ACCIDENT DETECTION SYSTEM BASED ON INTERNET OF THINGS

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Abstract: The upcoming technology the Internet of things (IoT) has caught about the focus and engaged a broad set of visions that encompass the complexities and perspectives of the various researchers. IoT has resolved many intricate accident cases such as identification of the victim or arrival of rescue team and help for the victim. The research is the implementation of an IoT based alert system, which notifies the registered family members about the mishap. It also helps in tracing the exact location of the accident scene. The system contains a backtracking system to cancel the false alarm generated in certain braking cases within ten seconds. The implementation is web based that uses a database containing the model number of the vehicle, owner's personal details and two emergency contact details. The project aims to solve the missing cases and provide immediate help to the victims of road accidents.

IndexTerms **- Internet of Things, Accident, Detection systems, Sensors**

I. INTRODUCTION

IoT is a system of interconnected and interoperable computing devices, digital objects and machines, or people which possess a distinct identifier, this enables transferring the data over network without any human intervention. The IoT intertwines the technology where computing ability and network interconnectivity expands to sensors, objects of the daily routine. The connected things and objects collect the information and oscillate the information for greater connectivity. It offers an independent communication between the linked objects which helps in optimizing the operations, minimizing the costs, enhancing the productivity and improving the lives [1]. The extensive traffic conditions and long distance travels have made it tough to identify the occurrence and location of the accident. In worst cases, the victim does not receive the help and the condition becomes miserable. The absence of identification and intimation systems in the traffic arrangement has created survival issues for the patient. The delay is even worse in cases of unreachable ambulances and remote hospitals in certain areas. The proposed system has designed a Vehicle fall detection system that senses the accidents and generates alert messages to enable immediate help. The system stores the essential information about the vehicle and emergency contact details. The notification message to the emergency contact would include the location and the happening of the accident. The system is a powerful tool to decrease the death rate due to critical accidents in the absence of required aid.

PROBLEM DEFINITION

The increasing traffic and road travels lead to numerous accidents. In most cases the victim(s) are unable to inform their family members or ask for help. In some cases that happen in distinct areas the identification of the victim is also difficult. The problem is mostly in cases of two wheeler vehicles and four wheeler vehicles that lack specified safety measures. Here, arises the need to ensure the safety for the people suffering in major or minor road accidents.

PROPOSED SOLUTION

The proposed is an Accident detection system based on internet of things containing devices that are connected through a unit which operates as monitoring services. The system is intended for accident fatalities such that immediate help could be granted as soon as the accident occurs. It is an Arduino based system which will store the model number of bike, name of owner and two emergency contact numbers. The alert will be send through GPS based system, which will include an alarm and accurate location of the accident sight. Fall detection alarms help people to feel secure and safer if they travel alone by providing contact to their native world in the case of an emergency. Accident and fall detection alarms allow people to call for the help if they met with any accident.

Objective of the research

1. To generate immediate information and notify the relatives of the accident victim
2. To send the exact location through the message
3. To circulate the coordinates of the accident location to nearby help centres
4. To differentiate and cancel between the false alarms generated within stipulated time

Scope of the system

5. The system can be applied in any two-wheeler automobile.
6. The information could be forwarded to nearby help centres to reduce the risks to the accident victim
7. The system uses the pre-obtained information to forward support to the victim.

8. It evaluates about the exact coordinates and location to trace the accident place.
9. It builds the connectivity between the victim and the hospitals.

II. EXISTING SYSTEM

According to the report by Transport Research wing under Ministry of Road Transport & Highways published in 2016, the number of people who died on roads accidents in India last year has increased as compared to the number of deaths in 2015. As cited in the reports, India recorded nearly 480,652 accidents in the year 2016 out of which 150,785 were reported dead. The figures reveal the at least 413 people die every day in 1,317 road accidents. Further break down of the information reveals that at least 17 deaths took place in road accidents in 55 accidents every hour in the known time period. Evaluating the recently recorded data from previous year clears that in spite of registering less accident in 2016, the number of deaths has occurred this year as in 2015. In 2015, 146,133 people died in 501,423 accidents. The accident harshness, which is deliberated as the number of individuals killed per 100 accidents, was documented as 29.1 in 2015 which is lesser as compared to 31.4 in 2016 [6].

Fall detection techniques allow quick detection and interference for a person who has experienced a fall. Whenever the units' notices a fall, it activates and sends signals to the contacts registered in the system. The accident and fall detection system has been of keen interests for the researchers to develop technological implementations to develop effective systems to minimize the risks of the occurred accidents. The use of wireless acoustic and ambient sensors, gyro meter and proximity meters and networks help in real world monitoring of the travels to avoid loss by the accidents. Te accidents result in physical injuries and long term hospitalizations in the victims of the accidents. The previous system have concentrated the focus of the people over the wearable fall detection system that included an inertial unit used a gyroscope, triaxial accelerometer, and magnetometer. This enabled an effective data synthesis and fall detection algorithm. The continuous simulation of raw data helped process the orientation filter which could provide the details about the system.

PROCESS FLOW

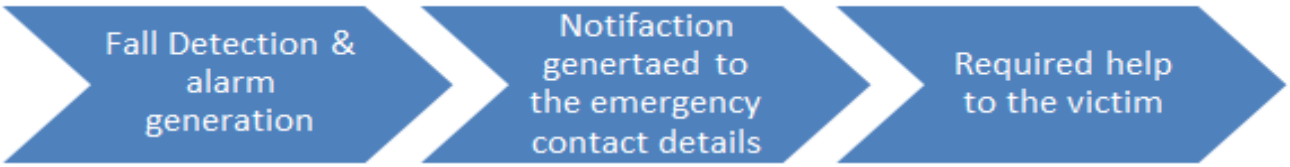

Figure 1 Process Flow of System "Accident notification system"

LIMITATIONS

The proposed system failed to predict the extent of physical and materialistic damage caused by the accident.

III. SYSTEM DESIGN

A. ACTIVITY DIAGRAM

Activity diagram is a flowchart to characterize the information flow from one activity to the other. The activity can be expressed as an action of the system. The control is transferred from one operation to another. The activity diagram of vehicle fall and accident detection system will illustrate the activity of each module. At the occurrence of the accident the system will send data to the nearby network tower. The network tower forwards the coordinates of the location to the neo-6m GPS tracker that receives the location and transmits it to GSM module. Now, this GSM module will send exact location and alert message to the emergency contact number. Later to which the help could be asked by forwarding those details to helpline centres like ambulance and police.

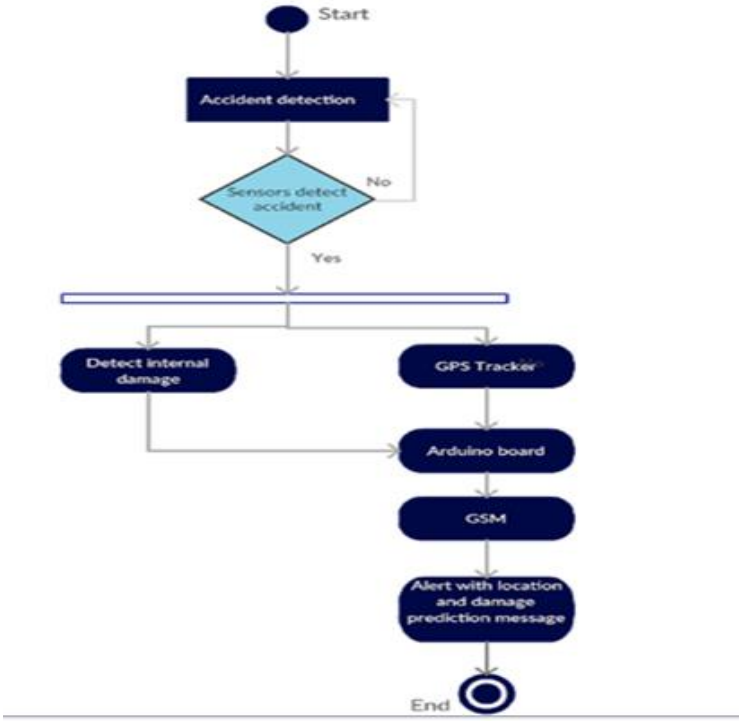

Figure 2: Activity Diagram

B. SEQUENCE DIAGRAM

A sequence diagram describes the object interactions ordered in time sequence. It illustrates the objects and classes implicated in the system and the series of messages transferred between the participating objects that are necessary to carry out the functionality. It shows the exchange of data between the objects of the system.

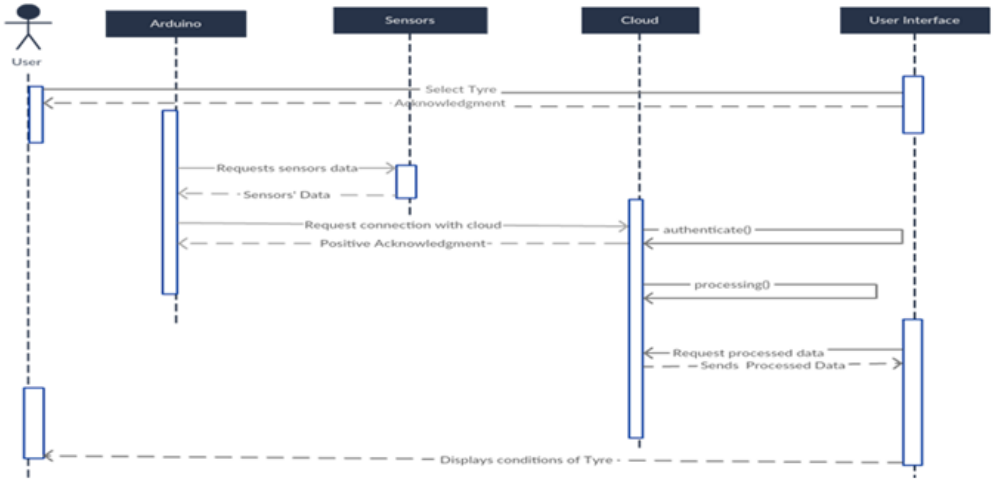

Figure 3 Sequence Diagram

The Figure 3 describes the workflow for the system. The sensors will sense the fall and accident of the vehicle and sends data to the Arduino board. The Arduino board will then verify the condition whether it is a false situation or true situation. If the condition is false then the false alarm will give 10 seconds to press the reset button which will reset the system. If the condition is true, the Arduino will send request to the NEO-6M GPS tracker which will in return sends location to the Arduino. Then the Arduino will send information to the GSM module through network tower. The GSM module then will send the exact location and alert message to the emergency numbers and helpline numbers.

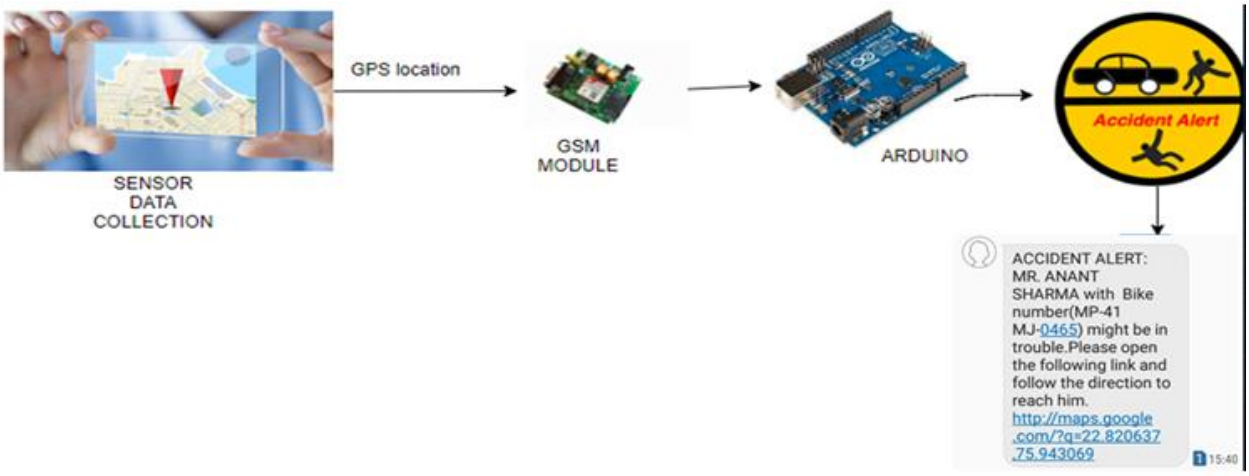

Figure 4: Process diagram

IV. IMPLEMENTATION

Below is the working raw code and circuit diagram of this research project.

```
// Include Library
#include <TinyGPS++.h>
#include <SoftwareSerial.h>
#include<Wire.h>
const int MPU6050_addr=0x68;
float AccX,AccY,AccZ;

int ldrpin = A1;
int ldrvalue=0;

int btn = 7;
int btnval = 0;
int buzzer = 53;
SoftwareSerial sim800l(13, 12);
// The TinyGPS++ object
TinyGPSPlus gps;

// The serial connection to the GPS device
SoftwareSerial ss(11, 10);

double lati = 0.0;
double longi = 0.0;
int accidentmsg=1;
int fallmsg=1;
void setup()

{
```

```
  pinMode(ldrpin, INPUT);
  Serial.begin(9600);
  ss.begin(9600);
  sim800l.begin(9600);

  Wire.begin();
  Wire.beginTransmission(MPU6050_addr);
  Wire.write(0x6B);
  Wire.write(0);
  Wire.endTransmission(true);
  pinMode(btn, INPUT);
  pinMode(buzzer, OUTPUT);
}

void loop()
{
  ldrvalue=analogRead(ldrpin);
  Serial.println(ldrvalue);
  Wire.beginTransmission(MPU6050_addr);
  Wire.write(0x3B);
  Wire.endTransmission(false);
  Wire.requestFrom(MPU6050_addr,14,true);
  AccX=Wire.read()<<8|Wire.read();
  AccY=Wire.read()<<8|Wire.read();
  AccZ=Wire.read()<<8|Wire.read();
  //Serial.print("AccX = "); Serial.print(AccX/16384.0);
  // Serial.print(" || AccY = "); Serial.print(AccY/16384.0);
  AccZ=AccZ/16384.0;
  Serial.print(" || AccZ = ");
  Serial.print(AccZ);
   ss.listen();
   delay(50);

  // This sketch displays information every time a new sentence is correctly encoded.
  while (ss.available() > 0)
  {
    gps.encode(ss.read());

    if (gps.location.isUpdated())
    {

      Serial.print("Latitude= ");
      Serial.print(gps.location.lat(), 6);
      Serial.print(" Longitude= ");
      Serial.println(gps.location.lng(), 6);
```

```
      lati=gps.location.lat();
      Serial.println(lati);
      longi=gps.location.lng();
      Serial.println(longi);

    }
  }

  // Bike Fall Notification Coding
 if ( AccZ < 0.8 && fallmsg ==1)
  {
// User have 5 seond to stop the Alarm
    for( int i=1; i<5; i++)
    {
     digitalWrite(buzzer, HIGH);
     delay(1000);
     digitalWrite(buzzer, LOW);
     delay(1000);
    }
Serial.println("Bike Fall");

  sim800l.listen();
  sim800l.println("AT+CSMP=17,167,0,0\r\n");
  delay(200);
  sim800l.println("AT+CMGF=1");
  delay(100);

  sim800l.println("AT+CMGS=\"+918888896575\"");
  delay(100);
  sim800l.print("Mr Ankit Sharma with bike no(MH-14 FJ-8563 might be fallen. Please follow the below link to reach bike's destination\n");
  sim800l.print("https://maps.google.com/?q="); //text content
  sim800l.print( gps.location.lat(), 6 );
  sim800l.print( "," );
  sim800l.print(gps.location.lng(), 6);
  delay(100);
  sim800l.write(26);
  delay(100);
 fallmsg=0;
 digitalWrite(buzzer, HIGH);
  }

// Accident Notification Coding
  if ( AccZ < 0.8 && accidentmsg ==1 && ldrvalue<600)
  {
```

```
// User have 5 seond to stop the Alarm
     for( int i=1; i<5; i++)
    {
     digitalWrite(buzzer, HIGH);
     delay(1000);
     digitalWrite(buzzer, LOW);
     delay(1000);
    }
  Serial.println("Accident");

  sim800l.listen();
  delay(10000);
  sim800l.println("AT+CSMP=17,167,0,0\r\n");
  delay(200);
  sim800l.println("AT+CMGF=1");
  delay(100);

  sim800l.println("AT+CMGS=\"+918888896575\"");
  delay(100);
  sim800l.print("Mr Ankit Sharma with bike no(MH-14 FJ-8563 might be in trouble or might meet with an ACCIDENT. Please follow the below link to reach his destination\n");
  sim800l.print("https://maps.google.com/?q="); //text content
  sim800l.print( gps.location.lat(), 6 );
  sim800l.print( "," );
  sim800l.print(gps.location.lng(), 6);
  delay(100);
  sim800l.write(26);
Serial.println("nooooooooooooooo");
delay(100);
   accidentmsg=0;
   digitalWrite(buzzer, HIGH);
  }

  delay(100);
// SOS Notification Coding

  btnval = digitalRead(btn);
  Serial.println(btnval);

 if ( btnval ==1 )
 {
  Serial.println("SOS");
  delay(3000);
  sim800l.listen();
```

```
  sim800l.println("AT+CSMP=17,167,0,0\r\n");
  delay(200);
  sim800l.println("AT+CMGF=1");
  delay(100);

  sim800l.println("AT+CMGS=\"+918888896575\"");
  delay(100);
  sim800l.print("Mr Ankit Sharma has pressed SOS Button with bike no(MH-14 FJ-8563. He might be in trouble. Please follow the below link to reach bike's destination\n");
  sim800l.print("https://maps.google.com/?q="); //text content
  sim800l.print( gps.location.lat(), 6 );
  sim800l.print( "," );
  sim800l.print(gps.location.lng(), 6);
  delay(100);
  sim800l.write(26);
 }
}
```

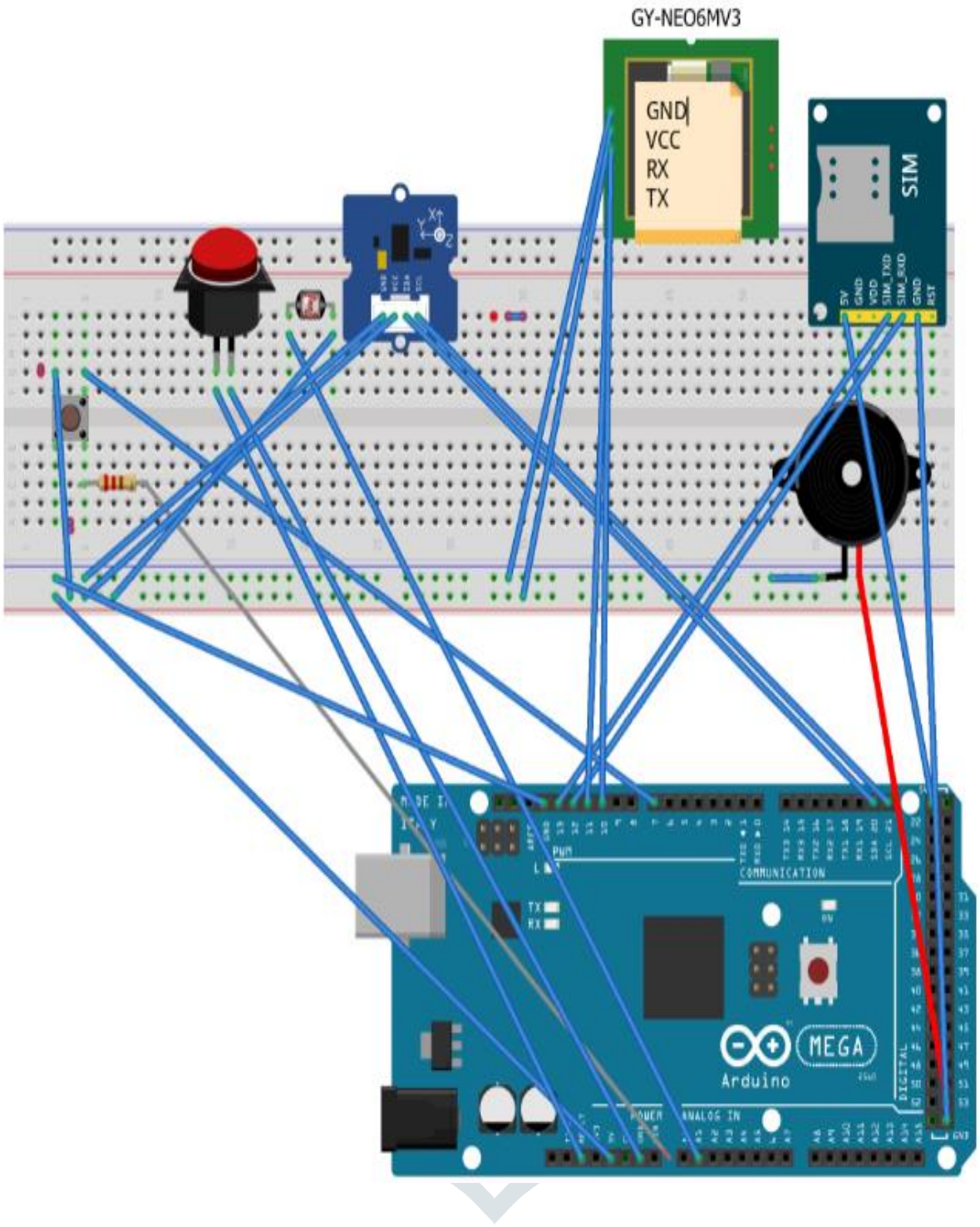

Figure 5: Circuit Diagram

V. EXTENSION TO THIS PROJECT

Companies (Flipkart, Amazon, Zomata, Uber Eats, Pizza Hut, Dominos Big Basket, and Reliance Fresh) are delivering in every corner. There is a sudden increase in number of delivery boys. Some companies are working in almost real time. Delivery boys of zomata, uber eats, pizza hut, and dominos have to deliver in constrained environment. Hence management and Security of delivery boys is a real problem.

PROBLEM STATEMENT:

Delivery boys of different organizations have different problems. Pizza delivery boys are always in hurry because they have to deliver pizzas within 30 minutes. In case of emergency (accident), there is no availability of real time information
In current scenarios in case of Amazon, Flipkart, Myntra customers are updated about the day of delivery, but not the exact time of delivery

PROPOSED SOLUTION:

- Sensors attached to helmet will send real time data (geolocation, time, impact status, collision data) to cloud via gateway

- Technology – LoRa (Benefits: long range, low power, long battery life, small capex)
- Sensor Id will be mapped to employee id of the delivery boy
- SAP Edge Services will help in taking real time actions

• In the case of emergency (accident)

- Traffic police of the particular area will be updated automatically
- Ambulance will be available to the location, and concerned doctors will be updated about the severity of the emergency
- Associated customers will be updated about the delivery, Family members will be informed about the situation in near real time

• This project will also help organizations in monitoring, tracking, and managing delivery boys

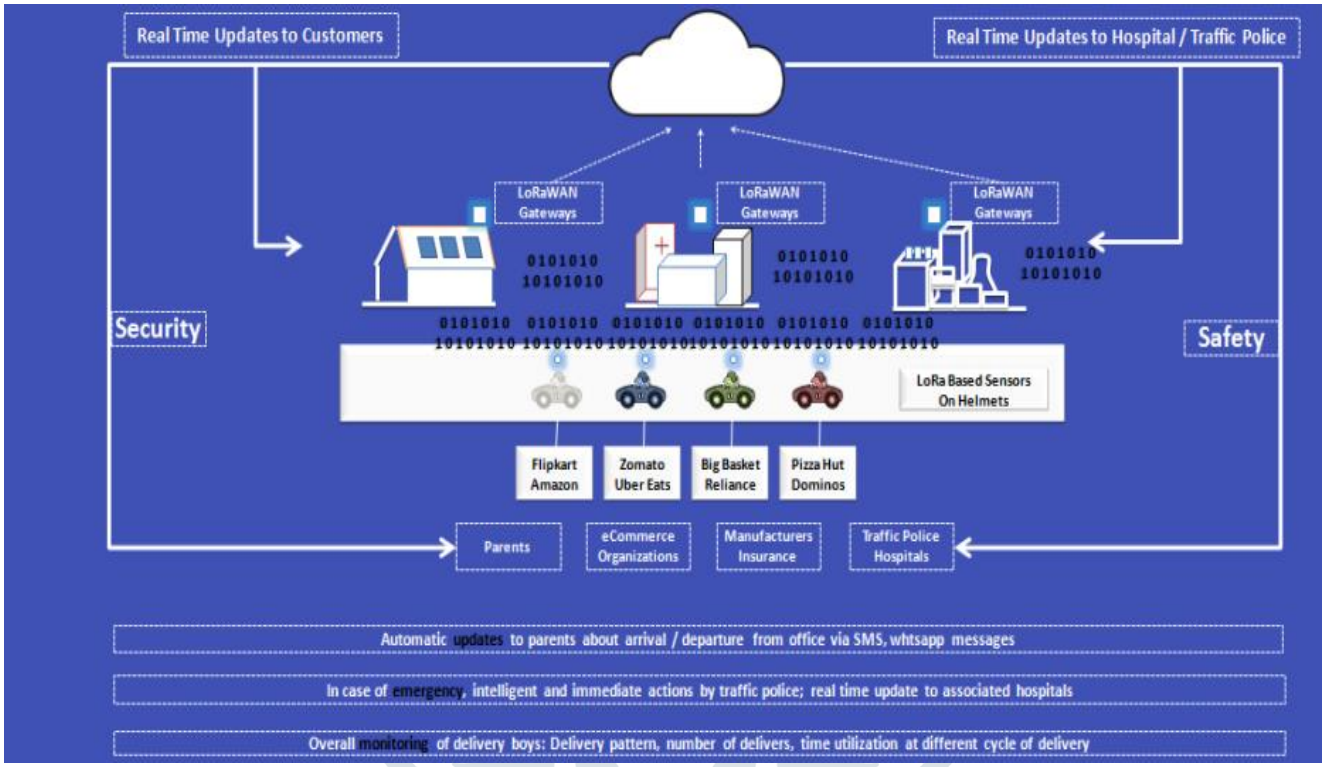

Figure 6: Project Extension Diagram

VI. CONCLUSION

Hence the automatic alarm device for vehicle accidents has been implemented using AtMega162 microcontroller. This design is a system which can detect accidents in significantly less time and sends the basic information to first aid centre within a few seconds covering geographical coordinates, the time in which a vehicle accident has occurred. The switch provides the driver a chance to cut off emergency help systems in case the system triggers a false alarm or if the accident is not very severe and immediate help is not required. The additional Google maps interface also makes the viewing of the location easier. Additional applications of this concept are Stolen Vehicle Recovery, Fleet Management, Asset Tracking, School bus tracking for safety of children and to keep tab on drivers.

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