VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"Jnana Sangama", Belgaum – 590 018

A PROJECT REPORT ON

"VADSR(Vehicle Accident Detection and Smart Rescue)"

Submitted in partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

in

INFORMATION SCIENCE & ENGINEERING

Submitted by

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DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Certificate

This is to certify that the project entitled **"Vehicle Accident Detection and Smart Rescue"** has been successfully completed by **Shwetha Satish (1CR16IS106), Swapna Amarnath (1CR16IS113), Sai Sunil K R (1CR16IS089)** and **Rakshith R (1CR16IS079),** bonafide students of CMR Institute of Technology in partial fulfillment of the requirements for the award of degree of **Bachelor of Engineering** in **Information Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year **2019-2020**. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the project report. This project report has been approved as it satisfies the academic requirements in respect of project work prescribed for the said degree.

Name & Signature of Guide	Name & Signature of HOD	Signature of Principal
(Dr.Shankar Ramamoorthy)	(Dr.M.Farida Begam)	(Dr.Sanjay Jain)

Name of the Examiners	**External Viva**	**Signature with date**
1.		
2.		

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DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Declaration

We,**Shwetha Satish(1CR16IS106)**, **Swapna Amarnath(1CR16IS113)**, **Sai Sunil K R(1CR16IS089)** and **Rakshith R(1CR16IS079)** bonafide students CMR Institute of Technology, Bangalore, hereby declare that the dissertation entitled, **"Vehicle Accident Detection and Smart Rescue"** has been carried out by us under the guidance of **Dr. Shankar Ramamoorthy,Professor,**CMRIT,Bangalore,in partial fulfillment of the requirements for the award of the degree of **Bachelor of Engineering** in **Information Science Engineering,**of the Visvesvaraya Technological University,Belgaum during the academic year 2019-2020. The work done in this dissertation report is original and it has not been submitted for any other degree in any university.

Shwetha Satish(1CR16IS106)

Swapna Amarnath(1CR16IS113)

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Acknowledgement

The satisfaction and euphoria that accompany a successful completion of any task would be incomplete without the mention of people who made it possible,success is the epitome of hard work and perseverance, but steadfast of all its encouraging guidance.

We would like to thank our beloved Principal, **Dr. Sanjay Jain,** CMRIT, Bangalore, for providing an excellent academic environment in the college and his never-ending support for the B.E. program

We would like to express our gratitude towards **Dr.M.Farida Begam**, Professor and HOD, Department of Information Science and Engineering CMRIT,Bangalore,who provided guidance and gave valuable suggestions regarding the project.

We consider it a privilege and honour to express our sincere gratitude to our internal guide **Dr.Shankar Ramamoorthy,**Professor, Department of Information Science and Engineering, CMRIT,Bangalore for his valuable guidelines throughout the tenure of this project.

We would also like to thank all the faculty members who have always been very co-operative and generous. Conclusively, we also thank all the non-teaching staff and all others who have done immense help directly or indirectly during our project.

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ABSTRACT

Vehicle accidents are one of the most leading causes of fatality. The time between an accident occurrence and the emergency medical personnel are dispatched to the accident location is the important factor in the survival rates after an accident. By eliminating that time between an accident occurrence and the first responders are dispatched to the scene decreases mortality rates so that we can save lives. An IOT based vehicle accident detection and rescue information system is developed in order to detect vehicle accident and send the location information of the accident place to vehicle owner, nearest hospital and police station via a web service. The communication between the web server and hardware device is established via GSM and the location is traced by using the GPS shield. The accident is detected through vibration sensors and accelerometer sensors . The project is developed for real time data fetching form the hardware device using through web application, android mobile application or SMS. This project approximately provides the accurate detection of the location of accident occurred, and send notification to the nearest police station and hospital.

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CHAPTER 1

PREAMBLE

1.1 Introduction

The high demand of vehicles has also increased the traffic hazards and the road accidents. Life of the people is under high risk. This is because of the lack of best emergency facilities available in our country. An automatic alert system for vehicle accidents is introduced in this paper. The proposed 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 and angle in which a vehicle accident had occurred. This alert message is sent to the central emergency dispatch server in a short time so that the emergency dispatch server will inform to the ambulances which are near to that location, which will help in saving the valuable lives. A Switch is also provided in order to terminate the sending of a message in rare case where there is no casualty, this can save the precious time of the ambulance. When the accident occurs the alert message is sent automatically to the central emergency dispatch server. The message is sent through the GSM module and the location of the accident is detected with the help of the GPS module. The accident can be detected precisely with the help of vibration sensor. This application provides the optimum solution to poor emergency facilities provided to the roads accidents in the most feasible way.

1.2 Existing System:

The existing system only use the information about the vehicle’s vibrating measurements to detect the accident and that is doesn’t work in network less areas. And after occurrence of the accident, controlling of traffic takes high time. This drawback can be overcome by proposed system.

1.3 Proposed System

This system is very efficient and hence worthy to be implemented. Accident detection and messaging system can be fitted in vehicle (Ambulance, Police or to the communication device of the near and dear) and they are informed about any such untoward incident at the go. Accident detection and messaging system is execution simple as the system makes use of GSM & GPS technologies. GPS is used for taking the coordinate of the site of the accident while GSM is used for sending the message to phone. To make this process all the control is made using Arduino whereas LCD is used to display the accident.

1.4 Problem Statement

An IOT device which automatically detects the occurrence of accident and take measures to save the life of the accident victim using the smart rescue approach.

1.5 Objective of the Project

Here the following objectives are set, in the view of mentioned research background for the present work in ADS, accident detection and rescue management system.

- To design a vehicle unit with sensor system to detect accident details and send the alert message to the Road side unit.
- To design a road side unit that receives all alert message's and sends that into the rescue team.

CHAPTER 2

LITERATURE SURVEY

1. **Vehicle accident prevent cum location monitoring system**

   Author: Abhirup Das ; Abhisek Ray ; Abhisek Ghosh ; Swarasree Bhattacharyya ; Debaleena Mukherjee ; T. K. Rana

   Publication: 2017 8th Annual Industrial Automation and Electromechanical Engineering Conference (IEMECON)

   Abstract: Rate of road accidents is increasing day by day. Fatal road accidents can be easily avoided by understanding the psychological state of a driver. Majority of road accidents occur during night driving due to the drowsiness state of a vehicle driver. The paper provides mechanism to reduce accidents to a large extend by monitoring eye blinking of the driver which indicates the drowsiness, obstacles located in the road and the drunken state of the drivers. Automatic pre-cautionary system is activated based on the above alarming condition. Accident and its probable location are also generated at the nearby police station that helps initiating medical help. In normal cases no medical help is received due to the non-availability of accident information. This happens mainly at night and in roads where the traffic is low.

2. **Design and implementation of an eye blinking detector system for automobile accident prevention**

   Author: Tariq Jamil ; Iftaquaruddin Mohammed ; Medhat H. Awadalla

   Publication: SoutheastCon 2016

   Abstract: Ever increasing number of fatal traffic accidents around the world can be significantly reduced if modern technology is incorporated within the automobile to assess the physical condition of the driver at regular intervals during the movement of the vehicle and preventive measures are automatically taken for the safety of all concerned entities, both within the vehicle and outside the vehicle. In this paper, design of an eye blinking detector system is presented which can monitor the physical state of the driver at regular intervals during his/her driving and, if needed, can raise an audible alarm within the vehicle to alert the driver or initiate application of vehicle's braking system. In case of multiple failures to raise the alertness level of the driver, the designed system can automatically inform the law enforcement authorities about the rogue driver on the road. The prototype of the design has been successfully implemented which leads to the conclusion that such a system can help in keeping the driver awake at all times while driving and hence facilitate in avoidance of any traffic accidents involving driver's alertness.

3. **Principal Component Analysis of Fatal Traffic Accidents Based on Vehicle Condition Factors**

   Author: Tang Youming ; Zhong Deliang ; Zha Xinyu ; Lv Na

   Publication: 2018 11th International Conference on Intelligent Computation Technology and Automation (ICICTA)

   Abstract: In order to find out several pivotal influencing factors of fatal traffic accidents, the number of fatal injuries recorded in the FARS database of the National Highway Traffic Safety Administration of the United States from 2010 to 2016 was calculated. The principal component analysis (PCA) method of multivariate statistical analysis is used to analyze the traffic conditions, and several pivotal influencing factors of fatal traffic accidents are obtained. The results show that tire wear, rim damage, exhaust system failure and coupling failure are the most important factors.

4. **An Automatic Car Accident Detection Method Based on Cooperative Vehicle Infrastructure Systems**

   Author: Daxin Tian ; Chuang Zhang ; Xuting Duan ; Xixian Wang

   Publication: IEEE Access (Volume: 7)

   Abstract: Car accidents cause a large number of deaths and disabilities every day, a certain proportion of which result from untimely treatment and secondary accidents. To some extent, automatic car accident detection can shorten response time of rescue agencies and vehicles around accidents to improve rescue efficiency and traffic safety level. In this paper, we proposed an automatic car accident detection method based on Cooperative Vehicle Infrastructure Systems (CVIS) and machine vision. First of all, a novel image dataset CAD-CVIS is established to improve accuracy of accident detection based on intelligent roadside devices in CVIS. Especially, CAD-CVIS is consisted of various kinds of accident types, weather conditions and accident location, which can improve self-adaptability of accident detection methods among different traffic situations. Secondly, we develop a deep neural network model YOLO-CA based on CAD-CVIS and deep learning algorithms to detect accident. In the model, we utilize Multi-Scale Feature Fusion (MSFF) and loss function with dynamic weights to enhance performance of detecting small objects. Finally, our experiment study evaluates performance of YOLO-CA for detecting car accidents, and the results show that our proposed method can detect car accident in 0.0461 seconds (21.6FPS) with 90.02% average precision (AP). In additionally, we compare YOLO-CA with other object detection models, and the results demonstrate the comprehensive performance improvement on the accuracy and real-time over other models.

5. **A Study on Road Accidents in Abu Dhabi Implementing a Vehicle Telematics System to Reduce Cost, Risk and Improve Safety**

   Author: Omar Kassem Khalil

   Publication: 2017 10th International Conference on Developments in eSystems Engineering (DeSE)

   Abstract: Road accident study in the Emirate of Abu Dhabi is imperative as it will allow the government to improve its transport system and realize the vision of Abu Dhabi Department of Transport to contribute to quality of life, economic growth and environmental sustainability of the Emirate of Abu Dhabi. Despite sustainable and continuous reduction annually, road accidents still remain a serious phenomenon in the Emirate of Abu Dhabi. Road accidents killed 5,564 people in the UAE over the past 6 years, an average of more than two each day, with Abu Dhabi being the main victim [8]. A further examination of the severity index, Police records have shown that the deaths during the years 2006-2011 were a result of nearly 56,700 accidents, which also injured 63,406 people [8]. Research has shown that over 80% of road accidents are related to human factors [6]. Bad driving habits are dangerous and can lead to loss of life. This study will propose possible method of adopting Telematics System for Abu Dhabi Department of Transport to enhance its road safety programs. Telematics System can help reduce fatalities and injuries, thus improving road safety and efficiency of driving performance. These services range from monitoring drivers' driving habits and reporting on driving errors, to offering analysis of any unfortunate incidents that may have occurred.

6. **Examining the driverless future: An analysis of human-caused vehicle accidents and development of an autonomous vehicle communication testbed**

   Author: John Rowley ; Ann Liu ; Steven Sandry ; Joshua Gross ; Melvin Salvador ; Chris Anton ; Cody Fleming

   Publication: 2018 Systems and Information Engineering Design Symposium (SIEDS)

   Abstract: This design study examines the trade-offs that occur in autonomous vehicle hardware and software design. Through this research process, the creation of a research testbed allows for more in-depth and holistic understanding of the design and construction process of scaled autonomous vehicles. The two current industry approaches to autonomous driving are the "Google Car Paradigm," where vehicles rely on sensing of the physical world to act accordingly, and the "V2X Paradigm," which additionally enables inter-vehicle communication. The latter approach has the potential to provide increased safety, mobility, and environmental sustainability, however, these claims have limited verification to date. Construction of a scaled autonomous vehicle testbed provides the necessary foundation for future teams to analyze the trade-offs between the two communication protocol in a variety of experimental designs to test environmental impact and traffic flow, among other research questions. Analysis of historical Virginia crash data was conducted to determine the conditions under which automation will reduce crash severity. Historical data from the years of 2011 to 2017 were utilized and segmented into categories inclusive of geographical region and details surrounding the accident such as the number of casualties, collision type, distractions, etc. Results yielded that crashes caused by human-error were found to be higher in severity, as well as a higher number of casualties, when alcohol was involved and when drivers self-reported drowsiness during the accident, both of which are crashes caused by human factors. These are situations in which autonomous vehicles would be able to minimize the likelihood of a crash, reduce the overall crash severity, and decrease human casualties. The design of the scaled vehicle testbed was designed with the capability to properly test metrics in areas of environmental impact, traffic flow, crash safety, and cyber-security to properly evaluate and compare the effectiveness of the two communication paradigms, as well as other metrics future experimenters develop. The vehicle design has the ability to answer important communication questions without the need for expensive equipment and substantial human risk. Additionally, this framework can be easily duplicated by other organizations and educational institutions to increase the collective knowledge of communication protocol and increase intercollegiate research.

CHAPTER 3

THEORETICAL BACKGROUND

Internet of Things-enabled Intelligent Transportation Systems (ITS) are gaining significant attention in academic literature and industry, and are seen as a solution to enhancing road safety in smart cities. Due to the ever increasing number of vehicles, a significant rise in the number of road accidents has been observed. Vehicles embedded with a plethora of sensors enable us to not only monitor the current situation of the vehicle and its surroundings but also facilitates the detection of incidents. Significant research, for example, has been conducted on accident rescue, particularly on the use of Information and Communication Technologies (ICT) for efficient and prompt rescue operations. The majority of such works provide sophisticated solutions that focus on reducing response times. However, such solutions can be expensive and are not available in all types of vehicles. Given this, we present a novel Internet of Things-based accident detection and reporting system for a smart city environment. The proposed approach aims to take advantage of advanced specifications of smartphones to design and develop a low-cost solution for enhanced transportation systems that is deployable in legacy vehicles. In this context, a customized Android application is developed to gather information regarding speed, gravitational force, pressure, sound, and location.

The speed is a factor that is used to help improve the identification of accidents. It arises because of clear differences in environmental conditions (e.g., noise, deceleration rate) that arise in low speed collisions, versus higher speed collisions). The information acquired is further processed to detect road incidents. Furthermore, a navigation system is also developed to report the incident to the nearest hospital. The proposed approach is validated through simulations and comparison with a real data set of road accidents acquired from Road Safety Open Repository, and shows promising results in terms of accuracy.

In present days the rate of accidents can be increased rapidly. Due to employment the usage of vehicles like cars, bikes can be increased, because of this reason the accidents can be happened due to over speed. People are going under risk because of their over speed, due to unavailability of advanced techniques, the rate of accidents can't be decreased. To reduce the accident rate in the country this paper introduces a optimum solution. Automatic alert system for vehicle accidents is introduced; the main objective is to control the accidents by sending a message to the registered mobile using wireless communications techniques. When an accident occurs at a city, the message is sent to the registered mobile through GSM module in less time. Arduino is the heart of the system which helps in transferring the message to different devices in the system. Vibration sensor will be activated when the accident occurs and the information is transferred to the registered number through GSM module. GPS system will help in finding the location of the accident spot. The proposed system will check whether an accident has occurred and notifies to nearest medical centers and registered mobile numbers about the place of accident using GSM and GPS modules. The location can be sent through tracking system to cover the geographical coordinates over the area. The accident can be detected by a vibration sensor which is used as major module in the system.

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CHAPTER 4

SYSTEM REQUIREMENT SPECIFICATION

4.1 INTRODUCTION

A System Requirement Specification (SRS) is basically an organization’s understanding of a customer or potential client’s system requirements and dependencies at a particular point prior to any actual design or development work. The information gathered during the analysis is translated into a document that defines a set of requirements. It gives the brief description of the services that the system should provide and also the constraints under which, the system should operate. Generally, SRS is a document that completely describes what the proposed software should do without describing how the software will do it. It’s a two-way insurance policy that assures that both the client and the organization understand the other’s requirements from that perspective at a given point in time.

SRS document itself states in precise and explicit language those functions and capabilities a software system (i.e., a software application, an ecommerce website and so on) must provide, as well as states any required constraints by which the system must abide. SRS also functions as a blueprint for completing a project with as little cost growth as possible. SRS is often referred to as the “parent” document because all subsequent project management documents, such as design specifications, statements of work, software architecture specifications, testing and validation plans, and documentation plans, are related to it.

Requirement is a condition or capability to which the system must conform. Requirement Management is a systematic approach towards eliciting, organizing and documenting the requirements of the system clearly along with the applicable attributes. The elusive difficulties of requirements are not always obvious and can come from any number of sources.

4.2 REQUIREMENTS

4.2.1 Functional Requirements:

System should automatically accident and intimate

System should automatically detect accident using vibration Sensor

System should automatically Read location of accident

System should automatically Read Patient Condition

System should automatically Check for crtical conditions

System should automatically Intimate to concerned persons

4.2.2 Non Functional Requirements:

Usability : Easy Implementation for user

Reliability :

- System should be reliable
- Should work in all weather conditions

Performance:

- Should not take excessive time in detecting the accident

Supportability:

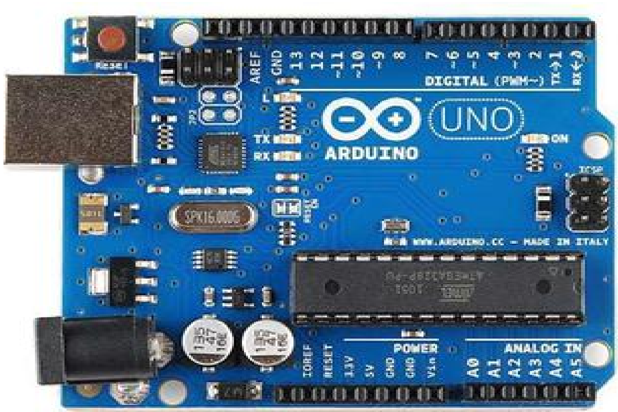
- Contain easy to understand code with provisions for future enhancement

4.3 HARDWARE REQUIREMENTS

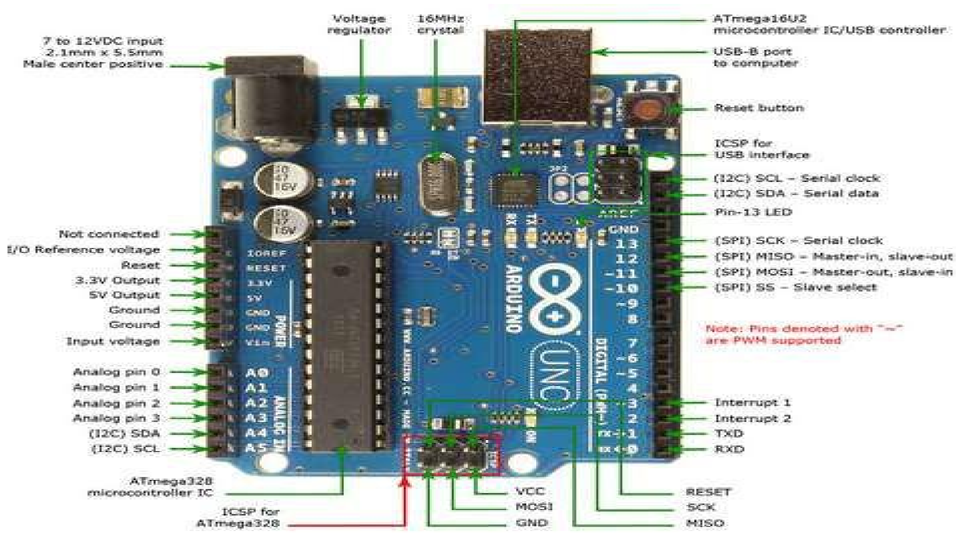
- Arduino
- Node MCU
- Vibration sensor
- LCD display
- Temperature sensor
- Heartbeat sensor
- Ultrasonic sensor
- Gas sensor
- Emergency switch

4.3.1 ARDUINO

Arduino is an open-source hardware and software company, project and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control both physically and digitally. Its products are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form or as do-it-yourself (DIY) kits.



Each of the 14 digital pins on the Uno can be used as an input or output, using pin mode (), digital write (), and digital read () functions. They operate at 5 volts. Each pin can provide or receive 20 mA as recommended operating condition and has an internal pull- up resistor (disconnected by default) of 20-50k ohm. A maximum of 40mA is the value that must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller.



Arduino/Genuino Uno has a number of facilities for communicating with a computer, another Arduino/Genuino board, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The 16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, an.inf file is required. The Arduino Software (IDE) includes a serial monitor which allows simple textual data to be sent to and from the board.

4.3.2 HEARTBEAT SENSOR

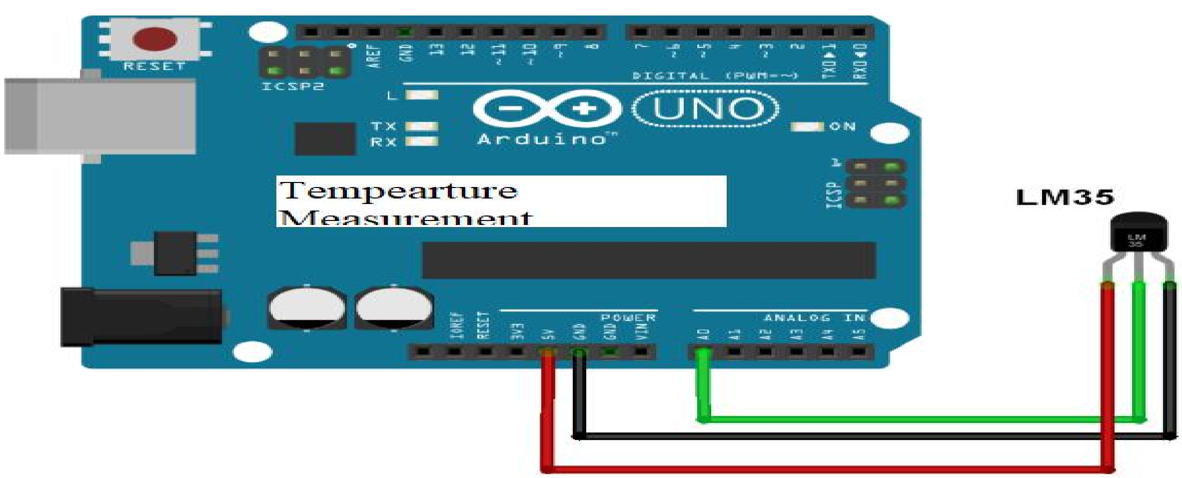
The new version uses the TCRT1000 reflective optical sensor for photoplethysmography. The use of TCRT100 simplifies the build process of the sensor part of the project as both the infrared light emitter diode and the detector are arranged side by side in a leaded package, thus blocking the surrounding ambient light, which could otherwise affect the sensor performance. I have also designed a printed circuit board for it, which carries both sensor and signal conditioning unit. and its output is a digital pulse which is synchronous with the heart beat.

This project is based on the principle of photoplethysmography (PPG) which is a non-invasive method of measuring the variation in blood volume in tissues using a light source and a detector. Since the change in blood volume is synchronous to the heart beat, this technique can be used to calculate the heart rate. Transmittance and reflectance are two basic types of photoplethysmography. For the transmittance PPG, a light source is emitted in to the tissue and a light detector is placed in the opposite side of the tissue to measure the resultant light.

4.3.3 TEMPERATURE SENSOR

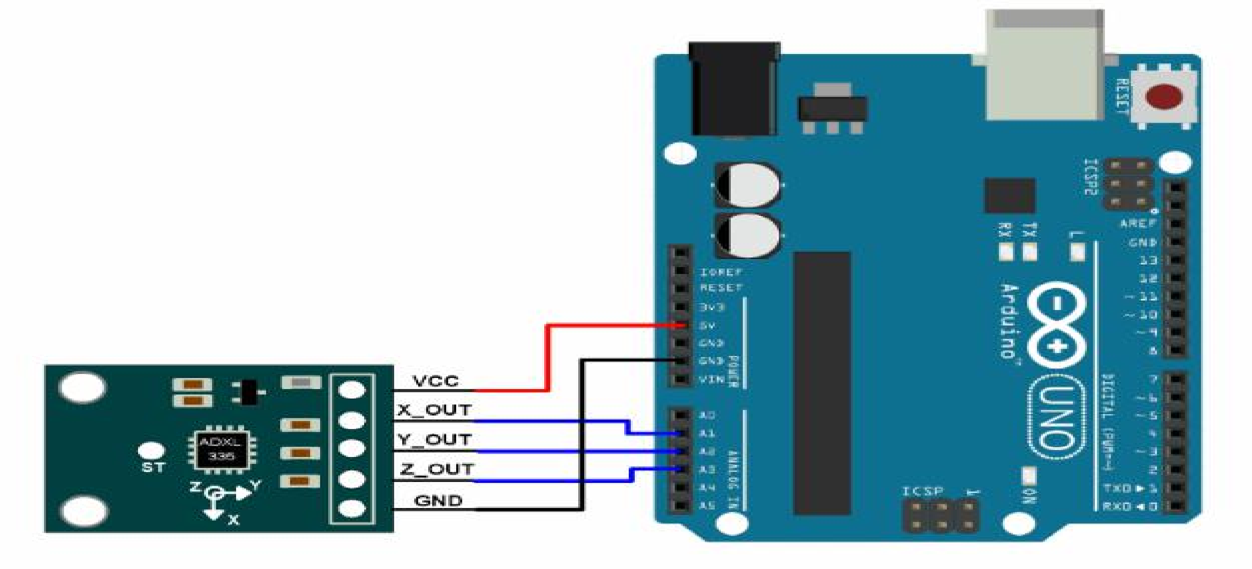
Temperature sensors are vital to a variety of everyday products. For example, household ovens, refrigerators, and thermostats all rely on temperature maintenance and control in order to function properly. Temperature control also has applications in chemical engineering. Examples of this include maintaining the temperature of a chemical reactor at the ideal set-point, monitoring the temperature of a possible runaway reaction to ensure the safety of employees, and maintaining the temperature of streams released to the environment to minimize harmful environmental impact.

The LM35 is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature (in ºC). The LM35 temperature sensor measure temperature more accurately than using a thermistor. The sensor circuitry is sealed and not subject to oxidation, etc. The LM35 generates higher output voltage than thermocouples and may not require that the output voltage be amplified. It has an output voltage that is proportional to the Celsius temperature. The scale factor of LM35 is 0.1 V/ ºC. The LM35 draws only 60 micro amps from its supply and possesses a low self heating capability. The sensor self heating causes less than 0.1 ºC temperature rise in still air.



4.3.4 ADXL335 ACCELEROMETER

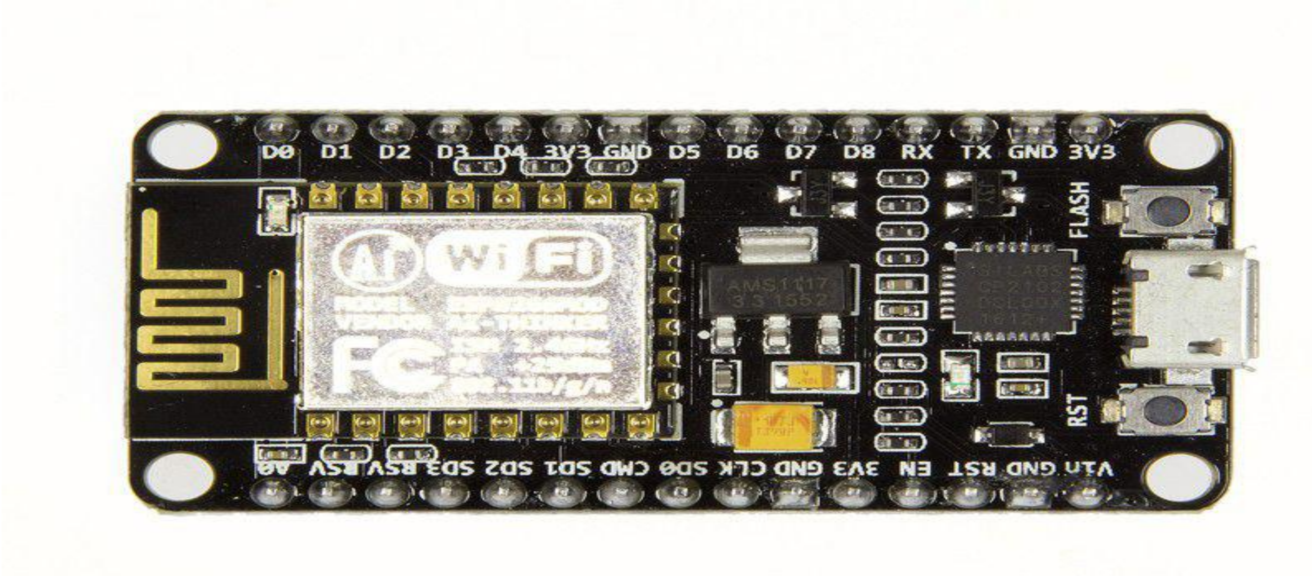
The **ADXL335** is a small, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration.



Interfacing ADXL335 Accelerometer Module With Arduino UNO

ADXL335 Accelerometer module consists of six pins i.e. VCC, GND, X, Y, Z, and ST. Using the Accelerometer module with a microcontroller is very easy. Connect VCC and GND pins to 5V and GND pins of Microcontroller. Also connect X, Y, and Z pins to the Analog pins of Arduino. The basic structure of the accelerometer consists of fixed plates and moving plates. When the acceleration is applied on an axis capacitance between fixed plates and moving plates is changed. This results in a sensor output voltage amplitude which is proportional to the acceleration.

4.3.5 NODE MCU



The NodeMcu is an open-source firmware and development kit that helps you to Prototype your IOT product within a few Lua script lines.

Features:

- Open-source
- Interactive
- Programmable
- Low cost
- Simple
- Smart
- WI-FI enabled

The Development Kit based on ESP8266, integates GPIO, PWM, IIC, 1-Wire and ADC all in one board.

Power your developement in the fastest way combinating with NodeMCU Firmware!

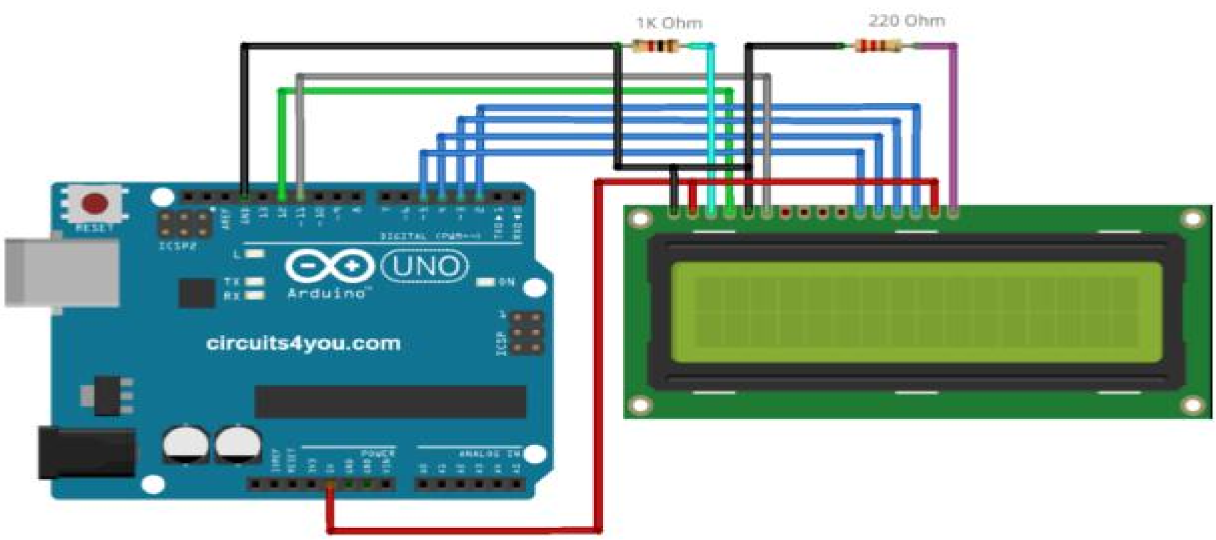
- USB-TTL included, plug&play
- 10 GPIO, every GPIO can be PWM, I2C, 1-wire
- FCC CERTIFIED WI-FI module（Coming soon）
- PCB antenna

4.3.6 LCD DISPLAY

A **liquid-crystal display** (**LCD**) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and 7-segment displays, as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

Interfacing an LCD with an Arduino

The 16x2 LCD has a total of 16 pins. As shown in the table below, eight of the pins are data lines (pins 7-14), two are for power and ground (pins 1 and 16), three are used to control the operation of LCD (pins 4-6), and one is used to adjust the LCD screen brightness (pin 3). The remaining two pins (15 and 16) power the backlight.

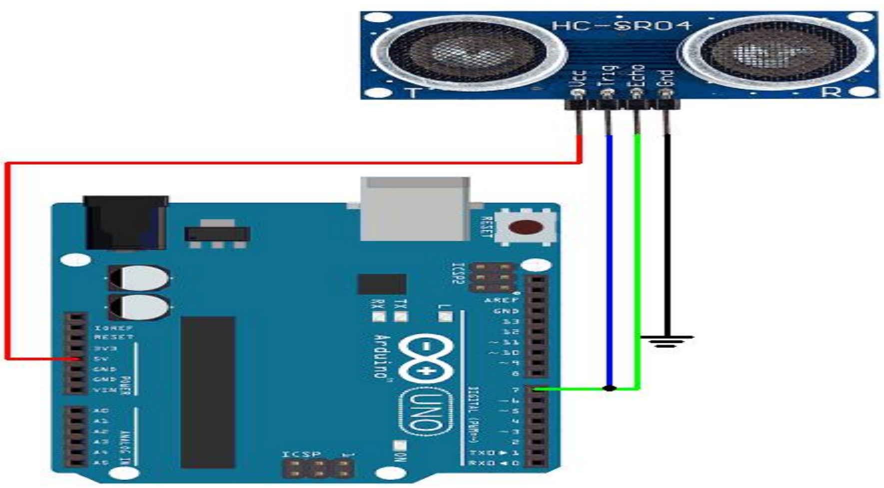


4.3.7 ULTRASONIC SENSOR

The HC-SR04 ultrasonic sensor uses SONAR to determine the distance of an object just like the bats do. It offers excellent non-contact range detection with high accuracy and stable readings in an easy-to-use package from 2 cm to 400 cm or 1” to 13 feet.

The HC-SR04 Ultrasonic Distance Sensor is a sensor used for detecting the distance to an object using sonar.

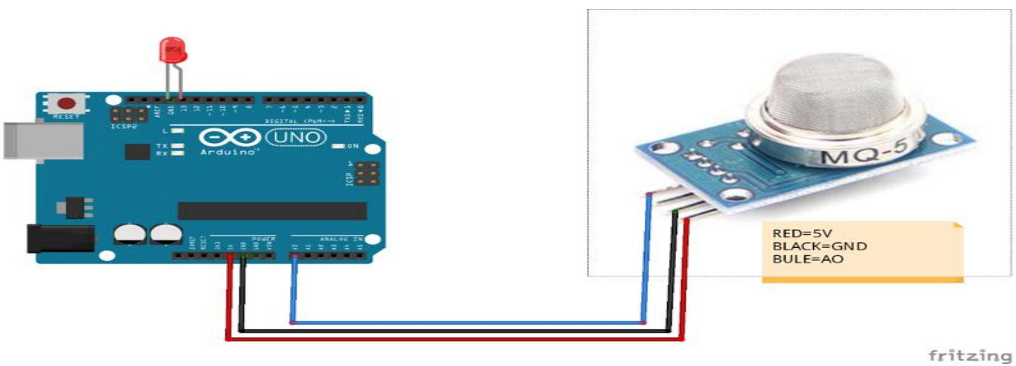
The transmitters emit a high frequency ultrasonic sound, which bounce off any nearby solid objects, and the receiver listens for any return echo.



4.3.8 GAS SENSOR

The MQ5 Gas Sensor module is useful for gas leakage detecting.
It can detect LPG, i-butane, methane, alcohol, Hydrogen, smoke and so on.
The sensitivity can be adjusted using the on-board potentiometer, and you'd use this sensor by reading the analog pin to which it is connected.

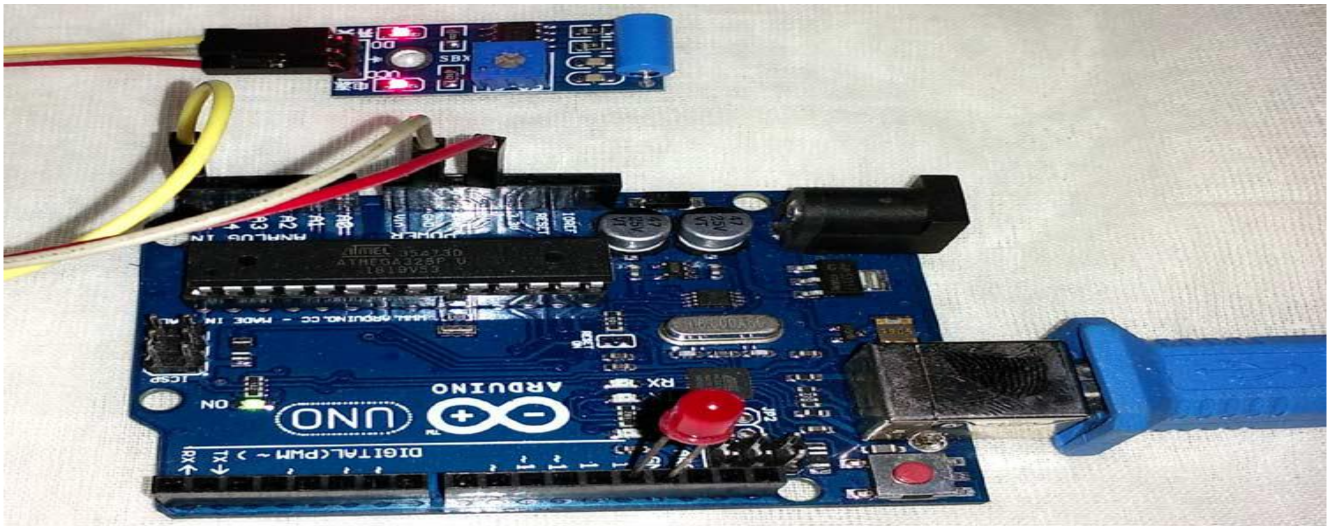
The MQ series of gas sensors use a small heater inside with an electro-chemical sensor. They are sensitive for a range of gasses and are used indoors at room temperature. The output is an analog signal and can be read with an analog input of the Arduino.



4.3.9 VIBRATION SENSOR

The **SW-420 vibration module**, which can work from 3.3V to the 5V. The sensor uses LM393 comparator to detect the vibration over a threshold point and provide digital data, Logic Low or Logic High, 0 or 1. **During normal operation, the sensor provides Logic Low and when the vibration is detected, the sensor provides Logic High.** There are three peripherals available in the module, two LEDs, one for the Power state and other for the sensor's output. Additionally, a potentiometer is available which can be further used to control the threshold point of the vibration.

The circuit doesn't require additional breadboard. It can be simply tested using the Arduino UNO Board. The led is monitored when the vibration sensor is hit or if it changes its state. The led will blink connected to Pin 13 of Arduino UNO when there is some vibrations. If the vibration sensor doesn't work then please check the connection and power. Avoid any loose connection between sensor and microcontroller.



4.4 SOFTWARE REQUIREMENTS

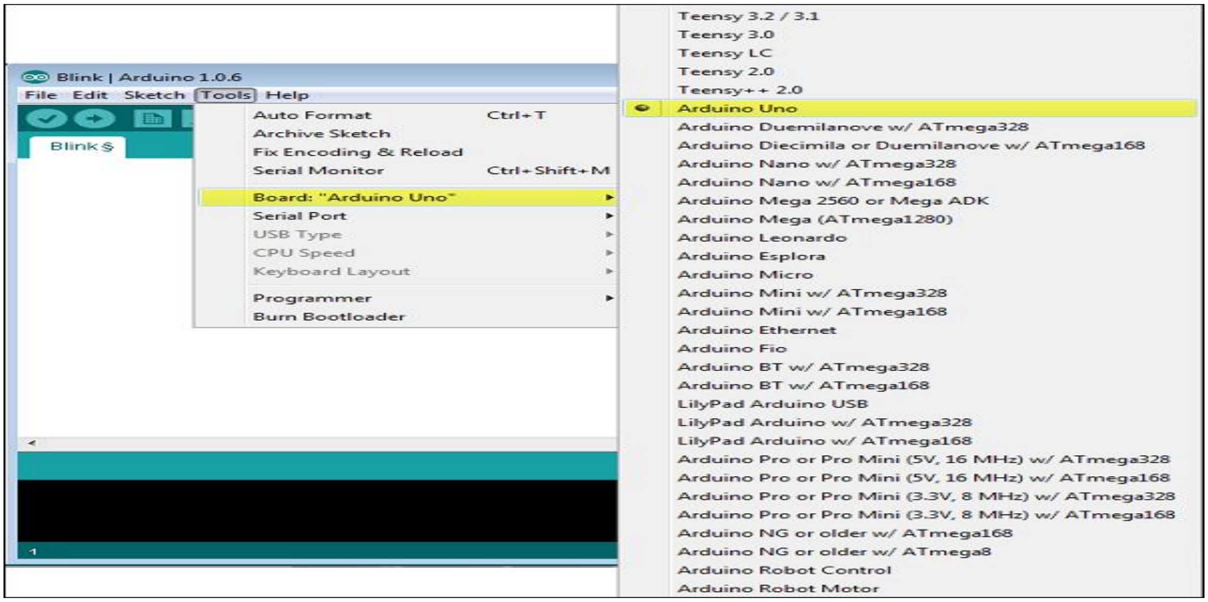
4.4.1 ARDUINO IDE

Arduino is a prototype platform (open-source) based on an easy-to-use hardware and software. It consists of a circuit board, which can be programed (referred to as a microcontroller) and a readymade software called Arduino IDE (Integrated Development Environment), which is used to write and upload the computer code to the physical board.

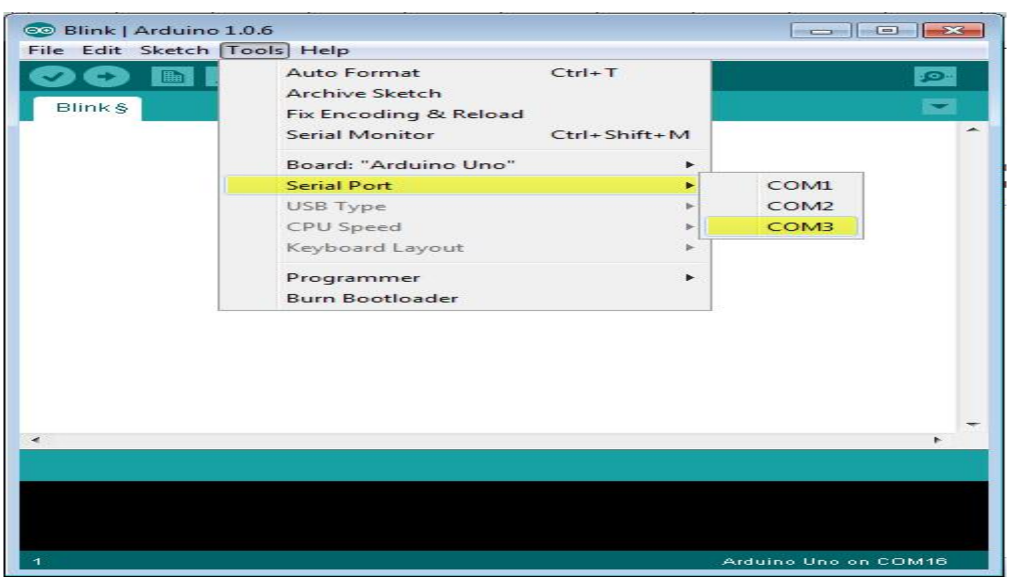
The Arduino project provides the Arduino integrated development environment (IDE), which is a cross-platform application written in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple one-click mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus.

To avoid any error while uploading your program to the board, you must select the correct Arduino board name, which matches with the board connected to your computer.

Go to Tools → Board and select your board.



Select the serial device of the Arduino board. Go to **Tools → Serial Port** menu. This is likely to be COM3 or higher (COM1 and COM2 are usually reserved for hardware serial ports). To find out, you can disconnect your Arduino board and re-open the menu, the entry that disappears should be of the Arduino board. Reconnect the board and select that serial port.



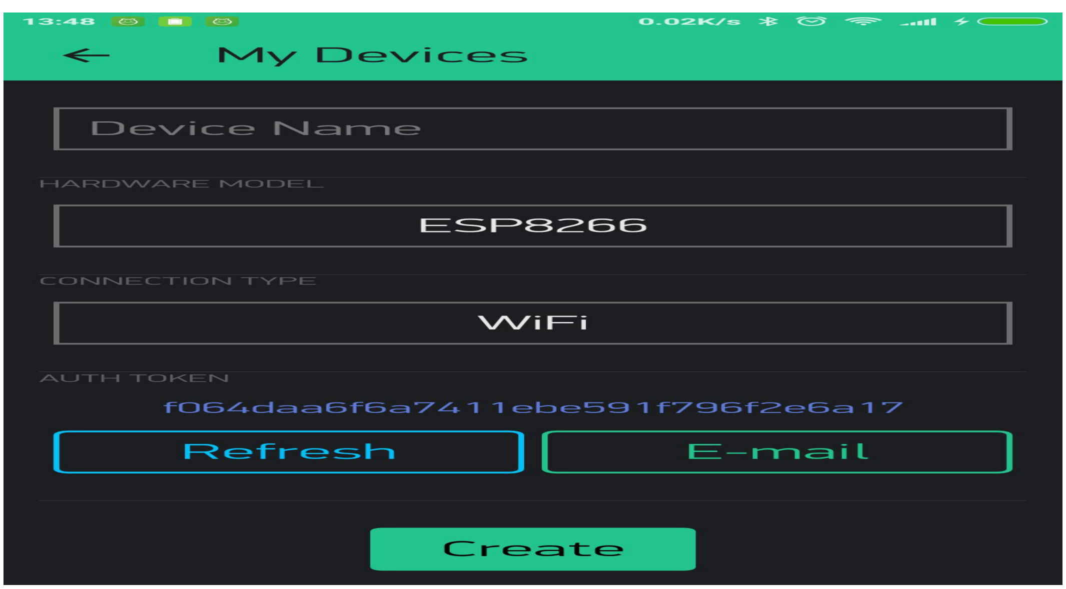
4.4.2 BLYNK

Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, vizualize it and do many other cool things.

There are three major components in the platform:

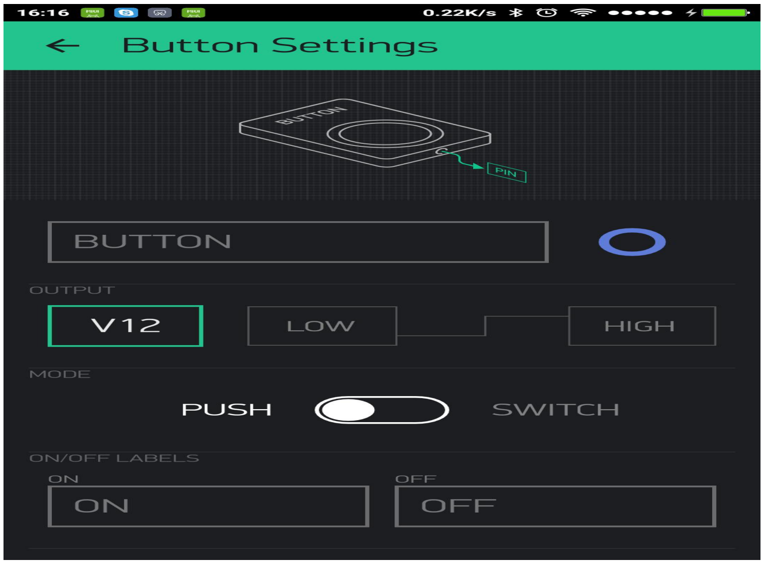
- **Blynk App** - allows to you create amazing interfaces for your projects using various widgets we provide.
- **Blynk Server** - responsible for all the communications between the smartphone and hardware. You can use our Blynk Cloud or run your private Blynk server locally. It's open-source, could easily handle thousands of devices and can even be launched on a Raspberry Pi.
- **Blynk Libraries** - for all the popular hardware platforms - enable communication with the server and process all the incoming and outcoming commands.

Auth Token is a unique identifier which is needed to connect your hardware to your smartphone. Every new project you create will have its own Auth Token. You'll get Auth Token automatically on your email after project creation. You can also copy it manually. Click on devices section and selected required device :

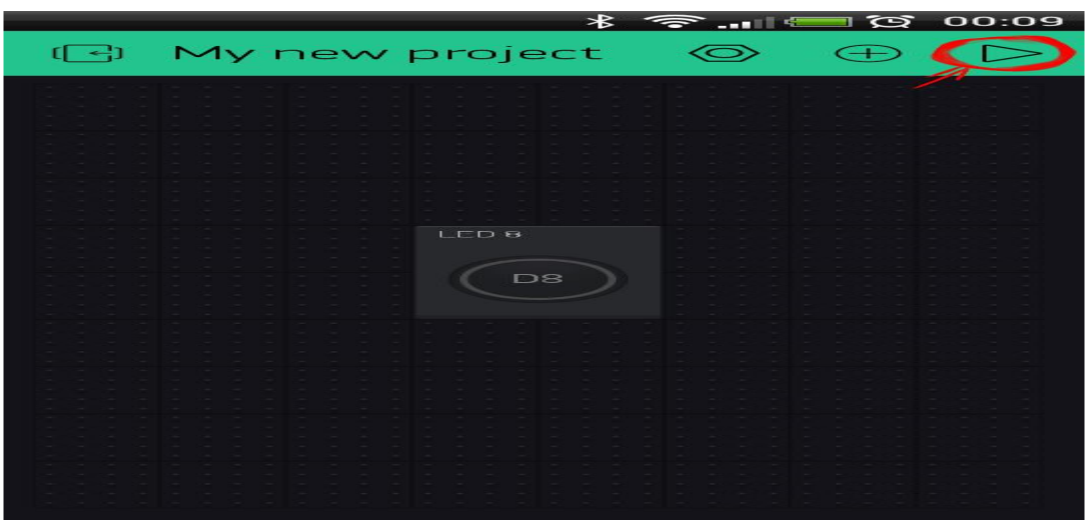


Your project canvas is empty, let's add a button to control our LED.

Tap anywhere on the canvas to open the widget box. All the available widgets are located here. Now pick a button.



When you are done with the Settings - press the **PLAY** button. This will switch you from EDIT mode to PLAY mode where you can interact with the hardware. While in PLAY mode, you won't be able to drag or set up new widgets, press **STOP** and get back to EDIT mode.

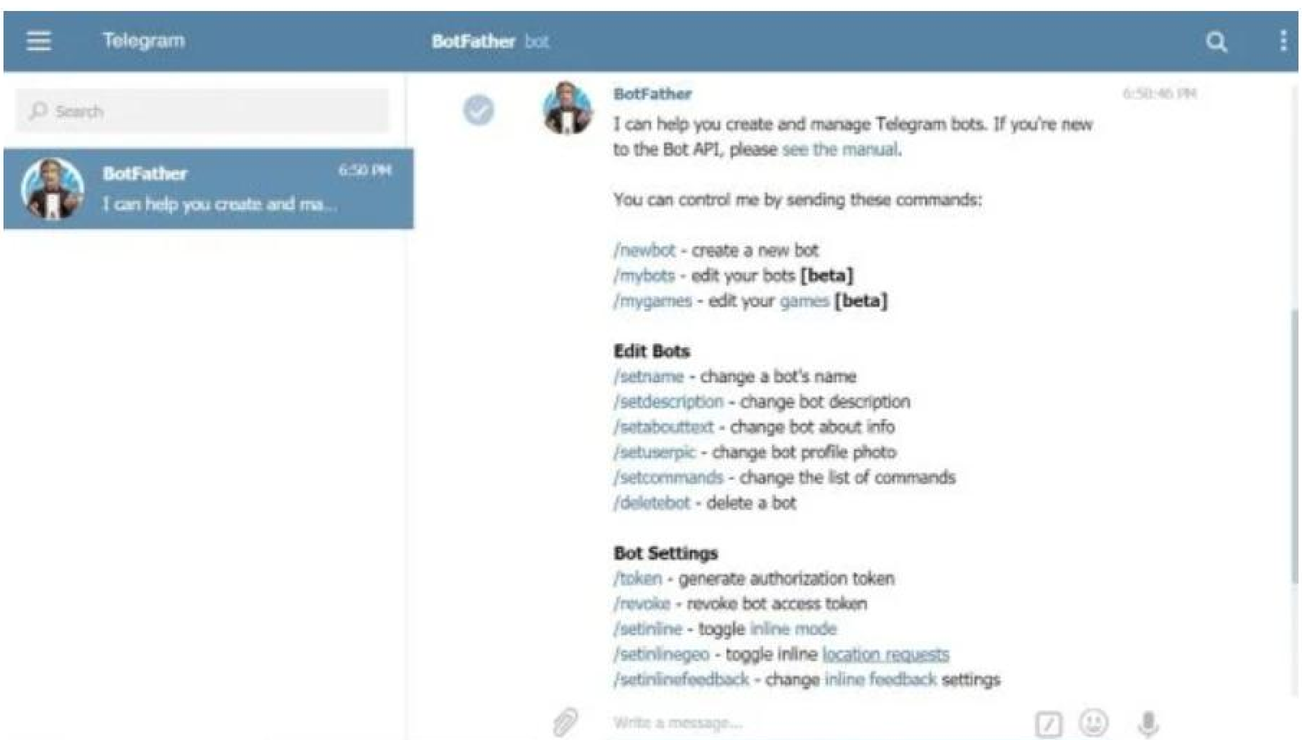


4.4.3 TELEGRAM

Bots are third-party applications that run inside Telegram. Users can interact with bots by sending messages, commands and inline requests. We can control our bots through HTTP APIs provided by Telegram.A Telegram bot is an application hosted on a server (here it is ESP8266) that uses Telegram bot API to connect to Telegram Messenger clients. A great advantage of Telegram bots is that they have zero install requirements and run seamlessly on all computer or mobile platforms where Telegram Messenger runs.

CONFIGURE TELEGRAM BOT

Install Telegram on your Laptop or Phone and search for BotFather. Through BotFather we can create a new bot. After creating a new bot, we have to note down the token which is the interaction key between device and Telegram bot API .



CHAPTER 5

SYSTEM ANALYSIS

Analysis is the process of finding the best solution to the problem. System analysis is the process by which we learn about the existing problems, define objects and requirements and evaluates the solutions. It is the way of thinking about the organization and the problem it involves, a set of technologies that helps in solving these problems. Feasibility study plays an important role in system analysis which gives the target for design and development.

Feasibility Study

The prime focus of the feasibility is evaluating the practicality of the proposed system keeping in mind a number of factors. The following factors are taken into account before deciding in favour of the new system.

- ECONOMICAL FEASIBILITY
- TECHNICAL FEASIBILITY
- SOCIAL FEASIBILITY

Economical Feasibility

VADSR will be economically viable to all the users as it will be an affordable application and reduces the need for manual aid.

Technical Feasibility

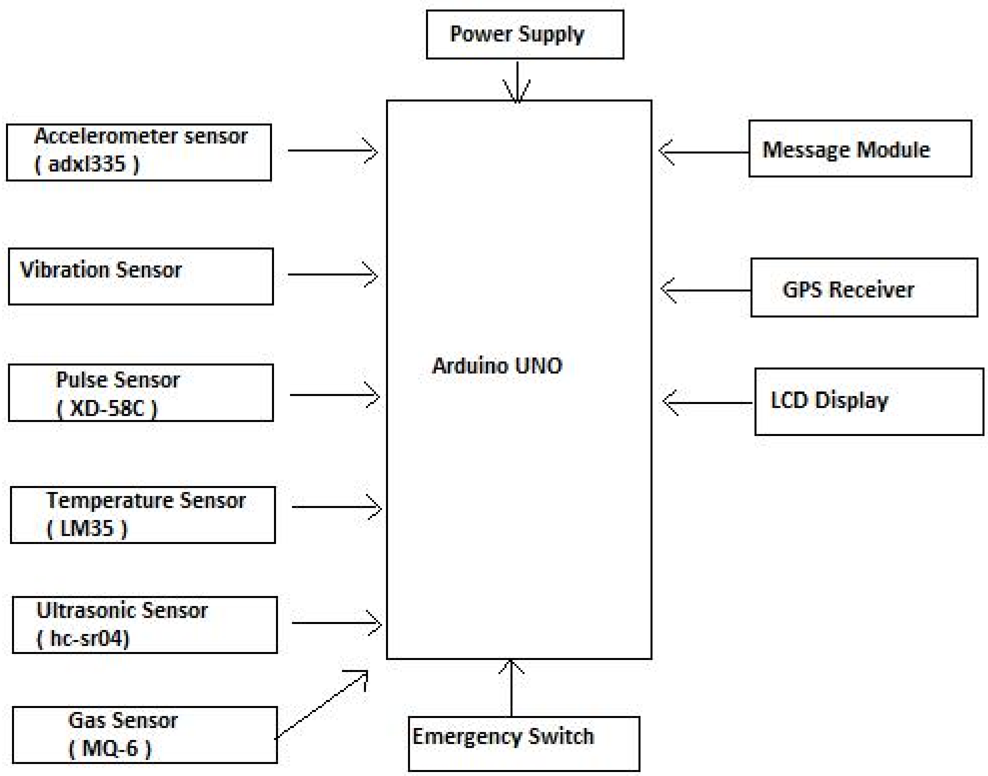
Keeping in view the above fact, nowadays all organizations are automating the repetitive and monotonous works done by humans. The key process areas of the current system are nicely amenable to automation and hence the technical feasibility is proved beyond doubt.

Social Feasibility

The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity. The level of acceptance by the users solely depends on the methods that are employed to educate the user about the system and to make him familiar with it. His level of confidence must be raised so that he is also able to make some constructive criticism, which is welcomed, as he is the final user of the system.

CHAPTER 6

SYSTEM DESIGN



6.1 Accidents

Automobiles are important to go to workplaces, meet family and friends and to deliver goods. But often they pave the way to big disasters. According to Wikipedia, accidents are is an unforeseen and unplanned event or circumstance, often with lack of intention or necessity. Road accident is most unwanted thing to happen to a road user, though they happen quite often. The most unfortunate thing is that we don't learn from our mistakes on road. Most of the road users are quite well aware of the general rules and safety measures while using roads but it is only the laxity on part of road users, which cause accidents and crashes.

Main cause of accidents and crashes are due to human errors. Following are the major reasons for accidents:

1. Over Speeding
2. Drunken Driving
3. Distractions to Driver
4. Red Light Jumping
5. Avoiding Safety Gears like Seat belts and Helmets
6. Non-adherence to lane driving and overtaking in a wrong manner.

6.1.1 Accident detection system

It detects the accident rather than predicting it. They are of three types.

- Manual detection system
- Driver initiated detection system
- Automatic detection system

Manual Detection System

In this method, accident is detected from:

- motorist report
- Transportation department
- Public crews report
- Aerial surveillance
- Close circuit camera surveillance.

The drawback of this type of detection system is that someone has to witness the incident. Driver initiated detection system. Moreover, there are delays and inaccuracies due to the expression problem of the witness.

Driver Initiated Detection System

Driver initiated incident detection system has more advantages which includes the quick reaction, more incident information etc. However, with the severity of the accident, driver may not be able to report at all.

Automatic Detection System

There are different types of automatic detection system.
Conventional built-in automatic accident detection system utilizes impact senor or the car airbag senor to detect an accident and gps to locate the accident place. However, the system did not utilize the gps to detect the accident.

6.2 Accident detection and reporting procedure Speed Measurement

Many techniques can be used to measure vehicle speed. The most common is the car speedometer. But analog to digital converter is required to acquire speed from the Speedometer. Laser speed guns are limited to single point and instantaneous measurements. But a GPS receiver provides speed information in every second. Therefore, it is more convenient to monitor the speed with a GPS receiver. GPS receiver communication is defined by National Marine Electronics Association (NMEA) specification [10]. The idea of NMEA is to send a line of data called a sentence that is totally self-contained and independent from other sentences. Out of these sentences, GPRMC is the most common sentence transmitted by the most GPS devices. This sentence contains nearly everything a GPS application needs.

6.3 Detection Procedure

The GPS receiver acquires the GPRMC sentence in every second. From the GPRMC sentence, the speed information will be extracted by counting the number of comma (,) by the MCU. Two memory spaces will be allocated for the speed, one memory space for the time and another for the latitude and longitude. The latest time and latitude/longitude will be always saved in the memory overwriting the previous values. The last two speed information will be always kept in memory. The latest speed information will be stored in the first memory space and will move to the second memory speed once new speed information is acquired. The MCU will compare the latest speed with the previous speed by utilizing the Equation (2). If the speed is less than the maximum speed found from Equation (2), the MCU will raise a flag to indicate that the accident took place

6.4 Reporting Procedure by MCU

When a flag is raised for accident, the MCU will initiate an emergency situation automatically. The MCU will wait for 5 seconds for the driver to press a button to cancel the accident reporting procedure. This will enable to reduce the false alarm to the Alert Service Centre. Once the 5 seconds waiting time is over, the accident information containing the location, time and the speed along with the contact number of relative of the occupant will be sent as a GPRS data to the Alert Service Centre through the GPRS modem by the MCU. However, GPRS coverage is not always available in every place. As such, simultaneously an SMS will also be initiated containing the same information. After the SMS is sent, the MCU will also initiate a voice call to the Alert Service Centre. This will enable the vehicle occupant to describe the emergency situation if they are in a condition to describe. Besides automatic accident detection system, b pressing the Manual Detection Switch, the vehicle occupant will also be able to initiate an emergency situation and it will report like the automatic accident detection system.

6.5 Accident Data Interpretation

The information sent as a GPRS data and SMS will be received by a GSM/GPRS modem connected to a computer. A middleware will be written to interpret the SMS and GPRS data. An appropriate program will be written so that Google Maps can be incorporated and the accident location is automatically plotted in the map utilizing the information from the interpreted SMS/GPRS data. It will also show the previous speed of the vehicle before committing the accident. This data will help the Alert Service Center to assess the severity of the accident basing on the speed. The modem will also establish a voice channel with the Alert Service Center. The flow chart is shown in the above Figure.

CHAPTER 7

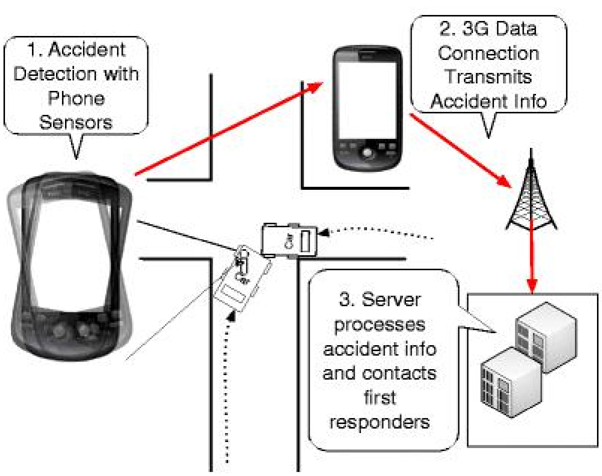
IMPLEMENTATION

7.1 Detection Procedure:

The Accident is detected by the Vibration Sensor and the Acclerometer, and GPS provides the location and time information of the Accident

7.2 Reporting Procedure:

When a flag is raised for accident, the MCU will initiate an emergency situation automatically. The MCU will wait for 5 seconds for the driver to press a button to cancel the accident reporting procedure. This will enable to reduce the false alarm to the Alert Service Centre. Once the 5 seconds waiting time is over, the accident information containing the location, time and the speed along with the contact number of relative of the occupant will be sent as a GPRS data to the Alert Service Centre through the GPRS modem by the MCU. However, GPRS coverage is not always available in every place. As such, simultaneously an Message will also be initiated containing the same information.



7.3 CODE IMPLEMENTATION

```
#define USE_ARDUINO_INTERRUPTS true // Set-up low-level interrupts for most acurate BPM math.
#include <PulseSensorPlayground.h> // Includes the PulseSensorPlayground Library.
#include<LiquidCrystal.h>
const int rs = 12, en = 13, d4 = 5, d5 = 4, d6 = 3, d7 = 2;
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);
//LiquidCrystal lcd(7, 6, 5, 4, 3, 2);

// Variables
const int PulseWire = A3; // PulseSensor PURPLE WIRE connected to ANALOG PIN 0
const int LED13 = 13; // The on-board Arduino LED, close to PIN 13.
int Threshold = 550; // Determine which Signal to "count as a beat" and which to ignore.
const int xpin=A1;
const int ypin=A2;
int SW=10;
int vib_pin=9;
const int sensor = A0;
float tempc;
float vout;
int SMOKEA4=A4;
const int triPin=6;
const int echoPin=7;
long duration, cms;
PulseSensorPlayground pulseSensor; // Creates an instance of the PulseSensorPlayground object called "pulseSensor"
```

```
void setup() {

Serial.begin(115200); // For Serial Monitor
lcd.begin(16,2);
pinMode(vib_pin,INPUT);
pinMode(triPin,OUTPUT);
pinMode(echoPin,INPUT);
// Configure the PulseSensor object, by assigning our variables to it.
pulseSensor.analogInput(PulseWire);
pulseSensor.blinkOnPulse(LED13); //auto-magically blink Arduino's LED with heartbeat.
pulseSensor.setThreshold(Threshold);
lcd.setCursor(0,0);
lcd.print("Accident");
lcd.setCursor(0, 1);
lcd.print("Detection");
delay(2000);
lcd.clear();
// Double-check the "pulseSensor" object was created and "began" seeing a signal.
if (pulseSensor.begin())
{
Serial.println("We created a pulseSensor Object !"); //This prints one time at Arduino power-up, or on
Arduino reset.

}
}
```

```
void loop() {

int myBPM = pulseSensor.getBeatsPerMinute(); // Calls function on our pulseSensor object that returns BPM as an "int".
// "myBPM" hold this BPM value now.
if (pulseSensor.sawStartOfBeat()) { // Constantly test to see if "a beat happened".
Serial.println("♥ A HeartBeat Happened ! "); // If test is "true", print a message "a heartbeat happened".
Serial.print("BPM: "); // Print phrase "BPM: "
Serial.println(myBPM); // Print the value inside of myBPM.
lcd.setCursor(0,2);
lcd.print("HeartBeat Happened !"); // If test is "true", print a message "a heartbeat happened".
lcd.setCursor(5,3);
lcd.print("BPM: "); // Print phrase "BPM: "
lcd.print(myBPM);
TEMP_MONITOR();
uv_reading();
vib();
accelometer_reading();
SMOKE();
sw();

}
}
```

7.3.1 ACCELEROMETER IMPLEMENTATION

```
void accelometer_reading()
{
  Serial.print(analogRead(xpin));
  Serial.print("x-axis\n");
  Serial.print(analogRead(ypin));
  Serial.print("y-axis\n");
  delay(1000);
  if (((analogRead(xpin))-(analogRead(ypin))>=25) || ((analogRead(xpin))-(analogRead(ypin))>=25))
  {

    Serial.println("accident happened");
    Serial.println("$accident happened#");
    lcd.print("Accident");
    lcd.setCursor(0, 1);
    lcd.print("Happened");
    delay(1000);
    lcd.clear();

  }
}
```

7.3.2 VIBRATION SENSOR IMPLEMENTATION

```
void vib()
{
  if(digitalRead(vib_pin)==LOW)
{
```

```
  lcd.print("OBJECT TOO ");
  lcd.setCursor(0, 1);
  lcd.print("NEAR Detect");
  Serial.println("OBJECT is near DETECTED");
  delay(1000);
  lcd.clear();
}
}
```

7.3.3 EMERGENCY SWITCH

```
void sw(){
if(digitalRead(SW)==LOW)
  {
    Serial.println("EMERGENCY");
    Serial.println("$EMERGENCY#");
    lcd.print("EMERGENCY...");
    delay(1000);
    lcd.clear();
  }
}
```

7.3.4 TEMPERATURE SENSOR

```
void TEMP_MONITOR()
{

   vout=analogRead(sensor);
    vout=(vout*400)/1023;
```

```
    tempc=vout;

    Serial.print("TEMP:");
    Serial.print(tempc);
    Serial.println('C');
    lcd.clear();
    lcd.setCursor(7, 0);
    lcd.print("T:");
    lcd.print(tempc);
    lcd.print('C');
}
```

7.3.5 ULTRASONIC SENSOR

```
void uv_reading()
{

digitalWrite(triPin,LOW);  // to reset or clear the trigger pin
delayMicroseconds(2);
digitalWrite(triPin,HIGH);
delayMicroseconds(10);
digitalWrite(triPin,LOW);
duration = pulseIn(echoPin, HIGH); // time given to calculate the distance from object
cms=duration*0.034/2;

//Serial.println("cms");
delay(2000);
if(cms<15)
  {
```

```
  Serial.println("OBJECT DETECED");
  lcd.print("OBJECT DETECED");
  delay(1000);
  lcd.clear();
  Serial.print(cms);
  Serial.print("cms");
 Serial.println();
 }
}
```

7.3.6 GAS SENSOR

```
void SMOKE()
{
 int al=analogRead(SMOKEA4);
 if(al>200)
 {
   Serial.print(al);
   Serial.println(" SMOKE DETECTED");
   Serial.println("$SMOKE DETECTED#");
   lcd.print(" SMOKE ");
   lcd.setCursor(0, 1);
   lcd.print("DETECTED");
   delay(1000);
   lcd.clear();
 }
}
```

CHAPTER 8

TESTING

System testing is actually a series of different tests whose primary purpose is to fully exercise the computer-based system. Although each test has a different purpose, all work to verify that all the system elements have been properly integrated and perform allocated functions. The testing process is actually carried out to make sure that the product exactly does the same thing what is supposed to do. In the testing stage following goals are tried to achieve: -

- To affirm the quality of the project.
- To find and eliminate any residual errors from previous stages.
- To validate the software as a solution to the original problem.
- To provide operational reliability of the system.

8.1 STATIC TESTING

Static tests measure the performance of sensors while both targets and sensors are stationary. This is expected to provide a measure of the optimal sensor performance since there is no relative motion. Static tests include range, accuracy, and reliability. Each of these criteria is evaluated for sensitivity to multiple objects, vibrations, and environmental factors.

RANGE, ACCURACY, AND RELIABILITY

8.2 DYNAMIC TESTING

Dynamic tests measure the performance of the sensors as the target or sensor moves during the test. Under some conditions the sensor's performance is degraded when there is relative motion. Dynamic tests are performed with controlled, usually fixed, velocities of the target object. Actual distance is determined using a separate, direct measurement scheme. In addition to determining the accuracy of a sensor under these circumstances, the dynamic tests enable additional assessment of sensitivity to direction of motion, near misses, detection time, and multiple objects.

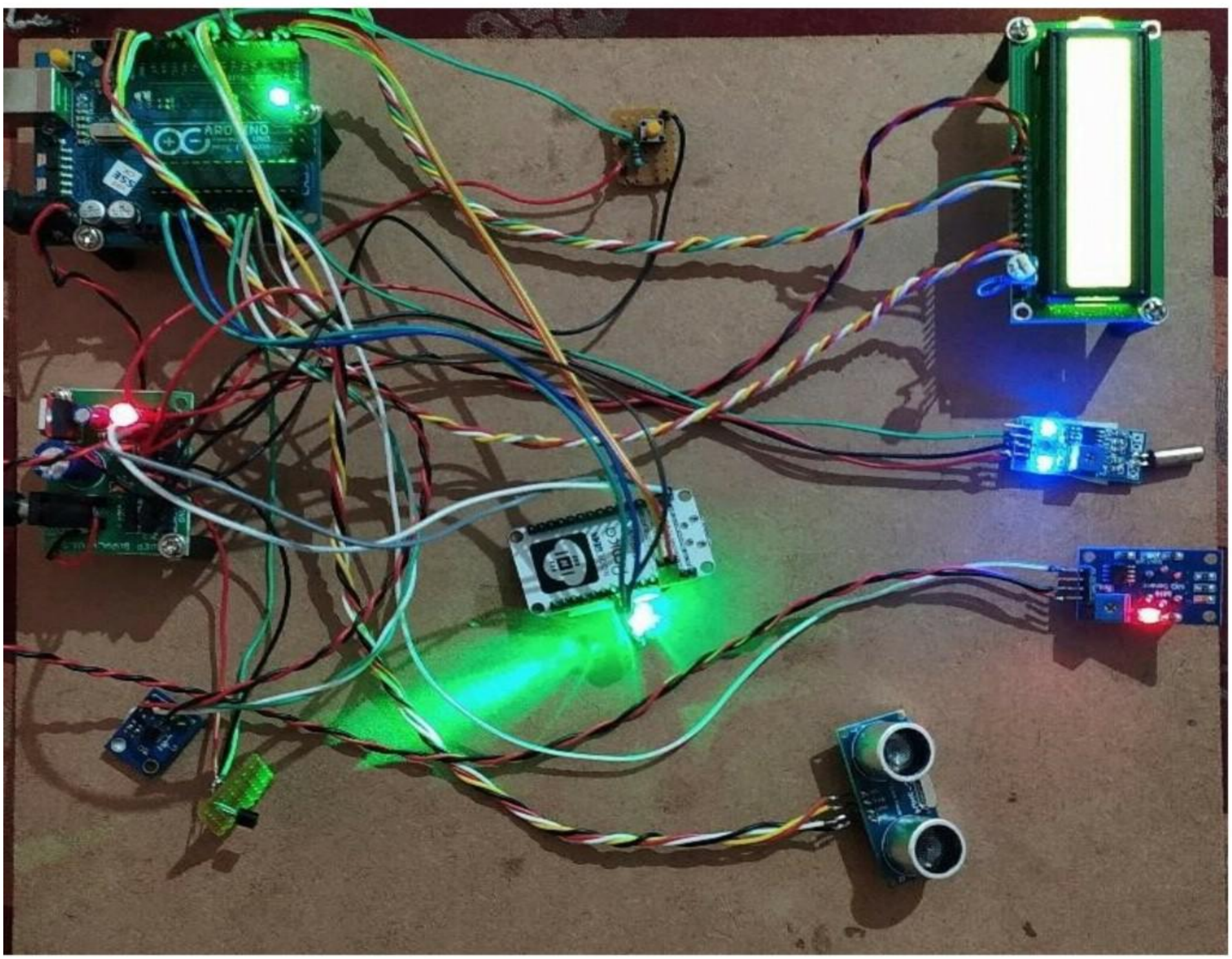
A related performance criteria evaluated through dynamic testing is the time it takes a sensor to detect an object when it enters the FOV. Two conditions will be considered – motion laterally into the FOV from outside the angular range, and motion longitudinally into the FOV from outside the distance range.

CHAPTER 9

SCREENSHOTS WITH DESCRIPTION

9.1 SYSTEM MODEL

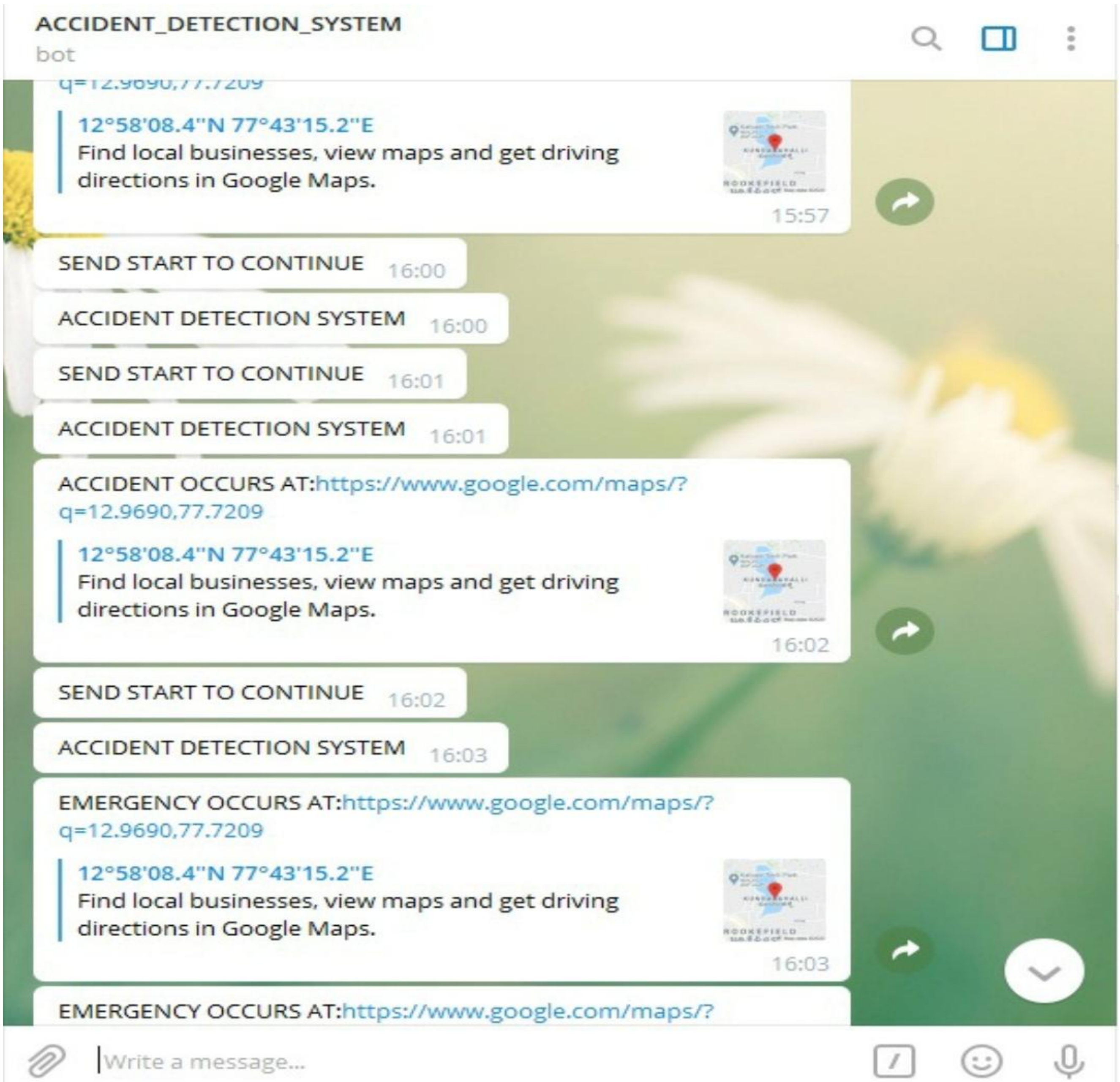
The below figure shows the various sensors like accelerometer,vibration sensor,ultrasonic sensor,temperature sensor connected to the arduino.



9.2 TELEGRAM

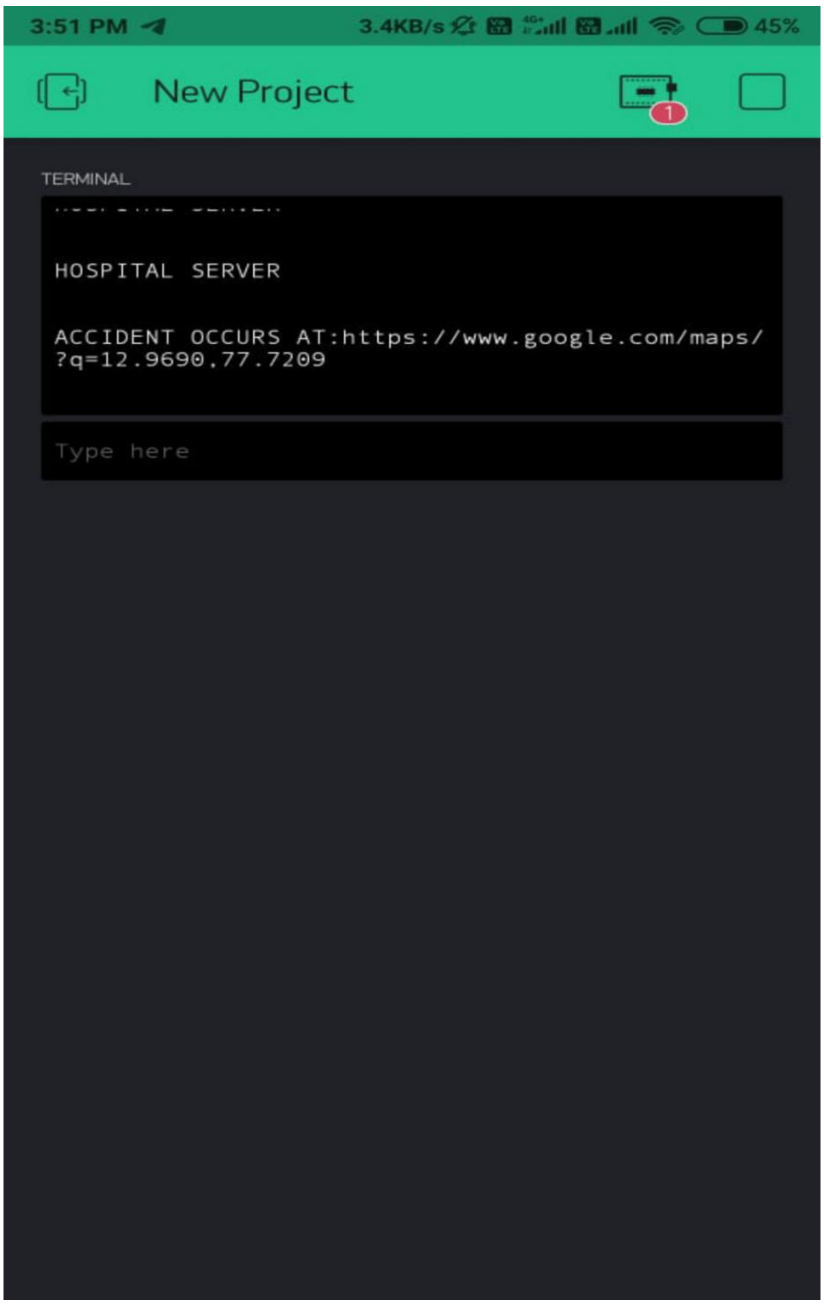
Whenever the accident is detected by the system,it sends a message with location of the accident to the emergency contact of the victim through telegram

Below figure shows the message seen on telegram



9.3 BLYNK

Whenever the accident is detected,the system sends the message to the telegram and to the nearest hospital through the help of blynk



CHAPTER 10

CONCLUSION AND FUTURE SCOPE

In modern cities, the volume of vehicles has increased drastically in recent years. This increased traffic has resulted in an increase in the number of accidents. While there exist a number of accident detection systems being brought to market, still a significant number of fatalities arise. At least part of this problem is due to the lack of a timely response to serious accidents, caused by inadequate automatic accident detection and inefficient notification and routing of emergency response. The lack of availability of effective systems, for affordability and retrofitting capability issues, only exacerbates the problem. To address these issues, we propose an IoT-based system for accident detection. We have shown that using a variety of different sensors can help in detecting a road accident more accurately. The proposed system immediately detects the location of an accident and calculates the nearest hospital and sends an emergency request for assistance to the required hospital department. A rescue measures in time with sufficient preparation at the correct place can save many life. Thus, the proposed system can serve the humanity by a great deal as human life is valuable.

CHAPTER 11

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