Accident Detection and Intimation System

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Abstract:

An accident is an unanticipated and unintended occurrence. In view of increase in the number of fatalities in our country and the delay in receiving immediate response is the leading cause of death in road accidents, accounting for half of all deaths. This system helps to identify collisions quickly and send the information to emergency responders in a quick manner. When the flex and mems accelerometer sensor threshold value exceed the configured maximum limit due to an accident, the ESP32 board collects GPS data from the GPS module and sends a notification containing all relevant information to the Blynk app. This system provides tracking and transmits the specific location of the accident, when detected to the registered email through Blynk app.

Keywords: Accident**s,** GPS, ESP32 module, MEMS accelerometer sensor, Flex Sensor, Blynk app.

INTRODUCTION:

On Indian roads, one of the main causes of death were traffic collisions. Bad roads, reckless driving and lack of immediate treatment are among the causes of India's unusually high number of on-road fatalities. This system provides to track and monitor the condition of vehicle and helps to notify to the registered email immediately after the accident has occurred to the Blynk app.

Though India is home to just 1 per cent of the world's vehicles, we still account for 11 per cent of the global road accident deaths -- the highest in the world [1].Every day, approximately 1,374 traffic injuries and 400 fatalities occur on Indian roads, equating to 57 collisions and 17 deaths every hour. Road Traffic Injuries (RTIs) were responsible for 2.9 percent of all fatalities and 43 percent of all accident deaths in 2015. The number of people who died as a result of RTI's rose by 51% from 98,254 in 2005 to 1,48,707 in 2015[2]. In India Official figures of 2018 show that 151,417 people died and 469,418 were injured in traffic accidents[3].

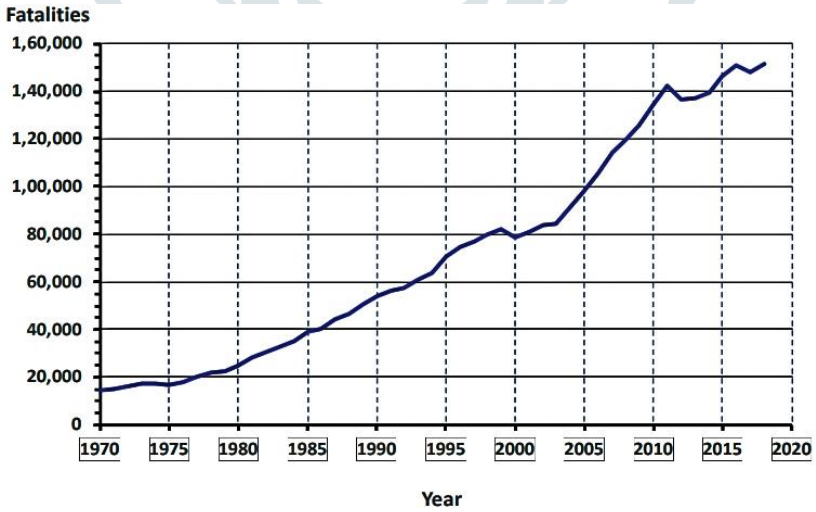

Figure 1: Road fatalities in India (1970-2018)

If we take an example of recent figures where accidents frequently occur, Table 1 shows that between 2014 and 2018, road fatalities on National Highways increased at a CAGR of 0.53 percent, people killed increased at a CAGR of 3.20 percent, and people injured were decreased at a CAGR of 1.22 percent on national roads.[4].

Year	National Highways (including Expressways)			State Highways			Other Roads			Total all roads		
	Road Accid -ents	Per-sons Killed	Persons Injured	Road Accid - ents	Per-sons Kille d	Persons Injured	Road Accid - ents	Per-sons Kille d	Person s Injured	Road Accid -ents	Per-sons Killed	Persons Injured
2014	1,37,903	47,649	1,47,696	1,23,408	40,678	1,31,959	2,28,089	51,344	2,13,819	4,89,400	1,39,671	4,93,474
2015	1,42,268	51,204	1,45,341	1,20,518	40,863	1,31,809	2,38,637	54,066	2,23,129	5,01,423	1,46,133	5,00,279
2016	1,42,359	52,075	1,46,286	1,21,655	42,067	1,27,470	2,16,638	56,643	2,20,868	4,80,652	1,50,785	4,94,624
2017	1,41,466	53,181	1,42,622	1,16,158	39,812	1,19,582	2,07,286	54,920	2,08,771	4,64,910	1,47,913	4,70,975
2018	1,40,843	54,046	1,40,622	1,17,570	40,580	1,21,579	2,08,631	56,791	2,07,217	4,67,044	1,51,417	4,69,418
CAGR 2014-2018	0.53	3.20	-1.22	-1.20	-0.06	-2.03	-2.20	2.55	-0.78	-1.16	2.04	-1.24

Table I: Trends of Road accidents during 2014 to 2018 in India

The Internet of things has now become a vital part of everyday life. Digital and electronic technology use is growing at a rate of more than 13 billion per year, or two devices per person. Any segment of the economy, including commercial, manufacturing, health care, and public safety, would contribute to future IoT growth[5].

The utility components, like all other daily gadgets, are being combined with Internet connectivity and efficient data processing methods, which is transforming how we live and function. As a result, the term "Internet of Things" refers to the expansion of network connectivity and computing capacity to common objects in order to create, share, and consume data with limited human intervention[6]. The usage of vehicles is increasing day by day in India, as accidents are unpredicted events in human life. Due to a lack of immediate treatment, several lives were lost. Our project seeks to provide people with faster response, who have logged on to Blynk application. So that faster medical aids could be provided to the victim. Accident Detection and Intimation is a project undertaken to intimate the location coordinates quickly to the near ones of the victim.

LITERATURE REVIEW:

Use of development boards like Arduino makes the project limited and slow and have less speed of calculation[7]. So, we used ESP32 which is faster than Arduino. Others used Arduino with GSM that only sends the message but not cannot analyze data and monitor car health[8][9]. In Amin, Jalil, and Reaz (2012) proposed methodology, for every second, the GPS receiver receives the GPRMC sentence. The most recent time the latitude and longitude values are stored in memory, overwriting previous data [3]. In the same manner for every one second the ESP32 will overwrite the location coordinates and stores the current position.

In soma, n.d work Raspberry Pi is interfaced with GPS modem via an internet to send message through WhatsApp [4]. Arduino Uno is interfaced with Wi-Fi module to send the SMS[12]. In some projects tracking is not possible[13]. But in our system, we can track the location of vehicle whenever the system is ON. In our System we have ESP32 which has inbuilt Wi-Fi to send the notification through internet. For car authentication Monisha used Ignition alert SMS using GSM, when engine is ON for security purposes[14]. Similarly, we have control access to Ignition from Blynk app to turn on/off the engine.

In existing work GSM technology is used to intimate the accident information[2][4]. In some projects, GSM is preferred to send message to pre-programmed number[18]. In Prabha, Sunitha, and Anitha (2014) EEPROM is used and this EEPROM stores the contacts that are entered by the user for receiving accident warning SMS[19]. These existing systems can only be used after the accident has occurred[20]. In Patel (2019) work, the location of the accident is seen through Blynk application to the emergency services and emergency contacts immediately[21].

So, rather than using GSM technology to send messages to the registered mobile numbers which is complex in sending to a lot of people. To overcome the delay caused by GSM, we use Blynk application for faster communication in sending notifications by providing a common email-id to near ones.

In Sulochana et al, (2014) paper aim is to find out the incident using accelerometer to detect accident[22].In kodali and sahu methodology used ADXL335 which is used to detect tilt[23]. we cannot know the severity of accident and it is difficult to find the particular values of the vehicle in all conditions. In Topinkatti et al. (2015) methodology used Bluetooth of phone, which monitors the accident [24]. In case the mobile is crashed, or Bluetooth is not connected to mobile, it cannot notify the accident. Kattukkaran also used Bluetooth technology with heartbeat sensor to detect the accident[25].

The heartbeat sensor is to be worn correctly and if it is not proper then there may be a chance of false calculations. Lavanya proposed that color sensor is employed to sense the facial color change and this information will be sent to the Arduino[26]. But color sensor cannot detect the facial color at nighttime. When

vehicle is involved in an accident vibration sensor will detect the accident[27]. In Sharma and Sebastian (2019) proposed theory when the vibration sensor senses any vibration above the threshold range it sends interrupt to microcontroller[28].

In general, our roads consist of speed breakers and potholes which are one of the biggest issues of our roads. As vibration sensor is sensitive to our road conditions and can detect the false accidents. Karmokar used load sensor to detect the accident which detects accident when pressure exerted[29]. We use flex sensor to detect the dent or damage occurred to the car and intimate the damage occurred to the microcontroller. The flex sensor which is flexible potentiometer produces a resistance output related to the bending of flex and can be preferably used to detect the dent.

A smart phone continuously detects the accelerometer and GPS data[30][31]. But if the mobile is crashed it cannot intimate accident. In our methodology we do not require a mobile for sensing, we use it only for monitoring. Considering the fatality rates in India due to accidents, a lot of lives were taken due lack of response. So, this project helps us to moitor the condition of the vehicle and track the location continuously through mobile phone efficiently.

PROPOSED METHODOLOGY:

The method of finding and identifying the victim's location after an accident is a challenging job that must be identified. The primary goal of the Accident detection and intimation system is to find the injured and report the accident to his or her concerned persons using a standard email address so that emergency support can be provided quickly.

To accomplish this capability, an ESP32 module is used, with a unique code programmed in it. The ESP32 module is connected to flex and mems sensors, that detects the severity of the collision. If sensor threshold value exceeds the configured maximum limit then location of the victim is sent quickly in terms of latitudinal and longitudinal data immediately to the registered email in Blynk application by GPS module. The maps will indicate the exact coordinates of the crash as well as the relevant details of accident can be seen on Blynk application.

When the threshold level is reached, the Blynk API is used initiate a response in our IoT system. This application has to be installed on all the mobiles of the user by providing a common email-id. With Blynk we can receive alert notification from ESP32 to mobile phones using basic scripting, we can track the status of the vehicle in Blynk map continuously whenever the GPS is turned ON. It can also act as a theft control of vehicle, where we can turn on/off engine using Blynk app.

FLOW CHART:

The power of the system is turned ON, then GPS will be initialized. If GPS is enabled, indicating Green LED ON. The flex, MEMS accelerometer sensor will start recording the values which are displayed on Blynk app. Thereby we can continuously track and monitor the condition of the vehicle and can have access to Ignition control of the Engine. If flex value exceeds the threshold value of less than 380 or greater than 680 or MEMS X, Y coordinate values changes individually by less than 1700 or greater than 2250. The ESP32 will notify the changes occurred in system by turning Red LED ON and Buzzer ON and notify the Blynk app that accident has occurred as shown in figure 2.

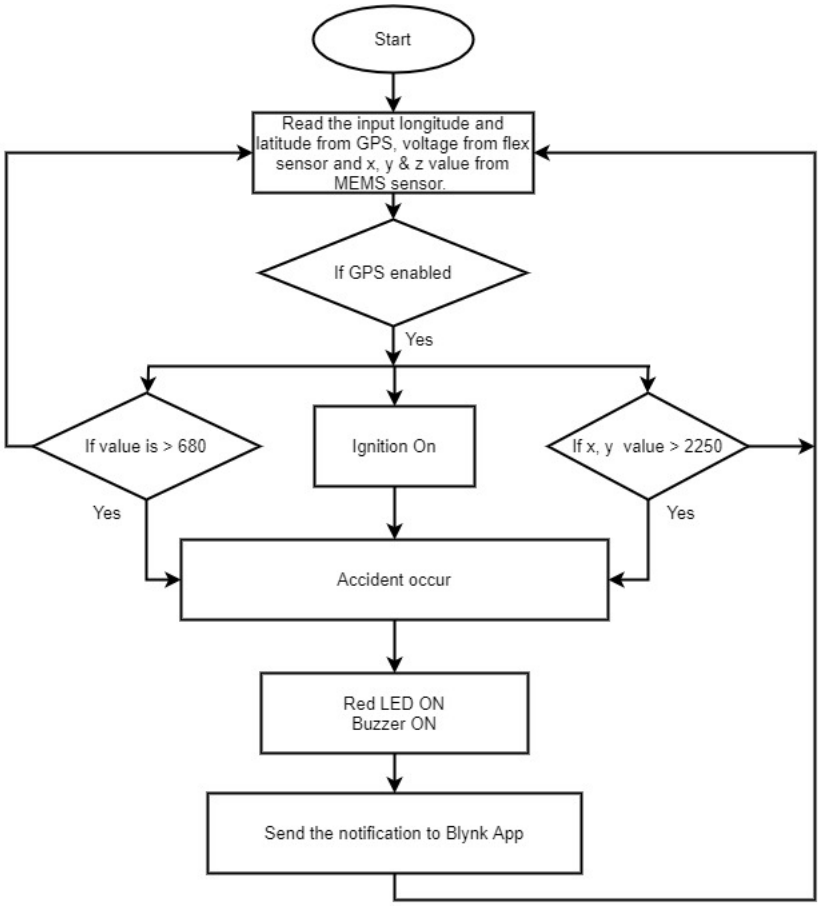

Figure 2: System flow chart of proposed methodology

SYSTEM IMPLEMENTATION:

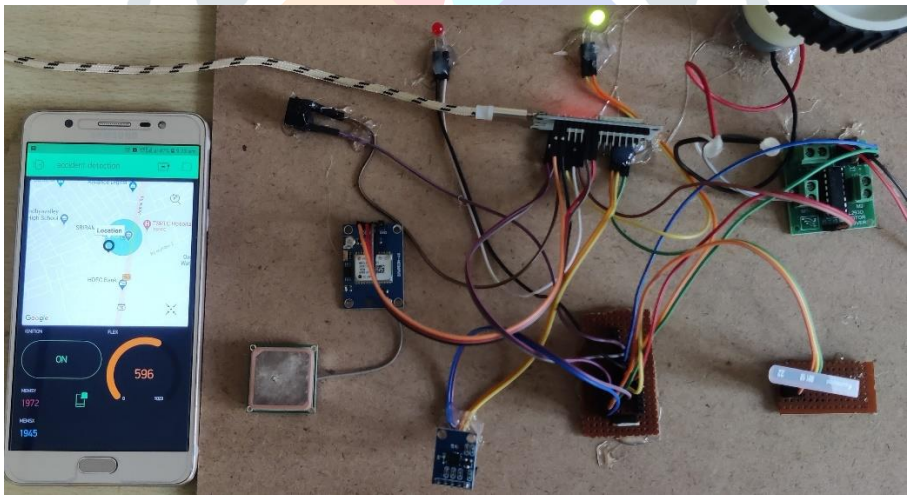

Figure 3: Accident Detection and Intimation setup

If the power supply is provided to the system, then GPS is turned ON. If the GPS is enabled then only the accelerometer sensor and Flex sensor will start recording the values in memory turning Green Led ON, these values are displayed on Blynk application. For every one second the ESP32 will overwrite the previous location coordinates and is stored in ESP32. If the value reaches out of threshold limit, then it intimates notification that accident has occurred turning red Led and buzzer ON, which is a sign of danger. The location of the incident with appropriate values are displayed in the Blynk application to whoever has signed into the Blynk application using the login credentials. This system also has access to Ignition control over Blynk for security purposes to turn on/off engine.

RESULTS AND DISCUSSION:

After installation, This device was tested in many places. The device sends information to responders mentioning driver's geographical position in the form of latitude and longitude values, which assist in identifying the rider's exact location. The warning notification is shown in Figure 5.

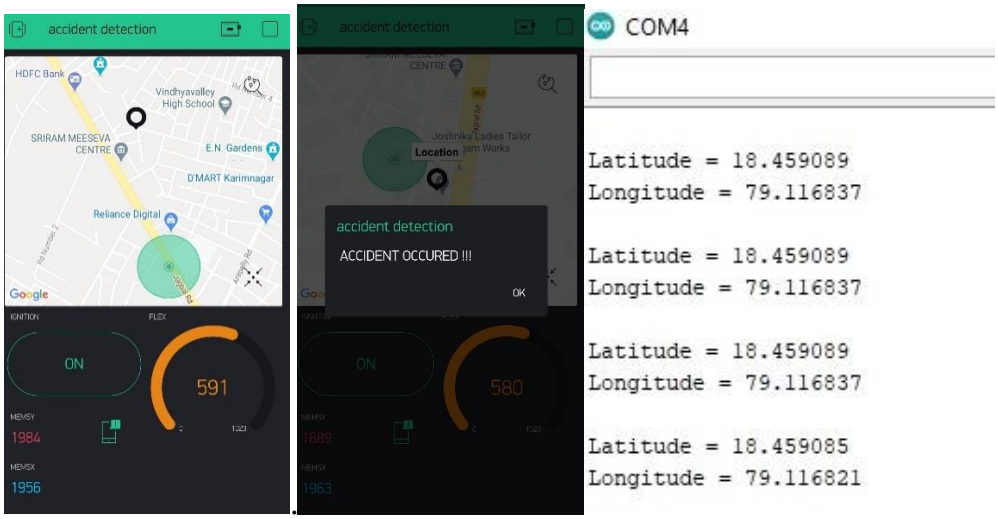

Figure 4: Display of tracking and alert message

The system provides faster intimation using internet without any delay to all the people who have the login credentials at same time and we can continuously track and monitor the condition of the vehicle, whenever the system is turned ON and having proper internet connectivity. This system also acts as a theft control by continuously monitoring the location and it also contains ignition control, where the engine can be turned on/off manually through Blynk application.

CONCLUSION:

In recent days, this alarming increase in accidents results in the loss of many lives. Many deaths are caused by a failure to receive the treatment in a timely manner or due to lack of communication to the responders at the time of accident. The proposed work addresses this issue by implementing an accident detection and intimation scheme with the aim of saving at least half of the lives involved in traffic collisions. This project helps us to track the status of the vehicle continuously by monitoring the location and health of vehicle. In future this device can be used for other safety purposes likewise to intimate over speeding of vehicle to the family members and can be implemented for smart locking of door using smart phone to the user as a theft control of vehicle. So, the project main aim is to provide faster response of accident and to avoid the delay time of response and plays a key role in providing quicker assistance to victim.

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