Design and Implementation of IoT based GPS-GPRS Vehicle Accident Detection and Tracking

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ABSTRACT - *Nowadays, we see many people losing their precious lives due to an increase in the number of vehicles, we often see many accidents on roads this may be due to rash driving, drunk and drive (human errors) carelessness of driver, sometimes unknowingly. The victim won't get proper medicine soon after the incident happens this delay is due to unpredictable accidents or difficulty in identifying the location of the individual. On considering the lives of people here in this paper we discussed the "Vehicle accident detection and tracking system", here the person initially needs to put this system in his vehicle once he/her met with an accident the notification will be sent to the registered number (Ambulance, Doctor, Concerned people). Here we have used Global Positioning System (GPS), Global System for Mobile (GSM), ATmega328p controller, sensor, buck converter regulator for constructing the system.*

Key Words: **Vehicle, accident, GSM, GPS, IOT, Traffic, Sensor.**

1.INTRODUCTION

The Internet of Things (IoT) is the interconnection of uniquely identifiable embedded computing devices that are able to collect and transfer data over a wireless network without human intervention. Due to rapid growth of world population, the demand for vehicles has increased tremendously, resultantly problems of traffic congestion and road accidents has also increased. The general population's life is under high risk, On the basis of evidences, we have proposed system which receives the vehicle's geographic coordinates and a vehicle's unique ID from an in-vehicle device in real time using the GPS module. Transmission of a vehicle's location information and a vehicle number to a web server using the GSM/GPRS module. Whenever a user requests the vehicle location, it can be accessed from and monitored on Google maps using smart phone.

Fig 1: TRACKING SYSTEM
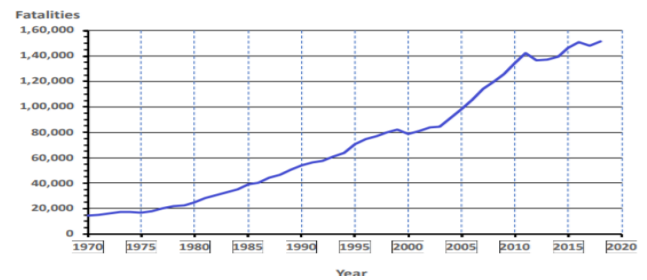
1.1   STATISTICAL INFORMATION

Fig 2: ROAD TRAFFIC DEATHS IN INDIA 1970-201

According to Planning Commission of India, the total annual economic loss is 2.5% of India's GDP due to rising number of road fatalities. According to National Crime Records Bureau, Ministry of Road Transport & Highway, Law commission of India, one serious road accident in the country occurs every minute and 16 die on Indian roads every hour.

2.   ARCHITECTURE AND METHODOLOGY

Road accidents are the leading cause of death and disability. The proposed system detects vehicle geographical location information and sends alert SMS to concerned people (Pre saved number).
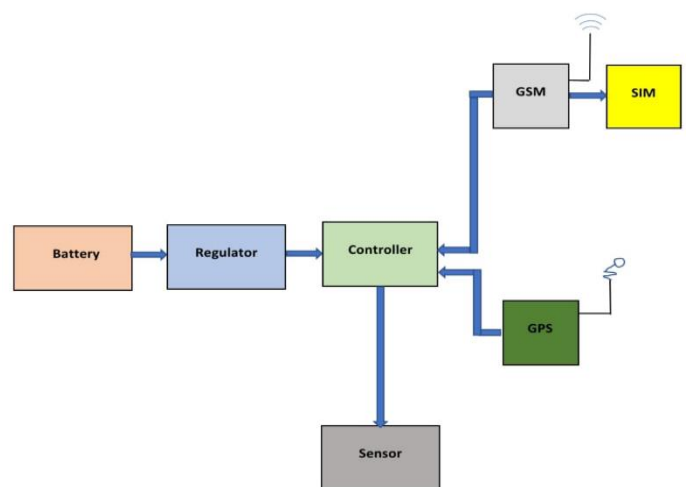

Fig 3: BLOCK DIAGRAM OF THE SYSTEM

WORKING:

The main objective of this system is to first detect the accident occurred exact location and call for the emergency service such as ambulance, this proposed system works on Arduino Uno tool which controls whole process with GPS and GSM, the Atmega328p chip has associate degree analog-to-digital convertor (ADC) inside it.

Fig 4: ARDUINO UNO(ATMEGA328P)

Further GPS receiver is used for detecting the coordinates of the vehicle it is directly connected to digital pin number 10 of Arduino, Serial communication is allowed on pin 10 and 11 made them R_x and T_x.


Fig 5: GPS MODULE

GSM module is used to send alert message (through inserted SIM) regarding coordinates of the vehicle which is send in the form of link of Google map, which is connected to digital pin number 8 and 9 of Arduino serial communication is allowed and made them R_x and T_x, works with 12V and 2A current supply.

Fig 5: GSM MODULE

Buck regulator is used for conversion of voltage from 12v to 5v with the output current 2A, which is suitable for working of the controller, as some components work with 12V and other 5V.
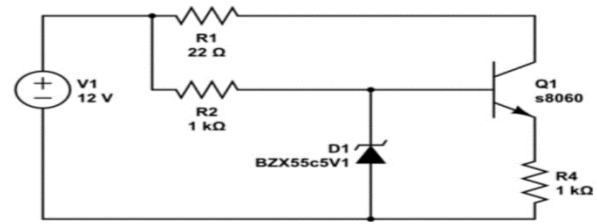
Fig 6: BUCK CONVERTER

We have used the Push button as a sensor which is connected to pin 12 of controller, as and when this sensor comes in contact with an object (the accident occurred) this sensor through GSM (with SIM inserted) sends an alert message to the controller with the help of GPS, location information will be collected and along with the SMS alert, telling the longitudinal and latitudinal position with google map link indicating exact location of accident vehicle this information will also be displayed on 16*2 LCD display.

Fig 7: Push button   **Fig 8:** LCD Display

EMBEDDED C CODE


```
#include <TinyGPS++.h>
#include <SoftwareSerial.h>
#include<LiquidCrystal.h>
LiquidCrystal lcd(2, 3, 4, 5, 6, 7);
SoftwareSerial mySerial(8, 9);
int btn = 12;
String responce = "https://www.google.com/maps/place/15.44618,74.99419";
int state =0;

void setup()
{
  lcd.begin(16, 2);
  pinMode(btn, INPUT);
  mySerial.begin(9600);   // Setting the baud rate of GSM Module
  Serial.begin(9600);     // Setting the baud rate of Serial Monitor (Arduino)
  delay(100);
  lcd.setCursor(2, 0);
  lcd.print("CAR ACCIDENT");
  lcd.setCursor(6, 1);
  lcd.print("DEMO");
  delay(2000);
  lcd.clear();
}
```

```
void SendMessage()
{
 lcd.clear();
 lcd.print("ACCIDENT OCCURRED");
 delay(1000);
 lcd.clear();
 lcd.print("SENDING LOCATION");
 lcd.setCursor(1, 1);
 lcd.print("TO REG NUMBER");
 delay(1000);
 lcd.clear();
 lcd.print("SENDING...");
 lcd.clear();
 lcd.print(LAT,15.44618);
 lcd.setCursor(0, 1);
 lcd.print(LOG,74.99419);
 delay(1000);
 mySerial.println("AT+CMGF=1");    //Sets the GSM Module in Text Mode
 delay(1000);  // Delay of 1000 milli seconds or 1 second
 mySerial.println("AT+CMGS=\"+91234567891\"\r"); // Replace x with mobile number
 delay(1000);
 mySerial.println(responce);// The SMS text you want to send
 mySerial.println("\n");
 mySerial.println("KA-25 CA 1234");
 delay(100);
 mySerial.println((char)26);// ASCII code of CTRL+Z
 delay(1000);
 lcd.clear();
 lcd.print("LOCATION SENT");
 delay(1000);
 lcd.clear();
}

void RecieveMessage()
{
 mySerial.println("AT+CNMI=2,2,0,0,0"); // AT Command to receive a live SMS
 delay(1000);
}

void checkLocation(){
  mySerial.println("AT+CIPGSMLOC=1,1");|
}
```
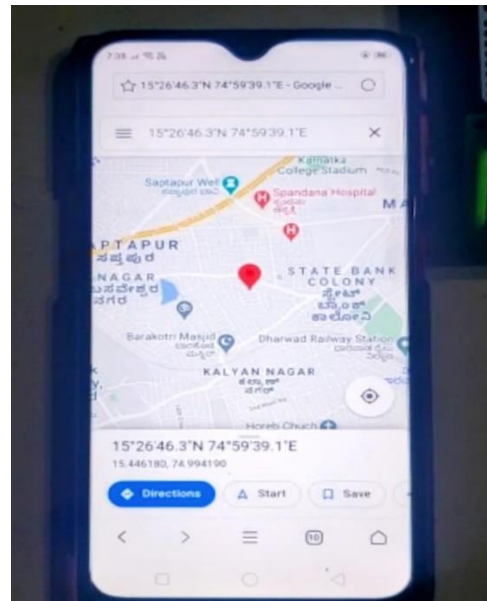
Fig 9: Snapshot of message sent to pre saved mobile number when accident occurs.
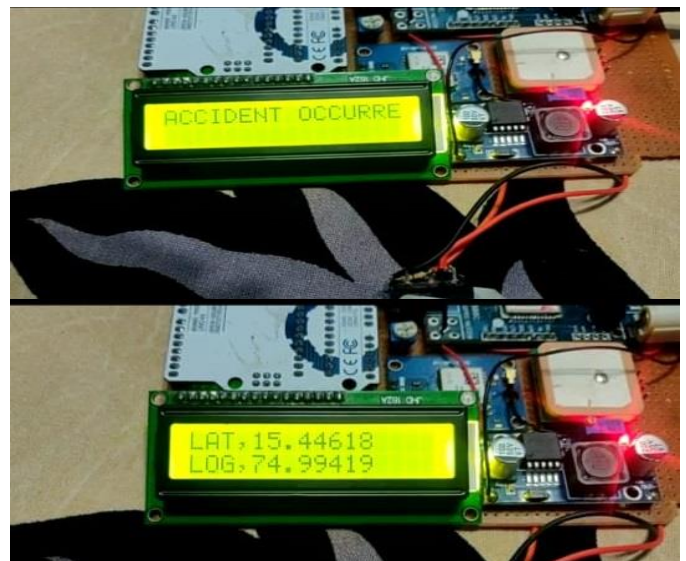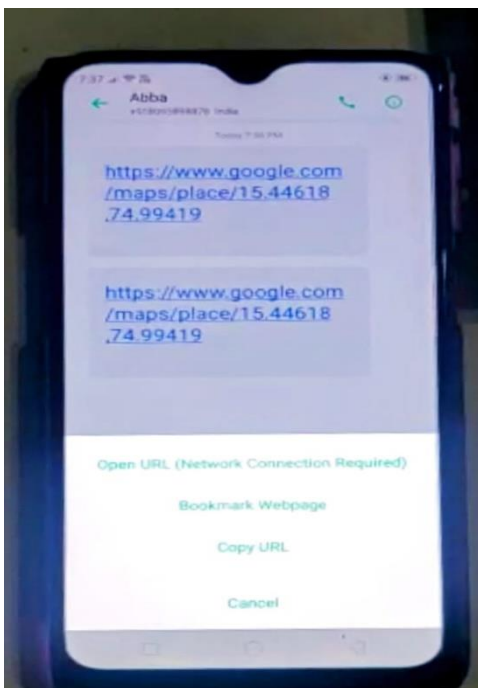
RESULT

Fig 10: Message displayed on LCD display.

Whenever an accident of the vehicle occurs, the device sends a message with the information of the accident location to the pre-saved numbers so that the injured person can get medical treatment immediately. The message will be in the form of URL of Google map and latitude and longitudinal position of the vehicle as shown in the above fig after pressing the link he/she gets through real-time navigation, will display a map indicating the exact location of the accident that occurred vehicle, further helps the concerned person to save their beloved once.

APPLICATIONS AND ADVANTAGES

❖ Automotive and transport vehicles, this module can be used in any vehicle and can take input from

multiple sources like pressure sensor and air bag system.

❖ This module can also be used as stand-alone system and can be fixed in-front of the vehicle for accident detection.

❖ It is an affordable system, the components used are not expensive.

❖ It is an immediate aid system and does not require any man power.

❖ Vehicle tracking systems are used around the world in many fields such as vehicle position tracking systems, vehicle anti-theft tracking systems, fleet management systems, and intelligent transportation systems.

CONCLUSION

With the advent of science and technology in every day of life, the importance of vehicle safety has received the highest priority. Proposing an IOT system which may help community decreasing the death rates resulting from vehicles accidents. It also provides many advantages compared to traditional systems, namely, minimizing injured passenger's interaction, providing basic medical information to rescue team of injured people, recognizing exact accident location. We have used the IoT for vehicle accident detection and alerting the authorities regarding accidents, vehicle tracking using GPS Modem. Furthermore, our implementation is low-cost, provides a feasible solution to traffic hazards and saves time and reduce the loss of lives.

FUTURE SCOPE

This system can be interfaced with airbag system that prevents vehicle occupants from striking interior objects such as steering wheel or window. This can also be developed by interconnecting a camera to the controller. Further this system can be enhanced into the advanced system which uses IOT concept to operate the vehicle remotely by anyone from anywhere in the world. It can be arranged in such a way that it can connect a call to the pre saved number (concern people) or it can send the information to the multiple persons.

ACKNOWLEDGEMENT

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