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IoT Based Automatic Vehicle Accident Apprise System

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Abstract

The concept of detecting car accidents is not fresh and the automobile industries have made tremendous progress in optimising the technology. Here we are seeking to stumble on accident through the accelerometer as it facilitates in identifying the vicinity and if the values of x, y and z parameters are extra than the defined values than it's going to set situation to proper and the code written for initiating the intimation and SMS alert gets executed. With this method the accident location can be detected easily and the information of the accident location can be sent via the GPS to the emergency offerings for assistance. In roadways transportation, main concern is the frequent accidents all over the world. Around 450000 accidents takes place in India every year. Among which approximately 150000 are dying. So to reduce this we have came up with a solution containing called vehicle accident and notification system.

Keywords: IoT 1, Accident alert 2, Emergency 3, GPS 4, Location 5

1. Introduction

- India has three modes of transportation: land, water, and air. Most Indians commute mostly by car, and the country has some of the most highly used road transportation infrastructure in the world. The four major Indian metropolises of Delhi(north), Kolkata(east), Chennai(south), and Mumbai are connected by the Golden Quadrilateral(west).
- After the United States, India has the second-largest and one of the busiest road networks in the world, carrying 8.225 billion passengers and more than 980 million tonnes of freight annually as of 2015. As of 2020, India's rail system was the second busiest and fourth-largest in the world, moving 8.09 billion people and 1.20 billion tonnes of freight yearly.
- Military and civil aviation make up the majority of aviation in India, which has the world's fastest-growing aviation market (IATA data).
- According to the 2011 Indian census, 4.70 percent of households in India had cars or vans, compared to an overall two-wheeler ownership rate of roughly 21 percent.
- With an annual growth rate of 10.5% and a present annual production of over 4.6 million automobiles, India's automobile industry is now expanding quickly. Future projections indicate that the number of vehicles produced will increase significantly(“road accident in Indian 2010”)
- There are 4 major causes for road accidents in India. They are due to over speeding, drunken drive, distraction of drivers and avoiding safety gears. 2019 saw a total of 4,37,396 road accident cases reported.

- The number of road accident cases in the nation declined from 4,45,514 in 2018 to 4,37,396 in 2019. The number of people killed in traffic collisions has risen by 1.3%. (from 1,52,780 in 2018 to 1,54,732 in 2019). Most of the people die due to late recovery from the accident area.(M.S. Amin et al.,2012).
- The growing demand for cars has also led to more traffic congestion and motor accidents. The lives of the people are in grave danger. This is due to the dearth of top emergency facilities in our nation.
- In this work, a car accident warning system is introduced. This concept is a system that can identify accidents in a lot shorter time and deliver the essential information to a first aid facility in a matter of seconds, including the location, the time, and the angle at which a car accident occurred.
- The rescue crew receives this warning message quickly, which will aid in saving precious lives. In the unusual instance if there are no casualties, a switch is also given to stop the message from being sent. This can help the medical rescue team save valuable time. The alarm message is automatically transmitted to the police station and the rescue crew when an accident happens.
- The GSM module is used to send the message, and the GPS module is used to determine where the accident occurred. Hence with the help of this project we can find the altitude and longitude of the vehicle using GPS.

2. Objective

- The main objective of this project is to design, construct and develop a system that detects a vehicle accident using GPS and GSM module and ensures that the right information reaches to the right authority.

3. Proposed Solution

- The major purpose of the proposed system is to track different types of vehicles, whether they are little vehicles like cars or motorbikes driven by their owners or various large-sized vehicles like buses and heavy trucks driven by the authorised corporation.
- This tracking technology aids in retrieving the precise location of the vehicles in the event of an accident. This technology automatically notifies all parties involved in the incident about the incident. When accidents occur, it becomes exceedingly challenging to provide aid to the victims because neither the hospitals nor the police or the victim's family have been informed of the incident. Thus leading to a significant loss of life.
- We can send an automatic SMS to the system's designated contacts to prevent such instances. The sensors employ Bluetooth Technology as a means to turn on the GPS. Between the sensors and the GPS, it is a bridge. However, MESA technology can also be used to activate GPS and broad cast the location coordinates to the designated numbers, in addition to Bluetooth technology.

4. Working Principle

- In todays world, accidents are major causes of death. Our system consists of Arduino uno, GSM, GPS, Vibration sensor and a buck converter.
- The kit is attached to all the four sides of vehicle. If two vehicles collide each other, vibration sensor gets activated and gives signal to Arduino uno. Then Arduino uno gives signal to GSM and GPS module.

- The GPS module collects the latitude and longitude of the vehicle with the help of satellite. Then the tracking system collects GPS data and transmits it via mobile communication to chosen mobile device using the GSM module.
- The message and location will also be sent to nearby police station, hospital and ambulance service for emergency purposes. Message will be displayed as **"ALERT ACCIDENT OCCURRED"**.
- A pushbutton is also provided near the driver's place, so that if the driver and passengers are not seriously injured they can press it. If the button is pressed, the message will not be sent to the family members and rescue team.
- This system will help to save many lives. In this model we have also used a buck converter because GSM module works only between 3.3 to 4.2V. If it exceeds the limit, GSM module may get damaged.

5. Advantages

- Immediate help can be provided
- Nearest hospital can be located
- Death rate can be reduced
- Family members will know the information immediately
- Cost efficient and easily controllable
- More reliable and assured safety
- Low power consumption
- Better accuracy
- Reduction in the chance of human error

5. Design Description

- Table 1 shows the components mainly used in the system. The setup mainly consists of electrical components. It includes Arduino uno, GSM module, GPS module, buck converter, impact sensor, vibration sensor, led display and a key.
- Once the sensors detect the accident it gives signal to the Arduino uno which gets location of the particular vehicle with the help of GPS module and sends message to the helpline with the help of GSM module within very short span of time.

Arduino UNO

- A microcontroller board called Arduino UNO is based on the ATmega 328P.
- It contains 6 analogue inputs, a 16 MHz ceramic resonator, 14 digital input/output pins (six of which can be used as PWM outputs), a USB port, a power jack, an ICSP header, and a reset button.
- It comes with everything needed to support the microcontroller; to get started, just plug in a USB cable, an AC-to-DC adapter, or a battery.
- You can experiment with your UNO without being too concerned about making a mistake; in the worst case, you can replace the chip and start over.

Pin configuration:

- **LED:** Digital pin 13 powers the integrated LED. The LED is on when the pin's value is high; it is off when the pin's value is low.

- **VIN:** The Arduino board's input voltage when powered by an external source (as opposed to 5volts from the USB connection). This pin can be used to access voltage that has been supplied via the power jack or to feed voltage to it.
- **5V:** The regulator on the board outputs a controlled 5V through this pin. The board's VIN pin, the USB connector (5V), or the DC power jack (7 to 20V) can all be used to supply power to it (7-20V). supplying power via the 3.3V or 5V pins.
- **3V3:** The on-board regulator's output of 3.3 volts. A 50 mA maximum current consumption is allowed. Ground pins, or GND.
- **IOREF:** The microcontroller's voltage reference is provided via this pin on the Arduino board.The IOREF pin voltage can be read by a properly constructed shield, which can then choose the proper power supply or enable voltage translators on the outputs to operate with 5V or 3.3V. Shields that block the reset button on the board are frequently added with this feature.

Communication:

- A computer, another Arduino board, or other microcontrollers can all be communicated with using the Arduino Uno's many communication features.
- On digital pins 0 (RX) and 1, the ATmega 328 provides UART TTL (5V) serial connection (TX). This serial communication is routed through USB by an ATmega 16U2 on the board, which is seen by computer software asa virtual com port.
- There is no external driver required because the 16U2 firmware works with the built-in USB COM drivers. On Windows, however, a inf file is necessary.
- A serial monitor is included in the Arduino Software (IDE) and allows straightforward textual data to be delivered to and received from the device.
- When data is transmitted using the USB-to-serial chip and USB connection to the computer, the RX and TX LEDs on the board will flash (but not for serial communication on pins 0 and 1).
- Any of the digital pins on the Uno can support serial communication thanks to the Software Serial library.

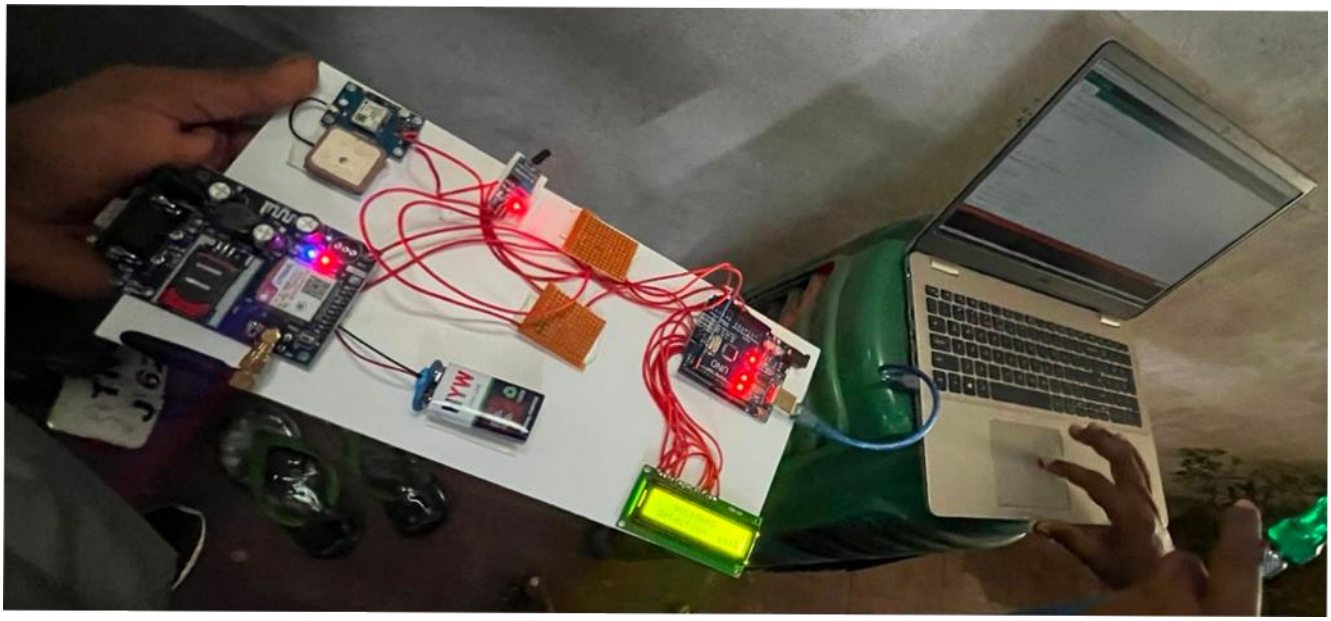
Electrical selection:

- The electrical section consists of Arduino uno, GPS Module, GSM Module, vibration sensor and buck converter. All the circuits are built on a dot board.
- The power supply to the system is received by a 12V adapter which converts into 3.3V or 5V based on the requirement of the circuit. GPS and GSM modules works under 3.3V to 4.2V power supply.
- Hence, buck converter is used as a DC-DC power converter which steps down voltage of above 4.2V.
- GPS receives the satellite data through dedicated RF frequencies. GSM module is designed for wireless radiation monitoring through Short Messaging Service(SMS).
- In this project, we have used SIM800L type GSM module and NEO 6M type GPS module. Vibration sensor containing 3pins VCC,GND,DO is also used in this project. A 16*2 LED display gives signal alert after the vibration sensor get activated.

Table 1: Components used

S.No	Components	Description
1	Arduino UNO	ATmega 328P
2	GPS Module	3.2 to 5V
3	GSM Module	SMS
4	PCB Board	12 X 18 cm
5	Vibration Sensor	Measure Frequency
6	Power Supply Cable	A - B Cable
7	Jumper Wires	Male to Female

Figure 1: Prototype of IoT Based Automatic Vehicle Accident Apprise System



6. Conclusion

- Better fleet management is made possible by vehicle monitoring systems, which results in significant financial gains. You can handle heavier loads in a given amount of time with better scheduling or route planning.
- Vehicle tracking enhances safety and security, communication tools, performance monitoring, and productivity when used for personal or corporate purposes. It will therefore have a significant impact on how human live in the following year.
- The accident alarm system project's main goal is to lessen the likelihood that someone will die in an accident that we can't prevent. When an accident is reported, paramedics are dispatched to the scene to improve survival rates. Accidents that happen at night or in deserted areas benefit more from the invention of this technology. In the future, this vehicle monitoring and accident alarm capability will be even more crucial to day-to-day living.

- The proposed programmed accident detection system can be a rescuer of life for the people who met with accidents. The proposed system is exceptionally easy to understand and even a non-specialised Person can use it without any problem.
- The system consists of equipment and programming segments. The equipment unit includes accident detection sensors that are constrained by an Arduino board and is fitted in the vehicle. Then again, the programming part is an Android application introduced in drivers Smartphones which is used to get the point by point map. In general, the benefits of this system are low cost, secure and simple to use. The system introduced in this work reduces the casualties due to accidents.

7. Future Scope

- Recovery of Stolen Vehicles: Both personal and commercial vehicles can be fitted withRF or GPS systems to enable tracking and recovery by police. In the case of LoJack, the police can directly turn on the vehicle's tracking device and monitor tracking signals.
- Asset tracking: Businesses may now plot the location of valuable assets in real- time on a map and closely monitor movement if they need to track them for insurance or other monitoring purposes.
- Addition of alcohol sensors: It can be used to detect the consumption of alcohol by the driver. If the sensor detects the alcohol consumption then the vehicle can be automatically turned off.
- Vehicle can be paired with the corresponding owner and monitored continuously and can get alerted in emergency situation.

8. Appendix

```
#include <LiquidCrystal.h>
// initialise the library by associating any needed LCD interface pin
const int rs = 3, en = 4, d4 = 5, d5 = 6, d6 = 7, d7 = 8;
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);
int vib=2;
void setup()
{
  Serial.begin(9600);
  pinMode(2,INPUT);
  lcd.begin(16,2);
  lcd.setCursor(0,0);
  lcd.print("   ACCIDENT     ");
  lcd.setCursor(0,1);
  lcd.print(" Detection  System   ");
  delay(3000);
}
void loop()
{
int a=digitalRead(vib);
Serial.println(a);
if (a==0)
{
```

```
  lcd.setCursor(0,0);
 lcd.print("   accident         ");
 lcd.setCursor(0,1);
 lcd.print(" detected        ");
gsm_code();
 gsm_code1();
}
}
void gsm_code()
{
    Serial.println("AT");
//Sets the GSM Module in Text Mode
    delay(4000);
    Serial.println("AT+CMGF=1");
//Sets the GSM Module in Text Mode
    delay(4000);
// Delay of 1000 milli seconds or 1 second
    Serial.println("AT+CMGS=\"+917502833905\"\r");
// Replace x with mobile number
    delay(4000);
    Serial.println("Accident identified.Lat:11.1007.Long:77.026");
// The SMS text you want to send
    Serial.println((char)26);
// ASCII code of CTRL+Z
    delay(3000);
    delay(5000);
}
void gsm_code1()
{
    Serial.println("AT");
//Sets the GSM Module in Text Mode
    delay(4000);
    Serial.println("AT+CMGF=1");
//Sets the GSM Module in Text Mode
    delay(4000);
// Delay of 1000 milli seconds or 1 second
    Serial.println("AT+CMGS=\"+917539908448\"\r");
// Replace x with mobile number
    delay(4000);
    Serial.println("Accident identified.Lat:11.1007.Long:77.026");
// The SMS text you want to send
    Serial.println((char)26); // ASCII code of CTRL+Z
    delay(5000);
```

```
    delay(3000);
}
```

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