the vehicle and therefore the heartbeat sensor on the user’s body senses the abnormality of the heartbeat to know the seriousness of the accident. Thus the systems will make the choice and send the knowledge to the smartphone, connected to the accelerometer and heartbeat sensor, through Bluetooth.

### III. Basic Theory and Operation:

In urban areas accidents are most common phenomena where many of such accidents can be taken care easily but some accidents occur during night time when the visibility is quite low, during such cases it will be difficult for an ambulance driver to identify the accident spot with the help of phone calls made by the citizens. If the driving force knows the precise spot of the accident the time period between the spot and the hospital is going to be significantly reduced. The main objective of this paper is to help reduce the time factor in case of accidents. There are many cases where an accident occurs during the night and the person met with the accident is unconscious then it would take hours for someone to find out and inform the authorities about it. So saving such precious time will indeed save lives. In connection with this concept, an experimental setup is constructed that can detect accidents automatically without any human help.

## IV.HARDWARE DESCRIPTION

### 4.1ARDUINO UNO

Arduino UNO is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects. This board can be interfaced with other Arduino boards, Arduino shields, Raspberry Pi boards and can control relays, LEDs, servos, and motors as an output. Arduino UNO features AVR microcontroller Atmega328, 6 analogue input pins, and 14 digital I/O pins out of which 6 are used as PWM output



Fig 1: Arduino UNO

This board contains a USB interface i.e. USB cable is used to connect the board with the computer and Arduino IDE (Integrated Development Environment) software is used to program the board. The unit comes with 32KB flash memory that is used to store the number of instructions while the SRAM is 2KB and EEPROM is 1KB.

The operating voltage of the unit is 5V which projects the microcontroller on the board and its associated circuitry operates at 5V while the input voltage ranges between 6V to 20V and the

recommended input voltage ranges from 7V to 12V.

#### 4.2 MC38 MAGNETIC SWITCH SENSOR

In 1966, the first home security system was invented by an African American Marie Van Brittan Brown. The latest technology introduced smart home security/alarm systems to avoid complex installation processes, and endless wiring to protect the business and homes from intruders with wireless connectivity. Home alarm systems require a variety of sensors such as heat sensors, proximity sensors, and magnetic door sensors to monitor the security status of your home. Based on its performance, accuracy, size, and price the MC38 magnetic switch sensor is the most reliable and widely used sensor to ensure additional security to offices, homes, hotels, and other commercial and residential security purposes. This article gives a brief description of the working of the MC38 magnetic switch sensor, which works as a door sensor Or window sensor.



Fig 2:MC38 magnetic switch

#### 4.3 GSM SIM800A

The SIM800A Quad Band GSM/GPRS Module with RS232 Interface is a complete Quad-band GSM/GPRS solution in an LGA(Land grid array) type which can be embedded in the customer applications. SIM800A support Quad-band

850/900/1800/1900 MHz, it can transmit Voice, SMS, and data information with low power consumption.

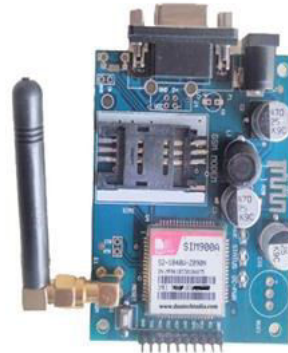


Fig 9:SIM800A

With tiny size of 100 x 53 x 15 mm, it can fit into slim and compact demands of custom design.

Featuring and Embedded AT, it allows total cost savings and fast time-to-market for customer applications.

The SIM800A modem has a SIM800A GSM chip and RS232 interface while enables easy connection with the computer or laptop using the USB to the Serial connector or to the microcontroller using the RS232 to TTL converter. Once you connect the SIM800A modem using the USB to RS232 connector, you need to find the correct COM port from the Device Manager of the USB to Serial Adapter.

#### 4.4GPS Module –

GPS is the abbreviation of Global Positioning System, which is a Satellite navigation system, which is about 20,000km away from the Earth. It can provide us with location and time information. It can work 24 hours a day under any conditions.

A complete GPS requires at least 24 satellites. As technology develop, more than 33 satellites work together in the system of GPS. Now we can use GPS in the navigation of airplanes, cars and trucks, GPS tracker that is a terminal device based on GPS positioning technology. The US Department of Defence (USDOD) initially only put these satellites into orbit for military use, such as controlling missile launches, until the 1980s, they were made available for civilian use. Since then, we can see that Various applications of GPS appear.



Figure 3: GPS Module

#### 4.5 BUZZER

An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren.

The pin configuration of the buzzer is shown below. It includes two pins namely positive and negative. The positive terminal of this is represented with the '+' symbol or a longer terminal. This terminal is powered through 6Volts whereas the negative terminal is represented with the '-' symbol or short terminal and it is connected to the GND terminal



Fig 4: Buzzer

#### 4.6 DC BRUSHLESS MOTOR

Brushless DC electric motors also known as electronically commutated motors (ECMs, EC motors).



Fig 5: DC brushless motor

Primary efficiency is a most important feature for BLDC motors. Because the rotor is the sole bearer of the magnets and it doesn't require any power. i.e. no connections, no commutator and no brushes. In place of these, the motor employs control circuitry. To detect where the rotor is at certain times, BLDC motors employ along with controllers, rotary encoders or a Hall sensor.

#### 4.7 POWER SUPPLY

6 Volt 1 Amp Power Adapter takes an AC INPUT of 100-240V and gives 6V 1A DC output



Fig 6: Power supply

Features:-

- Excellent Quality
- Short Circuit, Over Voltage & Over Current Protection
- Incredibly Low Fault Rates
- No Minimum Load
- This power supply is a regulated Center Positive power supply.
- It's plug design is for Indian power socket so, no plug converter is required
- Compact size & light weight

**V. PROPOSED SYSTEM AND SCHEMATIC DIAGRAM**

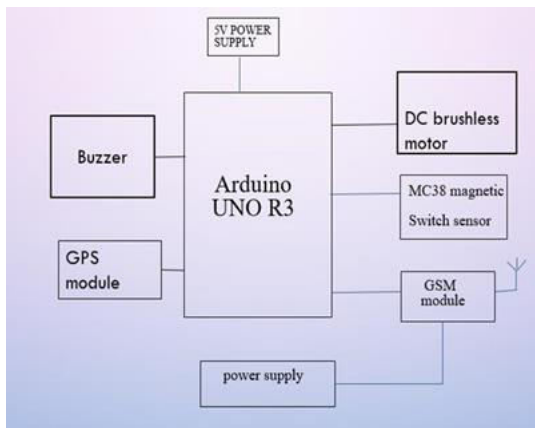


Fig 7:Block Diagram

**5.1 Features of Proposed system:**

The main principle of the project is the detection and rescue management. The system is on and initialization. If vehicle is normal, no messages has been sent to rescue team. And the temperature level of the driver is monitored in all

the time, if it reaches the threshold level then the action has been taken automatically. Whenever accident occurred, the MEMS sensor, tilt sensor and fire sensor detects the accident happened with vehicle. The controller get the input from sensors and send the accident alert information to road side unit and then message is send to the rescue team and also WIFI and GPS finds location of the vehicle and that also send to the rescue team. It will facilitate connectivity to the nearest hospital and provide medical help through IOT technology.

**5.2 Proposed Hardware Architecture:**

It contains Node MCU ESP8266, GPS receiver, tilt sensor, buzzer, and switch. If any accident occurs then the car may be tilted in XYZ directions and the buzzer starts beep sound and by using the WIFI module Node MCU esp8266 and GPS module will send the location to the nearest ambulance by using the Blynk app. By this ambulance can reach the accident location and can save a life by taking the victim to the nearest hospital. If there is any minor accident by using the kill switch it can stop the entire rescue operation.

**5.3 Schematic diagram**

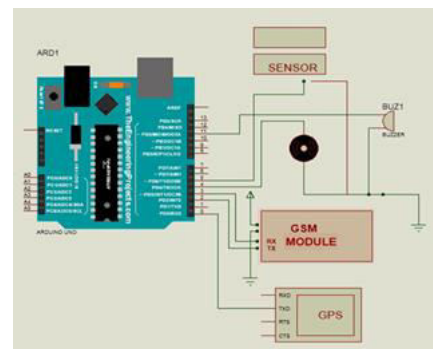


Fig 8:Schematic diagram



**VI.RESULTS**

**STAGE 1 RESULTS:**

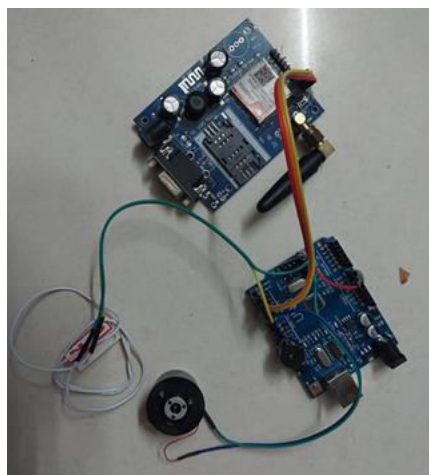


Fig9: Stage-1

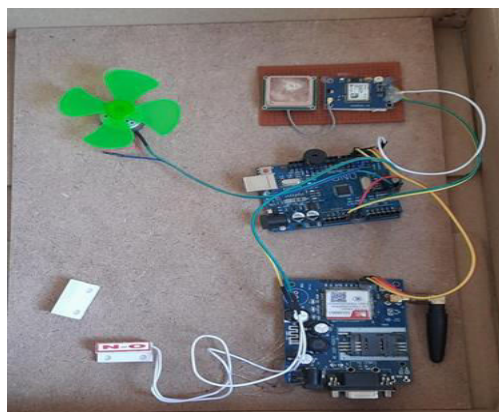


Fig10: stage 2

Test Scenario	Results
Simulated Accident	System successfully detected and reported the incident within second
Location Accuracy	GPS module consistently provided accurate location information.

**VII.CONCLUSION:**

The IOT-based automatic accident detection system presents a significant advancement in ensuring road safety and timely emergency response. With its robust design and efficient functionalities, the system holds the potential to minimize the impact of accidents and save lives. As technology continues to evolve, this solution stands as a testament to the power of innovation in addressing critical societal challenges.

**Future scope:**

Enhanced sensor integration: Incorporation of additional sensors for comprehensive environmental and impact data collection.

Ai-driven response: Integration of AI algorithms for proactive accident prevention and adaptive responses.

Smart communication: Development of direct communication interfaces with emergency services and hospitals for seamless support.

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