IoT Based Accident Alert & Tracking System

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ABSTRACT: Internet of Things (IoT) plays a vital role in connecting the surrounding environmental things to the networks and made it easy to access those un - internet things from any remote locations. It is inevitable for people to update growing technology. Generally, people are facing problems with the smart driving Accident Alert and Tracking System. Road accidents are the major cause of deaths in India. This is some serious matter at hands and measures need to be taken to save the lives of the victim. The victim's lives can be saved by taking preventive measures in the accident-prone zone. An accident-prone zone is a place where accidents frequently occur that is mainly at the curves of the road. Statistical measures are taken at those zones when two vehicles are coming in the opposite direction. Two Ultrasonic sensors with LED and Buzzer are placed at the two ends of the curvy road are connected to Node MCU Board to alert the driver. Although the alerts, if an accident occurs due to over speed we can track the accident location immediately by an IR Sensor, Node MCU Board, GPS module and Blynk App in the Smartphone and send the location details to victims emergency contacts and notify the ambulance and hospital services simultaneously through Blynk App. So that they will take immediate action to avoid wasting the lives and cut back the damages.

KEYWORDS: Curvy Roads, IoT, Ultra Sonic Sensors, Solar Panel, LED, Buzzer, alerting the driver, IRSensor, Node MCU Board, GPS Module, Blynk App, Smart Phone, Tracking the accident location.

I. INTRODUCTION

Road transport is essential for development as it provides mobility to people and goods. However, it also exposes people to the risk of road accidents, injuries and fatalities. Exposure to adverse traffic environment is high in India because of the unprecedented rate of motorization and growing urbanization fueled by a high rate of economic growth. As a result, incidents of road accidents, traffic injuries and fatalities have remained unacceptably high in India [1].

"Accidents are not natural but they are caused" is a common quotation in the area of traffic safety
Today, road traffic injuries are one of the leading causes of death, disabilities and hospitalization in the country. Road traffic injuries constitute the 8th leading causes of death in India by Ministry Of Road Transport And High ways (MORTH) (www. morth.nic.in), (IMHE; http://healthdata.org/india), and are the leading cause of health loss among young men of age 15-49 years. [1-2]

Number of Road Accidents in Top 15 States & Respective Shares in Total Accidents in 2019

S.No.	State	No. of Accidents
1	Tamil Nadu	65,562
2	Madhya Pradesh	53,399
3	Karnataka	42,542
4	Uttar Pradesh	38,783

5	Kerala	38,470
6	Maharashtra	35,853
7	Andhra Pradesh	25,727
8	Telangana	22,484
9	Rajasthan	22,112
10	Gujarat	19,081
11	Chhattisgarh	13,563
12	West Bengal	11,631
13	Haryana	11,258
14	Odisha	10,855
15	Bihar	8,855
	Total 15 States	4,20,175
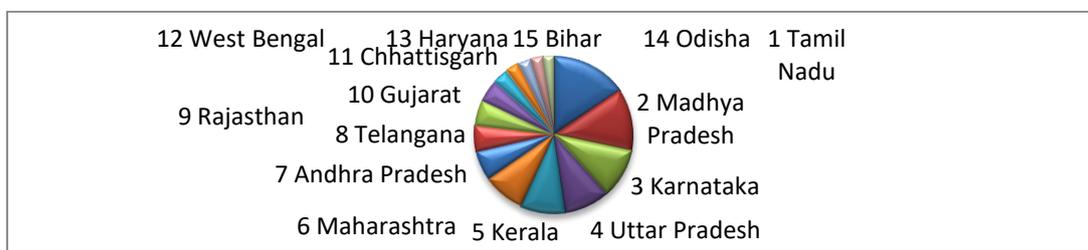
Number of Road Accidents in Top 15 States & Respective Shares in Total Accidents in 2019

Top 10 Dangerous Roads In India

In the developing countries accident is the major cause of death. If we gaze at the top 10 dangerous roads in India we can see that all of them are mountain roads and curve roads[2].

1. Zojilla Pass, J&K.

2. Nathula Pass - Indo China Border.

3.Leh - Manali High way, Himachal Pradesh.

4. Neral - Matheran Road, Maharastra.
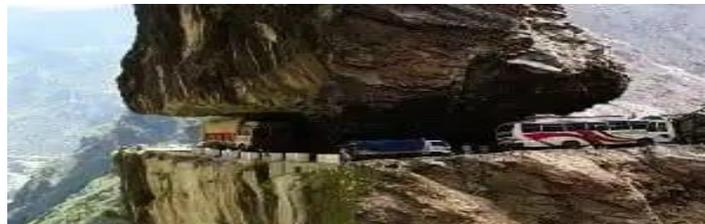
5. National High way - 22 (Highway to Hell) Bihar To Jharkhand.

6. Three Level Zig Zag Road, Sikkim.

7. Rajmachi Road, Western Ghats, Hindustan Tibet Road.

8. Kinnaur Road,Himachal Pradesh

9. Chang La Pass, J&K

10. Kolli - Hill Road, Tamilnadu

Accidents, Fatalities & Injuries By Road Feature

Road feature	Number of accidents	Persons killed	Persons injured
Curved road	54077	17814	57346
Bridge	15514	5543	15839
Culvert	11600	4144	11974
Potholes	9423	3597	8792
Steep grade	9124	3248	9753
Under construction	11822	4250	11425
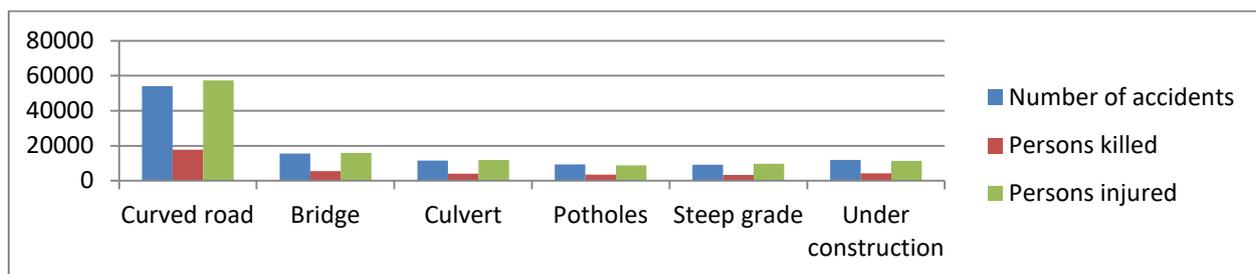
Accidents, Fatalities & Injuries By Road Feature

In the mountain roads, curvy roads there will be tight curves and the roads will be narrow. In these kinds of situations the driver of a vehicle cannot see vehicles coming from opposite side. Thousands of people lose their lives each year because of this problem. To overcome this problem I designed a project named, **"IoT Based Accident Alert and Tracking System"**. **IoT** means Internet of Things, The goal of the Internet of Things is to enable things to be connected anytime, anyplace, with anything and anyone. Here my project is connected to Smart phones over the internet which is IoT[3].

Internet of Things (IoT)
"Anything that can be connected will be connected" - Jacob Morgan.

Sensors and actuators for gathering the data and sending across the internet are also included in this advancement. cloud not only to store data but also for data analysis, gathering, visualization. Some applications of IoT are Smart energy, smart city, health monitoring system. In IoT data is transmitted from sensors and they can be stored and analyzed by diverse IoT platforms.

II. MATERIAL USED [4-8]

- Curvy Road Model, Buzzer
- PCB (Printed Circuit Board) , LED 'S As indicators, Street Lights
- Jump Wires, IR Sensor Board
- Ultrasonic Sensors, GPS Module
- NodeMCU Board, LCD Display(Smart Phone)
- Embedded (S/W),Power Supply
- Blynk App in the Smart Phone,Two toy cars


IoT Based Accident Alert & Tracking System

## BLOCK DIAGRAM

Figure : Block Diagram
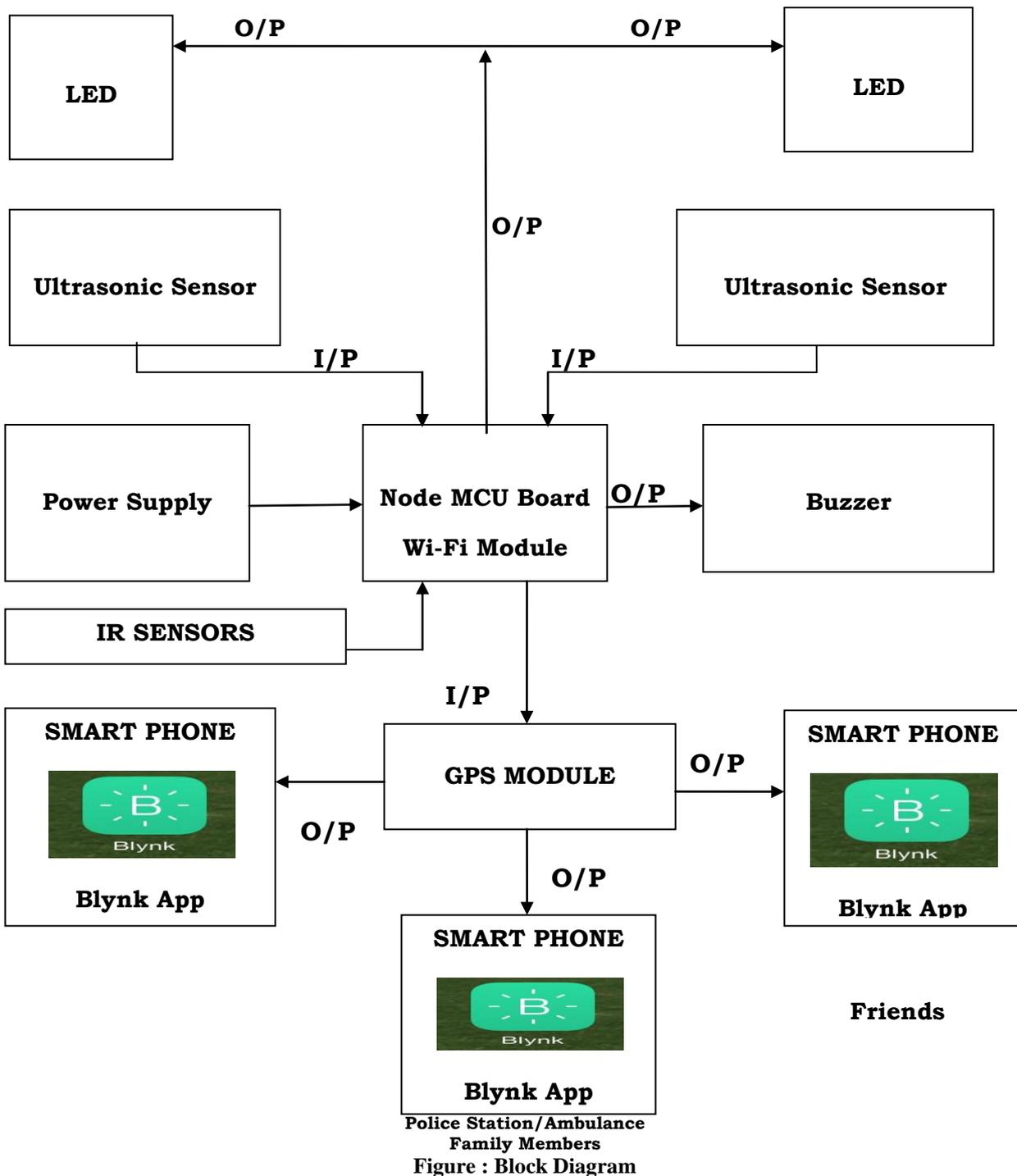
III. DETAILED WORKING OF BLOCK DIAGRAM

Here my project is connected to Smart phones over the internet which is IoT. Mainly my project has two parts. In the first part "Alerting the driver about the vehicle coming from the opposite side". In the second part tracking the accident location if the accident occurs. In the first part, I kept Ultrasonic sensors at the two ends of the curve road with LED and Buzzer if the vehicle comes from one end of the curve the Ultrasonic sensors senses and sends the information to Node MCU board which process the data and alert driver by glowing LED light at the opposite side with Buzzer sound. By looking at the LED light on/off criteria driver can become alert and can slow down the speed of the vehicle. In the second part, although the alerts, if an accident occurs due to over speed we can track the accident location immediately. For this, I took IR Sensor, NODE MCU Board, GPS Module, Buzzer Blynk App and Smart Phone. When an accident occurs IR Sensor in the car will send signals to NODE MCU Board which collect the location by GPS Module and send the location details to victims emergency contacts and notify the ambulance and hospital services simultaneously through Blynk App [9].
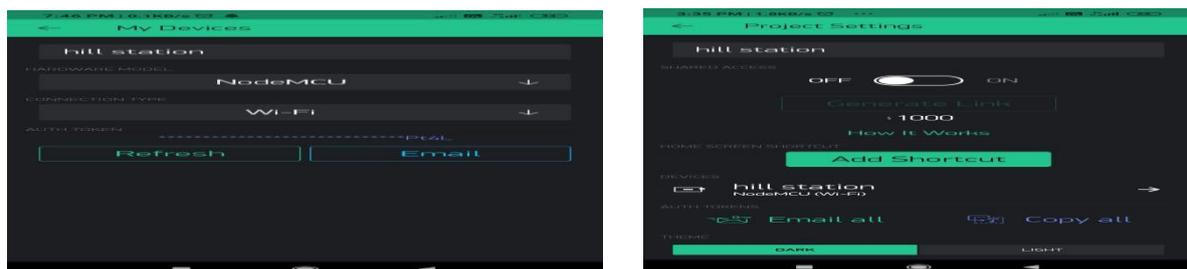
Blynk App Settings
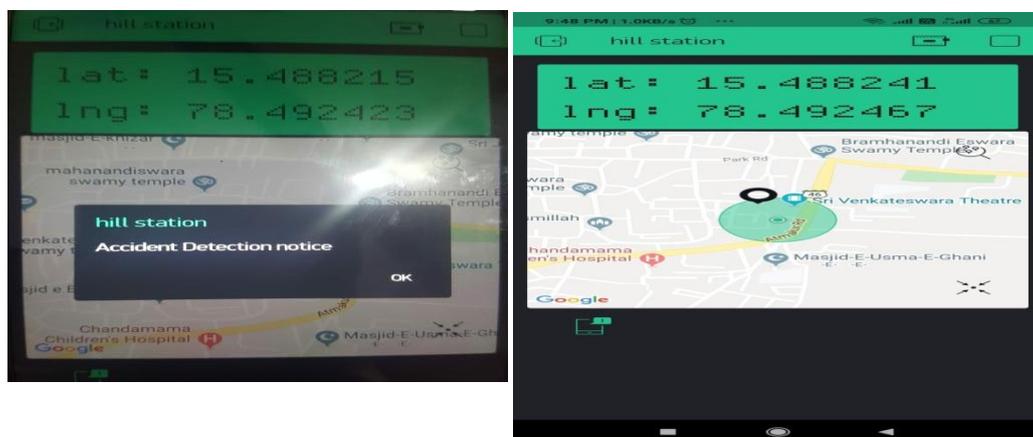
Screenshot of Blynk App Notification When the accident occurs
A Brief Information of components that are used [10-12]

1. Ultrasonic Sensors

Ultrasonic sensors are used to detect objects and measure distances. The frequency of (40,000 Hz) is more than Audible range of Human beings (20Hz- 20,000 Hz). The send and receive waves will determine how far the object is placed from the Ultrasonic sound waves amount of time it takes to sensor.

Ultrasonic Sensor (HC-SR04)

Following Table shows the main features of this Ultrasonic Sensor

Parameter	Value
Main Parts	Transmitter & Receiver
Technology Used	Non-Contact Technology
Operating Voltage	5 V
Operating Frequency	4 MHz
Detection Range	2cm to 400cm

HC-SR04 Pinout & Description

Pin Name	Pin Description
VCC	The power supply pin of the sensor that mainly operates at 5V DC.
Trig Pin	It plays a vital role to initialize measurement for sending ultrasonic waves. It should be kept high for 10us for triggering the measurement.
Echo Pin	This pin remains high for short period based on the time taken by the ultrasonic waves to bounce back to the receiving end.
Ground	This pin is connected to ground.

Applications
- Speed and direction measurement, Wireless charging
- Humidifiers, Medical ultrasonography
- Burglar alarms, Embedded system
- Depth measurement, Non-destructive testing

2. IR SENSOR

Infrared Obstacle Sensor Module has built-in IR transmitter and IR receiver that sends out IR energy and looks for reflected IR energy to detect presence of any obstacle in front of the sensor module. The module has on board potentiometer that lets user adjust detection range [10-12].
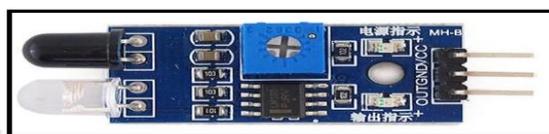
IR Obstacle Sensor

Applications
➢ Mobile Phones,Robots, Industrial Assembly,Automobiles Etc.

3. ESP8266 NodeMCU

In one phase NodeMCU is an open-source firmware and development kit that helps you to build IoT product. NodeMCU is an open source IoT platform.

NodeMCU v1.0

MCU stands for Micro Controller Unit - which really means it is a computer on a single chip. A microcontroller contains one or more CPUs (processor cores) along with memory and programmable input/output peripherals.
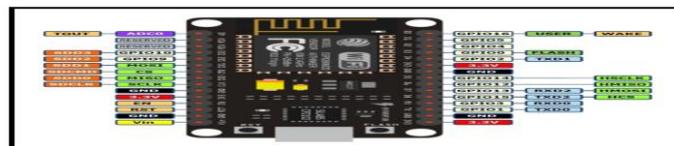
NodeMCU Board Pin Description

4. GPS MODULE

GPS is also known as Navigation System with Time and Ranging (NAVSTAR) GPS. A GPS navigation device, GPS receiver, or simply GPS is a device that is capable of receiving information from GPS satellites and then to calculate the device's geographical position.
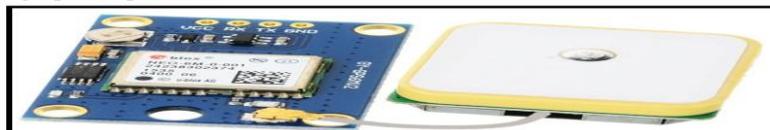
GPS Receiver Module

5. Blynk App

Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it and do many other cool things. Blynk App - allows to you create amazing interfaces for your projects using various widgets we provide.
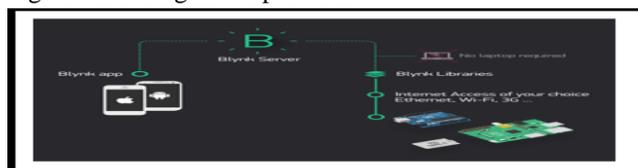
Working of Blynk App

Features of Blynk App
➢ Similar API & UI for all supported hardware & devices,
➢ Connection to the cloud using, Blynk works over the Internet.

6. Buzzer

An electrical device that makes a buzzing noise and is used for signaling.

Power Supply Design

230V AC 50Hz				D.C. Output
Step down Transformer	Bridge Rectifier	Filter		Regulator
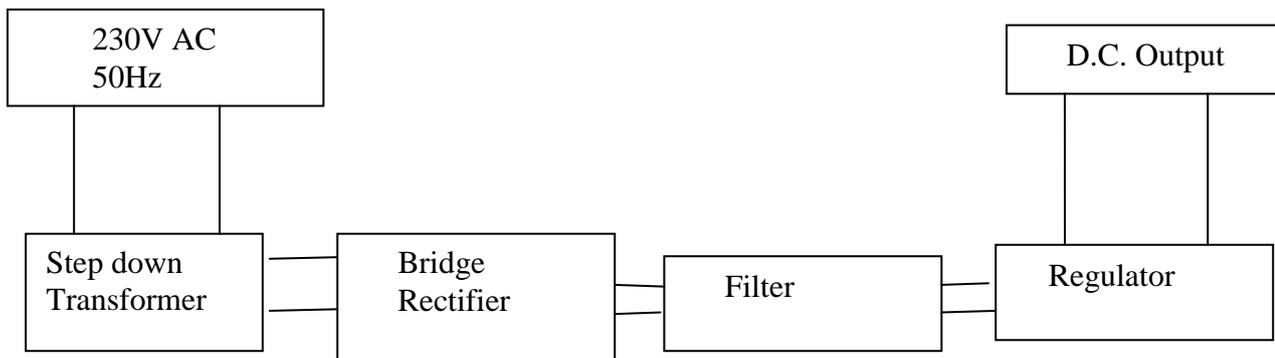
Power Supply

IV. ADVANTAGES OF THE PROPOSED TECHNIQUE

1. It reduces the maximum accident rate.
2. It helps to find the exact location of the accident with the help of GPS.
3. With the help of GPS, we get the latitude and longitude of the detected position.
4. The System is fully automated, thus it finds the accident spot, helping to reach the hospital in time.
5. The information about the accident is being directly sent to the rescue team and family which is a fast process but whereas in the present situation the pass by people detect the   accident and inform it to the rescue team and family which is a very slow process.
6. It makes our journey safe.

V. APPLICATIONS

Mainly used for Ambulance vehicles, Fire Engines and All vehicle tracking system.

VI. RESULTS

1. Our IoT Based Accident Alert & Tracking System is very useful to avoid accidents in the curvy roads.
2. The IoT based application and the guardian based application is created.
3. The guardian receives the message notification regarding the start of the hardware system and the vehicle where the system is implemented in the vehicle.
4. The guardian based application has specific features for the accessibility of the vehicle location.
5. The guardian requests for the location which is obtained as a message notification in the form of latitudes and longitudes.
6. The complaint is sent by the guardian in case of vehicle theft.

7. The guardian receives the message regarding the occurrence of accidents and the nearest medical assistance and police station information can be obtained by providing the specific latitude and longitude information for the provision to the former and latter facility.

VII. CONCLUSION

Proposing an IoT system which may help the community decreasing the death rates resulting from curvy roads accidents. It also provides many advantages compared to traditional systems, namely, minimizing injured passengers interaction, recognizing exact and accurate accidents locations. The main intention of this proposed approach is to minimize the number of curvy road accidences happen per year. This project aims to save human life. This methodology uses an Ultrasonic sensor-based IoT system to alert the driver about the vehicle approaching in the opposite direction of the curve, hairpin bend or a blind spot to reduce the accident rate. It also uses the IR Sensor, NodeMCU Board, GPS Module with Blynk app in the smartphones for sending GPRS location and accident messages to all the emergency contact numbers. Accident detection device installed in a vehicle when meets with an accident will send notifications through Blynk App to the pre-install numbers of the drivers family members, police station, and ambulance. Using this system we can do real-time surveillance of vehicles and emergency systems. This System is fully automated, thus it finds the accident spot, helping to reach the hospital in time. The system is cost-effective, dynamic and efficient.

VIII. ACKNOWLEDGEMENT

IX. FUTURE SCOPE

In this project, we have designed an IoT Based Accident Alert & Tracking System.

1. This system requires an external power supply, implementation of self - powered system using renewable energy like Wind and Solar will make the system more effective and efficient.
2. The hardware can be furthermore improvised using an alcohol sensor, where most of the accidents are occurring due to intoxication. This can be implemented by placing alcohol sensor as to detect the alcohol.
3. This project can also have eye blink sensor which prevents the individual who meets with an accident due to drowsiness. It can be overcome by placing an eye blink sensor as required for the individual.
4. Adding additional sensors in combination with an accelerometer for accident detection like microphone, camera (to automatically take pictures of the accident) and a voice recognition module to detect noises during a vehicle crash like noise when airbags are deployed, will drastically increase the reliability and accuracy of the system.

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