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Accident Detection with GPS Tracking and Messaging System

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ABSTRACT

Road traffic accidents are the leading cause of death by injury and the tenth leading cause of all deaths globally. This paper presents an accident detection system that detects an accident and alerts the family members and emergency services. The number of accidents happening is increasing every day. The existing systems for a person who has met with an accident do not work efficiently due to the large increment in population over the years. Also, the existing systems are mainly focused on the prevention of accidents rather than taking immediate actions after an accident has taken place. Often the family members and emergency services are just not informed in time which in turn results in delaying the help reached to the affected victims. Our project is designed to avoid such situations, detect such as road accidents, and locate the victims using a real-time vehicle tracking system using GPS.

Keywords - Internet of Things, Raspberry Pi, Cloud Database, Sensors, Gyroscope, GPS

I. INTRODUCTION

Roads are of crucial importance for both short and medium distances facilitating the transportation of passengers and goods. However, the roads in India are the biggest sources of accidents leading to deaths. In India, every four minutes a person is killed in road accidents. On average, 3287 deaths happen per day as a result of car accidents. Among young adults aged 15-29, the leading cause of deaths in a road accident which in turn cost countries 13% of the Gross Domestic Product (GDP).

An accident detection mechanism may be employed to tackle this problem. This system caters to situations of car accidents when individuals are subjected to serious or fatal injury, with no one around to help. This system collects vehicular information, for instance, the location and identity of the concerned individual that met with the accident and delivers the said information to emergency services and family members, thus acting as an accident identification mechanism. Further, the emergency services are conveyed all relevant information with regards to hospitals and police stations in the vicinity of the coordinates of the accident, in order to dispatch helping services immediately.

II. LITERATURE SURVEY

India, being one of the busiest nations in the world with regards to road traffic, has a road network spanning over 5M km, carrying almost 90% of the country's passenger traffic and 65% of goods. Road safety is a factor of utmost significance for the citizens considering the rapid increase in the number of vehicles and the heavily congested Indian roads. India reported over 151,000 fatalities by road accidents in 2019 itself. These lives may be saved if immediate medical services are provided. This paper resonates with a system suggesting a solution to this issue.

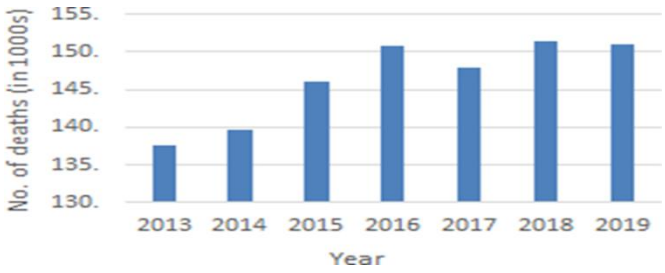

Fig. 1 Number of deaths due to road accidents across India (in 1,000s) (Source: Ministry of Road Transport and Highways India)

III. PROPOSED ACCIDENT DETECTION SYSTEM

Accidents are a very serious and widespread problem if the response from the emergency facilities is not fast it can even cause the victim's life. Many people die because they can not get a quick medical facility. We consider that time is a very important factor to protect the victim's life in case of an accident.

Therefore, the problem in this work concerns mitigating the considerable number of deaths resulted from car accidents and caused mainly due to the lack of latency of succouring responses to the injured person. Our System aims to detect accidents automatically using IOT sensors and automatically inform medical emergencies like the police station, hospital, fire station about Accident details.

IV. SYSTEM ARCHITECTURE MODEL

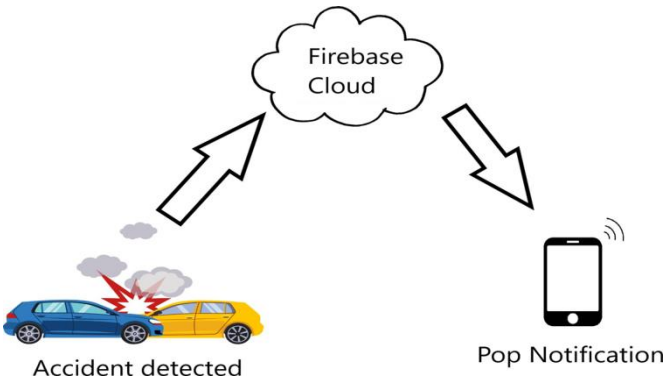

Fig. 2 System Overview

The figure(Fig. 2) shows us how the system will look like and how the components in the system will communicate. We will have all the IoT Sensors mounted on the Vehicle with Raspberry Pi. As soon as any of the Sensors detect the Accident, Raspberry Pi will communicate the data to the real-time cloud database(firebase). Firebase at the same time will ask the driver's Mobile Application for the live location of Rider. And will communicate this information to the informed emergency services like the police station, hospital, fire station on their dedicated Dashboard. Also, the Family Members of the victims will be shared details of the accident.

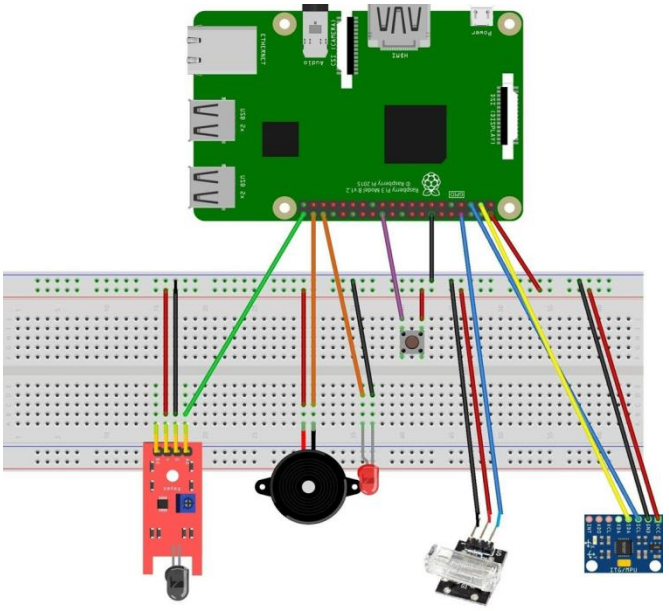

Fig. 3 Raspberry pi with Sensors

The above figure (Fig. 3) shows the architectural interfacing of Raspberry pi with all the sensors used. Sensors like Gyroscope, Fire Sensor, Knock Sensor are used to detect Accidents, based on their functionality. Red jumper wires specify the 5 volts VCC supply and black as ground. The given circuit can be mounted on the vehicle. The Gyroscope should be mounted on the plane surface to provide a 0-degree angle of reference with respect to the earth's gravity. Fire sensors should be placed inside the cabin where passengers reside. Knock Sensors can be placed on the outer side of vehicles so that they can detect the impact in terms of vibration. Buzzer, LED and push-button should be placed near the driver for easy access.

No external GPS module is required to be installed. Using the rider's phone as a GPS device reduces the cost and complexity of the whole system. Thus rider app gets the location from the rider's phone and sends location coordinates to the cloud database in case of an accident. The Mobile Application has been interfaced with Google maps to show the rider's current location. The app also has the facility to display all the hospitals and police stations nearby the rider. This will result in a quick response for taking further actions.

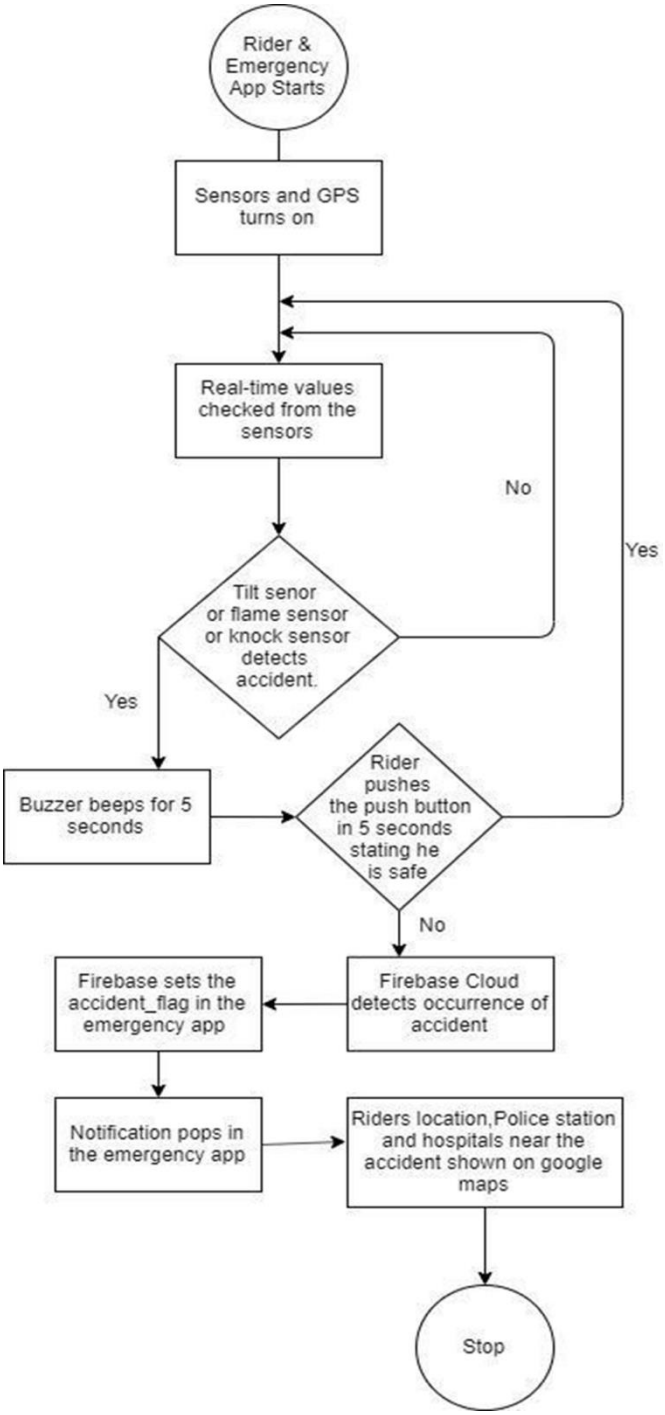

Fig. 4 Flow Chart

The figure (Fig. 4) shows the flow chart of the accident detection system. After detecting any sort of accident by the sensor the buzzer will beep. If the rider stops it by pressing a push-button in 5 seconds, the system will detect that the rider is safe and no notification will be sent. If not then the system will detect an accident and the emergency contact will be

prompted with the pop notification. Further rider's location, police stations, and hospitals near its location will be displayed. This feature is provided in cases where the accident is not severe enough or in the case any sensor detects any accident by mistake. Thus enhancing the efficiency of the overall system.

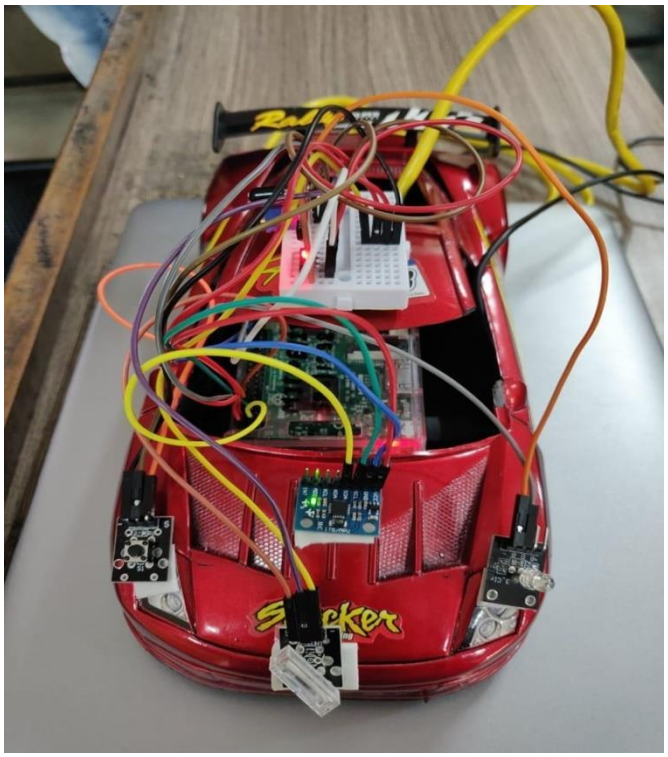

Fig. 5 Model with mounted sensors

V. HARDWARE AND SOFTWARE REQUIREMENTS

Hardware requirements:

- Raspberry Pi 3b
- Knock Sensor
- MPU5060 Gyroscope
- Flame Sensor
- RGB LED
- Bread Board
- Push-button
- Jumper wires
- Buzzer
- Smartphone

Software Requirements:

- Raspbian OS
- Firebase Cloud
- Android

Studio Sensors Used:

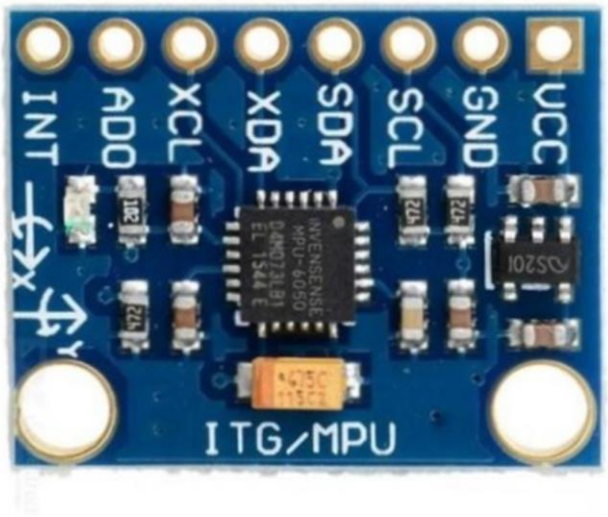

Fig. 6 MPU5060 Gyroscope

Fig. 7 IR Fire Sensor

Fig. 8 Knock Sensor

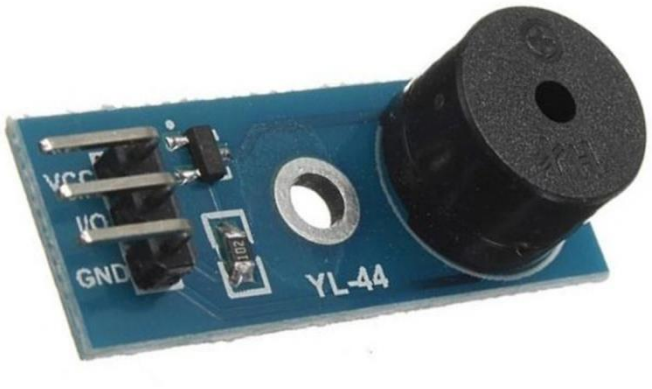

Fig. 9 Buzzer

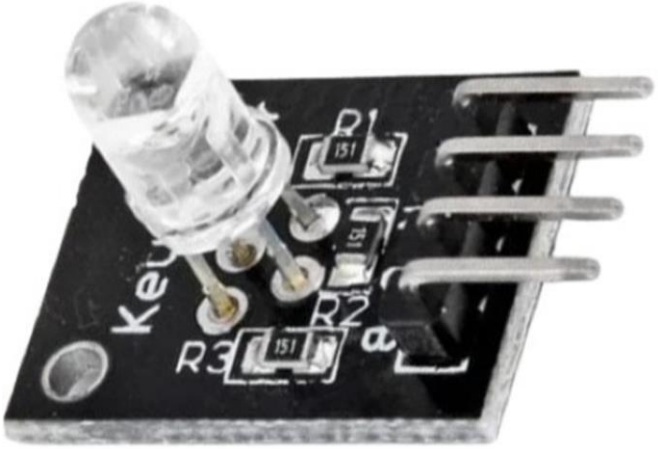

Fig. 10 RGB LED

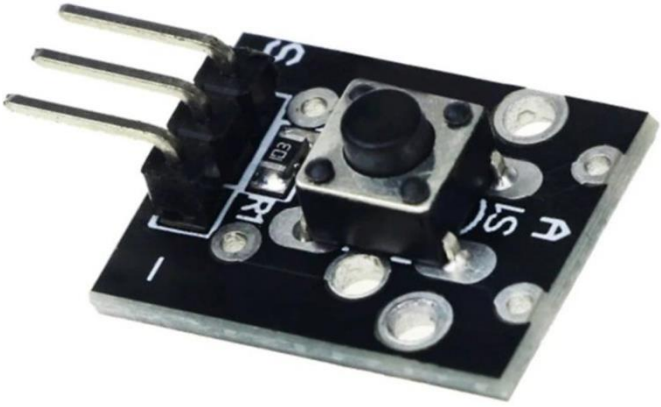

Fig. 11 Push Button

VI. RESULTS OBTAINED

The emergency application uses the location traced by the rider's application via his/her phone's inbuilt GPS. Thus no external module is required in our system. The screenshots of the two applications are shown in the given figure Fig 12 shows the Rider app interface and Fig 13 shows the Emergency app interface.

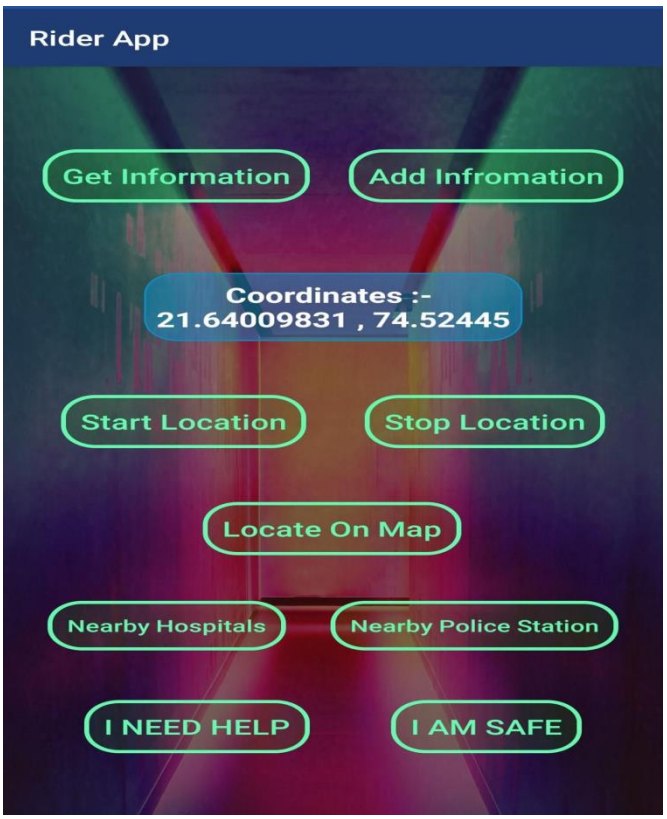

Fig. 12 Riders app

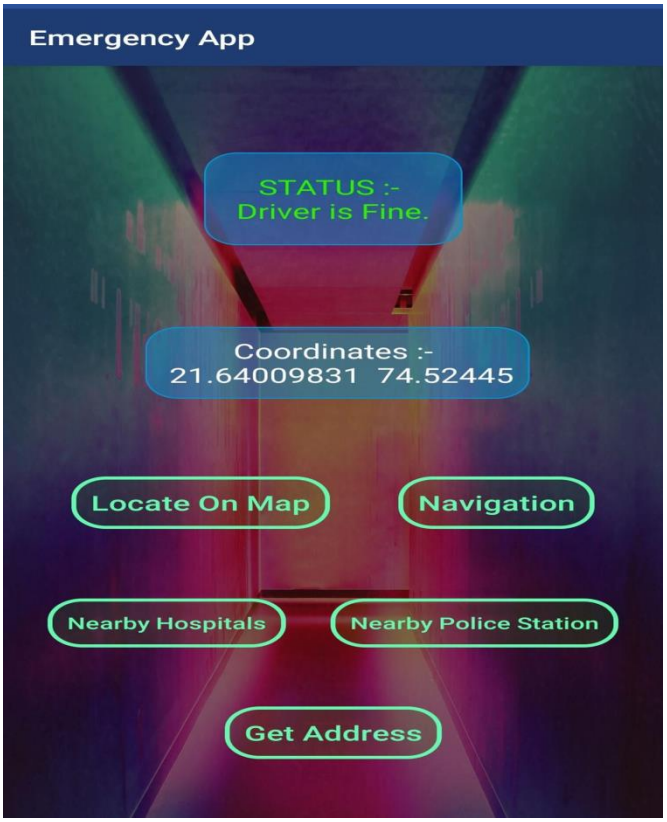

Fig. 13 Emergency app

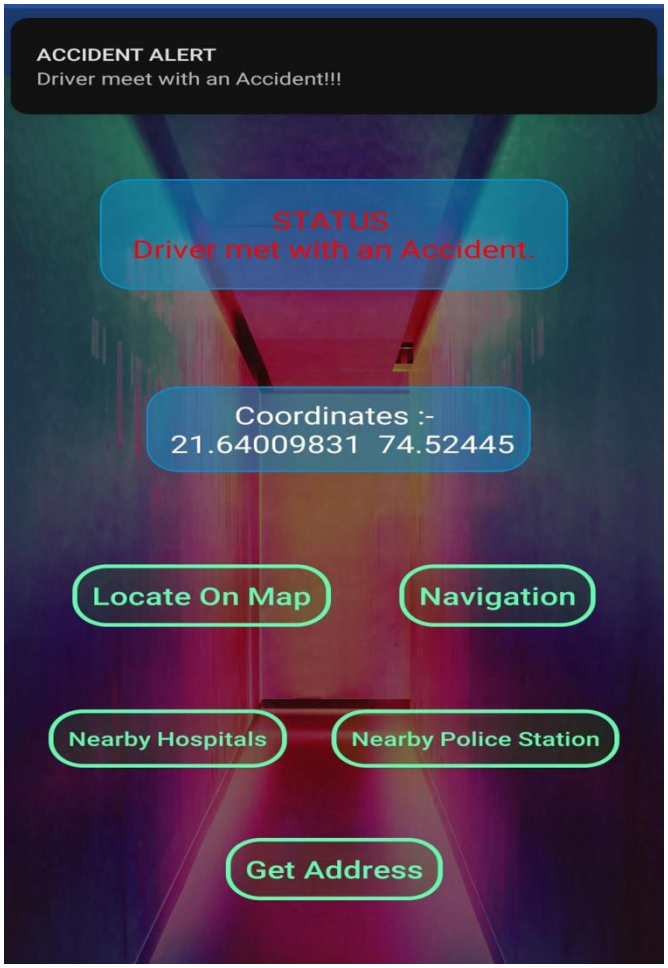

Fig. 14 Pop alert notification

Whenever an accident is detected, the emergency app pops a notification stating that the driver has met with an accident. The emergency app also shows the location, hospitals nearby, police stations near the rider's location. Figure 14 shows the pop notification.

VII. CONCLUSION

In this project, we have created an accident alert system by using raspberry pi, necessary sensors, and an application that will notify people who are either family members or relatives of that person i.e user-defined mobile numbers. This project is implemented by using a GPS tracking system so that whenever a person meets an accident then the app can track the users' location and send a notification to all nearby hospitals and police stations.

We have carried out a number of trials on this project and found that this system shows higher sensitivity and accuracy indeed. This project is user-friendly and very much reliable to be used in vehicles. The sensors used in this project will be integrated with the vehicle's computer unit in a protected place inside the vehicle in order to avoid damage when an accident happens. This proposed system can also be used for traffic estimation and accidents survey in the country by the road safety control department of India with some modifications.

VIII. REFERENCES

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