"MAKING SMART HELMET FOR SMART CITY"

A

Project Report

Submitted in the partial fulfillment of the requirements

For the Degree of

Bachelor of Engineering

In

Electrical (Electronics & Power)

By

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DEPARTMENT OF ELECTRICAL ENGINEERING

SHRI SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING

SHEGAON 444 203 M.S (INDIA)

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CERTIFICATE

Certified that the project report entitled, **"Making Smart Helmet For Smart City"** is a bonafied work done under my guidance by

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In partial fulfillment of the requirements for the award of degree of Bachelor of Engineering in Electrical (Electronics & Power).

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ABSTRACT

The smart helmet's main purpose is to give people a way to detect and report incidents. Infrastructures for cloud computing and sensors are used for constructing the system. The technique for detecting accidents transmits the processor's values from the accelerometer which constantly looks for irregular changes. once an When an accident happens, the emergency department is informed. by using a cloud-based service, contacts. The global positioning system is used to determine the location of the vehicle.

The system guarantees the timely and accurate distribution of accident-related information to cloud services that are accessed by IOT in real time. Thus, a smart helmet for accident detection is constructed by utilizing the pervasive connection that is a salient feature for smart cities.

The number of traffic collisions is rising daily. Numerous people sustain serious,long-lasting injuries, long-lasting harm, or even pass away. These days, protecting riders' safety has taken on greater importance. The goal of this research is to lower the possibility of Bike accidents. It finds important factors like intoxication and fatigue that contribute to bike accidents. When any or both are identified, the system will sound an alarm to alert the rider. If the bike is not moving, the ignition will also be locked.

This project has been developed out of a sense of social responsibility towards the community. While riding a bicycle can be enjoyable, accidents can and do happen. Due to its affordability, ease of maintenance, and versatility in traffic, many individuals in India choose to ride two-wheelers over cars. However, the accident rate for two-wheelers is much higher than that of four-wheelers, with motorcycles being particularly prone to fatal accidents. The primary goal this project to safety measures, secure the protection and well being of rider.

This end, the system is designed to require the rider to wear a helmet and not have consumed alcohol before the motorbike will start. Alcohol verification is achieved through the use of an Alcohol sensor, while helmet detection is achieved using IR sensors.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 Introduction :-

India has a huge number of road accidents every year. The accidents may be due to many reasons like by drink and drive, driving rashly, exceeding the speed limit, etc. Sometimes, the person who gets injured might not be responsible for the accident. It might be the fault of some other vehicle rider. But overall both riders will get affected. Due to a lack of first aid and emergency medical services on time, the riders may die. Some deaths are due to the ambulance not reaching the desired location on time.

In case of an accident, to save time and inform the concerned person, a system is proposed which can make sure that the rider gets the required attention in a short time. In India, many people use two-wheeler vehicles as compared to four-wheeler vehicles because of its low cost and simplicity. In many accidents, the rider gets injured mainly on the head. A helmet plays a very important role in saving the life of the ridden So to encourage people to wear helmets and to avoid accidents, a design is proposed that synchronizes the module present in bike.

The proposed project focuses on enhancing safety for two-wheeler riders by incorporating technology to detect whether the safety equipment instead of rider they are under the drinking of alcohol before not allowing to start the bike. This is achieved using IR and MQ-3 sensors.

Another critical aspect of the project is addressing the issue of delayed medical treatment, which can result in fatalities. In the event of an accident, a drop detection feature will send a message to the rider's family, alerting them to the incident and ensuring prompt medical attention.

Fatigue and distraction are also significant contributors to accidents. Therefore, the project includes a safety zone sign that alerts the rider to vehicles approaching from the left or right, improving their awareness and ability to make accurate judgments and prevent accidents.

1.2 Aim & Objectives

Aim:-

Our aim is to design smart helmet to decrease the death rate due to accident**.**

Objective :-

This system is based on new technology, its main purpose is to detect an accident and alert to the control room/ambulance/home, so the victim can find some help. It can detect accidents the intensity of the accident without any visual contact from control room. If this system is inserted in every helmet then it is easy to understand how many bikes are involved in a particular accident and how intense is it. So that the help from control room will be according to the control room. The present board designed has both vehicle tracking and accident alert systems, which make it more valuable and useful. This board alerts us from theft and on accident detection also. This device detects fire accidents also by placing fire detector in one of the interrupt pins.

Our project aims to enhance road safety through a combination of helmet authentication, alcohol detection, and a response system that uses GPS and GSM modules to alert the rider's family in case of an accident. The helmet authentication is achieved through the use of a limit switch, while the alcohol detection utilizes an MQ3 gas sensor.

- To design system that can improve bike rider safety.
- To design system that reduces the number of accident due to the drink and drive.
- To design system that ensure that the rider has worn helmet.
- To design system that reduces the loss of life due to late arrival of the ambulance.

1.3 Material and Methods

- This project's primary goal is to design and implement a system that uses multiple technologies, such as alcohol detection, helmet verification, location tracking, and collision avoidance, to prevent and address vehicle accidents and reduce their occurrence on the roads.

- To accomplish this goal, the system integrates different technologies like GSM for wireless communication and an Inquire module for establishing remote communication between the helmet and the vehicle.

- The system comprises two primary components: one installed on the helmet and the other on the vehicle, enabling seamless communication between the two devices.

CHAPTER 2

LITERATURE REVIEW:-

1)"Smart Helmet using IoT"

Author:- Guntupalli Sireesha, Anusha N, Ayusha Baburay, K. Baby Satya Jahnavi

As we know India is second most populated country and has a large youth population, nowadays youth are fond of bikes and because of fashion, they neglect wearing helmet. Because of these, bike accidents are increasing day by day which causes deaths. Major deaths are due to head injuries which can be prevented by wearing a helmet. Drunk and drive cases are becoming more, which causes accidents and due to lack of negligence where an accident occurs and people are dying. These incidents made us develop a smart helmet using internet of things which reduce the accidents and risk of deaths, which has following features, the bike starts only if the rider wears a helmet if the rider is over drunken then the ignition will be automatically offed and if any accident occurs then through GSM modem it will send the message to the registered contact number by using a sim card.

2)" Smart Helmet Using GSM &GPS Technology for Accident Detection and Reporting System."

Author:- Manjesh N , Prof. Sudarshan Raj.

A smart helmet is a special idea which makes motorcycle driving safer than before. This is implemented using GSM and GPS technology. The working of this smart helmet is very simple, vibration sensors are placed in different places of helmet where the probability of hitting is more which are connected to microcontroller board. So when the rider crashes and the helmet hit the ground, these sensors sense and gives to the microcontroller board, then controller extract GPS data using the GPS module that is interfaced to it. When the data exceeds minimum stress limit then GSM module automatically sends message to ambulance or family members.

3) "Helmet for Road Hazard Warning with Wireless Bike Authentication and Traffic Adaptive Mp3 Playback."

Author:- K. Sudarsan, P. Kumaraguru Diderot

In India still most of the people prefer two wheelers compared to other form of vehicle due to simplicity and its low cost. One important problem is bike riders suffer from inadequate roads and bad driving conditions. Other important problem with bikers is that most of the time they don't like to wear helmet which could be fatal when accidents happen. Two wheelers in everyone's life play vital role, moreover the safety is considered to be primary of all. According to some statistics 50% of accident occurs due to bad conditions of road and not wearing helmet. To avoid accidents and to encourage people to wear helmet a project is to be introduced that includes smart interactive robotic helmet with features like road hazard warning, wireless bike authentication and traffic adaptive mp3 playback. This helmet will warn the rider when road hazard is ahead, helmet will also communicate with rider if he is not wearing it and will perform wireless bike authentication that act as prevention from theft. It will also adjust the volume of the speakers automatically while rider is listening to music as a safety precaution. Since in India the usage of two wheelers is more compared to four wheelers, it requires more attention as far as safety is concerned.

4) “BIKE RIDER’S SAFETY USING HELMET.”

Author:- Manasi Penta, Monali Jadhav1 and Priyanka Girme

The idea of developing this project comes from social responsibility towards the society. Bike riding is a lot of fun, but accidents happen. People choose motorbikes over car as it is much cheaper to run, easier to repair, easier to park and flexible in traffic. In India more than 37 million people are using two wheelers. Since usage is high accident percentage of two wheelers are also high compared to four wheelers. Motorcycles have high rate of fatal accidents than cars or trucks and buses. This project aims for accident avoidance, safety and security of bike rider. The main purpose of the project is to encourage wearing helmet. The system will ensure that the motorbike will not start unless the rider is wearing a helmet and has not consumed alcohol. Thus alcohol detection is also an important part in this project. Alcohol detection is done by MQ-3 sensor and helmet detection is done by IR and PIR sensors. The system will also alert the bike rider if any obstacle comes too close while riding the bike. This is found to be useful at night or when the rider is drowsy or tired. By this accidents can be prevented. Also GSM technology is used to inform the family members in case of an accident. Accident detection is done using accelerometer. Wireless communication through Ask module is done between the helmet and motorbike.

5) “Smart helmet for safe driving.”

Author:- Keesari Shravya, Yamini Mandapati, Donuru Keerthi, Kothapu Harika, and Ranjan K. Senapati.

A smart helmet is a type of protective headgear used by the rider which makes bike driving safer than before. The main purpose of this helmet is to provide safety for the rider. This can be implemented by using advanced features like alcohol detection, accident identification, location tracking, use as a hands free device, fall detection. This makes it not only a smart helmet but also a feature of a smart bike. It is compulsory to wear the helmet, without which the ignition switch cannot turn ON. An RF Module can be used as wireless link for communication between transmitter and receiver. If the rider is drunk the ignition gets automatically locked, and sends a message to the registered number with his current location. In case of an accident it will send a message through GSM along with location with the help of GPS module. The distinctive utility of project is fall detection; if the rider falls down from the bike it sends a message.

CHAPTER 3

SOFTWARE DETAILS

3.1 Arduino IDE Software Introduction

The Arduino IDE is open-source software and is primarily used to write, compile and upload code on almost any Arduino or Node MCU Module. The Arduino IDE software is easy to download and install.

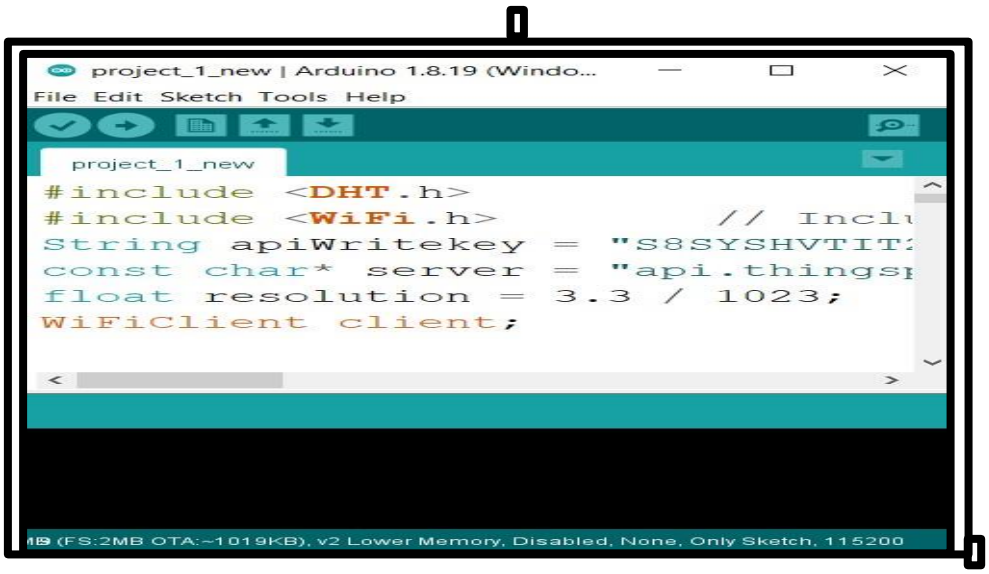


Fig. 3.1 Arduino IDE Interface

3.2 Preferences section in Arduino IDE

This is official Arduino software, which makes compiling code too easy. This is available for all operating systems and runs on the Java Platform. The platform comes with built-in functions and commands that play an important role in debugging, compiling, and editing the code. Arduino IDE supports C and C++ languages. Each contains a microcontroller on the board that is actually programmed and retrieves information in the form of code.

The main code is written on the IDE platform also known as a sketch eventually produces a Hex File. This file is transferred and uploaded to the controller on the board. The IDE environment contains two main parts: Editor and Compiler. The former writes the required code and later compiles the code and uploads the code into the given Arduino or NodeMCU module.

As one go to the preference panel and check the compilation panel, then click the upload button and the output panel will show the compilation code.

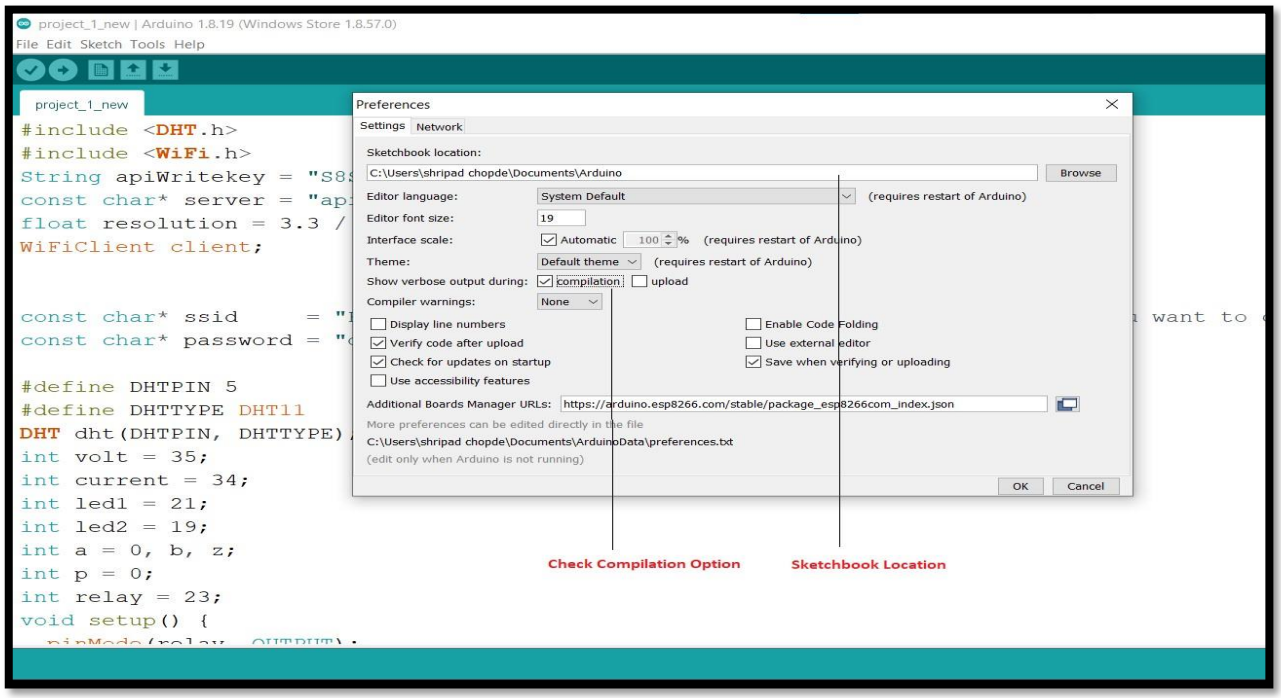


Fig 3.2 Preferences section in Arduino IDE

And at the end of the compilation, it will see the hex file generated for the final sketch and sent to the Arduino or NodeMCU Board for the specifi task one wants to be accomplished.

3.3 Six buttons to deal with running program

- **Edit** – Used to make further changes to the font to copy and paste the code.
- **Sketch** – Used to compile and program.
- **Tools** – Main use of this tool is for testing projects. The Programmer section in this panel is used to write the bootloader to the new microcontroller.
- **Help** – If there is any question about the software, get comprehensive help from a start-up to troubleshoot.

- The **Six Buttons** that appear under the Menu tab are linked to the running program as follows:

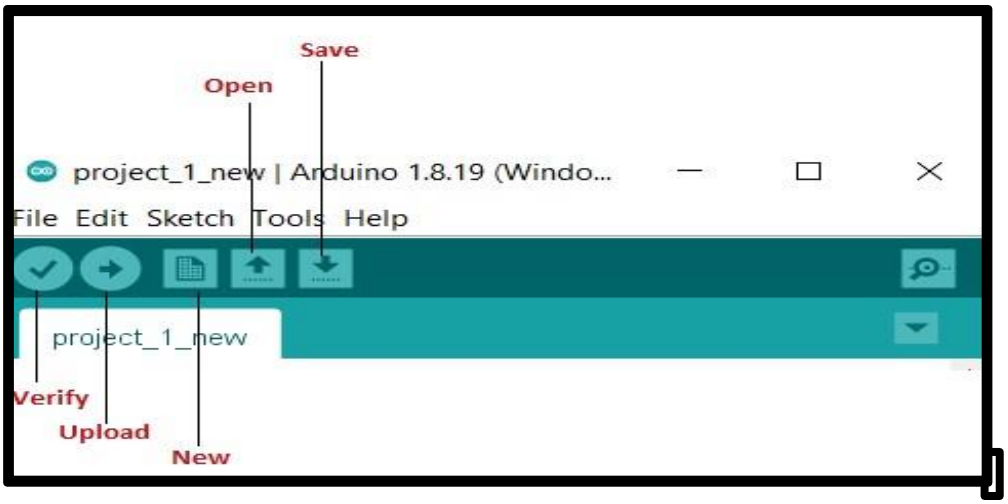


Fig. 3.3 Six buttons to deal with running program

The checkmark that appears on the round button is used to verify the code.
After writing the code, click on it.
The arrow keys upload the required code and send it to the Arduino or NodeMCU board.
The dotted paper is used to create new files.
The up arrow is reserved to open an existing Arduino project. • The down arrow is used to save the current executable code.
The button in the upper right corner is the **Serial Monitor** – A separate pop-up window that functions as an independent terminal and plays an important role in sending and receiving the Serial Data.

CHAPTER 4

SYSTEM DESIGN

The system has two sections
• Helmet section
• Bike section

4.1 Helmet section

This section comprises an alcohol sensor,Limit switch, accelerometer, Arduino Nano and RF transmitter. The switch examines whether the rider is wearing a helmet or not and alcohol sensor senses the rider is intoxicated or not and transmits the signal through RF transmitter to the bike section.

1) Alcohol sensor :

Fig 4.1: Alcohol sensor (MQ-3)

An alcohol sensor detects the attentiveness of ethanol in the air when the drunk person breathes near this sensor, it discloses the alcohol gas in his breath and obtains the output based on alcohol concentration. It is placed in the helmet such a way that it can easily sense the breath of the person. This module is made using Alcohol Gas Sensor MQ3. It is a low cost semiconductor sensor . which can detect the presence of **alcohol gases at concentrations from 0.05 mg/L to 10 mg/L.** The sensitive material used for this sensor is SnO2, whose conductivity is lower in clean air. It's conductivity increases as the concentration of alcohol gases increases. It has high sensitivity to alcohol and has a good resistance to disturbances due to smoke, vapor and gasoline. This module provides both digital and analog outputs. MQ3 alcohol sensor module can be easily interfaced with Microcontrollers, Arduino Boards, Raspberry Pi etc. This alcohol sensor is suitable for detecting alcohol concentration on your breath, just like our common breath alyzer. It has a high sensitivity and fast response time. Sensor provides an analog resistive output based on alcohol concentration.

The MQ-3 gas sensor is utilized in this system to detect the alcohol content in a person's breath and is positioned in front of the mouth for optimal detection. With its sensitivity to various alcohol molecules, the sensor can determine whether the rider is intoxicated or not, and it includes a potentiometer to adjust the concentration of gases.

The MQ-3 gas sensor is calibrated for a liquor concentration of 0.4mg/L in the air using a resistance of 200 KΩ and features four pins: GND, VCC, A out, and D out. While the MQ-gas sensor supports both analog and digital outputs, the digital output is employed in this system.

The sensor employs SnO2, a sensitive material with lower conductivity in clean air but greater conductivity as the concentration of alcohol gases increases. The MQ-3 gas sensor is resistant to interference from smoke, vapor, and gasoline and provides both analog and digital outputs, allowing it to interface with various devices.

This alcohol sensor functions much like a conventional breathalyzer, and it has high sensitivity and a fast response time for detecting alcohol concentration in a person's breath. sensitivity and a fast response time.

Character :

1) Good sensitivity to alcohol gas .
2) Long life and low cost .

Features

- 5V operation
- Simple to use
- LEDs for output and power
- Output sensitivity adjustable
- Analog output 0V to 5V
- Digital output 0V or 5V
- Low Cost
- Fast Response
- Stable and Long Life
- Good Sensitivity to Alcohol Gas
- Both Digital and Analog Outputs
- On-board LED Indicator

Technical Data

- Concentration : 0.05 mg/L ~ 10 mg/L Alcohol
- Operating Voltage : 5V ±0.1
- Current Consumption : 150mA
- Operation Temperature : -10°C ~ 70°C

Pin Out

- VCC – Input Power Supply
- GND – Supply Ground
- DO – Digital Output
- AO – Analog Output

2) Accelerometer:

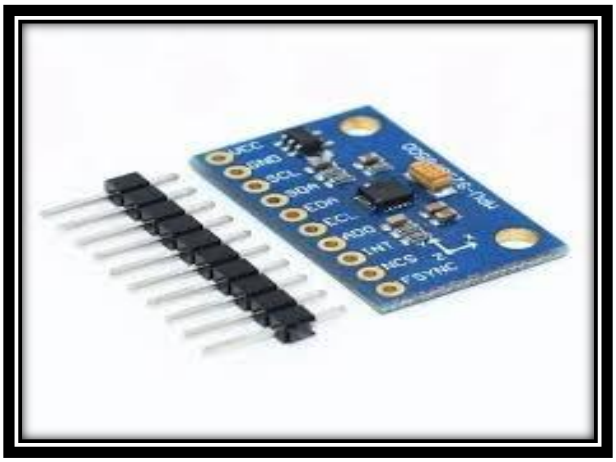


Fig 4.2: Accelerometer

On the hardware front, an accelerometer has been used as a crash or rollover detector of the vehicle during and after a crash. With signals from an accelerometer, a collision is recognized and the sensor will send a signal to microcontroller which in turn will activate GPS-GSM module.It is an electromechanical device which is used to measure acceleration forces and the forces will be static or dynamic forces. An accelerometer will measure the vibration of the material and it is employed to continuously monitor the head inclination of the rider and position of the helmet and helpful for calculating the likelihood of accidents.

General Specifications

ADXL335 3-axis Accelerometer
On-board 3.3V Voltage Regulator
Analog voltage output centered at 1.65V
Suitable for connection to 5V and 3.3V systems

Technical Specifications

Sensor Chip : ADXL335
Operating Voltage Range : 3V ~ 5V
Supply Current : 400uA
Interface : Analog quantity output
Full scale range : +/-3g
Operating Temperature : -40'C~ +85'C
Sensitivity : 300mv /g;
Sensitivity of accuracy (%) : +/- 10
Application : Various electronic products or DIY project
Material : PCB + Brass
Dimensions : 21 x 16 x 10 mm / 0.83 x 0.63 x 0.39 inch
Weight : 2 g / 0.07 oz
Colour : Blue

3) Limit Switch:

Fig 4.3: Limit switch

A switch is an electric mechanism for ON/OFF the device, it is used to regulate the flow of electricity by interrupting or diverting the current from one conductor to another. This switch is placed inside on top of the helmet and it is pressed when the rider wears the helmet and it released when helmet takes off. Based on the switch condition the bike ignition key will be ON/OFF. Electrical appliances including relays, sensors, motors, and lights can all be controlled by micro switches. In robotics, where they are often referred to as actuators since they produce motion rather than turning on and off, micro switches are also employed. A micro switch linked to a robot arm is one illustration.

It is utilized to direct the stream of power by hindering or redirecting the current from one conductor to another. This switch is put interior on beat of the head protector and it is squeezed when the rider wears the protective cap and it discharged when head protector takes off. Based on the switch condition the bicycle start key will be ON/OFF. Electrical apparatuses counting transfers, sensors, engines, and lights can all be controlled by miniaturized scale switches. In mechanical technology, where they are regularly alluded to as actuators since they create movement instead of turning on and off, miniaturized scale switches are too utilized.

4) Arduino Nano :-

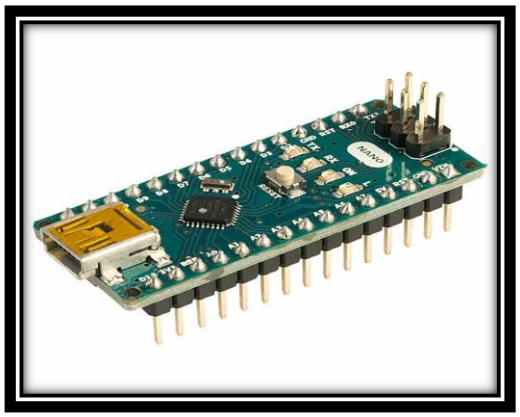


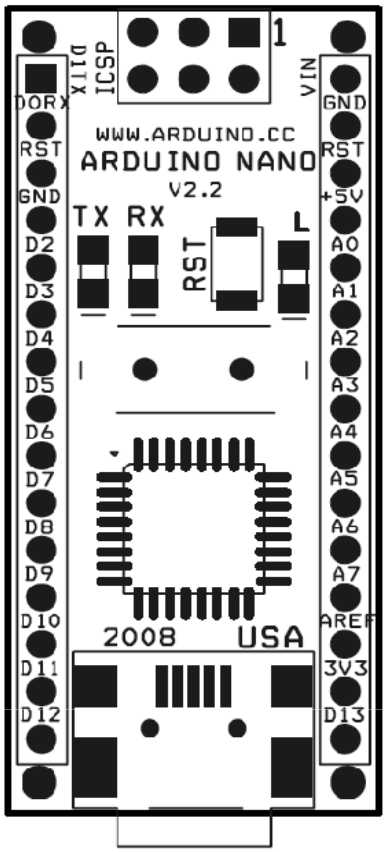
Fig 4 .4: Arduino Nano

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328P released in 2008. It offers the same connectivity and specs of ...CPU: Microchip AVR (8-bit) @ 16 MHz Memory:2 KB SRAM Manufacturer: ManyStorage:32KBFlash; 1KB EEPROM. It offers the same connectivity and specs of the Arduino Uno board in a smaller form factor.

The Arduino Nano is equipped with 30 male I/O headers, in a DIP-30-like configuration, which can be programmed using the Arduino Software integrated development environment (IDE), which is common to all Arduino boards and running both online and offline. The board can be powered through a type-B mini-USB cable or from a 9 V battery.

The Arduino Nano was released in 2008. In 2019, Arduino released the Arduino Nano Every, a pin-equivalent evolution of the Nano. It features a more powerful ATmega4809 processor

Arduino Nano Pin Layout



Pin No	Name	Type	Description
1-2, 5-16	D0-D13	I/O	Digital input/output port 0 to 13
3, 28	RESET	Input	Reset (active low)
4 , 29	GND	PWR	Supply ground

17	3V3	Output	+3.3V output (from FTDI)
18	AREF	Input	ADC reference
19-26	A7-A0	Input	Analog input channel 0 to 7
27	+5V	Output or Input	+5V output (from on-board regulator) or +5V (input from external power supply)
30	VIN	PWR	Supply voltage

5) RF Transmitter :

Fig 4.5: RF transmitter

RF modules are 434 MHz transmitter and receiver components. RF transmitter is the wireless data transmitting device. It transmits serial data to the receiver through an antenna which is connected to the 4th pin of the transmitter. It transmits the helmet data to the bike receiver through the radio frequency signals and microcontroller will process the received data.

A radio-frequency module, or RF module, is a (often) compact electronic gadget used to send or receive radio signals between two devices. It is frequently useful to connect wireless with another device in an embedded system.

Specification:

Transmitter:

Product Model: XD-FST
Launch distance :20-200 meters (different voltage, different results)
Operating voltage :3.5-12V
Dimensions: 19 * 19mm
Operating mode: AM
Transfer rate: 4KB / S
Transmitting power: 10mW
Transmitting frequency: 433M
Pinout from left → right: (DATA; VCC; GND)

4.2 Bike section

This section comprises RF receiver, Microcontroller, Ignition key, GPS , LCD, Arduino Uno ,GSM modem and decoder. The RF receiver gets the signal from the helmet section and decodes signal using decoder if the person is over drunken then ignition will be automatically offed by the relay and if any accidents occur message will be sent using GSM modem

Main components description

1) Arduino UNO :

Fig 4.6: Arduino UNO

Arduino is the open-source platform used for building electronic projects. It consists of both hardware circuit and software tool, and this software is used to write the code and upload into the physical board through the cable. Arduino IDE uses the simplified version of C++, but this is one of the easiest ways to write the code. Arduino can interact with sensors, motors, internet, smart-phone and the TV. Arduino has varieties of boards but the UNO is one of the most popular board in the Arduino family.

Microcontroller	ATmega328P – 8 bit AVR family microcontroller
Operating Voltage	5V
Recommended Input Voltage	7-12V
Input Voltage Limits	6-20V
Analog Input Pins	6 (A0-A5)
Digital I/O Pins	14 (Out of which 6 provide PWM output)
DC Current on I/O Pins	40mA

DC Current on 3.3V Pin	50mA
Flash Memory	32 KB (0.5 KB is used for Bootloader)
SRAM	2kB
EEPROM	1kB
Frequency (Clock Speed)	16MHz

Features

ATMega328P Processor
Memory
AVR CPU at up to 16 MHz
32KB Flash
2KB SRAM
1KB EEPROM
Security
Power On Reset (POR)
Brown Out Detection (BOD)
Peripherals
2x 8-bit Timer/Counter with a dedicated period register and compare channels
1x 16-bit Timer/Counter with a dedicated period register, input capture and compare channels
1x USART with fractional baud rate generator and start-of-frame detection
1x controller/peripheral Serial Peripheral Interface (SPI)
1x Dual mode controller/peripheral I2C
1x Analog Comparator (AC) with a scalable reference input
Watchdog Timer with separate on-chip oscillator
Six PWM channels
Interrupt and wake-up on pin change
ATMega16U2 Processor
8-bit AVR® RISC-based microcontroller
Memory
16 KB ISP Flash
512B EEPROM
512B SRAM
debugWIRE interface for on-chip debugging and programming
Power
2.7-5.5 Volts

2) GPS Module:-

Fig 4.7: GPS

GPS (Global Positioning System) is a satellite navigation system that furnishes location and time information in all climate conditions to the user. GPS is used for navigation in planes, ships, cars and trucks also. The system gives critical abilities to military and civilian users around the globe. GPS provides continuous real time, 3-dimensional positioning, navigation and timing worldwide.

GPS stands for Global positioning system. GPS tracker is a navigation device, used for tracking the location of moving person, vehicle and animals. The information that is collected from the device is stored on the device inside and then is transmitted through a wireless network or cellular network. the information reported from the vehicle is the real-time location and is displayed on a map in near real-time. The software for tracking the vehicle will be available on all smartphones.

A GPS tracker is a device that uses the Global Positioning System to determine and track the precise location of a person, vehicle or object. The location data is collected by the device and can be transmitted through wireless or cellular networks. Real-time location information is then displayed on a map or tracking software, which can be accessed on smartphones or other devices. GPS trackers are commonly used for fleet management, asset tracking, personal tracking, and other applications that require real-time location monitoring**.**

3) GSM Module:-

Fig 4.8: GSM MODULE

The wireless module SIM800L is incredibly small and dependable. This entire GSM/GPRS module is of the SMT variety, features an AMR926EJ-S core integrated single-chip processor, and benefits from compact dimensions and low-cost solutions.
A sim has to be inserted into the sim card port in modem and can be operated using a mobile device, it can send and receive messages from registered numbers.
A sim should be embedded into the sim card harbour in modem and can be worked employing a versatile gadget, it can send and get messages from enlisted numbers.

4) Microcontroller :-

Fig4.9: Microcontroller

A microcontroller is a solid integrated circuit; on a single chip, it includes many devices. It is similar to the central processing unit that has decision-making capabilities. It consists of 64KB Flash and 1024 bytes RAM. The microcontroller used in products such as engines, medical devices, appliances and in embedded systems.

5) LCD :-

Fig 4.10: LCD DISPLAY

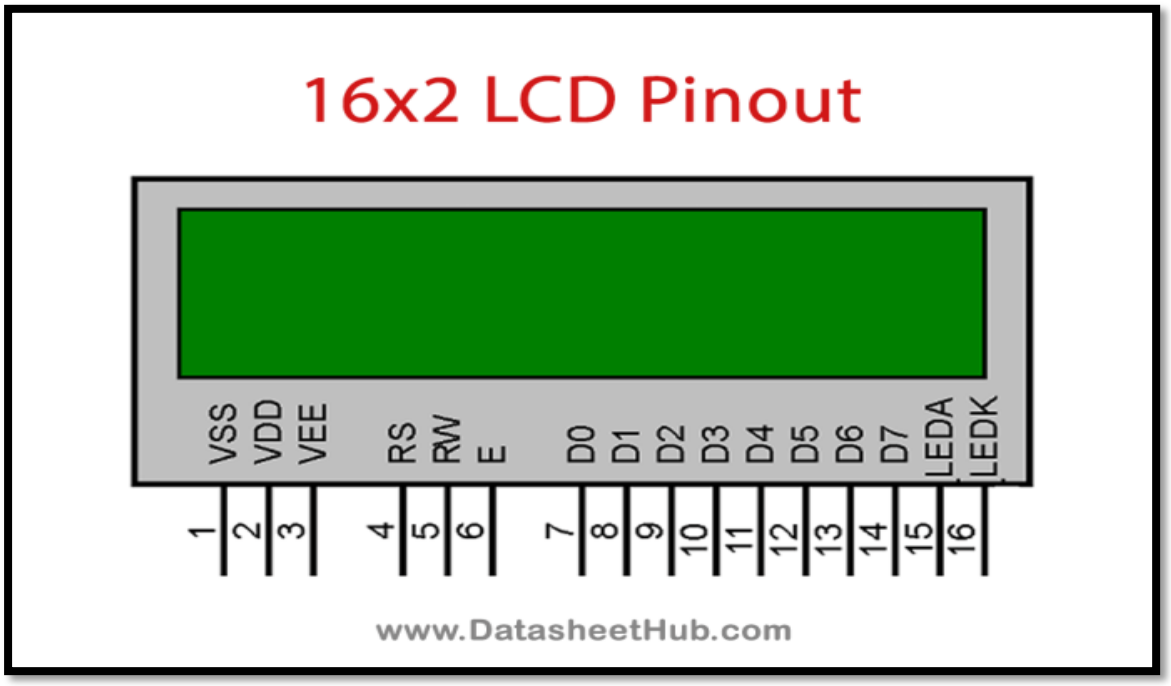
LCD stands for liquid crystal display that it uses liquid crystals for operation. It is very popular and broadly used in electronic projects as they are used for displaying information like sensors data from the project, and commonly found in smart-phones, televisions, computer monitors and instrument panels.

A 16×2 LCD (Liquid Crystal Display) screen is an electronic display module used in various devices and circuits. A 16×2 LCD can display 16 characters per line with the characters stretched between 2 rows (i.e. lines). In a 16×2 LCD, each character is displayed in a 5×7 pixel matrix. The 16×2 intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols. This LCD has two registers, namely, Command and Data. Command register stores various commands given to the LCD display. The data register stores data to be displayed on the LCD matrix. The process of controlling the display revolves around putting the data that form the image of what you want to display into the data registers, then putting instructions in the instruction register.

Features

- Type: Character
- Display format: 16 x 2 characters
- Built-in controller: ST 7066 (or equivalent)
- Duty cycle: 1/16
- 5 x 8 dots (includes a cursor)
- + 5 V power supply (also available for + 3 V)
- LED can be driven by pin 1, pin 2, pin 15, pin 16, or A and K
- N.V. optional for + 3 V power supply

16×2 LCD Character Display Module Pinout



Pin Name	Pin No.	**Description**
VSS	1	Ground
VDD	2	3 V or + 5 V
V0	3	Contrast adjustment
RS	4	H/L register select signal
R/W	5	H/L read/write signal
E	6	H –> L enable signal
DB0	7	H/L data bus line
DB1	8	H/L data bus line
DB2	9	H/L data bus line
DB3	10	H/L data bus line
DB4	11	H/L data bus line
DB5	12	H/L data bus line
DB6	13	H/L data bus line
DB7	14	H/L data bus line
A/VEE	15	4.2 V for LED (RA = 0 Ohm)/negative voltage output
K	16	Power supply for B/L (0 V)

Specifications

- The operating voltage of this display ranges from 4.7V to 5.3V
- The display bezel is 72 x 25mm
- The operating current is 1mA without a backlight
- The PCB size of the module is 80L x 36W x 10H mm
- HD47780 controller
- LED color for the backlight is green or blue
- Number of columns – 16
- Number of rows – 2
- Number of LCD pins – 16
- Characters – 32
- It works in 4-bit and 8-bit modes
- The pixel box of each character is 5×8 pixel
- Font size of character is 0.125Width x 0.200height

6) Power : 12V Power Adaptor

Fig 4.11: Power: 12V Power Adaptor

Use of an external power supply allows portability of equipment powered either by mains or battery without the added bulk of internal power components, and makes it unnecessary to produce equipment for use only with a specified power source; the same device can be powered from 120 VAC or 230 VAC mains, vehicle or aircraft battery by using a different adapter. Another advantage of these designs can be increased safety; since the hazardous 120 or 240 volt mains power is transformed to a lower, safer voltage at the wall outlet and the appliance that is handled by the user is powered by this lower voltage.

- Wide input range, high precision voltage.
- Overload protection
- Short circuit protection
- Over temperature protection
- Saving Power
- Input:100-240V AC 50/60Hz
- Output: DC 12.0V 1A
- Plug: EU Plug

7) RF Receiver :-

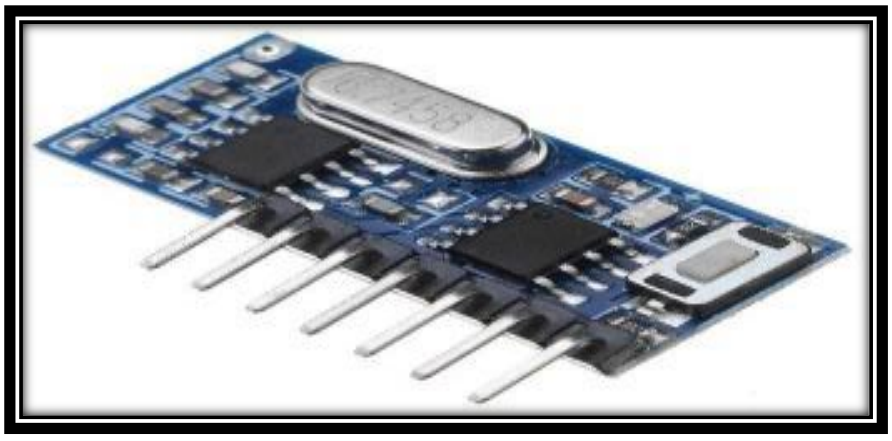


Fig 4.12: RF Receiver

Radio-frequency receiver is an electronic device, used to communicate between two electronic devices which are connected wirelessly. The transmission takes place through the radio waves which are of the form of electromagnetic radiation. The helmet module(transmitter) output data will be received by the vehicle module(receiver) and the process will take place by wireless technology.

A radio-frequency module, or RF module, is a (often) compact electronic gadget used to send or receive radio signals between two devices. It is frequently useful to connect wireless with another device in an embedded system.

Radio-frequency recipient is an electronic gadget, utilized to communicate between two electronic gadgets which are associated wirelessly. The transmission takes put through the radio waves which are of the frame of electromagnetic radiation. The head protector module(transmitter) yield information will be gotten by the vehicle module(receiver) and the method will take put by remote innovation.

Specification:

Receiver module:
Product Model: XD-RF-5V
Operating voltage: DC5V
Quiescent Current: 4MA
Receiving frequency: 433.92MHZ
Receiver sensitivity: -105DB
Size:30x14x7mm

8) Lithium-ion: battery :-

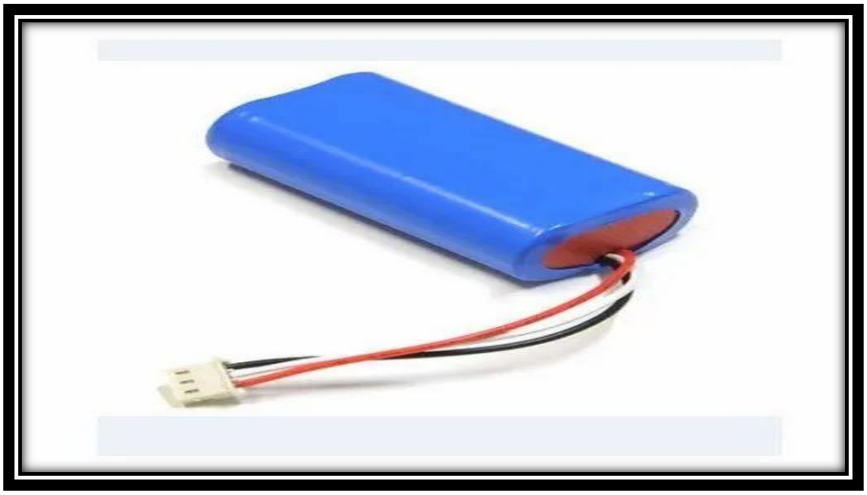


Fig 4.13: Lithium-ion: battery

- A Lithium-ion or Li-ion battery is a type of rechargeable battery which uses the reversible reduction of lithium ions to store energy.

- Rechargeable 12v lithium-ion battery manufacturer based in China, We have In stock small and compact 12v lithium battery pack.

- Cameras, LED lights, Mobile Phone Spammer, Solar Power system, Electric Garden Sprayer, Electric Lawn Sprayers, Handheld Electric Airless Sprayer, and mechanical cotton picker .

- We use the latest lithium battery technologies to make the 12v rechargeable battery pack just ensure that you can get the highest quality and less or even no customer returns, we work with you to do the label, shrink wrap, custom terminates or encloses in plastic.

- We focus on the best and cheap small design 12v DC battery pack products that are the most cost-effective, environmentally safe and exceed all of their specifications.

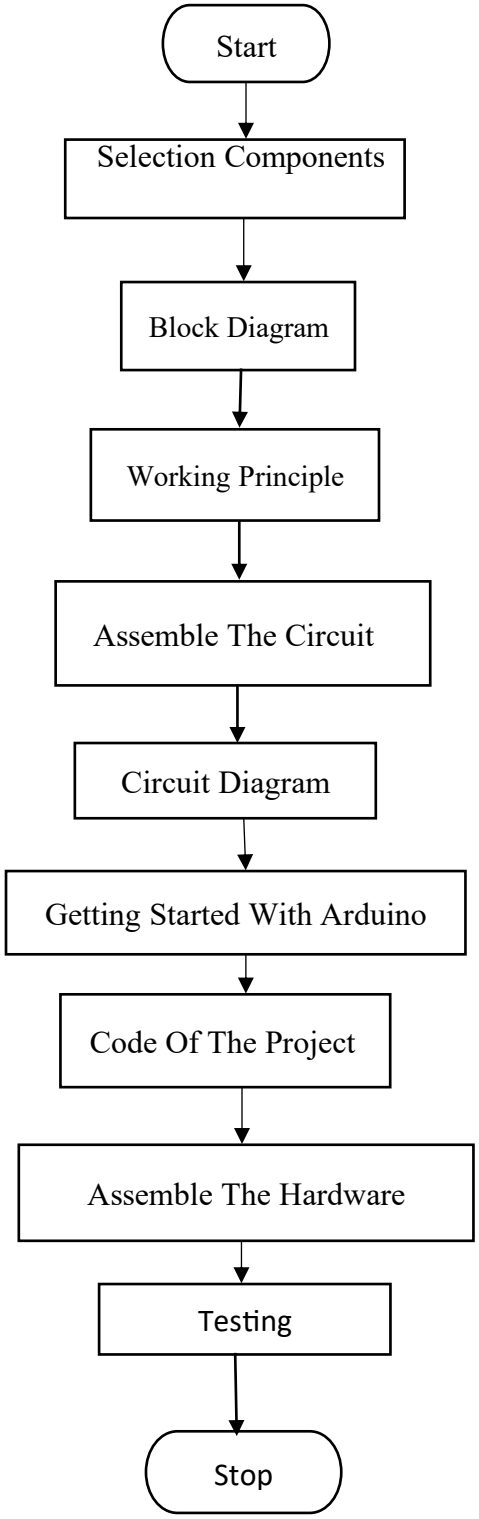
CHARGE/DISCHARGE

While the battery is discharging and providing an electric current, the anode releases lithium ions to the cathode, generating a flow of electrons from one side to the other. When plugging in the device, the opposite happens: Lithium ions are released by the cathode and received by the anode.

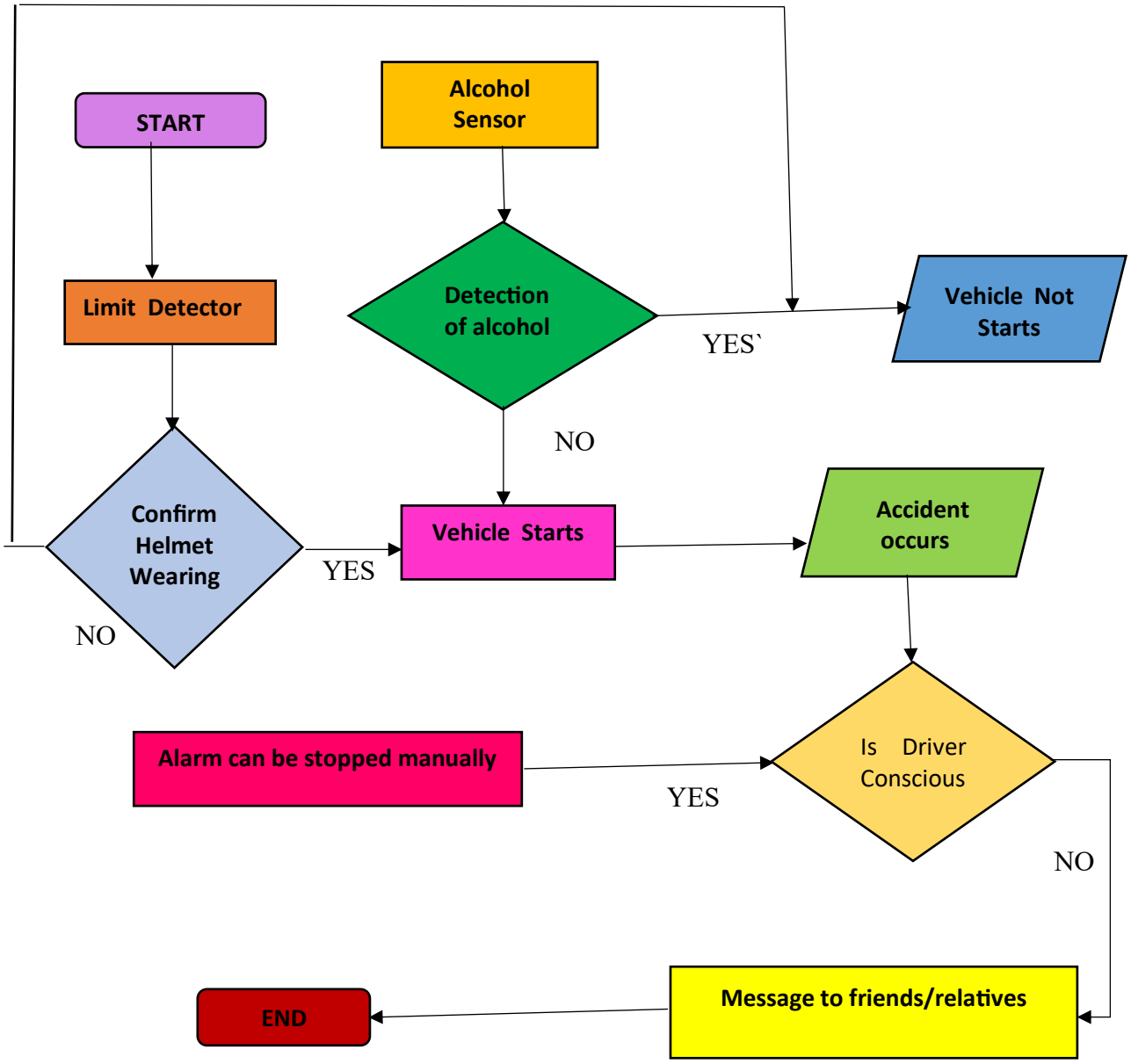
CHAPTER 5

METHODOLOGY

5.1 ALGORITHM:-



5.2 FLOWCHART :-



5.3 BLOCK DIAGRAM AND CIRCUIT DIAGRAM :-

Block Diagram :-

HELMET

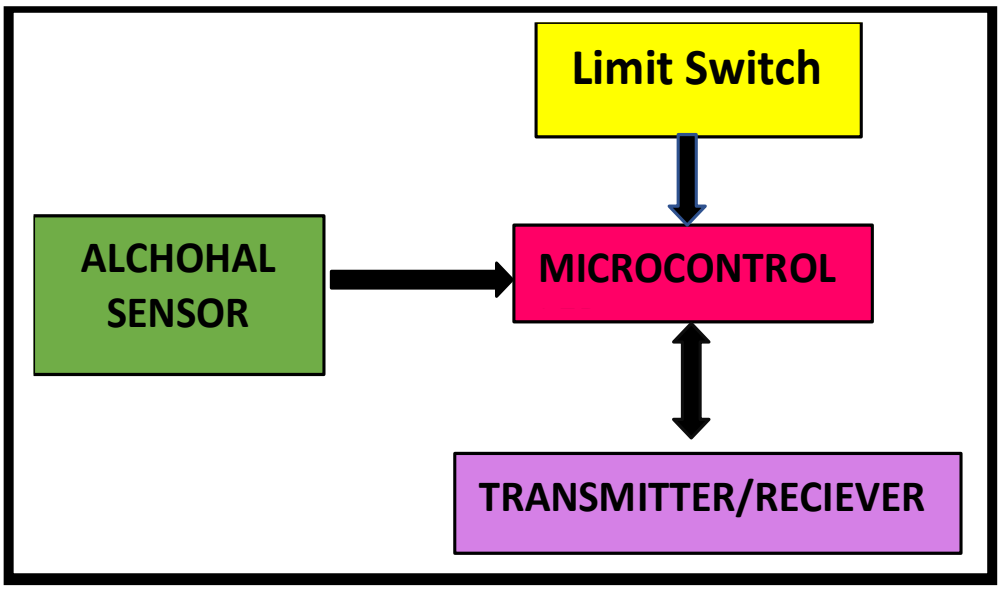


Fig 5.1:Helmet Module

VEHICLE

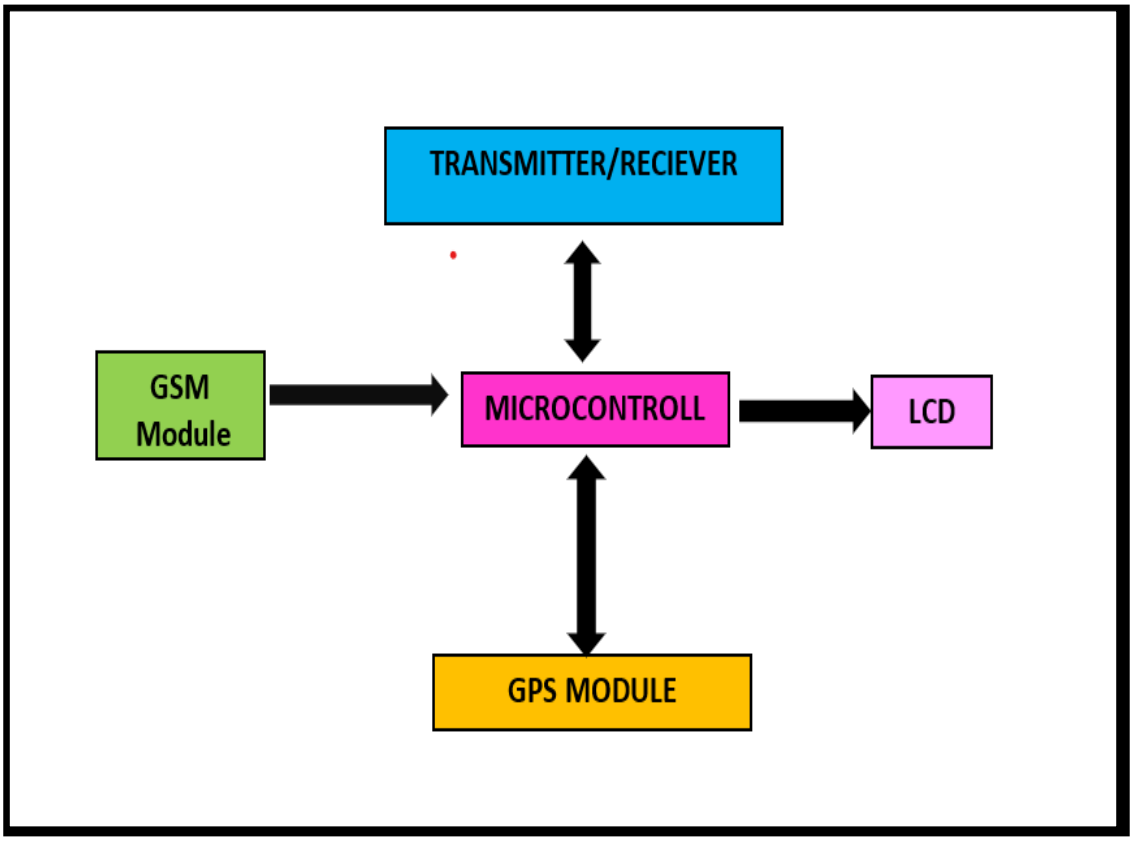


Fig 5.2: Vehicle Module

Smart helmet works on the principal of Radio frequency communication. The current condition and state of biker is determined by the help of this project. Smart helmet consists of two controllers namely Arduino UNO each at the helmet and bike module.

Each Arduino board is connected to each other with NRF radio frequency modules so that each module can communicate with other to send the signal.

Helmet module consists of IR sensors and alcohol sensor. IR sensor continuously feeds the incoming data to Arduino and checks when the biker has wear, the helmet or not. When it has a high signal i.e. when it has detected and alcohol sensor will check the toxic level of the biker. If the IR signal is low, it means that helmet is not wear by the rider and also alcohol level is not determined hence the bike will not start. When rider wears the helmet the IR signal becomes HIGH, and at the same time the alcohol level will be checked by the MQ-3 alcohol sensor, if the toxic level increases above the predetermined threshold level, it means the biker is drunk and it will send the signal and bike will not start. When IR signal is “High” and alcohol level is controlled, biker can start the bike.

On the helmet side, there is GSM and GPS module connected to the controller. GSM module here is used to send a message to biker's relatives. The data collected from helmet module about the toxicity level of biker; if it is above threshold then a message will be sent to the biker's relatives.

Vibration sensor attached at the bike module is used to detect the accident. In such case the GSM module will send a message to particular registered biker's parent or relatives. GSM module will send an alert to the registered number and the co-ordinates received by the GPS module will be updated in that msg. Relatives of the biker will get the exact location of the biker to take responsive action.

Intercom is just system as phone connectivity but without use of any SIM card of mobile phone. It works on the principal of RF communication, Many NRF modules can connect and form a network which can communicate to each other.

RF transceiver operates in TX or RX mode, to establish a connection we need to use two Arduino, two NRF24L01 at each side of the module. One module operates in TX mode while other operates in RX mode. There is need of 3.3V voltage supply for RF module. For working in a proper condition both the RF modules are set to a work at 2.4GHz and 2.475GHz frequency. The antenna is used for connectivity between these modules which improves the range of working of the circuit. Normally RF module can work within the range of 10m but with an antenna, range can be extended up to 30m-50m. A microphone a speaker are connected as a input and output to the TX and RX module respectively.

CHAPTER 6

RESULT AND DISCUSSION :-

All the components are assembled and tested successfully. The circuit is designed in such a manner that bike does not start until and unless rider wears the helmet. Also the bike won't start if the rider is drunk, this helmet alarms the rider if he crosses a certain speed limit by buzzing an alarm. If an accident occurs the engine automatically shuts off to avoid further injuries.

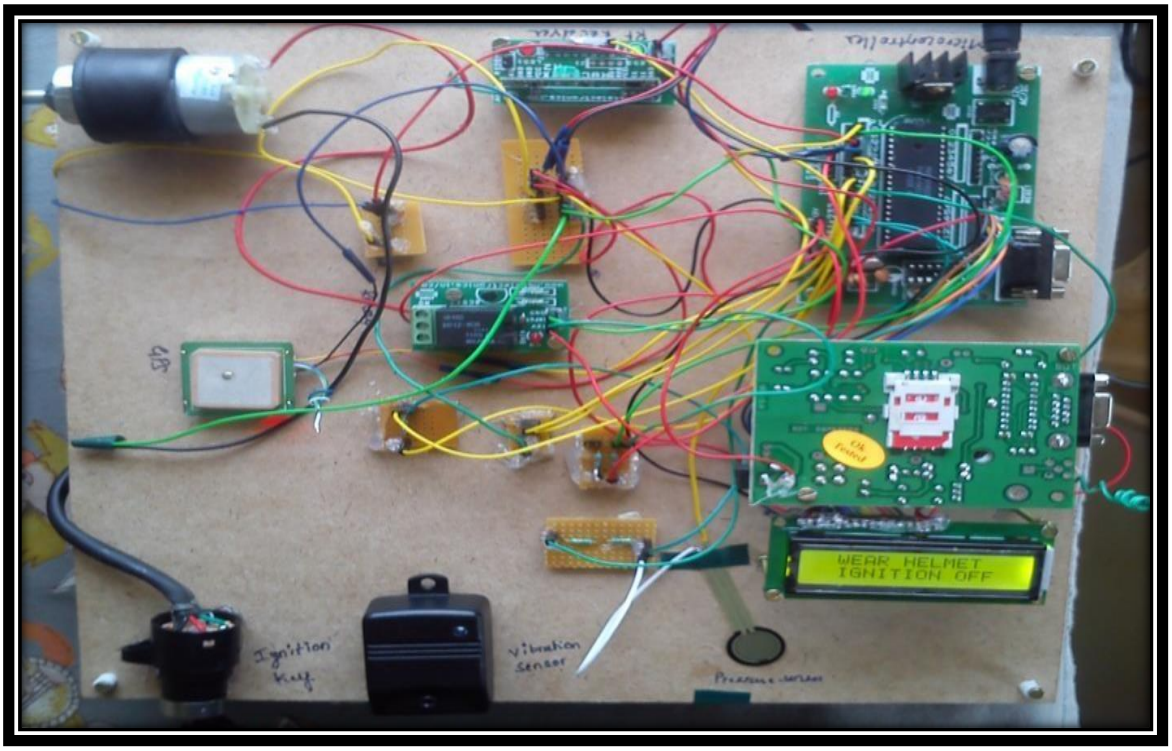


Fig.6.1

6.1 RESULT ANALYSIS :-

Fig.6.2

Fig.6.3

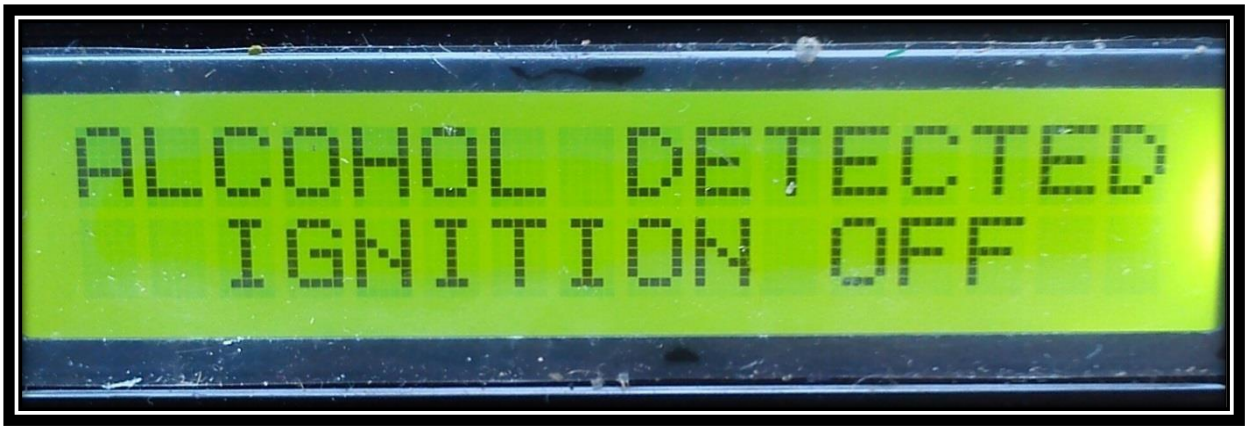


Fig.6.4

Fig.6.5

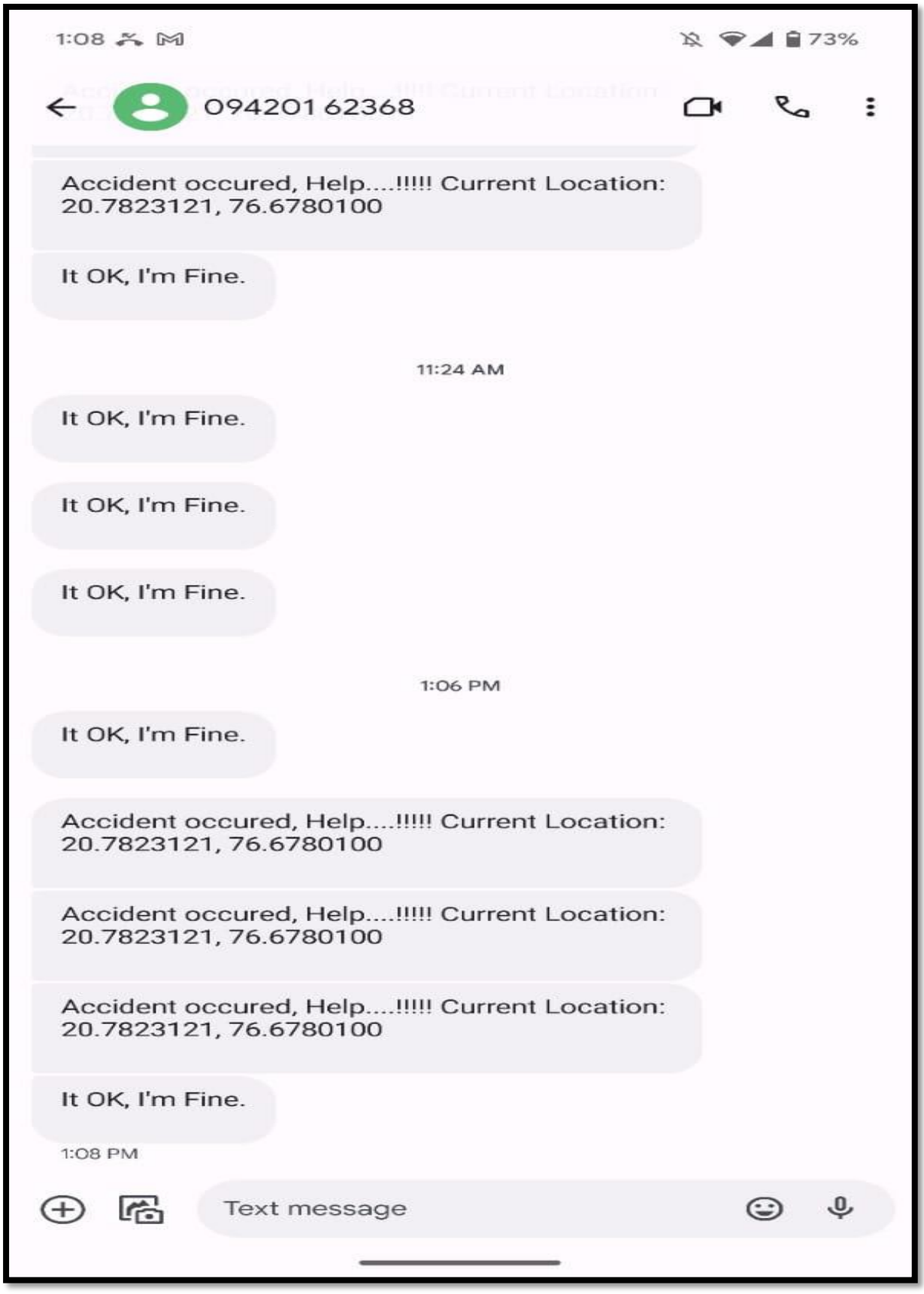

1:08
73%
094201 62368
Accident occured, Help....!!!!! Current Location: 20.7823121, 76.6780100
It OK, I'm Fine.
11:24 AM
It OK, I'm Fine.
It OK, I'm Fine.
It OK, I'm Fine.
1:06 PM
It OK, I'm Fine.
Accident occured, Help....!!!!! Current Location: 20.7823121, 76.6780100
Accident occured, Help....!!!!! Current Location: 20.7823121, 76.6780100
Accident occured, Help....!!!!! Current Location: 20.7823121, 76.6780100
It OK, I'm Fine.
1:08 PM
Text message

Fig.6.6

The hardware system is designed as two modules 1. Helmet module 2. Bike Module and the complete system are described in the following sections.

Helmet Module

- To power all the peripherals built into the helmet, a 12V adaptor is linked to the helmet. Only the ignition control operates when the rider is wearing a helmet. In an emergency, a limit switch is utilized to notify the family or any other authorized parties of the dire circumstances. The trigger signals regarding the status of switches are sent to the bike module through the RF Transmitter to enable the controlled action**.**

Bike Module

- GSM and GPS are built into the bike module in order to send emergency and accident alert messages to the family and/or authorized number. The ignition control indicator board is used to control the bike's ignition, and a sensor is included to detect an accident. The RF receiver receives alert signals from the helmet module and sends them to the controller, which takes the necessary actions requested by the rider.

6.2 ADVANTAGES :-

a) It will help to reduce the number of road accidents which are very frequent in a country like India where the traffic is very high.
b) It will help to create awareness about the need to wear helmet during bike riding.
c) The system will ensure that the motorbike will not start unless the rider is wearing a helmet and has not consumed alcohol.
d) The system will also alert the bike rider if any obstacle comes too close while riding the bike.
e) Also GSM technology is used to inform the family members in case of an accident.

6.3 APPLICATION :-

a) The system will ensure that the motorbike will not start unless the rider is wearing a helmet and has not consumed alcohol. Hence safety of person is ensured.
b) Also ,GSM technology is used to inform the family members in case of an accident. This project could be highly developed with upcoming technologies to provide further more safety and security to the vehicle systems.
c) The vehicle tracking system can be implemented. This will protect the vehicle from theft. This can also be used to ensure that rider is not misusing the bike.
d) The developed system senses the obstacles in front of the vehicle and so that the accidents due to static obstacles could be avoided.
e) In future if all the bike manufacturing companies include this system on each bike before the sell, accident rates will drastically all down.

CHAPTER 7

CONCLUSION AND FUTURE SCOPE

7.1 Conclusion:-

Road accidents are increasing day by day because the riders are not using the helmet and due to consumption of alcohol. In today's world, huge numbers of people are dying on road accidents. By using smart helmet, the accidents can be detected. The main target of the project is designing a smart helmet for accident avoidance and alcohol detection. The IR sensor checks if the person is wearing the helmet or not. The Gas sensor recognizes the alcoholic substance in the rider's breath. If the person is not wearing the helmet and if he consumes alcohol , the bike will not start. If there is no sign of alcoholic substance present and helmet is used, then only the bike will start. At the point when the rider met with an accident, the sensor recognizes the condition of the motorbike and reports the accident. Then the GPS in the bike will send the location of the accident place to main server of the nearby hospitals.

7.2 Future Scope:-

1.We can implement various bioelectric sensors on the helmet to measure various activities.
2. We can use small camera for the recording the drivers activity.
3. It can be used for passing message from the one vehicle to another vehicle by using wireless transmitter.

CHAPTER 8

REFERENCES :-

1) International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181 Published by, www.ijert.org NCETESFT - 2020 Conference Proceedings

2) International Journal of Electrical and Electronics Research ISSN 2348-6988 (online) Vol. 2, Issue 4, pp: (122-127), Month: October - December 2018, Available at: **www.researchpublish.com** Page | 122 Research Publish Journals
Smart Helmet Using GSM &GPS Technology for Accident Detection and Reporting System Manjesh N1, Prof. Sudarshan Raj2

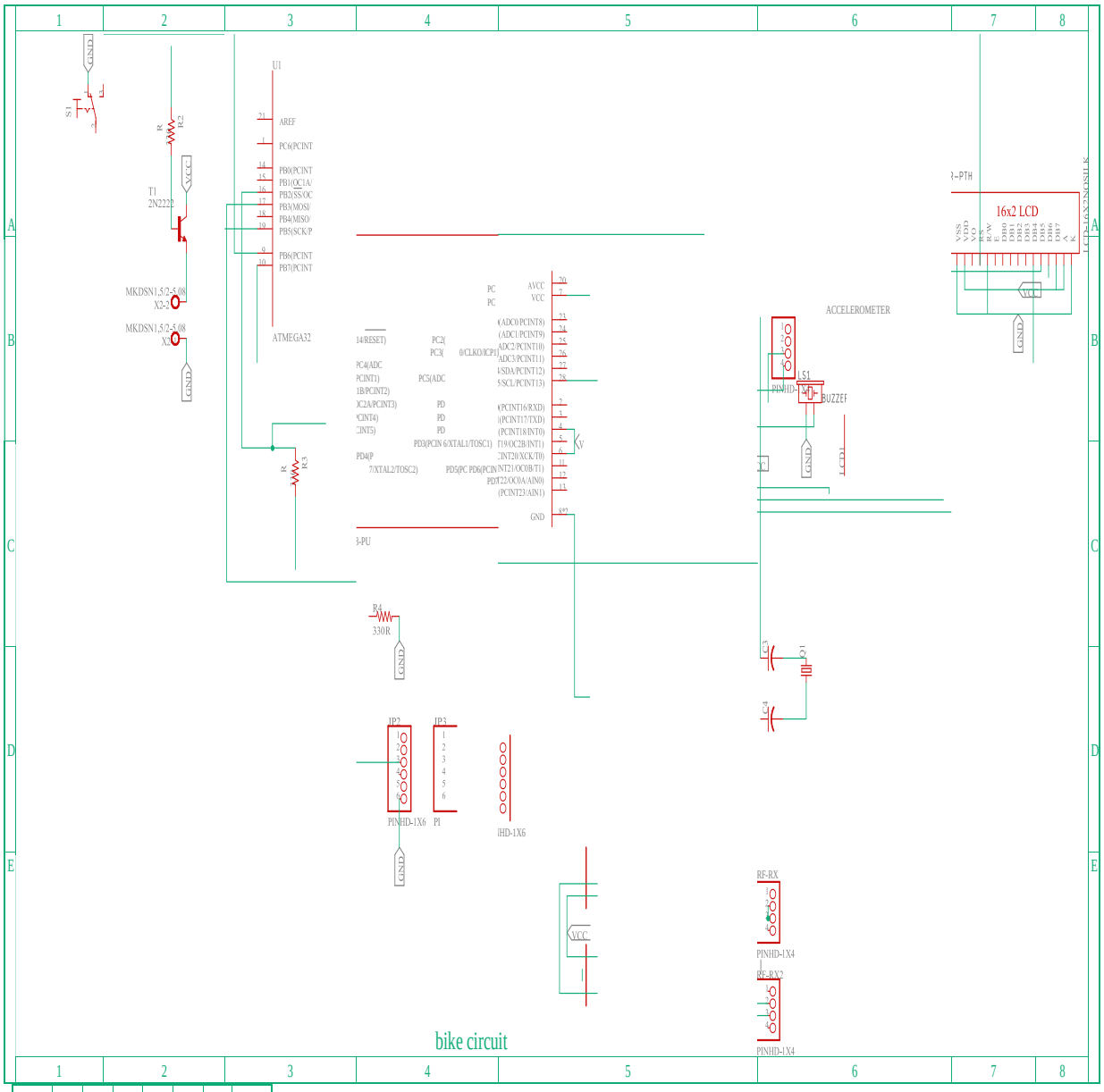
3) Helmet for Road Hazard Warning with Wireless Bike Authentication and Traffic Adaptive Mp3 Playback **International Journal of Science and Research (IJSR) ISSN (Online): 2319 - 7064K. Sudarsan1, P. Kumaraguru Diderot2**
Volume 3 Issue 3, March 2018 Paper ID: 020131130 **www.ijsr.net**

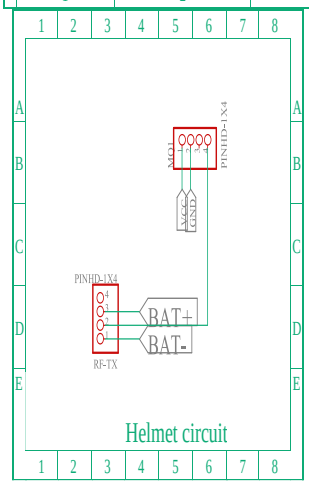
4) ISSN 2319 – 2518 www.ijeetc.com Vol. 4, No. 2, April 2020 © 2020 IJEETC. All Rights Reserved BIKE RIDER'S SAFETY USING HELMET Manasi Penta1*, Monali Jadhav1 and Priyanka Girme1

5) stats, and author profiles for this publication at:
https://www.researchgate.net/publication/331281166 Smart helmet for safe driving
Article *in* E3S Web of Conferences · January 2019

APPENDEX :-

Circuit Diagram:-





CODE :-

```
#include <LiquidCrystal.h>
#include <Wire.h>
//#include "I2Cdev.h"
#include <MPU6050.h>
#include <SoftwareSerial.h>
#include <RH_ASK.h> // Include RadioHead Amplitude Shift Keying Library
#include <SPI.h> // Include dependant SPI Library

// Create Amplitude Shift Keying Object
RH_ASK rf_driver;

//Create software serial object to communicate with mySerial800L
SoftwareSerial mySerial(3, 2); //mySerial800L Tx & Rx is connected to Arduino #3 & #2

int _timeout;
String _buffer;
String number = "+917785851717"; //-> change with your number
// uncomment "OUTPUT_READABLE_ACCELGYRO" if you want to see a tab-separated
// list of the accel X/Y/Z and then gyro X/Y/Z values in decimal. Easy to read,
// not so easy to parse, and slow(er) over UART.
#define OUTPUT_READABLE_ACCELGYRO

#if I2CDEV_IMPLEMENTATION == I2CDEV_ARDUINO_WIRE
#include "Wire.h"
#endif
const int ignsw = A2;
const int buzzer = 5;


MPU6050 accelgyro;

int16_t ax, ay, az;
int16_t gx, gy, gz;

unsigned long int z;
bool t, y;
//LCD Constants Start
const int rs = 13, en = 12, d4 = 7, d5 = 10, d6 = 9, d7 = 8;
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);
//LCD End
int i, h;
float d;

// Set buffer to size of expected message
uint8_t buf[7];
```

```
uint8_t buflen = sizeof(buf);

void setup() {
  pinMode(ignsw, INPUT_PULLUP);
  pinMode (buzzer, OUTPUT);
  // Initialize ASK Object
  rf_driver.init();

#if I2CDEV_IMPLEMENTATION == I2CDEV_ARDUINO_WIRE
  Wire.begin();
#elif I2CDEV_IMPLEMENTATION == I2CDEV_BUILTIN_FASTWIRE
  Fastwire::setup(400, true);
#endif
  accelgyro.initialize();
  mySerial.begin(9600);
  Serial.begin(9600);
  lcd.begin(16, 2);
  lcd.setCursor(0, 0);
  lcd.print("Smart Helmet");
  lcd.setCursor(0, 1);
  lcd.print("By Group 09");
  delay(1000);
  lcdinit();
  mySerial.println("AT");
  Serial.println("AT Sent");
  delay(2000);
  mySerial.println("AT+CSQ");
  delay(2000);
  mySerial.println("AT+CMGF=1");    //Sets the GSM Module in Text Mode
  delay(1000);
  mySerial.println("AT+CMGS=\"" + number + "\""); //Mobile phone number to send message
  delay(1000);
  String SMS = "It OK, I'm Fine.";
  mySerial.println(SMS);
  delay(200);
  mySerial.println((char)26);// ASCII code of CTRL+Z
  delay(1000);
}
void lcdinit() {
  lcd.clear();
  lcd.print("Intialising");
  lcd.setCursor(0, 1);
  lcd.print("Helmet..");
  delay(900);
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Checking Helmet..");
```

```
  delay(900);
}
void IGN() {
  lcd.clear();
  lcd.print("Ignition ON");
  delay(500);
  lcd.clear();
  lcd.print("Vehicle Started");
  delay(700);
  accel();
}
void loop() {
  rf_driver.recv(buf, buflen);
  delay(900);
  i = digitalRead(ignsw);
  String t = (char*)buf;
  Serial.println(t);
  if (t == "Helmet") {
    lcd.clear();
    lcd.print("Helmet Weared");
    lcd.setCursor(0, 1);
    lcd.print("No Alchohol");
    delay(500);
    digitalWrite(buzzer, LOW);
    if (i == LOW) {
      Serial.println("SW");
      IGN();
    }
    else {
      lcd.clear();
      lcd.print("Ignition is OFF");
      delay(700);
      lcd.setCursor(0, 1);
      lcd.print("Turn Ignition On");
      delay(500);
    }
  }

  if (t == "Hel_Fa") {
    lcd.clear();
    lcd.print("Helmet Not Weared");
    digitalWrite(buzzer, HIGH);
    delay(400);
    digitalWrite(buzzer, LOW);
    lcd.clear();
    lcd.print("Helmet Not Weared");
    delay(700);
```

```
  }

  if (t == "MQ3_Fa") {
    digitalWrite(13, HIGH);
    lcd.clear();
    lcd.print("Alchohol Detected");
    digitalWrite(buzzer, HIGH);
    delay(200);
    digitalWrite(buzzer, LOW);
    delay(200);
  }

  accelgyro.getAcceleration(&ax, &ay, &az);
  accelgyro.getRotation(&gx, &gy, &gz);

  //#ifdef OUTPUT_READABLE_ACCELGYRO
  //  //  display tab - separated accel / gyro x / y / z values
  //  Serial.print("a/g:\t");
  //  Serial.print(ax); Serial.print("\t");
  //  Serial.print(ay); Serial.print("\t");
  //  Serial.print(az); Serial.print("\t");
  //  Serial.print(gx); Serial.print("\t");
  //  Serial.print(gy); Serial.print("\t");
  //  Serial.println(gz);
  //#endif
}


void accel() {
  Serial.println("Testing device connections...");
  Serial.println(accelgyro.testConnection() ? "MPU6050 connection successful" : "MPU6050
connection failed");
  if (gz >= 2500) {
    z = true;
  }
  while (z) {
    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("Accident Occured");
    delay(900);
    lcd.clear();
    lcd.print("Emergency!!!");
    delay(900);
    gsm();

  }
}
```

```
void gsm() {
  Serial.println("Sending Emergency Message");
  lcd.clear();
  lcd.print("Sending ");
  lcd.setCursor(0, 1);
  lcd.print("Emergency Message");
  mySerial.println("AT");
  Serial.println("AT Sent");
  delay(2000);
  mySerial.println("AT+CSQ");
  delay(2000);
  mySerial.println("AT+CMGF=1");    //Sets the GSM Module in Text Mode
  delay(1000);
  mySerial.println("AT+CMGS=\"" + number + "\""); //Mobile phone number to send message
  delay(1000);
  String SMS = "Accident occured, Help....!!!!! Current Location:
https://maps.app.goo.gl/vUQbF4EHJdtBen2EA";
  mySerial.println(SMS);
  delay(200);
  mySerial.println((char)26);// ASCII code of CTRL+Z
  delay(1000);
}
```

ABBREVIATION:-

GPS - Global Positioning System

GSM - Global System for Mobile Communication

LCD - Liquid Crystal Display

RF - Radio Frequency

IR - Infrared Radiation

MQ3 - Alcohol Vapor (Gas detected type sensor)

MIX - Maximum

MIN - Minimum