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Raja Manesh Kumar
Department of Computer System Engineering Mehran University of Engineering and Technology, Jamshoro Sindh, Pakistan

Muhammad Ali Zardari
Department of Computer System Engineering Mehran University of Engineering and Technology, Jamshoro Sindh, Pakistan

Kanchan Bajaj
Department of Computer System Engineering Mehran University of Engineering and Technology, Jamshoro Sindh, Pakistan

Dr. Bushra Naz
Department of Computer System Engineering Mehran University of Engineering and Technology, Jamshoro Sindh, Pakistan

Corresponding Author:
Raja Manesh Kumar
Department of Computer System Engineering Mehran University of Engineering and Technology, Jamshoro Sindh, Pakistan

Vehicle accident detection and information system using android smart phone

Raja Manesh Kumar, Muhammad Ali Zardari, Kanchan Bajaj and Dr. Bushra Naz

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Abstract
Vehicle accident is the paramount thread for the people's life which causes a serious wound or even dead. Nearly more than millions of people died in road accident every year. The automotive companies have made lots of progress in alleviating this thread, but still the probability of detrimental effect due to an accident is not reduced. And in many situations due to accident family member and rescue service is not informed due to high demand of automobiles has also increased the traffic hazards and road accidents which can lead the individual death. For this purpose, we have developed the hardware-based Android application that detects an accidental situation and sends emergency alert message to emergency contact number. Our accidental detect system is integrated by hardware and software. Hardware system measures speed and change of tilt angle with gyroscope accelerometer and knock sensor.by checking conditions, this system also capable of reducing the rate of false alarm.

Keywords: vehicle accident, android smart phone, gyroscope accelerometer

Introduction
It is perceived that cities are getting to be progressively swarmed in terms of guest's tenants and vehicles .The increment within the number of vehicles has driven to an increment in traffic, which has led to an increment within the number of streets traffic mishaps. As of late, there has been a worldwide increment in the yearly number street traffic passing's even in created nations with great street security measures. However, it remains the case that the Best Weight of street traffic fatalities and wounds lays in low-and center salary nations. Cell phones are getting further developed and complex, and backing an enormous number of Sensors including knock sensors, Bluetooth transceiver, accelerometers and MPU6050 Sensor not withstanding numerous others. There are Numerous chances of executing purchaser application that astutely misuse the underlying Sensors of cell phone. There are numerous chances of actualizing. Customer application that brilliantly abuse the inherent sensors of cell phones. This application is more valuable for casualties. In world there is increment utilization of vehicle, such coming about expanded traffic just as ascent of street mishap. This framework gives quick accessibility of wellbeing. Vehicle is the fundamental method of transportation. There is a need of legitimate Ride just as security is the principle issue the present lives. There is a no framework which ready when mishap was occurred. There is a need to plan framework that will help to casualty who languishing over mishap. These framework configurations help to send genuine mishap area and furthermore send crisis message to individuals who determined in crisis contact rundown of casualty. It is conceivable a programmed vehicle mishap identification by utilizing gyroscope accelerometers, GPS and GSM module plan. We are worried about the strategy to utilize GPS innovation. The number and assortment of cutting-edge applications that use trend setting innovations, for example, portable processing, remote correspondence and detecting are tremendous and expanding. Models incorporate clever vehicle, urban areas, and fiasco the executive's frameworks, and a lot more that have become a hot examination theme because of improved remote correspondence innovation. Decreased expenses of capacity and preparing force, and accessibility and reasonableness of gadgets Savvy urban communities are being intended to give better, more smart, responsive and practical administrations to the populace. Brilliant urban areas can give portability arrangements through developing astute vehicle frameworks. Numerous nations are executed integral time clever traffic frameworks to build wellbeing and lessen contamination.

Related Work

There are numerous plans and strategies in the writing to address street wellbeing, vehicular correspondence and salvage activities after a mishap. We center on the most down to earth arrangements techniques for mishap identification. This segment presents an investigation of existing frameworks identified with traffic dangers and street mishaps, featuring their qualities, shortcomings and restrictions.

This framework [2] planned assistance to send real mishap area and furthermore send crisis message to individuals who determined in crisis contact rundown of casualty. It is conceivable a programmed vehicle mishap location by utilizing GPS and GSM module plan. They were worried about the technique to utilize GPS innovation. Here fundamental bit of leeway our framework is that to give prompt emergency clinic administration, police administration and quick area following of where mishap happens. Hence the principle needs of venture this framework is in police headquarters, Hospital and so forth additionally the principle need of this framework is for the human life wellbeing. Framework is helpful in various zone, for example, traffic, Hospital and Transportation and so forth on the off chance that a mishap happens in country region or populated zone, this application is more helpful for casualties. In world there is expanded utilization of vehicle, such coming about expanded traffic just as ascent of street mishap. This framework is more solid than some others, yet disappointment can emerge on account of worker.

The medical services [3] industry is profiting by the mechanical advances that IoT has to bring to the table with improved admittance to mind, expanded quality, effectiveness, and decreased expenses. As the innovation for gathering, examining and sending information in the IoT keeps on developing, presently, numerous vehicles are outfitted with a programmed crash reaction framework that can speak with a worker in the Cloud cautioning a paid supplier of a crisis. When the supplier has been alarmed, an administrator imparts back with the driver to get further guidance and sends crisis faculty if essential. This paper proposes a framework that can kill the requirement for an administrator. At the point when the vehicle is in a mishap it discusses straightforwardly with crisis administrations and relatives giving the seriousness of the mishap, GPS area, and the vehicle ID. Ambulances are right now equipped for sending understanding data to the emergency clinic. The uniqueness of this undertaking is that sensors distinguish a mishap and data is sent promptly to the rescue vehicle. Other than their Different components like versatility, adaptability, asset restriction and so forth are thought of.

In [5] they were utilizing an alert framework which helps in improving the crisis arrangement of the mishap framework. This framework identifies the mishap event and the co-ordinated of the mishap are informed to the salvage group. An exchanging framework is utilized switch off on the off chance that there is no causality. The Accident is identified with the assistance of MEMS Sensor and Vibration Sensor. The Angle where the vehicle has moved off is demonstrated through a message. This Application helps in giving practical answer for the helpless crisis encourages. Other than PUSH ON SWITCHES sense the mishap and send the area to the client characterized telephone number utilizing GSM and Network is must.

In [1] author creates android cell phone to distinguish mishaps and report it to the closest accessible crisis responders with the area of casualties in crisis. On a crisis responder side, the framework will advise responders about the episodes that happen close to them and give them continuous following of crisis casualties on a Google map. This will help crisis responders monitor casualty's area and salvage them as quickly as time permits. Calculation they utilized on-board accelerometer sensor of a cell phone to recognize mishaps was created for their framework in the accelerometer esteems that are being produced by the accelerometer sensor and setting limit esteem that will trigger the mishap alert. Accelerometer conveys quickening esteems for every one of the three tomahawks. They have likewise added a few highlights to improve the frameworks unwavering quality, precision and dodge bogus positives. Yet there were need of progress for bogus positive alert other than it ought to be need of dynamic web association.

In [6] most important factor that is used, by car accident detection systems, to detect car accident is the G-Force value that, several studies have been performed rear-ended impacts with volunteers; the data used in these studies mean a unique opportunity to analyze how acceleration influences the risk of injury. The results are shown that most occupants suffer from neurological signs, had a mean acceleration above 4G. Actually G-Force value is not enough evidence, to detect car accident, which would lead to false positive sign proposed detection phase, running inside the smartphone, continuously sampling and reading the smartphone accelerometer sensor to detect the collision. In the case of an accident, the smartphone experiences the same acceleration force experienced by the occupants of the vehicle, because smartphones are frequently carried in a pocket attached to the occupants. In fact, there are several issues that have to be considered during the accident detection phase. The most important system done in this field is activated when the vehicle is at high speed of above 24 km/h. and the smartphone acceleration experiences greater than 4G. This system didn’t take into account accident detection when the vehicle is travelling at a low speed, below 24 km/h, which is also subject to an accident. Thus, one of the main contributions of this paper is the detection of car accident at a low speed, below 24 km/h, and the smartphone acceleration experiences greater than 4G.

Technologies Utilized

Arduino nano

Arduino Nano is a microcontroller board developed by Arduino.cc.

The microcontroller used in the Arduino Nano is the Atmega328, which is comparable to that used in the Arduino UNO. It has a wide range of hire and is a remarkable microcontroller board due to its small gauge and flexibility. In this way, we must also see its basic features.

It has 22 grains of information / yield on 14 hard and fast pins of these automated pins 5V to 12V It also supports various communication techniques, namely Serial Protocol, I2C Protocol and SPI Protocol. It looks like it has a smaller size than the expected USB Pin used to move the code and also has a Reset on it.

A. Bluetooth Transceivers

The HC-06 is Bluetooth module that permits us to impart remotely over a short separation.

The Bluetooth module is associated with the Arduino Nano to convey since the Bluetooth module alone is much the same as a receiving wire to send/get information. It needs a microcontroller like Arduino nano to speak with it and send or get the information from it to another Bluetooth gadget (Mobile Phone). The Bluetooth module has predominantly 4 pins that we use:

1. RX: Receiving the information
2. TX: Sending the information
3. VCC: Power pin (3.3V to 5V input)
4. GND: Ground Pin.

B. Motor driver (L298N)

L298N is a Dual Motor Controller Module 2A with Arduino. This permits you to control the speed and bearing of two DC engines, or control one bipolar stepper engine easily. The L298N H-connect module can be utilized with engines that have a voltage of somewhere in the range of 5 and 35V DC.

The L298N is a strong integrated circuit for the 15 leading Multiwatt and PowerSO20 leaders. It is a high voltage, high double pressure that fully connects the removed driver to mark the normal TTL loads of sensible inductive driving, for example, transmission, solenoids, DC and start engines. Two power inputs are provided to enable or disable the gadget for free input signals.

C. WD Robot chassis

This Multi-Functional 4WD Robot Car Chassis Kit with ARDUINO UNO R3 is basic but flexible planned explicitly for understudies and specialist. Highlighting enormous size frame plates cut in acrylic and planned with various gaps and mounting focuses, giving a lot of room to convey a PCB board and any extra parts that you pick. The prospects are just restricted by your creative mind. This unit incorporates everything of the parts required to collect the 4WD Robot Car Chassis Kit just like a 4xAA battery holder with four apparatus engines along 65mm wheelset. As a result of the utilization of all the more valuable metal parts (orientation, transmission gear, associating pole, metal engine, controlling cup, multi-work section, and so forth), which is costly, the client can look at the benefits, obviously, the market is likewise less expensive Similar to the skeleton, work isn't on a degree of them.

D. Batteries

Batteries are an assortment at least one cells have their own synthetic responses that trigger the progression of electrons in a region. All batteries have three main components: an anode (the '- ' side), a cathode (the '+' side), and few sorts based on electrolyte (a substance that synthetically responds with the anode and cathode).

E. MPU6050

The MPU6050 is a Micro Electro- Mechanical Systems (MEMS) with a 3-hub Accelerometer and a 3-pivot Gyroscope inside it. This encourages us to measure speed, speed, direction, breaking and other parameters related to the movement of the frame or article. This module additionally has a (DMP) Digital Motion processor inside it that breaks down enough to make complex measurements and therefore loosens the Microcontroller function.

The module likewise has two auxiliary anchors that can be used to connect without IIC modules such as a magnetometer, however it is optional. Since the IIC address of the module can be adjusted more than one MPU6050 sensor can be inserted into a Microcontroller using an AD0 pin. The module also has reported and modified round libraries accessible after which it is very easy to use with celebrated categories like Arduino. So in case you need a motion sensor for your RC Car, Drone, Self- adjusting Robot, Humanoid, Biped or something else then this sensor may be the right choice for you.

F. Crash/knock sensors

Knock Impact sensor (KY-031) - is a gadget that is equipped for recognizing stun or vibration in the zone. It is an incredible option for the SW-420 vibration sensor. It comprises of a spring sensor that will distinguish the vibration, a pull up resistor and three header pin that is dispensed for the VCC (+5 Volts), GND (Ground) and S (Signal).

The working of this sensor is plain straightforward, at whatever point it identifies an abrupt/momentary jolt, for example, smashing vehicle, it yields a rationale level (0/1) utilizing that rationale level we can identify the mishap.

G. C++

C ++ is a platform language that can be used to create advanced applications. C ++ was developed by Bjarne Stroustrup, as an extension to the C language. C ++ gives editors a high level of control over program resources and memory. It is also used by arduino for making it more functional.

H. Smartphones

Smartphones are mobile phones that have considerably a lot of functionality than a regular mobile phone. They're mobile computers. Smartphones are powerful and versatile as a result of built in sensors, powerful processors, multiple network interfaces and a high amount of memory for such small devices.

I. Android Studio

Android Studio is the official IDE of Android. It's a reason we worked for Android to speed up your event chance and help you build the highest quality apps for each Android gadget. Android Studio offers many highlights that enhance your profits when building Android apps. To help improve the system within the Android operating system, Android Studio uses a Gradle-based form framework, emulator, code formats, and Github integration. Each task in Android Studio has at least one way with source code and asset records. These modules include Android app modules, Library modules, and Google App Engine modules.

J. Java

Android applications are created utilizing the Java language. Starting at now, that is actually your solitary choice for local applications. Java is a mainstream programming language created by Sun Microsystems (presently claimed by Oracle). Grown long after C and C++, Java fuses a significant number of the incredible highlights of those ground-

breaking dialects while tending to a portion of their downsides. All things considered; programming dialects are just as incredible as their libraries. These libraries exist to assist designers with building applications.

K. Shared Preferences

Android gives numerous methods of putting away information of an application. One of this ways is called Shared Preferences. Mutual Preferences permit you to spare and recover information as key, value pair.

One of the most Interesting Data Storage alternatives Android gives its clients is Shared Preferences. Common Preferences is the manner by which one can store and recover limited quantities of crude information as key/esteem sets to a document on the gadget stockpiling, for example, String, int, coast, Boolean that make up your inclinations in a XML record inside the application on the gadget stockpiling. Mutual Preferences can be thought of as a word reference or a key/esteem pair. For instance, you may have a key being "username" and for the worth, you may store the client's username. And afterward you could recover that by its key (here username). You can have basic common inclinations API that you can use to store inclinations and pull them back as and when required. Common Preferences class gives APIs to perusing, composing and dealing with this information.

L. Google Map Url

In May 2017 Google announced the Google Maps URLs API that allows constructing universal cross- platform links. Now you can open Google maps on web, Android or iOS using the same URL string in form.

System Overview

The designed system consists of two Modules.

Hardware Module

It detects the accident of Victim when hit by any Object.

Android Application:

Hardware sends the notification to the Android Application.

A. ML Diagram

Android Application:

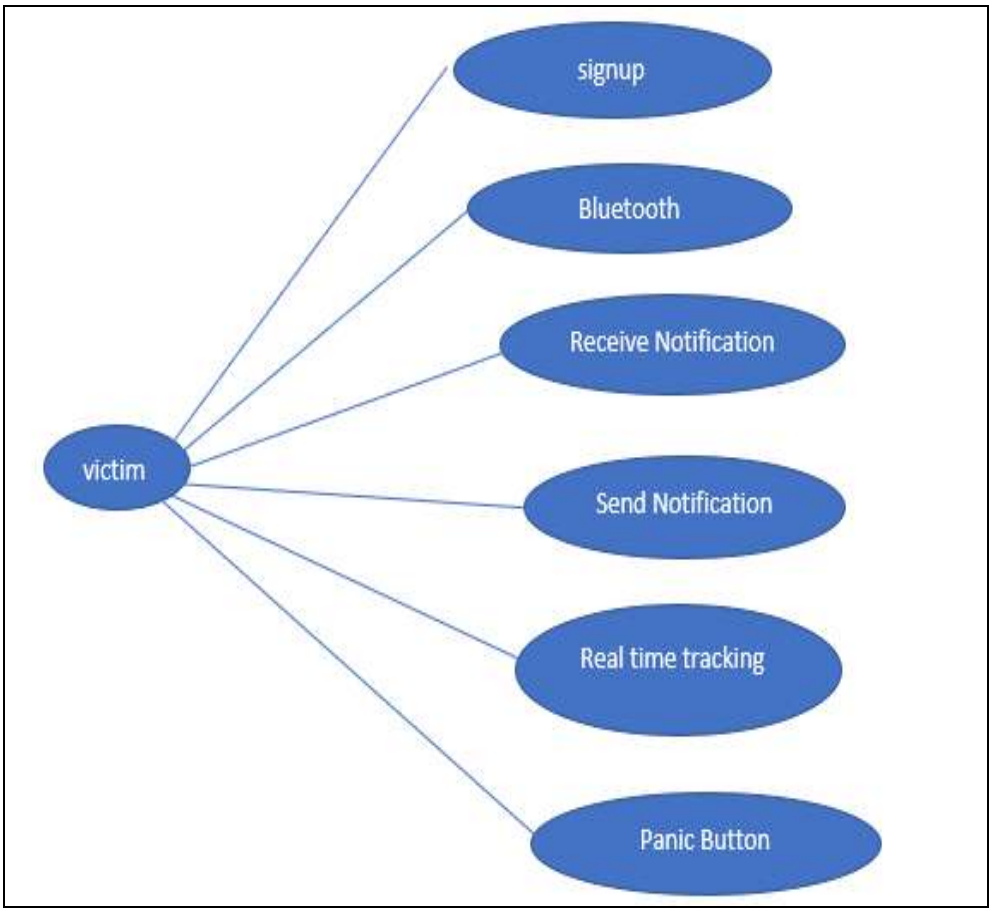

Fig 1: UML Diagram

Fig 1 shows the Top-Level Use Case of Application, which indicates the user's full interaction with the system. It shows the user is firstly registering him he/she can view/update his profile at any time after authenticated. The user can turn on Automatic Monitoring which will register an accelerometer service running in the background, it can now detect all kinds of jerks produced by the user on his/her smartphone and correctly differentiate between accidents and normal routine jerks. Upon detecting the right accidents, the system will generate an alert containing an notification of the emergency victim's phone. Users will be able to cancel sending alert to emergency responders in case of false alert (accident didn't occurred) under 15 seconds. Responders will get victim's notification via SMS in location format using Google Map Url.

B. Activity Diagrams

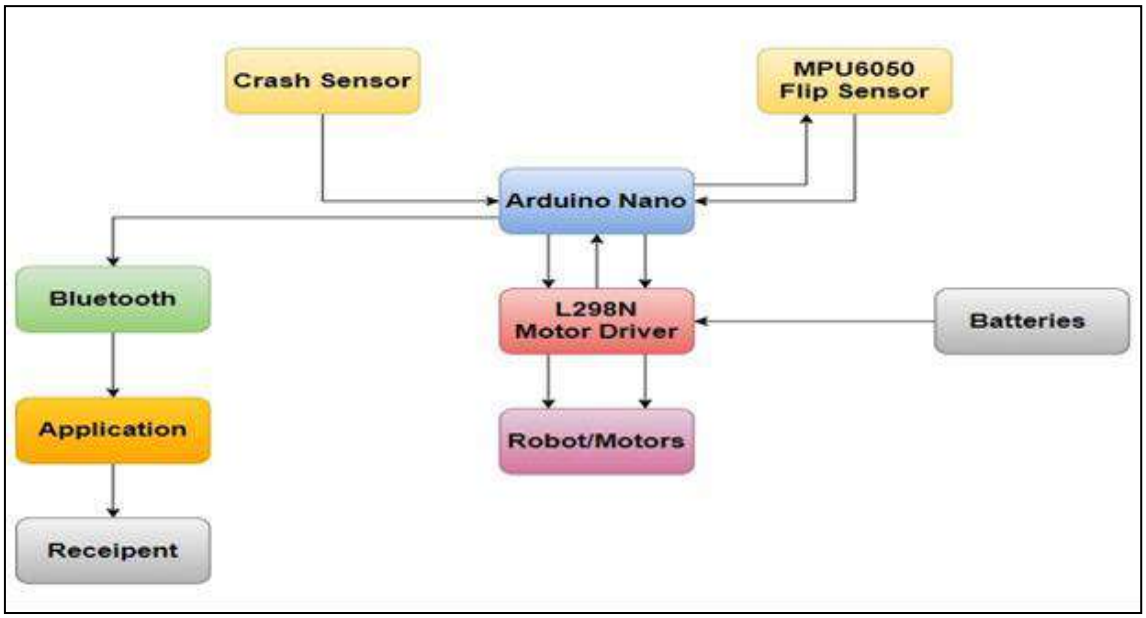

Fig 2: Hardware Activity Diagram

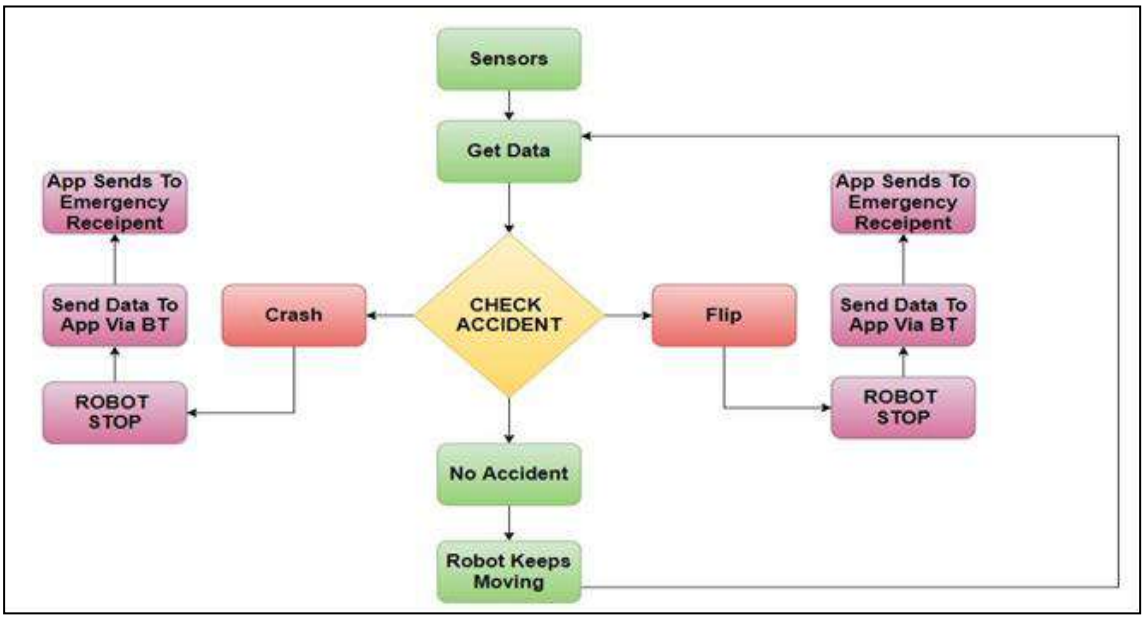

Fig 3: Over All System Activity Diagram

C. Working of Hardware

a. First Scenario

At the point when the gyros are pivoted about any of the sense tomahawks, the Coriolis Effect causes a vibration that is identified by a MEM inside MPU6050. The subsequent sign is intensified, demodulated, and separated to create a voltage that is relative to the precise rate. This voltage is digitized utilizing 16-piece ADC to test every pivot. The full- scale scope of yield are +/ - 250, +/ - 500, +/ - 1000, +/ - 2000. It gauges the rakish speed along every pivot in degree every subsequent unit.

The implanted Digital Motion Processor (DMP) is utilized to register movement preparing calculations. It takes information from gyrator, accelerometer and extra outsider sensor, for example, magnetometer and procedures the information. It gives movement information like move, pitch, yaw edges, scene and picture sense and so forth. It limits the procedures of host in figuring movement information. The subsequent information can be perused from DMP registers. On-chip temperature sensor yield is digitized utilizing ADC. The perusing from temperature sensor can be perused from sensor information register.

b. Second Scenario

When robot is moving Accident is being monitored in the case of Vehicle, in the accident, vehicle will strike to any object. Here Knock sensor/ crash detector is used to detect the strike of vehicle.

The output voltage of the Knock sensor/ crash detector is made, when the Strike of Object is more than its critical value. Thus, when a low signal output is being produced and send to the microcontroller, microcontroller will confirm an

accident being occurred. Then an interrupt is generated and the information as well as "1" data is sent to Bluetooth device.

D. Over All System Working

This is the entire System flow of hardware along with their components and containing android application. The diagram defines the whole phenomena of the "Vehicle Accident Detection and Information System Using Android Smart Phone**"**. The sensors which relate to the Arduino Nano are Bluetooth Transceiver**,** Motor Drivers, MPU6050 Accelerometer Gyroscope, Knock sensor/shock detector. Data is sent to the mobile application by Bluetooth device. Hardware system communicates with the Application with the help of Bluetooth transceiver. When the accident occurs, data is sent to Android Application by the Bluetooth transceiver. And the victim will get notify by notification. He having two choice weather he wants to cancel the notification he can do if he able reach to emergency service otherwise notification will go toward to emergency contact which will be given by Victim. The rescue person when get notify by accident of Victim by message he will get location of Victim by Google Map Url.

Design of Hardware

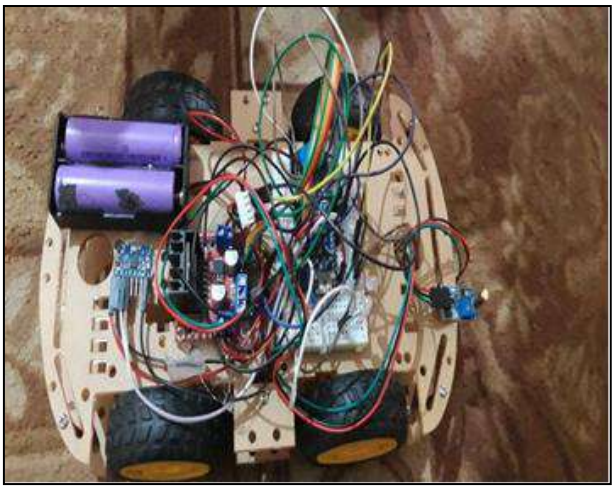

Fig 4: Hardware System

Front End Design

Android Application

Figure 5 shows the result of Android application when user sign up for first time he has to give emergency number of relative, friend or any emergency service the notification will send that given Number**.**

Fig 5: User Sign Up

Figure 6 show the when accident occur victim will get notification on his mobile for 15 second if he able to move to emergency service he can easily cancel the notification otherwise after 15 second notification will go automatically to given emergency contact.

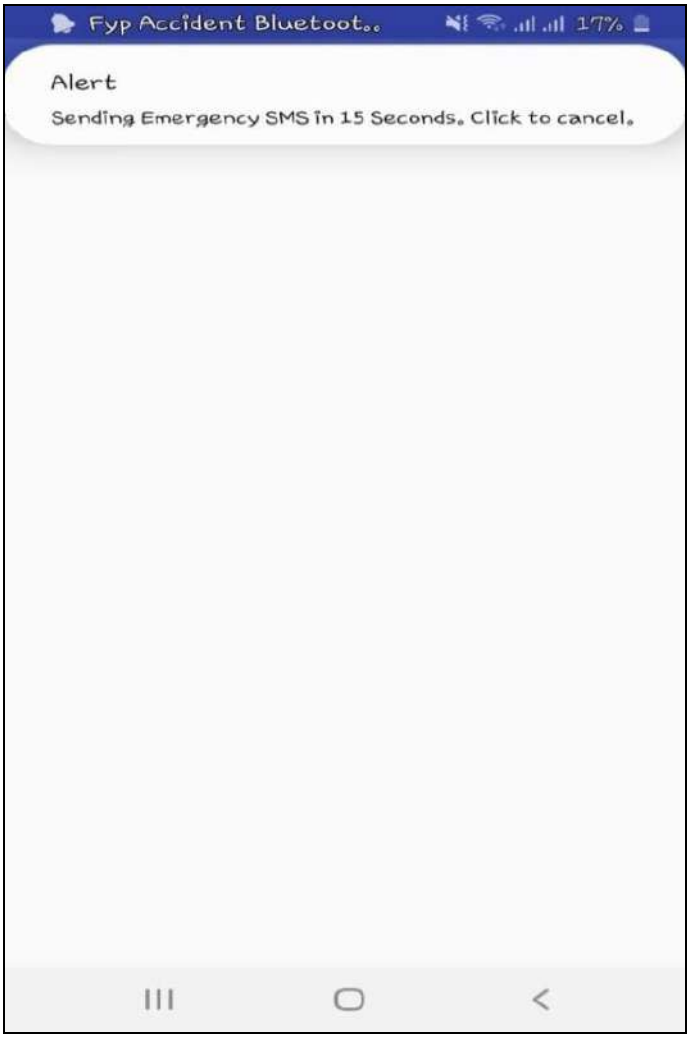

Fig 6: Victim Notification

Figure 7 shows after accident SMS of victim. Receive to the emergency contact.

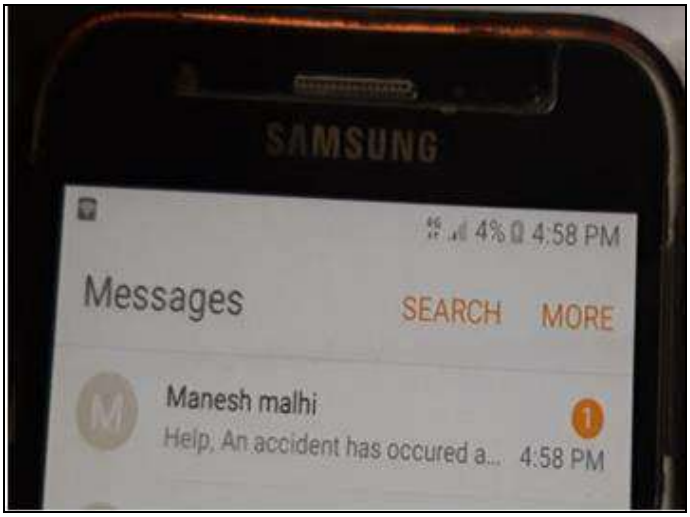

Fig 7: Notification

Figure 8 show location of Victim where the accident occurs.

Fig 8: Map Url.

Figure 9 shows Google map location of Victim where the accident occurs.

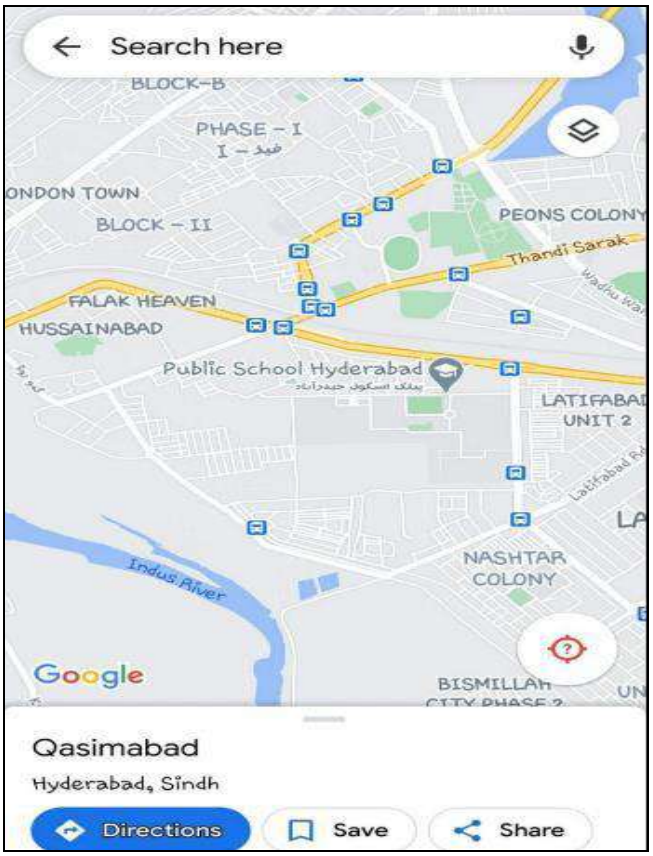

Fig 9: Google Map Url.

Sults and Discussion

Cardinal goal of this research work is to develop a real-time Accident detection system in order to avoid the loss of human lives.

An Automatic Accident detection and Alert System for automobiles is used for providing help to the accident victims.

Application sends the accident message to emergency number provided by application user With the use of sensor, which are connected with other electronic devices, detect the vibrations and shocks which are being faced and these sensors are controlled by Arduino Nano and these sensors send the information to the responders and the attached electronic device often Computer Processor.

Future Recommendations

It is well known that the traffic is increasing day by day which is causing the ratio of accident occurring surround the globe. The risks of accidents will not decrease in future days due to the increase in the vehicles all around the world. This concept led us to believe that Accidents are also increasing on daily bases. It is understood that the notification system like accident notification warning system should take successful measures to notify the people of the world and play an active role in saving the economy of any country, educational institutes, Agriculture and other fatal loses.

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