INTELLIGENT VEHICLE ACCIDENT DETECTION SYSTEM

A PROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

Certified that this project report "**INTELLIGENT VEHICLE ACCIDENT DETECTION SYSTEM"** is the bonafide work of **SRIRAM.L, ABDUL RAHUMAN.A, KIRTHIK ROSHAN.N** and **NIRMAL S A** who carried out the project work under my supervision.

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INTERNAL EXAMINAR

EXTERNAL EXAMINAR

ABSTRACT

Nowadays, to provide a suitable safety of road accident preventing and detection system is becoming one of the most important things for the future generation. The death of people because of road accidents has increased to a certain proportion. The aim for this process is to save life just on time after the accident has occurred. There are so many ways to know the location after the accident has occurred. This GPS and GSM based automatic accident detection system is also one of the most effective system for this present days. Vehicle tracking system makes better fleet management and which in turn brings large profits. Better scheduling or route planning can enable you handle larger jobs loads within a particular time. Initially the GPS continuously takes inputs from the satellite and stores the latitude and longitude values in Arduino. If we've to trace the vehicle, we can send a message to GSM device, by which it gets activated. It also gets activated by detecting accident on the proximity sensor connected to the vehicle which in parallel, deactivates GPS with the assistance of relay .Once GSM gets activated it takes the last received latitude and longitude positions values from the arduino and sends a message to the number or laptop which is predefined within the program. Once message has been sent to the predefined device the GSM gets deactivated and GPS gets activated.

Keywords: Arduino, GPS, GSM, Gyroscope sensor, Proximity sensor, Vehicle accident detection.

ACKNOWLEDGEMENT

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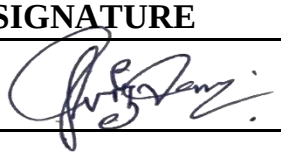
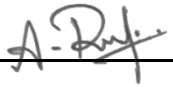
1	SRIRAM L	17BMC009	
2	ABDUL RAHUMAN A	17BMC011	
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NOMENCLATURE

GSM	Global System For Mobile Communication
GPS	Global Positioning System
ITLS	Intelligent Traffic Light system
RF	Radio Frequency
IMU	Inertial Measurement Unit
TDMA	Time Division Multiple Access
LBS	Location Based Service
FPGA	Field Programmable Gate Array

CHAPTER 1

1. INTRODUCTION

1.1 BRIEF BACKGROUND

Vehicle tracking system's main aim is to offer security to all or any vehicles. Accident alert system' main aim is to rescuing people in accidents. This will improve the security systems in vehicles. The latest technologies like GPS are highly useful now a days, this technique enables the owner to watch and track his vehicle and determine the vehicle movement and the past activities of vehicle. This new technology, popularly called Vehicle Tracking Systems which created many wonders towards the security of the vehicle. This hardware is fitted on to the vehicle in such a fashion that it's not visible to anyone who is inside or outside of the vehicle. Thus it's used as a covert unit which continuously or by any interrupt to the system, sends the situation data to the monitoring unit. When the vehicle is stolen, the data from tracking system can also be used to locate the last known coordinates of the vehicle efficiently. The accident alert system in it detects the accident and the location of the accident occurred and sends GPS coordinates to the specified mobile, computer etc.

1.2 NEED FOR THIS PROJECT

It mainly benefits for the industries which that has a transport system. Since it can show the position of all vehicles in real time, with that they will create the expected data accordingly. These tracking system can store the entire data where the vehicle had gone, where it had stopped, what proportion of time it takes at every stop and may also create a whole data analysis. It is also utilized in buses and trains, to estimate their arrivals, how much time it takes for them to return to a specific stop etc. These systems are helpful in data capture, data storage, data analysis and eventually data transfer. This system is evidently based on the new technologies and its main purpose is to detect an accident and to alert the necessary people, therefore the victim can find some help at the right time. It can detect accidents, the intensity of the accident with zero visual contact from control room. If this technique is implemented in every vehicle then it's easy to know the percentage vehicles that are involved during a particular accident and how intense it is. The board designed has both vehicle tracking and accident alert systems, which makes it more valuable and useful. This board alerts us from theft and on accident detection also. This device can also be used to detect fire accidents, by placing fire detector in one of the interrupt pins.

1.3 USAGE OF VEHICLE TRACKING IN INDIA

Tracking in India is especially employed by transport systems, taxi companies, traffic operators. Taxi operators use this to estimate how far the vehicle is from a specific area and send this information to call centers and that they can inform general public about how far their ride is and the time of their arrival. Another use is for traffic police if this technique is found in every vehicle they will estimate the traffic by depending on the map and if any accident is detected then they will route the traffic in to a different way. This is how tracking is beneficial because India is one among busy traffic countries and this technique can control many of the traffic problems.

1.4 OBJECTIVES:

- The sole objective of this project is to save the innocent victims by initiating the emergency alert to the emergency/rescue teams.
- The emergency alert must be sent to the rescue teams as soon as the accident has been sensed.
- The project targets the vehicles, especially the lower end models which contributes a major ratio in the automobile market.
- The end product must be economical which can be affordable by every person.

CHAPTER 2

2. LITERATURE REVIEW

2.1 Accident Detection and Ambulance Rescue with Intelligent Traffic LightSystem, International Journal of Advanced Technology and Engineering Research, 2013, by Mr.S.Iyyappan and Mr.V.Nandagopal .

Findings:

This paper mainly suggest the connection and introduction of PIC microcontroller and the GSM module. They said that Now a days the road accidents in modern urban areas are increased to uncertain level. The loss of human life due to accident is to be avoided. Traffic congestion and tidal flow are major facts that cause delay to ambulance. To bar loss of human life due to accidents we introduce a scheme called ITLS (Intelligent Traffic Light system). The main theme behind this scheme is to provide a smooth flow for the emergency vehicles like ambulance to reach the hospitals in time and thus minimizing the delay caused by traffic congestion. The idea behind this scheme is to implement ITLS which would control mechanically the traffic lights in the path of the ambulance. The ambulance is controlled by the control unit which furnishes adequate route to the ambulance and also controls the traffic light according to the ambulance location and thus reaching the hospital safely. The controller identifies the location of the accident spot through the sensor systems in the vehicle which determined the accident and thus the controller walks through the ambulance to the spot**.**

2.2 Automatic Traffic Accident Detection Based on the Internet of Things and Support Vector Machine, IJSH, Vol. 9, no. 4, pp. 97-106, 2015, by G. Liang.

Findings:

This paper mainly suggest on the focus on the traffic accident detection in the IoT platform. Specifically, we propose an overall framework of intelligent transportation. Then, for traffic accident detection, we proposed a Support Vector Machine (SVM) modified by Ant Colony Algorithm (ACA) as the solution. We conduct experiments on real world traffic data to predict 7 types of traffic accidents. The results show that our proposed method is effective and efficient. Intelligent transportation systems (ITS) are the best solution to above issues. Data collection is based on Internet of Things (IoT) technology, which refers to the interconnection of computing devices and sensors using RFID technology and wireless communication within existing Internet infrastructure. Currently, IoT have been applied in more and more fields, such as agriculture, environment monitoring, transport logistics, etc. In this work, we propose an intelligent transportation framework based on IoT and cloud computing infrastructure. Specifically, we focus on the automatic incident detection application in the framework. According to the statistics results from, there are approximately 1.3 million people died and 20-50 million injured in traffic accidents. Therefore, the security issue of transportation has been a significant problem.

2.3 Intelligent Accident-Detection And Ambulance- Rescue System, International Journal Of Scientific & Technology Research, Vol. 3, No. 6, 2016, by B. Prachi, D. Kasturi and C. Priyanka.

Findings:

In this paper, they proposed and implemented an IoT system which may help the community decreasing the death rates resulting from vehicles accidents. Results showed that this solution provided many advantages compared to traditional systems, namely, minimizing injured passenger's interaction providing basic medical information to rescue teams recognizing exact and accurate accidents locations, and facilitating the routing process. The IoT de-vice keeps sending continuous notification of crash occurrence until it makes sure its reception by the headquarters. Accident detection device installed in a vehicles when meets with an accident will send SMS/ messages to the preinstalled numbers of the drivers Family members, police station, ambulance and nearest hospital. This embedded system is useful for tracking and retrieving the exact position of any vehicle which has met with an accident by using Global Positioning System (GPS) and sensors.

2.4 Automatic accident detection with multi-modal alert system implementation for ITS, Vehicular Communications, Vol. 3, pp. 1-11, 2016, by B. Fernandes, M. Alam, V. Gomes, J. Ferreira and A. Oliveira.

Findings:

This study mainly provide an accident detection mechanism and eCall implementation, a native Android application was developed and connected to a USB port of the IT2S ITS-G5 station. Notice that the smartphone could have been connected via Bluetooth instead, however that would limit the battery life of the smartphone and Bluetooth is not as dependable as USB. The IT2S platform, is a ITS-G5 plat- form developed from scratch at Telecommunications Institute, in the scope of two research projects: Highway Environment Advanced Warning Ssstem (HEADWAY) and Intelligent Cooperative Sensing for Improved traffic efficiency (ICSI). The main features of the platform useful for this project are the availability of a Global Positioning System (GPS) receiver, 2 Radio Frequency (RF) modules, a Field Programmable Gate Array (FPGA) for lower MAC and baseband PHY layer implementation and Universal Serial Bus (USB) connections. The accident alert is broadcast by three sources. The first is the vehicular network, by transmitting a Decentralized Environmental Notification Message (DENM) message containing a Road Hazard Warning via the IT2S platform. The second is the Emergency Medical System (EMS), by performing an eCall. During development it was verified that it was difficult to perform an eCall with the provided APIs.

2.5 Automatic Accident Detection: Assistance Through Communication Technologies and Vehicles, IJETST- Vol. 02, Issue 04 Pages 2285-2288 April 2015, by Pranav Dhole, Saba Shaikh, NishadGite, Vijay Sonawane .

Findings:

The system uses various technologies developed along the years like GPS, GPRS, and Android Device to serve as a tool to reduce the count for number of deaths due to road accidents. It incorporates automatic detection of an occurrence of accident with the vehicle, records the location of the car at the time of accident and uses it to facilitate the emergency services to reach at the accident location and provide instant medical help. Along with this the system will further provide post-accident assistance like providing a towing service, notifying the insurance services for easy claims and notifying the relative of the victim. Even the vehicles are becoming more sophisticated with features like GPS navigation and airbags for safety. In spite of this the victims of the accidents which occur at remote locations do not get prompt medical service. There are several cases where the accident victims lose their lives due to lack of medical assistance. These victims may get serious injuries due to which the might not be able to move or communicate to the rest of the world. In such situations the advancements in technology and the sophistication of the vehicles do not seem to be useful. Smart Accident Detection and Assistance Systems overcomes this limitations as it will automatically detect an accident and notify the nearest emergency response services i.e. Hospitals and Towing services which will enable the accident victim to receive instant medical help and assistance.

2.6 Implementation of Location Awareness and Sharing System Based on GPS and GPRS Using J2ME, PHP and MYSQL, 3rd International Conference on Computer Research and Development, Shanghai, 11-13 March 2011, pp. 216-220, DOI: 10.1109/ICCRD .2011.5764007, Ankur Chandra, Shashank Jain, Mohammed Abdul Qadeer.

Findings:

This study tells about the implementation of GPS and GSM module in the system. The paper describes position detection and tracking system which has the following three objectives: Develop an android application which can be used to locate the position of the friends and family members. This application has an alert mechanism to send a popup SMS to the user when his friends or family members are nearby. The proposed system is implemented using Android. The database used is MySQL and user can access the database using PHP as interface. Mobile Client system consists of five modules such as Register/Login module, GPS module, Notification module, Data sharing module and Chatting module. The proposed system uses GPS and Web Technology in order to enhance the positioning experience. The position detection and tracking system effectively alerts the user about the position of a person using mobile phone. This location and position of person information can be shared online. Location Based Service (LBS) has been considered as the most potential part of wireless value-added services.

2.7 Smart Accident Detection & Assistance System, International Journal of Emerging Trends in Science and Technology, Vol. 2, no. 4, pp. 2285- 2288, 2015, P. Dhole, S. Shaikh, N. Gite and V. Sonawane.

Findings:

This paper proposes a new dimension in order to allow early response and rescue of accident victims; saving lives and properties. Our system uses the capability of GPS and GSM along with the android phone to provide a solution which can be used to precisely detect the accident spot and to send the emergency notification to the nearby hospital s ICU and to the victim s relatives. The proposed system consists of two units namely, Crash Detector Embedded Unit and Android Control Unit. Crash Detector Embedded Unit is responsible for detecting the accident condition using three-axis accelerometer sensor, position encoder, bumper sensor and one false alarm switch. Bluetooth module (HC-05) is used to send the accident notification to the victim s android phone where an android app will get the GPS location of accident spot and compare it with all the nearby hospital s location in order to calculate the shortest path and send the notification to the nearest hospital s ICU as mentioned earlier in the form of SMS.

2.8 Various Accident Detection Technologies and Recovery Systems with Victim Analysis, International Journal of Advanced Trends in Computer Science and Engineering (IJATCSE), Vol.2, No. pp: 07-12, Special Issue of ICCSIE 2013, by Ramya Keerthi, G.Shanmukh, Dr. R. Sivaram.

Findings:

The enhanced automatic accident identification and victim status indicating system consists of microcontroller (PIC16F877) based CPU, Heart rate and heart beat monitoring module, SM/GPS module, Body temperature sensor module (LM35), Coma stage status identification module and RS232, USB serial communication devices to interface the system with the Lab VIEW environment to evaluate the parameters are in normal or abnormal and also utilized to monitor and display same. As now a day's mobile is common electronic gadget that is present with everyone and this problem can be solved by it only. By the short message service (SMS) on of the fetcher of mobile will help to solve this problem. By this embedded system we can now the place of accident, rate of accident, status of the victim like blood pressure and heart beat. By this information rescue team will be easily help the victim. By using technologies GPS and GPRS one can easily locate the position of the accident. This paper say the technologies that how an accident is detected and victim status. The technology needs to have more features like pre analysis of driver and then the vehicles get started. As prevention is better than cure. The main motive of this paper is to reduce the accident rate and reduce the time for first aid.

2.9 Integrated Vehicle Accident Detection and Location System", TELKOMNIKA (Telecommunication Computing Electronics and Control), Vol. 12, no. 1, pp. 73, 2014, by M. Amin, M. Bin IbneReaz and S. Sheikh Nasir.

Findings:

In this system the GPS and IMU based acceleration fusion system is developed to determine the deceleration for accident detection purpose. The higher rate of IMU's accelerometer data can detect any instantaneous deceleration and also can fill the gap during GPS outage. The accident location module was also developed by integrating the IMU based AHRS with the GPS by utilizing Kalman filter. The test result shows that the system can detect the accident location efficiently. This will save many lives by sending the automatic and correct accident location to an appropriate agency. This paper proposes an accident detection and location system by determining the deceleration and data fusion from accelerometers and GPS. The bias, drift and noise errors of accelerometers and GPS outage limitation are overcome by integrating with Kalman filter. The test result shows the correct deceleration for accident detection and location. The proposed system will be able to overcome the limitations of GPS/IMU and save valuable human lives. The GPS is a popular technology which was developed by American Department of Defence (DoD). The GPS receiver determines its current position and heading by comparingthe time signals it receives from a number of the GPS satellites and triangulating on the known positions of each satellite.

2.10 Providing accident detection in vehicular networks through OBD-II devices and Android-based smartphones.Proceeding of Local Computer Networks (LCN), pp. 813-819, 2011, by Zaldivar J, Calafate CT, Cano JC, Manzoni P.

Findings:

This application was developed for the Android platform, nowadays available in most smartphones in both Europe and the USA. Android-based smartphones typically include differ-ent wireless interfaces, such as Bluetooth, Wifi, GPS and 3G, making them ideal for our purposes. In particular, our solution will rely on the Bluetooth technology to establish a data link between the smartphone and a Bluetooth-enabled OBD-II interface. This approach removes the need for any sort of cable, thus making it more robust against car crashes. Since data communications channel between the smartphone and anonline server is required, it can be established using either the Wifi or the 3G interface. Typically, mobile telephony services, such as voice calls and SMS generation, can also be used. For instance, the system can be configured to send an SMS to our family, establish a voice channel with the emergency services, and send detailed accident information, including impact speed and current GPS position, to a special purpose server. This way, all the entities involved in the process may obtain all the information considered relevant.

CHAPTER 3

3. MATERIALS AND COMPONENTS

- Arduino UNO
- GPS Module
- GSM Module
- Gyroscope sensor
- Power Supply

3.1 ARDUINO UNO

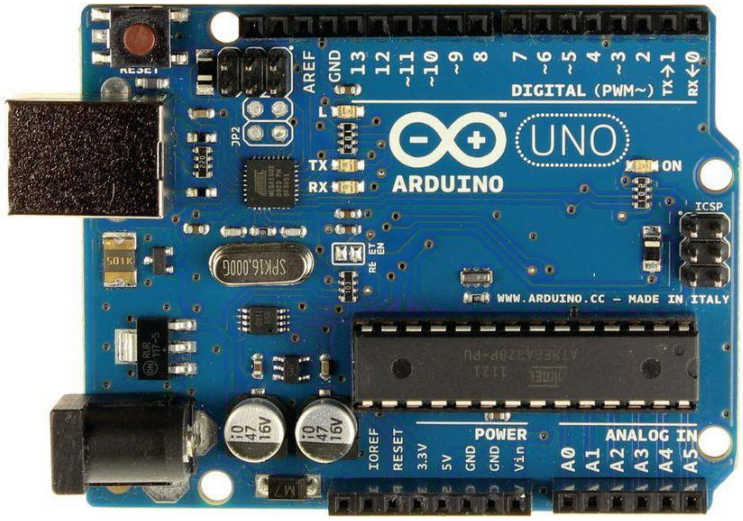

Figure 3.1: Arduino UNO

Arduino is an excellent designed open source platform. It has specially designed boards which may be programmed using the Ardunio programing language (APL). The presence of Arduino isn't only spreading between hobbyists, but it's also expanded its roots in industries and employed by experts for creating prototypes of economic products. Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. You can tinker with your Uno without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again. "Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

3.2 GPS MODULE

Figure 3.2: GPS Receiver Module

GPS is also known as the NAVSTAR (Navigation System for Timing and Ranging). GPS works across the world and in all weather conditions, thus helping the users track locations, objects, and even every individual. GPS technology can be used by anyone if they have a GPS receiver. The GPS satellites rotate twice a day around the earth in a specific orbit. These satellites transmit signal information to earth. This signal information is received by the GPS receiver in order to measure the user's correct position. The GPS receiver compares the time a satellite transmits the signal with the time the signal is received. The time difference calculated enables us to know the distance of the satellite. By measuring the distance of few more satellites, the user's position can be verified and displayed on the unit's electronic map. The receiver can measure 3D position (latitude, longitude and altitude) if the GPS receiver locks the signal of four or more satellites. On determining the position of the user, the unit of GPS can measure speed, trip distance, bearing, distance to destination, tack, time of sunrise and sunset, etc.

3.3 GSM MODULE

Figure 3.3: GSM Module

GSM/GPRS module is used to establish communication between a computer and a GSM-GPRS system. Global System for Mobile communication (GSM) is a system used for mobile communication in most of the countries. Global Packet Radio Service (GPRS) is an extension of GSM that enables higher data transmission rate. GSM/GPRS module consists of a GSM/GPRS modem assembled together with power supply circuit and communication interfaces for computer. The MODEM is the heart of such modules. GSM technology was developed as a digital system using the time division multiple access (TDMA) technique for communication purposes. A GSM digitizes and reduces the data, then sends it down through a channel with two different streams of client data, each in its own particular time slot.

3.4 GYROSCOPE SENSOR

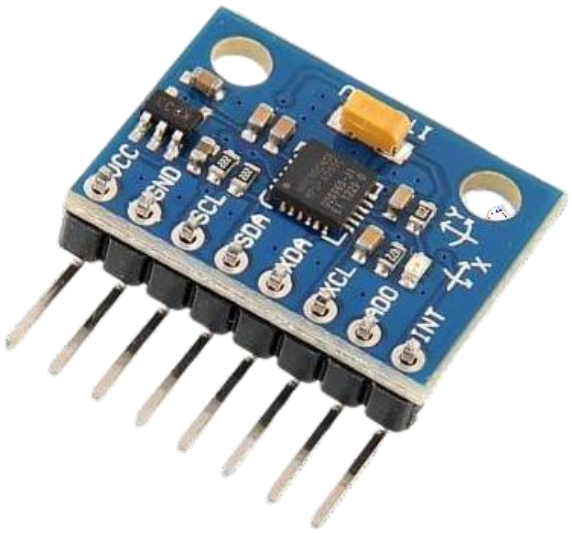

Figure 3.4: Gyroscope Sensor

A gyroscope sensor is basically a device that takes the help of the earth's gravity in determining the orientation. It is a type of sensor which we find inside IMU (Inertial Measurement Unit). A gyroscope can be used to measure the rotation on a particular axis. The device consists of a rotor which is nothing but a freely rotating disc. The rotor is mounted on a spinning axis which is present in the center of another larger wheel.

CHAPTER 4

4. METHODS

4.1 BLOCK DIAGRAM

The block diagram given below demonstrates a simple overview of the working flow of the project.

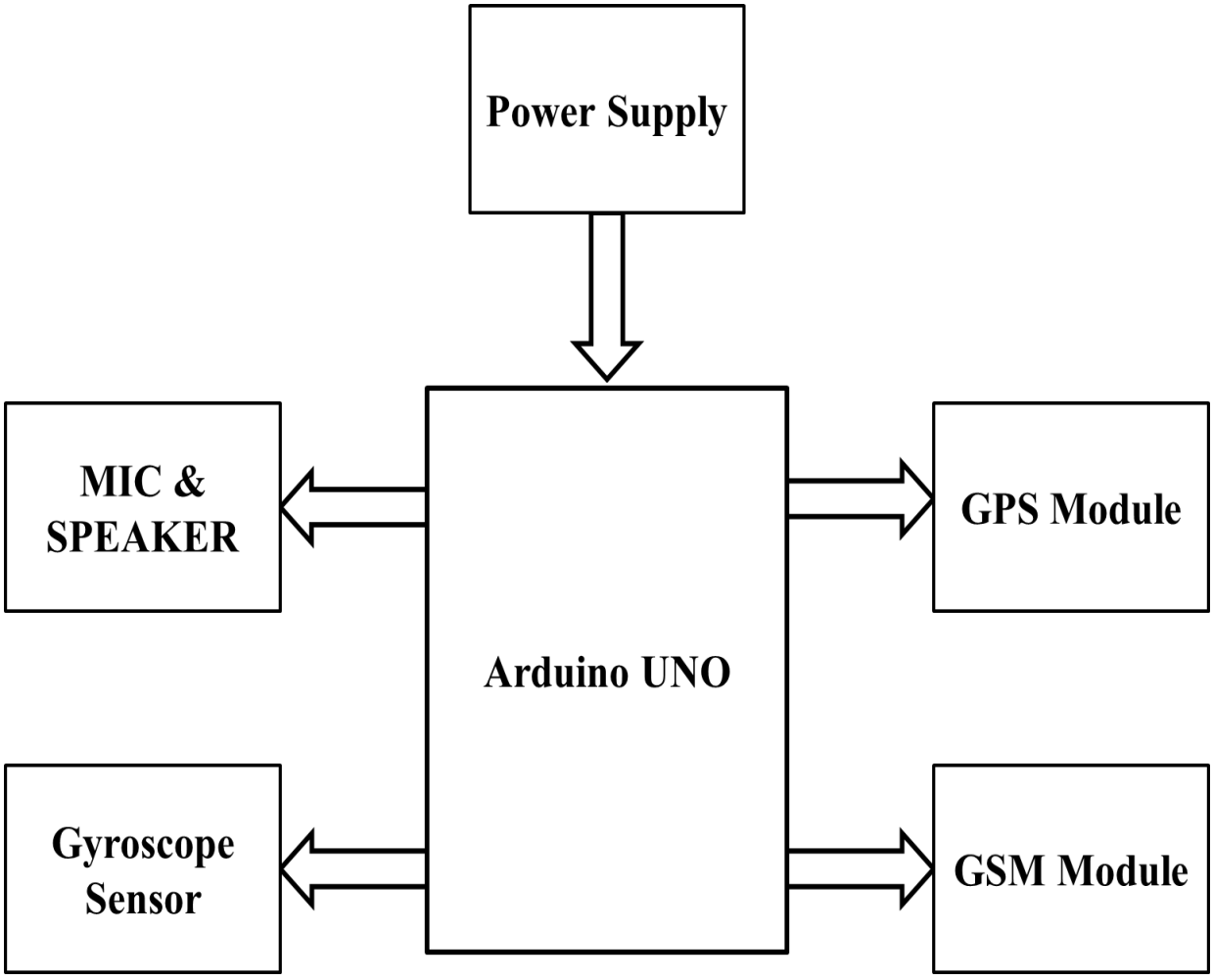

Figure 4.1: Block Diagram

4.2 WORKING METHODOLOGY

Before going into the working process, let us have a quick insights on how the project flow works. Initially let us consider that an accident have been taken place. As soon as there are any abnormalities, the gyroscopic sensor will sense it within a matter of seconds. The gyroscopic sensor sends the signals to the microcontroller, which in our case in arduino. The arduino will wait for the victim to manually turn off the device before sending the alert. This helps us in preventing the false alarms in cases where the accident isn't much worse and fatal. There will be a specific time period for this operation. Once the arduino doesn't detect any inputs from the victim, it will initiate the alerts to the pre-programmed numbers. As a result the emergency contacts will have the actual geographical coordinates of the victim and can alert the rescue team in the meantime. This will result in the reduction of casualties in the road accidents.

4.3 WORK FLOW

Once the accident has been caused, the gyroscopic sensor will come into action. The gyroscope sensor works on the principle of conservation of angular momentum. It works by preserving the angular momentum. In a gyroscope sensor, a rotor or a spinning wheel is mounted on a pivot. The pivot allows the rotation of the rotor on a particular axis which is called a gimbal. Here, we will use two gimbals at a time. One gimbal will be mounted on another. This will give the rotor three degrees of freedom. Whenever we spin the rotor of the gyroscope, the gyroscope will continue to point in the same direction. Once gyroscope done its part, the GPS sensor will come into action. GPS receivers are generally used in smartphones, fleet management system, military etc. for tracking or finding location. Global Positioning System (GPS) is a satellite-based system that uses satellites and ground stations to measure and compute its position on Earth. GPS is also known as Navigation System with Time and Ranging (NAVSTAR) GPS.GPS receiver needs to receive data from at least 4 satellites for accuracy purpose. GPS receiver does not transmit any information to the satellites. GPS receiver uses a constellation of satellites and ground stations to calculate accurate location wherever it is located. These GPS satellites transmit information signal over radio frequency (1.1 to 1.5 GHz) to the receiver. With the help of this received information, a ground station or GPS module can compute its position and time. GPS receiver receives information signals from GPS satellites and calculates its distance from satellites.

This is done by measuring the time required for the signal to travel from satellite to the receiver.

f{Distance = Speed x Time}

Where,

Speed = Speed of Radio signal which is approximately equal to the speed of light i.e.3*10^{8}

Time = Time required for a signal to travel from the satellite to the receiver.

By subtracting the sent time from the received time, we can determine the travel time

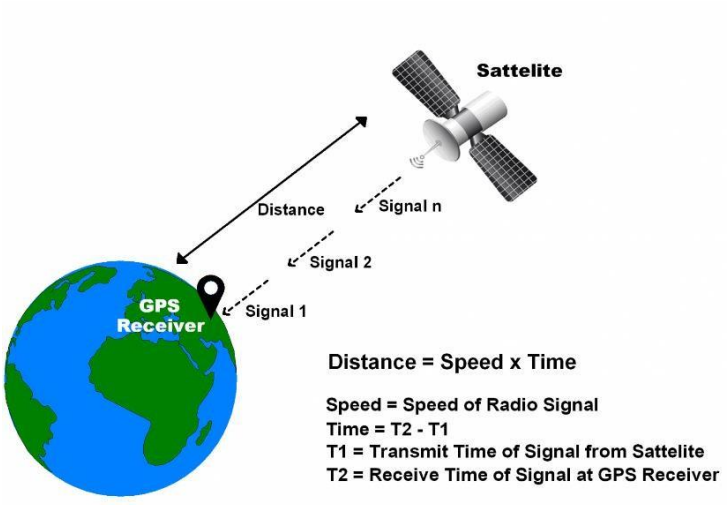

Figure 4.2: GPS Distance Calculation

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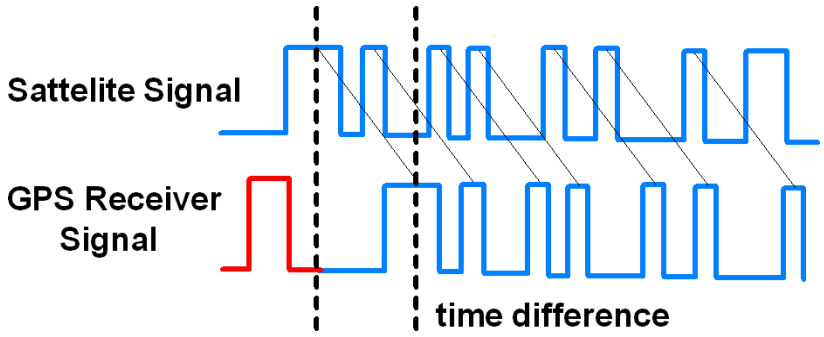

Figure 4.3: GPS Travel time calculation

To determine distance, both the satellite and GPS receiver generate the same pseudocode signal at the same time. The satellite transmits the pseudocode; which is received by the GPS receiver. These two signals are compared and the difference between the signals is the travel time. Now, if the receiver knows the distance from 3 or more satellites and their location (which is sent by the satellites), then it can calculate its location by using Trilateration method. GPS receiver module gives output in standard (National Marine Electronics Association) NMEA string format. It provides output serially on Tx pin with default 9600 Baud rate.

This NMEA string output from GPS receiver contains different parameters separated by commas like longitude, latitude, altitude, time etc. Each string starts with '$' and ends with carriage return/line feed sequence.

Example for such feed sequence are as follows:

$GPGGA,184237.000,1829.9639,N,07347.6174,E,1,05,2.1,607.1,M,-64.7,M,,0000*7D

$GPGSA,A,3,15,25,18,26,12,,,,,,,,5.3,2.1,4.8*36

$GPGSV,3,1,11,15,47,133,46,25,44,226,45,18,37,238,45,26,34,087,40*72

$GPGSV,3,2,11,12,27,184,45,24,02,164,26,29,58,349,,05,26,034,*7F

After we got the accurate geographical coordinates of the victim, the GSM module will comes into action. GSM stands for Global System for Mobile communication. Today, GSM is used by more than 800 million end users spread across 190 countries which represents around 70 percent of today's digital wireless market. So, let's see how it works. In GSM, geographical area is divided into hexagonal cells whose side depends upon power of transmitter and load on transmitter (number of end user). At the center of cell, there is a base station consisting of a transceiver (combination of transmitter and receiver) and an antenna. GSM is combination of TDMA (Time Division Multiple Access), FDMA (Frequency Division Multiple Access) and Frequency hopping. Initially, GSM use two frequency bands of 25 MHz width: 890 to 915 MHz frequency band for up-link and 935 to 960 MHz frequency for down-link. Later on, two 75 MHz band were added. 1710 to 1785 MHz for up-link and 1805 to 1880 MHz for down-link. Up-link is the link from ground station to a satellite and down-link is the link from a satellite down to one or more ground stations or receivers.

GSM divides the 25 MHz band into 124 channels each having 200 KHz width and remaining 200 KHz is left unused as a guard band to avoid interference. The security strategies standardized for the GSM system make it the most secure telecommunications standard currently accessible. Although the confidentiality of a call and secrecy of the GSM subscriber is just ensured on the radio channel, this is a major step in achieving end-to-end security. The SIM card mounted GSM modem upon receiving digit command by SMS from any cell phone sends that data to the MC through serial communication. While the program is executed, the GSM modem receives the command 'STOP' to develop an output at the MC, the contact point of which are used to disable the ignition switch. Through this we can send the alerts via the telephony servers, irrespective of the recipient's carrier and service providers. Thus the alerts via both voice calls and text message is achieved.

4.4 CONCEPTUAL DESIGN

Figure 4.4: Conceptual Design

CHAPTER 5

5. PROGRAM AND EXPLANATION

5.1 GPS INTERFACING

CODE:

```
#include <LiquidCrystal.h>
#include <SoftwareSerial.h>
#include <TinyGPS.h>
float lat = 28.5458,lon = 77.1703; // create variable for latitude and longitude object
SoftwareSerial gpsSerial(3,4);//rx,tx
LiquidCrystal lcd(A0,A1,A2,A3,A4,A5);
TinyGPS gps; // create gps object
void setup(){
Serial.begin(9600); // connect serial
gpsSerial.begin(9600); // connect gps sensor
lcd.begin(16,2);
}
void loop(){
   while(gpsSerial.available()){ // check for gps data
   if(gps.encode(gpsSerial.read()))// encode gps data
   {
   gps.f_get_position(&lat,&lon); // get latitude and longitude
   // display position
   lcd.clear();
   lcd.setCursor(1,0);
   lcd.print("GPS Signal");
   lcd.setCursor(1,0);
```

```
   lcd.print("LAT:");
   lcd.setCursor(5,0);
   lcd.print(lat);
   lcd.setCursor(0,1);
   lcd.print(",LON:");
   lcd.setCursor(5,1);
   lcd.print(lon);
   }}
 String latitude = String(lat,6);
 String longitude = String(lon,6);
  Serial.println(latitude+";"+longitude);
  delay(1000);
}
```

5.1.1 GPS INTERFACING PROGRAM EXPLANATION

- First we have to include the TinyGPS++ library in our Arduino IDE.
- Open Arduino IDE and under File navigate to and upload the code. Once, the code is uploaded open the serial monitor and you will and the data are now more readable like Location: Latitude, Longitude along with Date/Time.
- The GPS Module is now integrated.

5.2 GSM INTERFACING

CODE:

```
const int Input1=8;
int State1=0;
void setup(){
  Serial.begin(9600);
  pinMode(Input1, INPUT);
}
void loop(){
State1= digitalRead(Input1);
 if(State1 == HIGH){
 sendsms();
delay(2000);
}}
void sendsms(){
 Serial.println("AT\r");
 delay(1000);
 Serial.println("AT+CMGF=1\r");
 delay(1000);
  Serial.println("AT+CMGS=\"XXXXXXXXXX\"\r");
  delay(1000);
  Serial.println("MESSAGE 1");
  delay(1000);
  Serial.println((char)26);
  delay(100);
}
```

5.2.1 GSM INTERFACING PROGRAM EXPLANATION

- Input1 is a constant integer type, constants won't change and it is set to pin number 8 of Arduino. State1 is a variable, variables will change and it is assigned with 0 value**.**
- Put your setup or configuration code in the setup function, it will only run once during the startup.
- Initialize the Input1 pin as an input. Set the Baudrate of Serial communication as 9600.
- Put your main code in void loop() function to run repeatedly. Read the state of the State1 variable value and check if the switch is pressed which is connected pin number 8 of arduino.
- If it is, then it will call GSM function to send SMS to the programmed mobile number.
- This function is used to establish communication between arduino and GSM module by AT commands to send SMS to the provided mobile number.
- The GSM Module is now integrated.

5.3 GYROSCOPE SENSOR INTERFACING

CODE:

```
#include<LiquidCrystal.h>
LiquidCrystal lcd(8,9,10,11,12,13);
#include <Wire.h>
#include <MPU6050.h>
#dene period 10000
MPU6050 mpu;
int count=0;
char okFlag=0;
byte degree[8] = {
 0b00000,
 0b00110,
 0b01111,
 0b00110,
 0b00000,
 0b00000,
 0b00000,
 0b00000
};
void setup()
{
 lcd.begin(16,2);
 lcd.createChar(0, degree);
 Serial.begin(9600);
 Serial.println("Initialize MPU6050");
```

```
 while(!mpu.begin(MPU6050_SCALE_2000DPS, MPU6050_RANGE_2G))
 {
   lcd.clear();
   lcd.print("Device not Found");
   Serial.println("Could not nd a valid MPU6050 sensor, check wiring!");
   delay(500);
 }
 count=0;
 mpu.calibrateGyro();
 mpu.setThreshold(3);
 lcd.clear();
 lcd.print("MPU6050 Interface");
 lcd.setCursor(0,1);
 lcd.print(" Circuit Digest");
 delay(2000);
 lcd.clear();
}
void loop()
{
   lcd.clear();
   lcd.print("Temperature");
   long st=millis();
   Serial.println("Temperature");
   while(millis()<st+period)
   {
     lcd.setCursor(0,1);
     tempShow();
```

```
  }

  lcd.clear();
  lcd.print("Gyro");
  delay(2000);
  st=millis();
  Serial.println("Gyro");
  while(millis()<st+period)
  {
   lcd.setCursor(0,1);
   gyroShow();
  }
  lcd.clear();
  lcd.print("Accelerometer");
  delay(2000);
  st=millis();
  Serial.println("Accelerometer");
  while(millis()<st+period)
  {
   lcd.setCursor(0,1);
   accelShow();
  }
}
void tempShow()
{
  oat temp = mpu.readTemperature();
  Serial.print(" Temp = ");
```

```
  Serial.print(temp);
  Serial.println(" *C");
  lcd.clear();
  lcd.print("Temperature");
  lcd.setCursor(0,1);
  lcd.print(temp);
  lcd.write((byte)0);
  lcd.print("C");
  delay(400);
}
void gyroShow()
{
 //lcd.setCursor(0,0);
 lcd.clear();
 lcd.print(" X     Y     Z");
 Vector rawGyro = mpu.readRawGyro();
 Vector normGyro = mpu.readNormalizeGyro();
 lcd.setCursor(0,1);
 lcd.print(normGyro.XAxis,1);
 lcd.setCursor(6,1);
 lcd.print(normGyro.YAxis,1);
 lcd.setCursor(12,1);
 lcd.print(normGyro.ZAxis,1);
 Serial.print(" Xnorm = ");
 Serial.print(normGyro.XAxis);
 Serial.print(" Ynorm = ");
 Serial.print(normGyro.YAxis);
```

```
 Serial.print(" Znorm = ");
 Serial.println(normGyro.ZAxis);
 delay(200);
}
void accelShow()
{
// lcd.setCursor(0,0);
 lcd.clear();
 lcd.print(" X     Y     Z");
 Vector rawAccel = mpu.readRawAccel();
 Vector normAccel = mpu.readNormalizeAccel();
 lcd.setCursor(0,1);
 lcd.print(normAccel.XAxis,1);
 lcd.setCursor(6,1);
 lcd.print(normAccel.YAxis,1);
 lcd.setCursor(12,1);
 lcd.print(normAccel.ZAxis,1);
 Serial.print(" Xnorm = ");
 Serial.print(normAccel.XAxis);
 Serial.print(" Ynorm = ");
 Serial.print(normAccel.YAxis);
 Serial.print(" Znorm = ");
 Serial.println(normAccel.ZAxis);
 delay(200);
}
```

5.3.1 GYROSCOPE SENSOR INTERFACING PROGRAM EXPLANATION

- Here we have used this MPU6050 library to interface it with Arduino. So first of all, we need to download the MPU6050 library from GitHub and install it in Arduino IDE.
- In coding, we have included some required libraries like MPU6050 and LCD.
- In setup function, we initialize both devices and write welcome message over LCD void setup()
- In loop Function, we have called three functions in every 10seconds for displaying temperature, gyro, and accelerometer reading on LCD.
- MPU6050 gyro and accelerometer both are used to detect the position and orientation of any device. Gyro uses earth gravity to determine the x,y and z-axis positions and accelerometer detects based on the rate of the change of movement.

CHAPTER – 6

6. RESULTS AND DISCUSSIONS

6.1 REAL TIME RESULTS

The real time results of this project have been shared below.

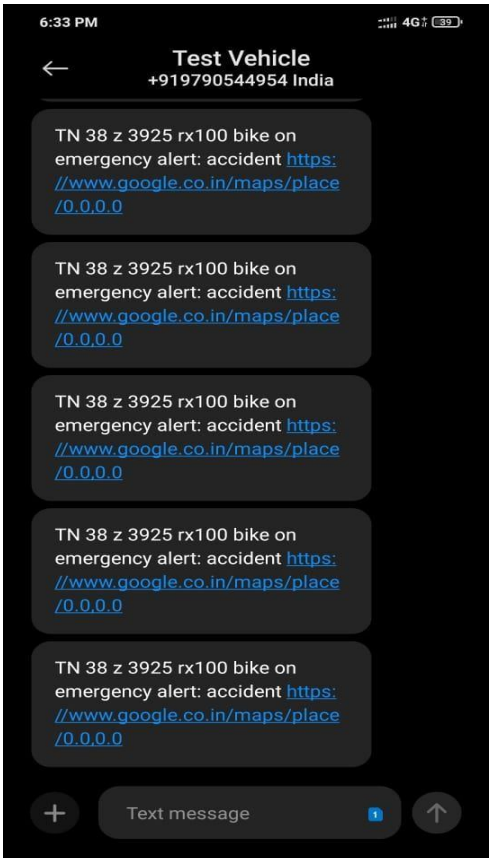

Figure 6.1: Result (1/2)

- The emergency alert via message, containing the exact geographical coordinates of the accident location has been successfully sent to the pre-programmed number.

.

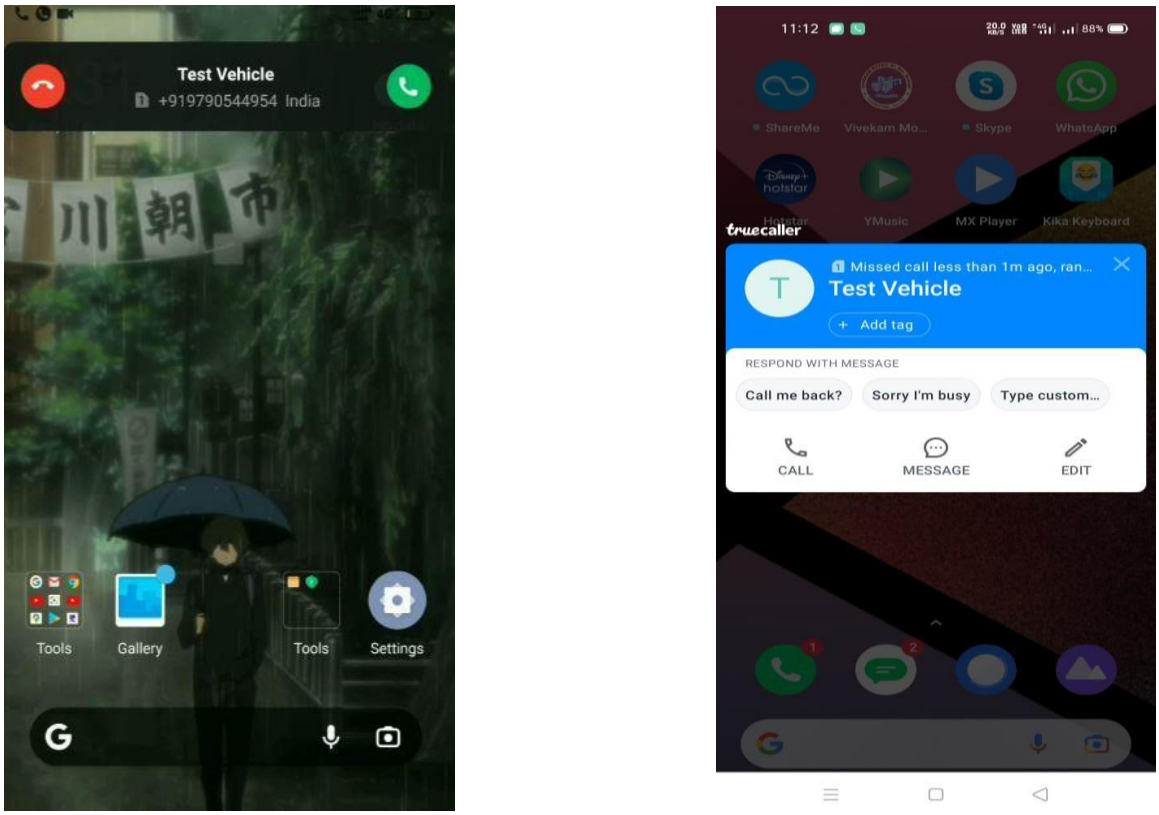

Figure 6.2: Result (2/2)

- The emergency alert via phone call, after finding the accident location, has been successfully sent to the pre-programmed number.

CHAPTER 7

7. CONCLUSIONS

In this report, the prototype of an automatic accident detection system is proposed. In the future, this device can also be used against vehicle thefts. The high accuracy tracking system will make this prototype a potential model for the tracking down of the people who involved in those heinous crimes. This prototype can also be integrated with the emergency services in partnership with the local governments to deploy the rescue team to the accident scene as soon as possible. We are desirous to implement this system for real life use in near future. Thus the proposed system of the accident alert system is developed and explained in this report. Main motto of the accident alert system project is to decrease the chances of losing life in such accident which we can't stop from occurring. Whenever accident is alerted the paramedics are reached to the particular location to increase the chances of life. This device invention is much more useful for the accidents occurred in deserted places and midnights. This vehicle tracking and accident alert feature plays much more important role in day to day life in future.

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