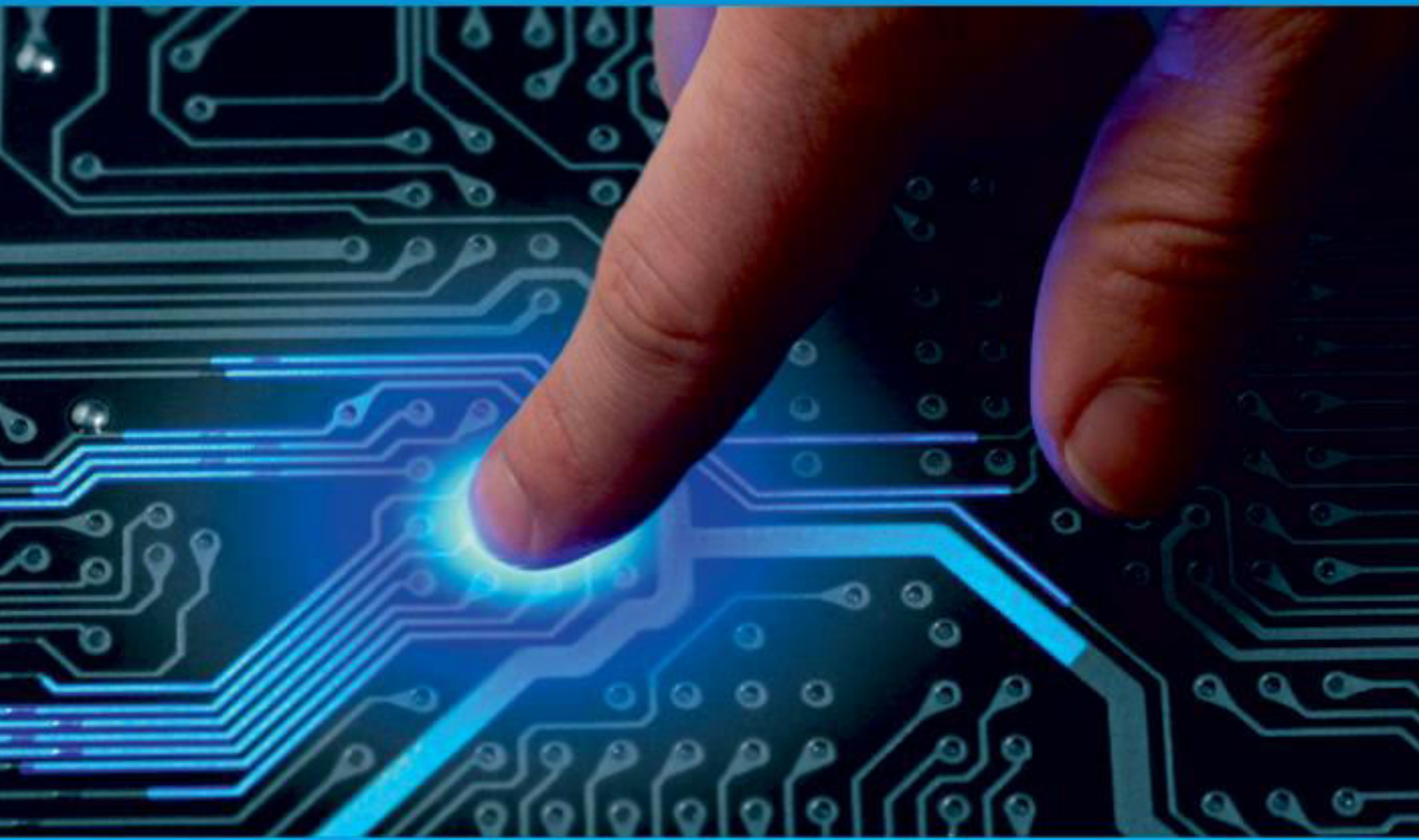




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Novel Approach for Vehicle Accident Detection

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ABSTRACT: Throughout many years with rapid growth of technology focusing on automobiles sectors has been increased. With increased in population and the ratio of vehicles on road also has been increased. According to WHO road accident is major reason for increased in human death. As advancement in research area moving further towards autonomous vehicle there is huge demand and need for vehicle accident identification. Also there are some systems available in the market for in vehicle monitoring of surrounding using camera module or Automatic Breaking System also there are some systems available for preventing major damage to vehicle or for drivers safety measures like advanced airbag with alert system. This paper introduces a novel approach for Vehicle Accident Detection System using MPU6050, GPS Neo 6m and SIM800L modules. Approach aims towards low cost, more accurate and efficient module for vehicle accident detection.

KEYWORDS: Road Accident, Vehicle Accident, Microcontroller, Alert System, GSM, GPS, Accelerometer.

I. INTRODUCTION

Nowadays vehicles play a major role in our society from start of the day to end of the day most people uses vehicles to reach out their work destination or at another place. Rapid growth in Standardization and Globalization had a major impact on lifestyle in India. Majority towards standard living with increased in demand of Vehicles in India. Nowadays a vehicle with added features are much more in demand with increased in competitors which are leading the vehicle market in India. Also, road accidents are major issue faced by many governments. Especially in India road accidents are increased from year 2013 till now. Most of the reports focused on the death report stated the lack of emergency alert systems. In most of the cases location of the accident is unknown due to this medical services being delayed in reaching the accident spot. Indian government prioritized the road safety as first priority. According to the study of Ministry of Road Transportation India suggest that there were 4,12,432 road accidents claimed during the year 2021 with of which 1,53,972 cases were failed to recover. Still the numbers are increasing each year [1]. In addition to the safety measures various activities are launched by government of India to reduce the incidents. Major activities involving approaching entrepreneurs for latest innovations through the activities like make in India, Smart India Hackathon, and Innovate India [2]. In advancement the paper proposed a prototype for Automatic vehicle accident detection system using accelerometer sensor MPU6050, a GPS module Neo 6m, a GSM module for alert SIM800L. Basic idea behind the project is using accelerometer to sense the tilting of the vehicle. Further tracking GPS location and sending the alert message to the emergency helpline using GSM module. In most of the country's area is limited for mobile network range but using GSM module for emergency toll free number will be very useful in all the areas.

II. RELATED WORK

There are various accident detection systems are available in the market, as the automobile sector moving towards the advancement and automation various work in this fields were taken some of these work includes:

A system integrated with GPS, ZigBee Communication protocol for tracking the real time location of the vehicle. Using accelerometer for detection of accident [3]. Another approach uses an inbuilt vibration sensor to detect the vibration during accident which is the part of the inbuilt airbag system. So, whenever accidental vibrations are sensed the system will automatically sends an alert sms using GSM module and sends location using GPS device [4]. Using

IMU accelerometer for detection of tilting of vehicle and uses GPS and GSM module which will provide sms based and location based alert also provided audio based alert using speaker and micro SD card [5]. LPC2148 based vehicle accident detection system involves an accelerometer for detection of over speeding and tilting of vehicle interfaced with an Android app for easy user interface. Whenever accident is happened the alert will be send to the Android app and also data is stored on the app [6]. An approach equipped with drivers health monitoring and accident detection system. Whenever accident is detected using accelerometer health monitoring comes in picture equipped with driver’s heart rate monitoring and uses GPS and GSM services for alerting medical facilities [7]. A smart helmet solutions for bikers which uses alcohol detection and bike accident detection integrated. Whenever the biker is drunk or he doesn’t wear helmet, he won’t be able to drive bike as relay is connected to the circuit which will disconnect the motor from circuit so that bike won’t be able to start also build mobile app for user friendly experience of the system [8]. Using MEMS accelerometer for detecting the Right, Left, Front and Back accident of vehicle and sending the alert based on the accident using GSM module. The system provides more accurate accident details send on the SMS [9]. Using two different sensors speed sensor and force sensor for accident detection also interfaced RFID based auto toll pay system. The system is added advantage of two different system in single system [10].

III. PROPOSED ALGORITHM

The proposed system will efficiently work on field also the system will ensure that all components will work efficiently without failing. Need of accident identification system will ensure drivers full safety also in place where the mobile network is weak and far from city the GPS tracker will send the longitude and latitude through vehicle tracking can be easily possible Also the system is reliable and can be modified as per the requirement of user and inbuilt features can be extended to meet certain requirements of user.

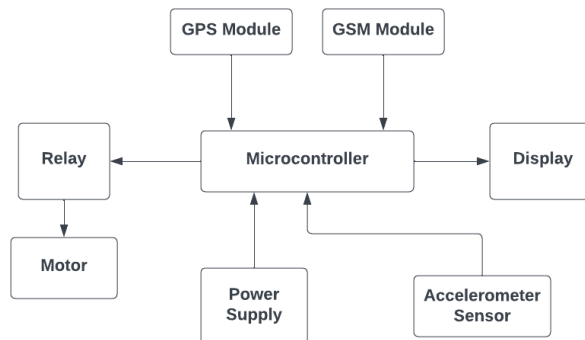


Fig. 1 Block Diagram of Proposed System

IV. PROPOSED SYSTEM

Proposed system for vehicle accident detection and identification consist of accelerometer and gyroscope MPU6050 which will provides the tilting information of vehicle which will predict whether accident detected, a GSM module for communication, a GPS neo 6m module for location tracking all these component can be worked together with Arduino Nano microcontroller to efficiently communicate with each other and work without failing. Proposed system will satisfy the user requirement also having an accident detection on the vehicle will help to maintain user’s peace of mind.

1. Circuit Diagram:

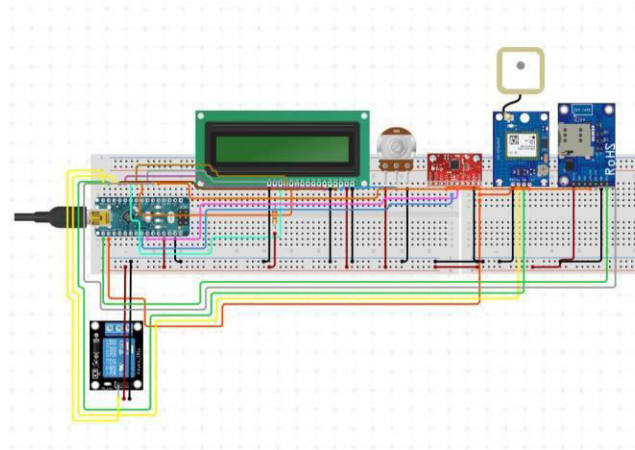


Fig. 1 Circuit diagram of proposed system

2. Working:

The proposed system is divided into several components to get better understanding of each components. As shown in fig. 1, starting with the MCU unit which consist of Arduino Nano controller and power supply unit. Second component of the system is Accelerometer and Gyroscope MPU6050 which is the main component in the proposed system to make the system work. MPU6050 assumes a threshold value of tilting the vehicle which is pre-scaled. At uniform vehicle speed the component assumes the normal behavior of the vehicle that is normal acceleration and normal tilting behavior. Whenever vehicle exceeds the threshold value the MPU6050 comes into picture and senses the tilting of the vehicle. And as soon as the critical tilting value reached it will send alert signal to the microcontroller and then the third component which is GPS Neo 6m comes into picture and work in association with GSM module. The GPS module will inform the location of the vehicle to the emergency number using GSM SIM800L module. Also an alert SMS message will be send to the emergency number using GSM module this is critical component in proposed system for communication related task. And after the accident is detected fourth module which consist of Relay which is triggered to turn of the motor and stops the movement of the vehicle.

3. Flow Chart

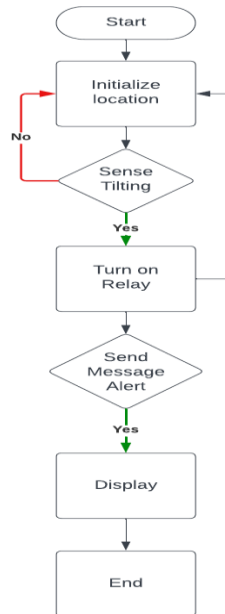


Fig 2. Flow chart of proposed system

Fig. 2 shows the working flow diagram of the proposed system. Starting with initialization of all components and fetching the location of the user. Followed with MPU6050 which will continuously sensing the acceleration and tilting of the vehicle if the irregular tilting is sensed it will trigger the relay also sends the GPS location and an alert SMS through SIM800L module. Also the alert message will be displayed on the screen.

If there is no irregularities in acceleration and tilting is sensed the system will behave normally and the process will continue in infinite loop checking whether actions needs to be taken or not.

V. TOOLS AND TECHNOLOGY USED

As discussed, the proposed system uses Arduino Nano as controller which is small and user friendly board based on ATMEGA328p controller. A MPU6050 sensor which senses acceleration, rotation of vehicle and provides output in Digital format based on Micro Electrical Mechanical System and works on 2.5v to 5.5v supply.

A GPS Neo 6m module provides an accurate global positioning or location. A SIM800L gsm module is a compact and lower power device provides a 2G mobile communication standard including a built in sim card slot works on frequency range 850/900/1800/1900 MHz.

A relay module and a Motor with basic configurations and 16 x 2 LCD to display the alert message.

1. Applications:

- i. Useful in Automobiles Sector.
- ii. Useful in high load vehicles.
- iii. Smart City.

2. Advantages:

- i. Easy to use
- ii. Low Power Consumption
- iii. Automatic Data Logging

VI. RESULTS AND ANALYSIS

After the assembly of prototype testing was successfully performed on Vehicle Accident Detection System. Prior to the existing system with similar functionalities the proposed system is more reliable with cost effective solution using MPU6050 and Neo 6m with Arduino Nano technology. Below fig. 4 shows actual prototype and at initial state with no accident detected and the normal working of vehicle is detected and message is displayed on the screen. As soon as accelerometer sensor detects improper tilting and acceleration of vehicle an alert message is displayed on screen as shown in fig. 6 and alert message is sent through GSM module on mobile phone as shown in fig. 7 with GPS co-ordinates.

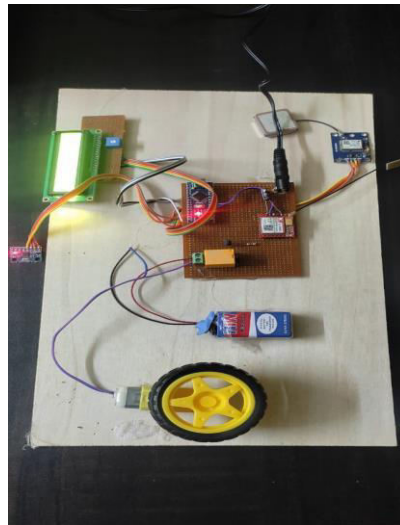


Fig. 4 Vehicle Accident Detection Prototype



Fig. 5 Vehicle Initial State



Fig. 6 Accident Detected Alert

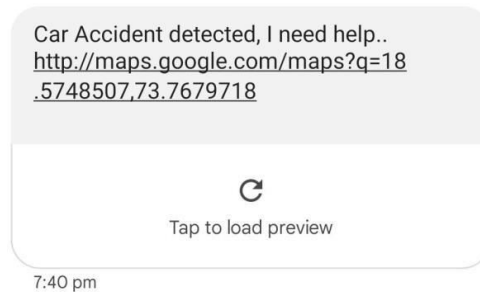


Fig. 7 SMS alert

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