ABSTRACT

Safety has always been a primary concern for two-wheeler riders, given the high risk of accidents and fatalities associated with non-compliance to safety measures. This project proposes a Wireless Safety Control System designed to enhance the safety of two-wheeler riders through advanced monitoring and control technologies. The system integrates multiple features, including helmet detection, alcohol level monitoring, accident alert mechanisms, and remote safety compliance verification, to ensure rider safety in real-time.

A camera-based helmet detection module verifies whether the rider is wearing a helmet before allowing the vehicle to start. An alcohol detection sensor checks the rider's breath for alcohol levels and prevents ignition in case of intoxication. A GSM-based emergency notification system sends instant SMS alerts to pre-configured contacts in the event of a crash or distress. Additionally, the system features a servo motor-controlled engine lock mechanism that enforces compliance with safety protocols.

The solution is complemented by a cloud-hosted IoT platform that logs safety compliance data and enables real-time monitoring of vehicle and rider status. The hardware includes microcontrollers such as ESP32 and ATMEGA328P, interfaced with sensors, GSM modules, and servo motors, ensuring seamless communication and control. The system's design prioritizes cost-efficiency, reliability, and ease of implementation.

This wireless safety control system has the potential to significantly reduce road accidents involving two-wheelers by promoting adherence to safety protocols and providing timely assistance during emergencies.

CHAPTER - 1

INTRODUCTION

Two-wheeler transportation, including motorcycles and scooters, has become a primary mode of commuting due to its affordability, efficiency, and ease of navigation in congested traffic. However, with the increasing number of two-wheeler riders globally, the rate of accidents and injuries associated with their use has also risen, making rider safety a paramount concern. Despite advancements in vehicle safety technology, two-wheeler riders remain particularly vulnerable due to the lack of protective barriers, limited visibility, and the risks posed by external factors like road conditions, weather, and traffic behaviour.

In response to these challenges, there has been a growing interest in developing innovative safety systems aimed at protecting riders. One such development is the wireless safety control system, which leverages cutting-edge technologies such as wireless communication, sensors, and real-time data analysis to enhance rider safety. These systems can provide an additional layer of protection by alerting the rider to potential hazards, controlling critical functions in emergency situations, or even preventing accidents through automated interventions.

The concept of *Wireless Safety Control for Riders of Two-Wheelers* focuses on creating a system that utilizes wireless technologies to monitor and control various aspects of the rider's safety. This system can include features such as crash detection, collision avoidance, emergency alerts, real-time tracking, and rider condition monitoring, all of which are essential for minimizing accidents and ensuring rapid response in critical situations.

The primary objective of this report is to explore the feasibility, design, and potential benefits of implementing wireless safety systems in two-wheelers. By integrating modern technologies like IoT (Internet of Things), sensors, and wireless communication, these systems can significantly improve rider safety, reduce accident rates, and provide greater peace of mind for two-wheeler users worldwide. The report will discuss the key components of such systems, the challenges involved in their implementation, and the potential impact they could have on two-wheeler safety.

Two-wheelers, including motorcycles and scooters, are widely used for daily commuting due to their efficiency, fuel economy, and ability to navigate through congested traffic. However, despite their advantages, two-wheelers are associated with a higher risk of accidents compared to other vehicles. Riders are more exposed to road hazards, weather conditions, and the risk of collisions, making safety a significant concern. In fact, road traffic statistics reveal that two-wheeler accidents contribute to a substantial portion of injuries and fatalities, particularly in urban environments.

To address these safety challenges, the integration of advanced technologies into two-wheelers has become a critical focus. One promising solution is the development of wireless safety control systems that can enhance the protection of riders. Wireless safety systems employ a combination of sensors, communication technologies, and real-time data analysis to detect potential hazards, monitor the rider's condition, and automatically intervene in critical situations to prevent accidents.

The concept of wireless safety control for rider of two-wheeler aims to leverage the power of wireless communication and smart technology to provide an additional layer of security for riders. Such systems can include features like collision detection, automatic braking, real-time alerts, tracking and location services, as well as communication with emergency services. These features work together to reduce the likelihood of accidents, ensure a faster response in emergencies, and increase overall rider awareness.

This report explores the design, functionality, and potential benefits of wireless safety systems for two-wheeler riders. It highlights the components of such systems, the technology involved, and how these innovations can reduce accident rates and improve rider safety. Through the implementation of wireless safety controls, the aim is to create a safer, more efficient riding experience for millions of two-wheeler users worldwide**.**

CHAPTER - 2

LITERATURE REVIEW

The development of wireless safety control systems for two-wheeler riders has gained considerable attention in recent years due to the increasing number of accidents and fatalities involving motorcycles and scooters. A wide range of studies, research papers, and technological innovations have explored the application of wireless communication, sensors, and real-time data analysis to enhance the safety of two-wheeler riders. This literature review examines key research and advancements in this field, focusing on the integration of wireless technologies to address rider vulnerabilities.

1. Two-Wheeler Safety and Challenges

Two-wheeler riders face unique safety challenges compared to other road users, as they are less protected in the event of a collision. The most common causes of two-wheeler accidents include loss of control, road surface issues, sudden obstacles, speeding, and impaired visibility. According to the World Health Organization (WHO), road traffic injuries are a leading cause of death globally, with motorcyclists and cyclists making up a significant proportion of fatalities. In many cases, these accidents are preventable with the aid of safety technologies.

Recent studies, such as those by Adekoya and Uddin (2020), highlight that while motorcycles account for a significant share of global road traffic, there is still a lack of adequate safety measures in terms of crash avoidance and rider protection. This gap has fueled interest in exploring wireless systems that can assist in accident prevention and enhance emergency response.

2. Technological Innovations in Motorcycle Safety

Several technological advancements have been explored to improve rider safety. A major area of focus has been on the use of **Advanced Driver Assistance Systems (ADAS)**, commonly found in automobiles, and adapting them for two-wheelers. Key innovations include:

3. Wireless Communication Technologies

Wireless communication technologies, such as **Bluetooth, Zigbee, and V2X (Vehicle-to-Everything)**, have proven to be effective in transmitting data between vehicles, infrastructure, and the rider's devices. V2X communication allows two-wheelers to interact with surrounding vehicles, infrastructure (e.g., traffic lights), and road hazard sensors to improve situational awareness.

4. Crash Detection and Accident Prevention

Wireless safety systems that can detect and respond to crashes are a significant advancement in motorcycle safety. A number of studies have focused on **crash detection algorithms** that use sensors like accelerometers, gyroscopes, and GPS to detect sudden changes in speed or orientation, indicative of a crash.

5. Challenges in Implementation

While the potential for wireless safety systems is significant, several challenges remain in their implementation:

6. Future Directions and Opportunities

As wireless safety technologies continue to evolve, there is great potential for integrating more advanced features into two-wheeler safety systems. Future research could focus on enhancing machine learning algorithms for better hazard prediction, developing more energy-efficient systems, and creating universal standards for wireless communication in motorcycles. Furthermore, there is a growing interest in combining rider-centric data with smart city infrastructure to create a more connected and safe transportation environment for two-wheeler riders.

CHAPTER - 3

PROBLEM DEFINITION AND MOTIVATION

Two-wheeler riders face significantly higher risks compared to drivers of other vehicles due to their increased exposure to road hazards, lack of physical protection, and limited safety mechanisms. Despite motorcycles and scooters being a popular mode of transportation globally, accounting for a substantial share of road traffic, the safety of two-wheeler riders continues to be a major concern. In many countries, the number of two-wheeler accidents and fatalities remains alarmingly high, making rider safety a critical issue.

The absence of advanced safety systems that are readily available in four-wheel vehicles—such as airbags, automatic braking, and collision avoidance technologies—leaves riders highly vulnerable in the event of an accident. Traditional safety measures like helmets and protective gear offer limited protection in extreme cases, particularly in high-speed or high-impact collisions. Furthermore, rider behaviours such as speeding, distractions, or fatigue can exacerbate the risk of accidents.

Existing technologies aimed at enhancing two-wheeler safety are often fragmented or underdeveloped, and there is a lack of integrated solutions that provide real-time protection and immediate responses to potential hazards. The challenge, therefore, is to develop an effective *wireless safety control system* that can enhance rider awareness, predict accidents before they occur, and provide automatic intervention in critical situations.

The problem is compounded by the fact that current systems fail to seamlessly integrate the rider with the vehicle and surrounding infrastructure. As a result, the rider's ability to react to dangerous situations may be limited, and the motorcycle itself lacks the capability to take proactive safety actions autonomously.

CHAPTER - 4

OBJECTIVES

The objectives of a Wireless Safety Control System for Two-Wheeler Riders focus on addressing the core safety challenges faced by motorcyclists, including accident prevention, real-time hazard detection, emergency response, and improved rider awareness. By leveraging wireless technologies, sensors, and communication networks, the system can provide proactive safety measures that reduce the risks associated with two-wheeler travel. The ultimate goal is to create a comprehensive safety solution that saves lives, enhances the rider's experience, and fosters the widespread adoption of safer motorcycles on the road.

• A wireless Safety control for rider of two-wheeler is used to protect the rider .

• To prevent the accident.

• To send the message to parents ,police, friends through GSM.

• To send the live location through GPS.

• The alcohol sensor can help detect if the rider is under the influence of alcohol. If alcohol safe limits, the system can prevent the rider from starting their vehicle, or if alcohol levels exceed overlimit then bike will not started. Levels exceed

• If rider is drowse then eye blink sensor will detect and bike speed will be reduce.

• By using the end switch we can detect the rider is wearing the helmet or not.

• The goal of a two-wheeler rider safety system is to reduce the number of accidents.

CHAPTER - 5

WORKING PRINCIPLE

Figure:5.1 Working Principle

The **Wireless Safety Control System** on the transmitter side uses a combination of **alcohol sensors**, **eye-blink sensors**, and a **gyroscope** to monitor the rider's condition. These sensors detect whether the rider is sober, alert, and balanced. The data is processed and transmitted wirelessly to the bike using **RF transmission**. The system is powered by a **12V battery**, ensuring continuous monitoring and communication to keep the rider safe. If any dangerous conditions are detected, the system can trigger alerts or safety actions, helping to prevent accidents.

1. **Monitoring the Rider's Condition**
   - **Alcohol Detection**: The alcohol sensor continuously monitors the air the rider exhales. When the rider exhales into the helmet or a small mouthpiece, the sensor checks for the presence of alcohol. If alcohol levels are detected above a threshold (indicating impairment), the system registers a warning.
   - **Eye Blink Detection**: The eye-blink sensor uses optical sensors or cameras to monitor the rider’s eyes. The system tracks the frequency and duration of the rider’s blinks. If the blink rate slows down or the rider's eyes remain closed for too long (a sign of drowsiness or fatigue), the system detects it and marks the rider as potentially unsafe.
   - **Gyro Sensor**: The gyroscope detects changes in orientation and sudden movements. If the rider tilts too much (suggesting a possible fall) or experiences a sudden, sharp movement (like a crash or jerk), the gyro sensor registers this data.
2. **Data Collection and Processing**:
   - All the sensor data (alcohol level, eye-blink status, and gyro movement) is continuously monitored and processed by a small **microcontroller** (typically embedded within the helmet or wearable device).
   - The microcontroller decides whether there is any danger to the rider based on predefined thresholds for alcohol level, eye blink rate, and sudden movements detected by the gyroscope.

3. **Wireless Transmission (RF Transmission)**:
   - Once the microcontroller processes the data and detects any danger (e.g., alcohol level exceeding the safe limit, drowsiness, or a fall), the system triggers the **RF transmitter**.
   - The RF transmitter converts the processed sensor data into radio signals and transmits it wirelessly to the **RF receiver** mounted on the bike.
4. **Powering the System**:
   - The entire system is powered by a **12V rechargeable battery**, which supplies power to the sensors, microcontroller, and RF transmitter. The 12V battery is typically designed to be long-lasting and durable, ensuring continuous operation throughout the ride.
5. **Communication to the Bike (Receiver Side)**:
   - The **RF receiver** installed on the bike receives the signals from the helmet or wearable device.
   - If the receiver detects unsafe conditions (e.g., alcohol detected, rider is drowsy, or a fall is detected), it can trigger appropriate actions like sending an alert to the rider (through vibrations or sounds), alerting emergency services, or activating the bike's safety features (e.g., emergency stop, automatic lights, or sending the rider's location to emergency contacts).

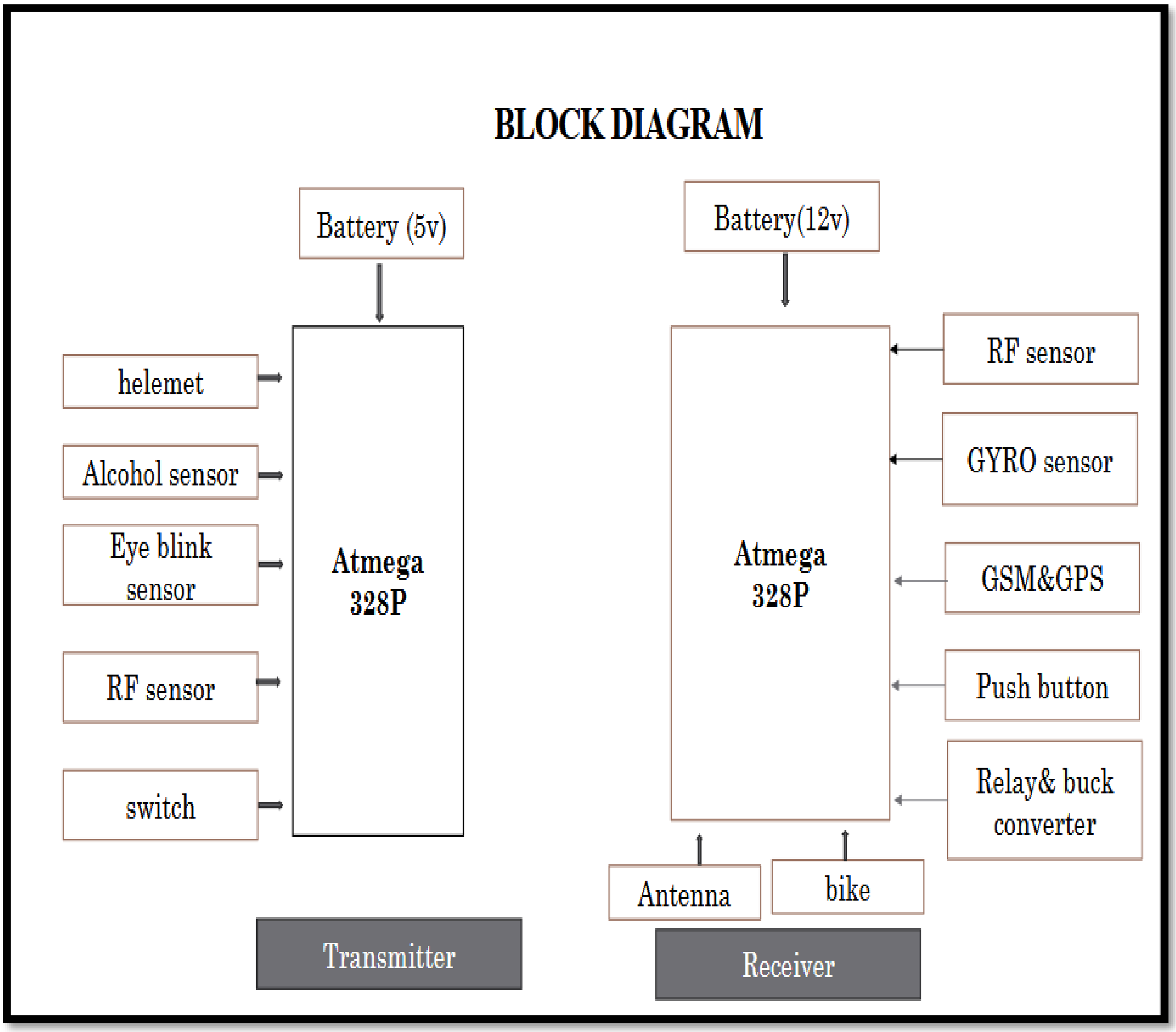


Figure:5.2 Block Diagram

Transmitter Side:

1. Battery (5V):
   - Powers the components of the transmitter circuit.
2. Helmet:
   - Indicates the presence of the helmet in the system. Could involve a detection mechanism ensuring the helmet is worn.
3. Alcohol Sensor:
   - Detects the presence of alcohol in the rider’s breath. Prevents the bike from starting if alcohol is detected.
4. Eye Blink Sensor:
   - Monitors the rider's eye blink patterns to detect drowsiness or unconsciousness.
5. RF Sensor:
   - Communicates wirelessly with the receiver module on the bike. Ensures the bike operates only when the helmet is in use.
6. Switch:
   - Likely used for system activation or manual input for the rider.
7. Atmega328P:
   - A microcontroller that processes signals from the sensors and transmits data wirelessly to the receiver.
8. Antenna:
   - Sends signals from the transmitter to the receiver.

Receiver Side:

1. Battery (12V):
    - Powers the components of the receiver circuit and potentially the bike's systems.
2. RF Sensor:
    - Receives signals from the transmitter to verify conditions like helmet usage and other safety checks.
3. GYRO Sensor:
    - Monitors the bike’s tilt or orientation to detect accidents or unsafe riding conditions.
4. GSM & GPS Module:
    - Provides location tracking and communication for emergency alerts or tracking purposes in case of an accident.
5. Push Button:
    - Could serve as an emergency or control button for manual override or SOS activation.
6. Relay & Buck Converter:
    - The relay controls the bike’s ignition system, enabling or disabling it based on safety conditions.
    - The buck converter adjusts the voltage as needed for different components.
7. Bike:
    - Represents the motorbike system that the receiver controls.
8. Antenna:
    - Communicates with the transmitter for data exchange.

CHAPTER - 6

RESEARCH METHODOLOGY

The entire project is divided into number of phases which are carried out step by step. The plan of action of the project step wise is given below:

1. Conduct a thorough review of existing safety systems for two-wheeler riders and define the key problems and gaps in current solutions.
2. Identify suitable materials and components for the wireless safety control system, including sensors, communication modules, and safety devices.
3. Interface a camera with a microcontroller to ensure the rider wears a helmet, integrated with a unique QR-based identification system to authorize the vehicle start.
4. Design a touch-free emergency notification system using wireless communication protocols for alerting in case of accidents or mishaps.
5. Incorporate a breath sensor module to prevent the rider from starting the vehicle under the influence of alcohol.
6. Develop a servo motor-controlled engine locking system that is wirelessly activated based on safety compliance checks.
7. Connect a GSM modem to a microcontroller to send SMS notifications to emergency contacts in case of a crash or rider distress.
8. Host a cloud-based dashboard for tracking and managing safety metrics and logs of the vehicle.
9. Design a system for tracking safety compliance data (e.g., helmet detection, alcohol test) and generating reports.
10. Create hardware designs and detailed schematics for the wireless safety control system.
11. Manufacture and assemble the printed circuit boards (PCBs) for the system.

CHAPTER - 7

HARDWARE USED:

- **ATMEGA328P CONTROLLER**

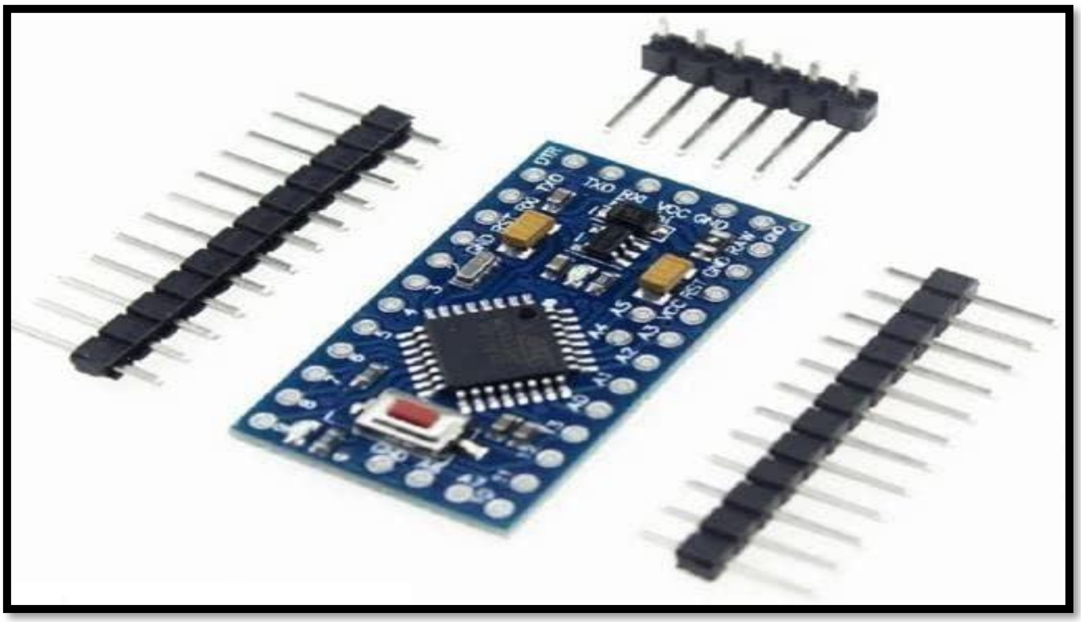


Figure:7.1 Atmega328p

Mini pro is a micro-controller board. It has 14 digital input/output pins (of which 6 can be used as pawn outputs), eight analogy inputs, a 16mhz resonator, a reset button, mounting hole pin head. Technical parameters: 14 digital input/output ports R^x, T^x d2-d13 of, 8 analogy input port a0 to a7 the TTL level serial transceiver port R^x/T^x 6 paw ports, d3,, d5, d6, d9, d10, d11 using Atmel atmega328p-au micro controller supports serial download support for external 3. 3v ~ 12v DC power supply support 9v battery-powered clock frequency 16mhz dimensions: 33. 3 * 18. 0 (mm).

➢ Features

- **Brand** Robodoc
- **Memory Storage Capacity** 32 KB
- **Connectivity Technology** USB
- **Included Components** 1 x Nano V3.0 CH340 Chip with Mini USB Cable Compatible with Arduino (Unsoldered)
- **CPU Manufacturer** Atmel

➢ About this item

- Microcontroller: CH340
- Operating Voltage: 5V
- Input Voltage (recommended): 7-12V
- Digital I/O Pins: 54
- Analog Input Pins: 16

➢ Buzzer

The buzzer consists of an outside case with two pins to attach it to power and ground. Inside is a piezo element, which consists of a central ceramic disc surrounded by a metal (often bronze) vibration disc. When current is applied to the buzzer it causes the ceramic disk to contract or expand. Changing the this then causes the surrounding disc to vibrate. That's the sound that you hear. By changing the frequency of the buzzer, the speed of the vibrations changes, which changes the pitch of the resulting sound.

Figure:7.2 Buzzer

- **DISPLAY**
- **16X2 LCD interface (JHD162A – HD44780 compatible Display Controller):-**

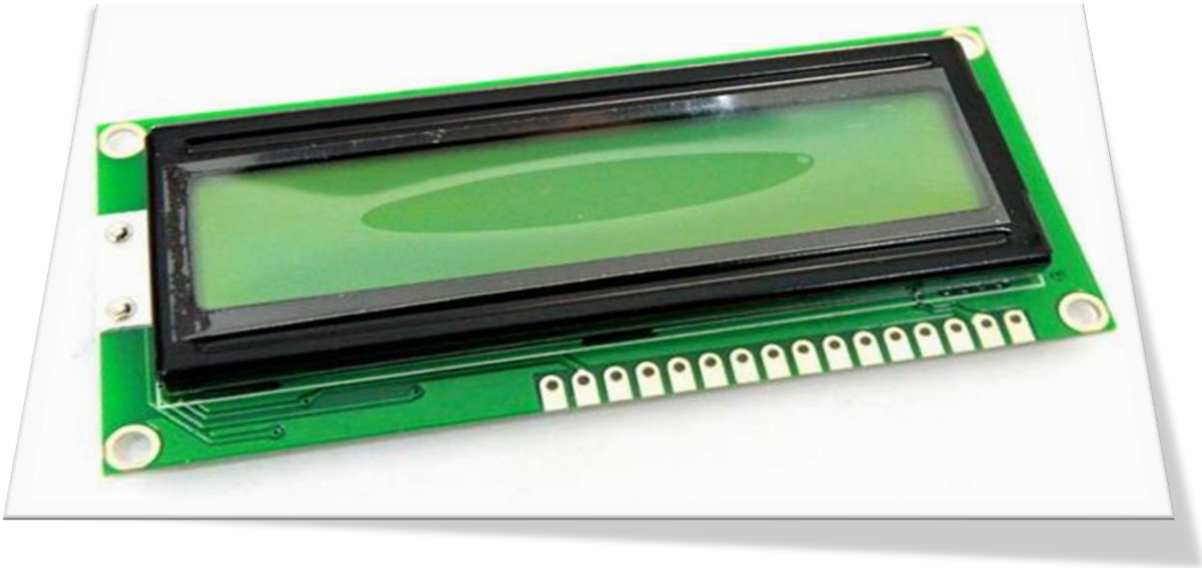
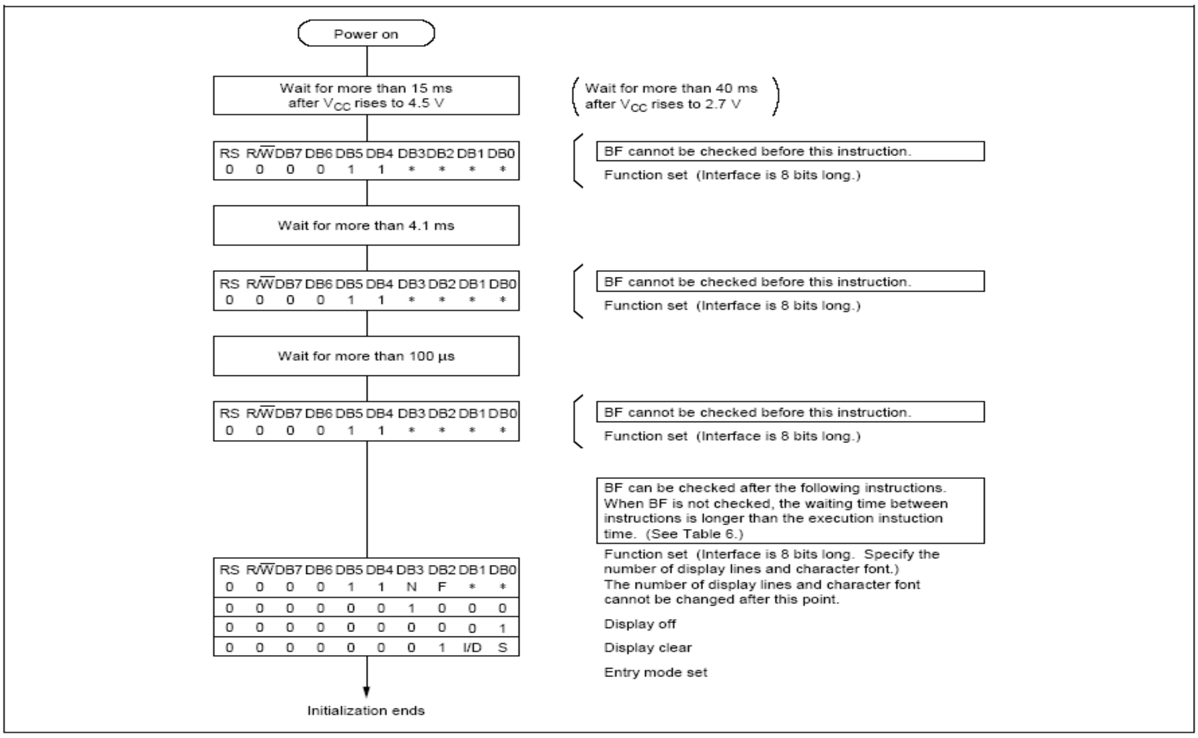
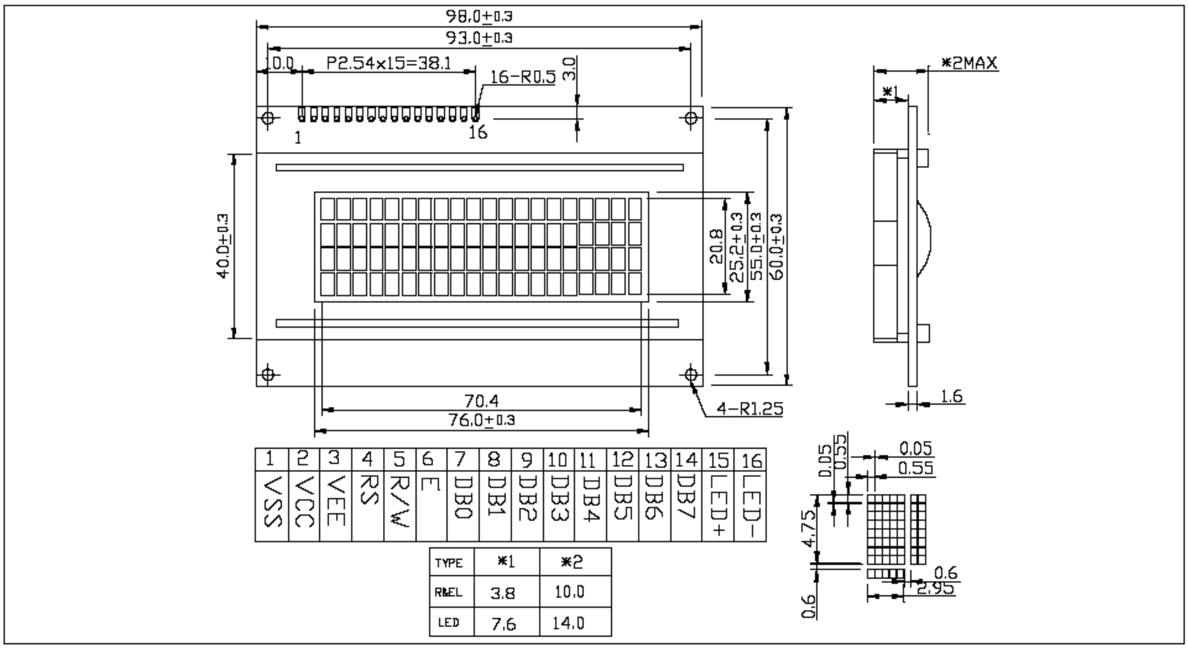


Figure:7.3 Display

The LCD display can be interfaced to the system in either 4 bit or 8 bit data interface length mode but we have selected an 8 bit interface mode for faster display data update. The previous mode could be used in applications where the number of I/O pins availability is limited i.e. A smaller MCU with less I/O Pins. The LCD is interfaced to the MCU with data lines connected to port 1 of the 8051 and control lines RS, EN connected to port 3.2, 3.3 respectively. The R/W control line is permanently tied to ground for write only operations to the LCD display. The program is coded BASCOM8051 basic assembler for 8051 MCU's. The assembled program in the form of an Intel HEX file is generated by the assembler which is further uploaded to the 8051 target board using a In circuit programming software – Flash Magic developed by ESA, for in circuit programming of NXP micro controllers.



LCD Display Initialization Procedure



PIN CONFIGURATION

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VSS	Vcc	VEE	RS	R/W	E	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7	LED+	LED-

Figure:7.4 LCD Display Module Mechanical Dimensions & Pin Configurations

➢ 12V 3Ah Li-ion Lithium Rechargeable Battery with BMS Protection | 12volt 3000mAh- LRSA

Product details

Number of Batteries	3 Cell Lithium Ion batteries required.
Brand	LRSA
Battery Cell Composition	Lithium Ion
Recommended Uses For Product	Power Tool
Voltage	12 Volts
Item Weight	200 Grams
Amperage	3 Amps

About this item

- Small in size and weight compared to Ni-Cd, Ni-MH, and Lead Acid Batteries and Very High in Power.
- Long life with full capacity for up to 1000~1500 Approx charge cycles
- Maximum Capacity – 5 AH or 5000 mah
- 4 months Warranty against Manufacturing Defects Only.

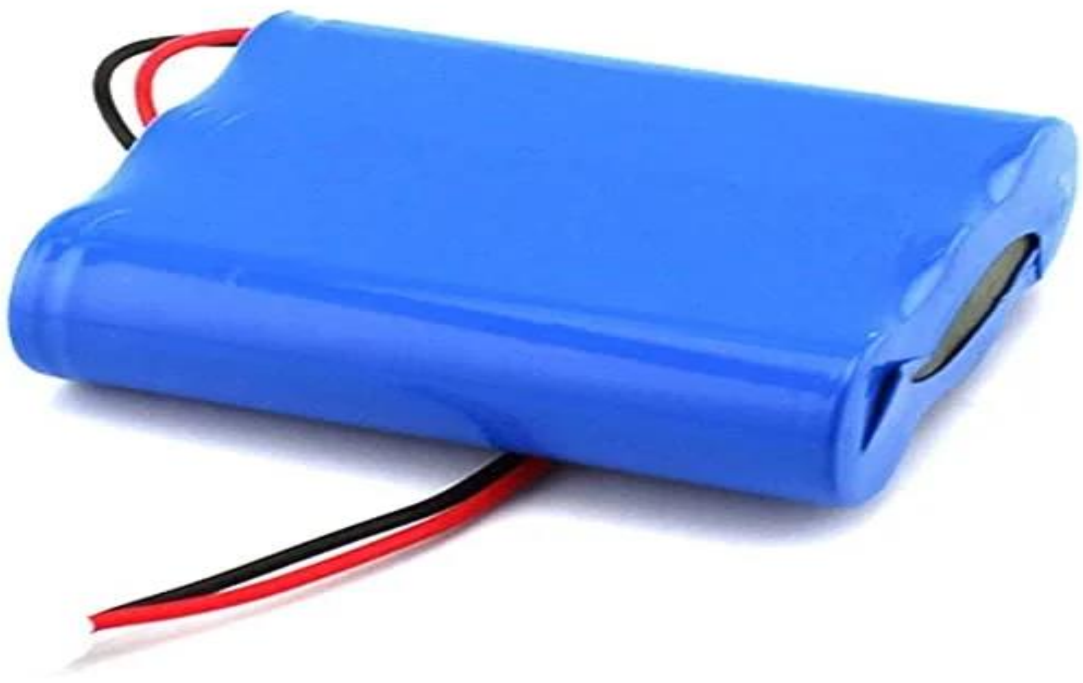


Figure:7.5 Li-ion Lithium Rechargeable Battery

This battery is protected with a BMS connection. This means the battery is with overcharge protection. Low discharge protection. This battery weight is very low than your normal lead-acid battery. And can provide appropriate Power to your Motor. This Battery provides a lifespan of max of 10 years. The Lithium battery cells used in this battery are also used in electric vehicles such as cars, motorbikes, and Mobile batteries. Lithium battery is the latest technology product in the battery storage market, It has many advantages including: 1) faster charging 2) It is maintenance-free 3) Longer Battery life – Compared to Lead-acid and SMF, a Lithium battery has 1000 cyclic life which translates into 10 years of useable life. 4) lightweight – The weight of a lithium battery is 1/4th of Other comparable batteries such as SMF, and lead-acid batteries.

➢ Servo Motors

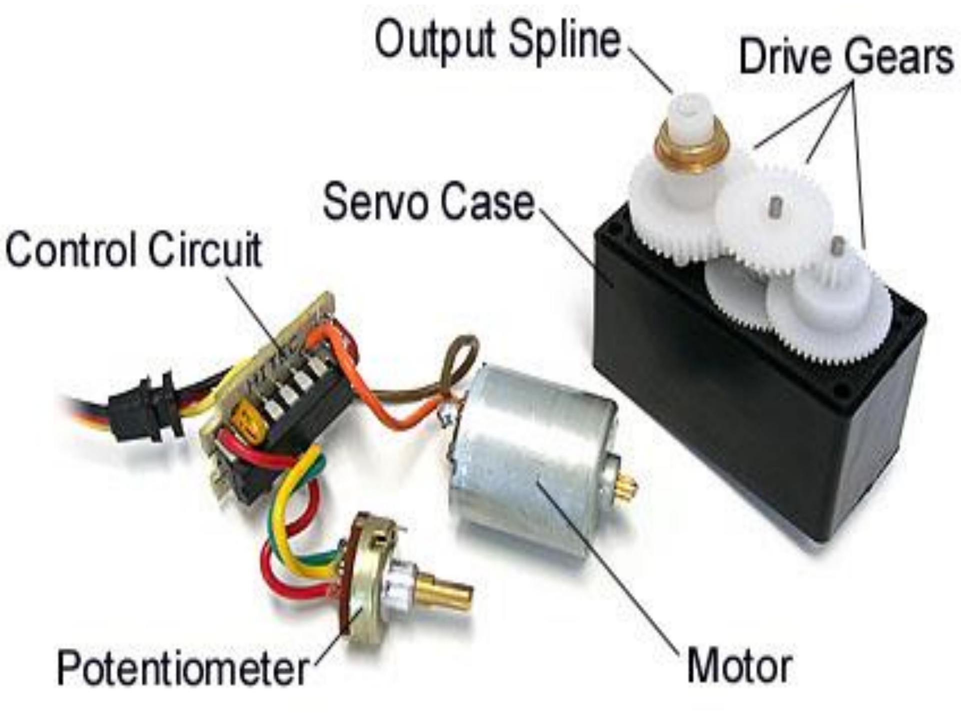
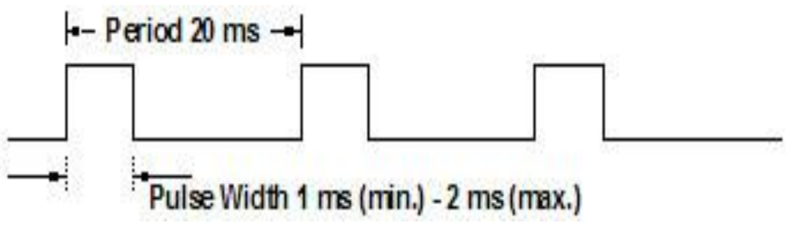


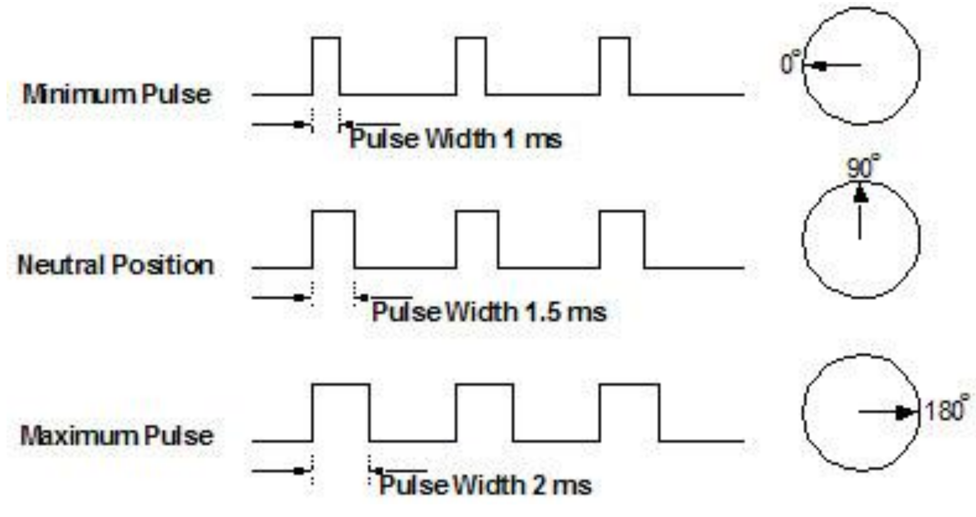
Figure:7.6 Servo Motors

Servos are controlled by sending them a pulse of variable width. The control wire is used to send this pulse. The parameters for this pulse are that it has a minimum pulse, a maximum pulse, and a repetition rate. Given the rotation constraints of the servo, neutral is defined to be the position where the servo has exactly the same amount of potential rotation in the clockwise direction as it does in the counter clockwise direction. It is important to note that different servos will have different constraints on their rotation but they all have a neutral position, and that position is always around 1.5 milliseconds (ms).



The angle is determined by the duration of a pulse that is applied to the control wire. This is called Pulse width Modulation. The servo expects to see a pulse every 20 ms. The length of the pulse will determine how far the motor turns. For example, a 1.5 ms pulse will make theWhen these servos are commanded to move they will move to the position and hold that position. If an external force pushes against the servo while the servo is holding a position, the servo will resist from moving out of that position. The maximum amount of force the servo can exert is the torque rating of the servo. Servos will not hold their position forever though; the position pulse must be repeated to instruct the servo to stay in position.

When a pulse is sent to a servo that is less than 1.5 ms the servo rotates to a position and holds its output shaft some number of degrees counter clockwise from the neutral point. When the pulse is wider than 1.5 ms the opposite occurs. The minimal width and the maximum width of pulse that will command the servo to turn to a valid position are functions of each servo. Different brands, and even different servos of the same brand, will have different maximum and minimums. Generally the minimum pulse will be about 1ms wide and the maximum pulse will be 2 ms wide.



Another parameter that varies from servo to servo is the turn rate. This is the time it takes from the servo to change from one position to another. The worst case turning time is when the servo is holding at the minimum rotation and it is commanded to go to maximum rotation. This can take several seconds on very high torque servos.

➤ ANTENNA

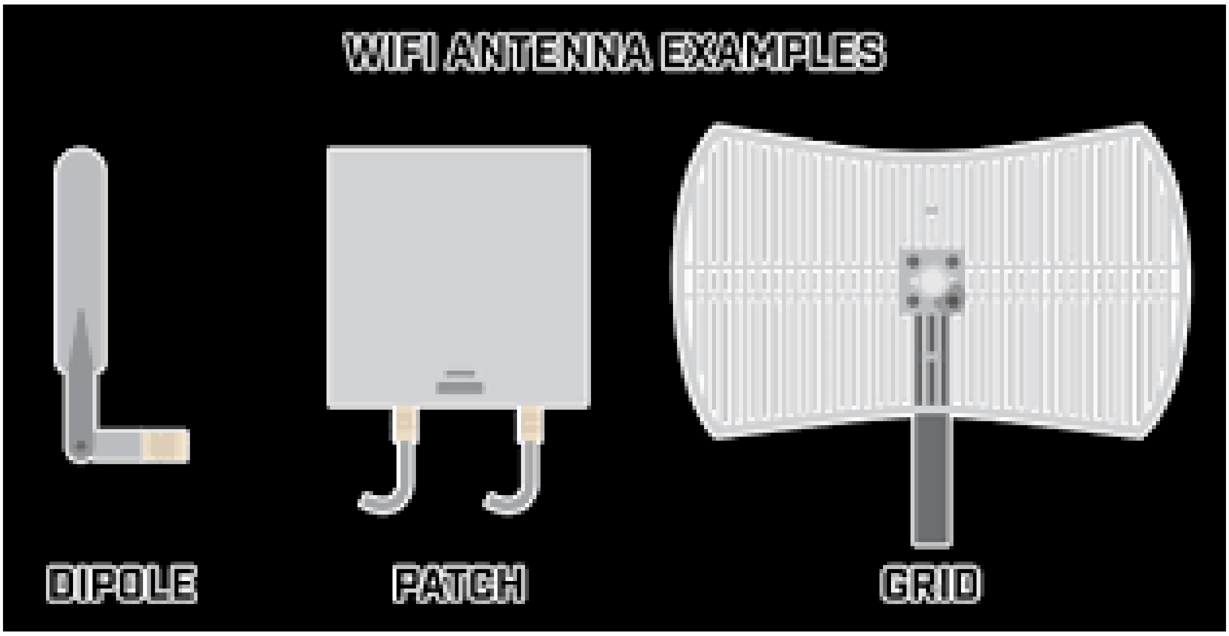


Figure:7.7 Antenna

Several varying types of antennas exist for Wi Fi, each with a specific purpose for how and when they should be used. Different types of antennas can be found anywhere from small office settings to outdoor camping grounds. While there are many types of antennas, all of them have the same purpose: producing radio waves to send information through the air. The three main antenna types are omnidirectional, semi-directional, and highly directional.

➢ SIM800L GSM Module

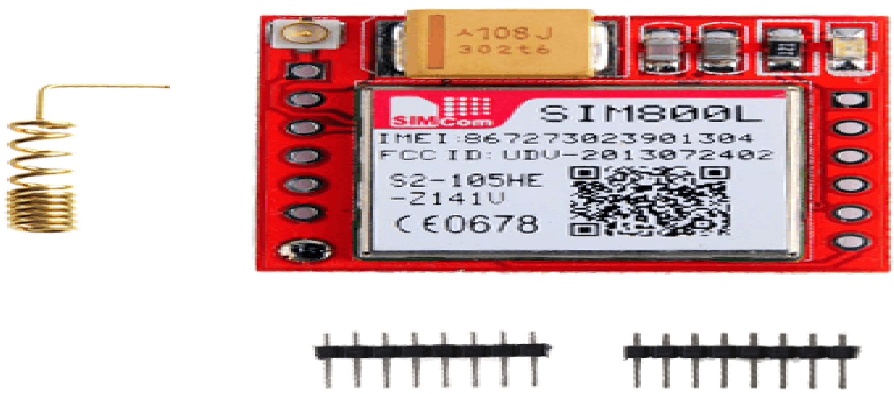


Figure:7.8 SIM800L GSM Module

Sim800L Module is low cost, low form factor GSM module based on Sim coms SIM800L chipset. Sim800L module supports quad-band GSM and GPRS network.

This breakout board is perfect for application where size and cost is a constraint. Sim800l gsm module also supports quad band which means that it can work anywhere in the world. This low cost module is perfect for launching your next IoT project. Using this module you can almost make your own cell phone.

Using this module you can:-

- Send Text Messages (SMS)
- Make or receive Phone calls
- Connect to Internet via GPRS
- TCP/IP

The main drawback of this module is works on 3.7 to 4.2 volts so you cannot power it directly through Arduino or Raspberry Pi. Moreover the sim800L GSM and GPRS module requires up to 2 ampere current so accordingly design your power supply. You can use a 3.7 volt lip battery to directly power the GSM module You can communicate with SIM800l module via UART port, supports command including 3GPP TS 27.007, 27.005 and SIM COM enhanced AT Commands.

Features of SIM800L GSM Module :-

- Quad-band 850/900/1800/1900MHz – connect onto any global GSM network with any 2G SIM (in the USA, T-Mobile is suggested).
- Make and receive voice calls using a headset or an external 8Ω speaker and electret microphone.
- PWM/Buzzer vibration motor control
- AT command interface with “auto baud” detection
- Send and receive SMS messages.
- Send and receive GPRS data (TCP/IP, HTTP, etc.).
- Scan and receive FM radio broadcasts.
- Lead out buzzer and vibration motor control port.
- AT command interface with “auto baud” detection.
- Onboard IPEX socket that can be connected to external antenna.
- Breakouts for external 8W speaker and electret mic if you don’t want to use a headphone
- Level shifting circuitry so you can run it with 2.8V to 5V logic.
- Vibrational motor (buzzer) driver so you can have noiseless notifications
- uFL or SMA connections for external antenna
- Indicator LEDs for power and network connectivity
- Standard SIM slides into the back

- **433 MHZ RF MODULES TX & RX:**

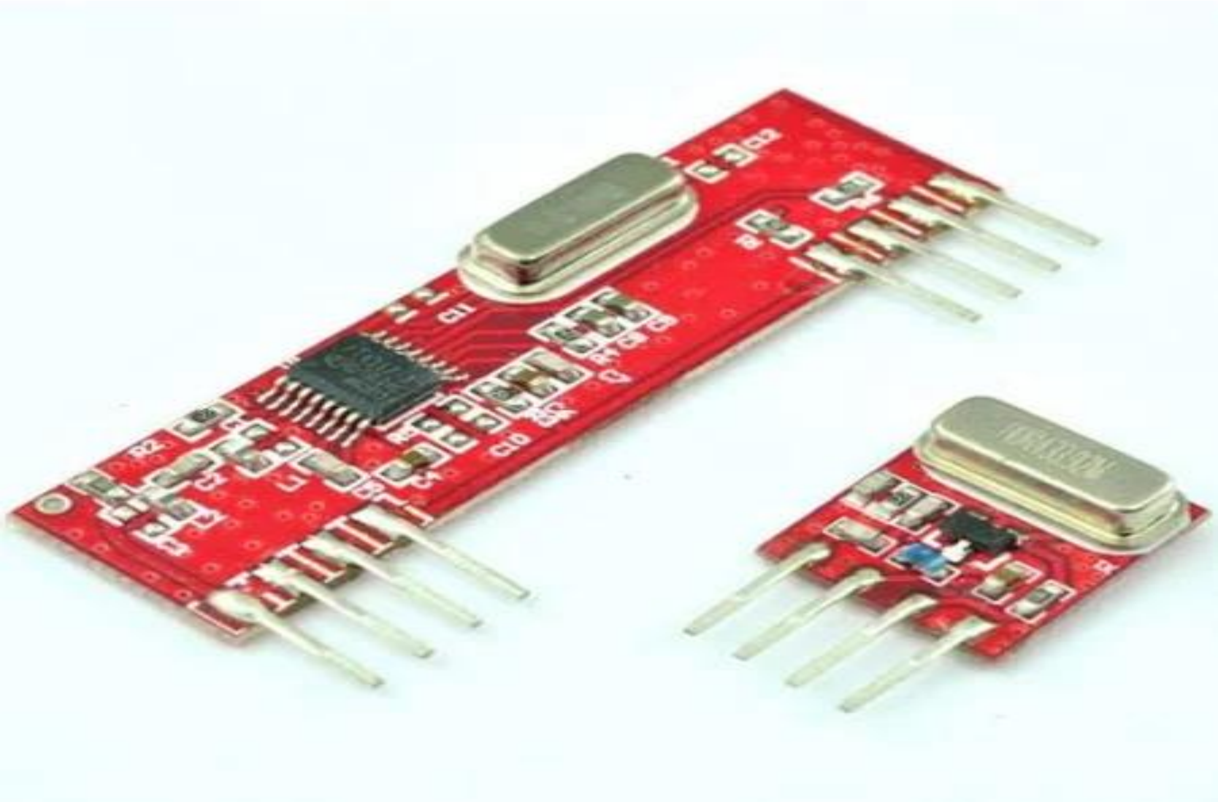


Figure:7.9 433 MHZ RF MODULES TX & RX

The transmitter module is very simple to operate and offers low current consumption (typical. 11mA). Data can be supplied directly from a microprocessor or encoding device, thus keeping the component count down and ensuring a low hardware cost. This hybrid RF Transceiver Module provides a complete RF transmitter and receiver module solution which can be used to transmit data at up to 3KHz from any standard CMOS/TTL source.

The RX – ASK is an ASK Hybrid receiver module. The RF Transceiver Module is an effective low-cost solution for using 433 MHz. The TX-ASK is an ASK hybrid transmitter module. TX-ASK is designed by the saw resonator, with an effective low cost, small size, and simple to use for designing.

Features :

- Low Power Consumption
- Low Current Consumption (Typ 11mA)
- Wide Operating Voltage (1.5-5v)
- Easy For RF-based Application
- Complete Radio Transmitter
- CMOS / TTL Input
- No Adjustable Components
- Very Stable Operating Frequency
- ASK Modulation

Specifications:

- Range in open space(Standard Conditions) : 100 Meters
- TX Frequency Range: 433.92 MHz
- TX Supply Voltage: 3V ~ 6V
- TX Output Power: 4 ~ 12 Dbm
- RX Receiver Frequency: 433 MHz
- RX Typical Sensitivity: 105 dB
- RX Supply Current: 3.5 mA
- RX IF Frequency: 1MHz
- RX Operating Voltage: 5V

➢ BUCK CONVERTER

Figure:7.10 Buck Converter

The XL6009 Step Up Down module is one of the widely used module, where there is requirement of having a specific fixed output voltage, even when the input voltage is below or above the required output voltage.

This is an automatic Buck Boost Converter. And as a result the output voltage of the module can be fixed at specific voltage, and input can be higher or lower than the output voltage. The onboard variable resistor is used to change the output voltage.

Specifications:

- Automatic Buck Boost Converter
- Output Current: 4A
- Switching Frequency: 400 Khz
- Input Voltage: 3.8V to 32V
- Output Voltage: 1.25V to 35V
- Conversion Efficiency: <94%

➢ GYRO SENSOR

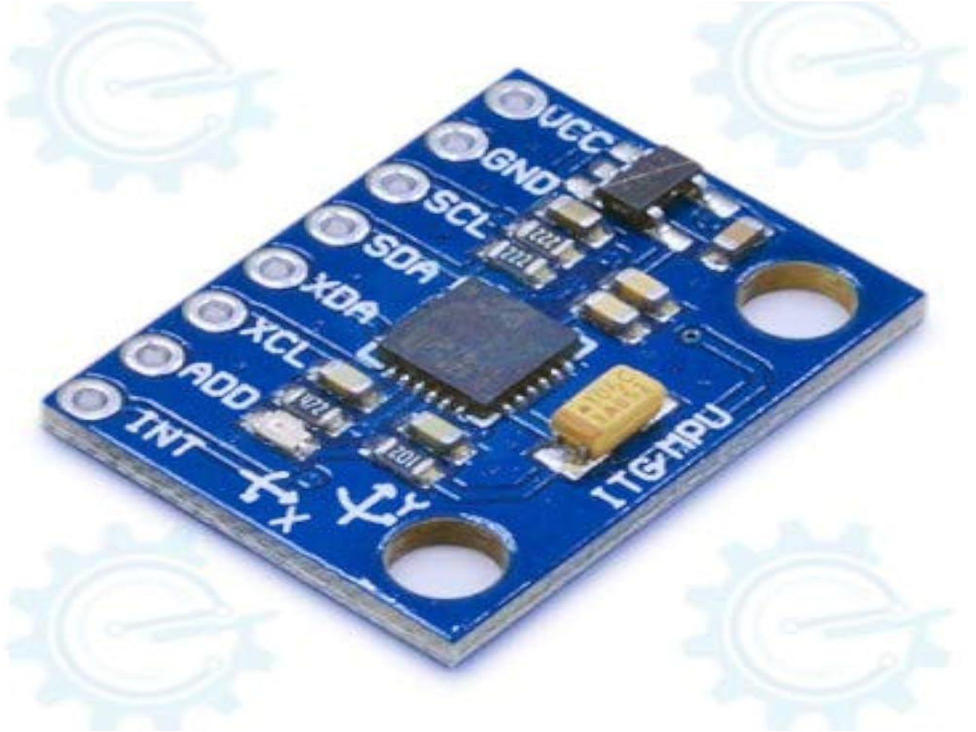


Figure:7.11 Gyro Sensor

About this item

- Model: GY-521
- Chip: MPU-6050. Power supply: 3~5V
- Communication mode: standard IIC communication protocol. Chip built-in 16bit AD converter, 16bit data output
- Immersion Gold plating PCB, machine welding process to ensure quality. Pin pitch: 2.54mm.

➢ EYES BLINK SENSOR

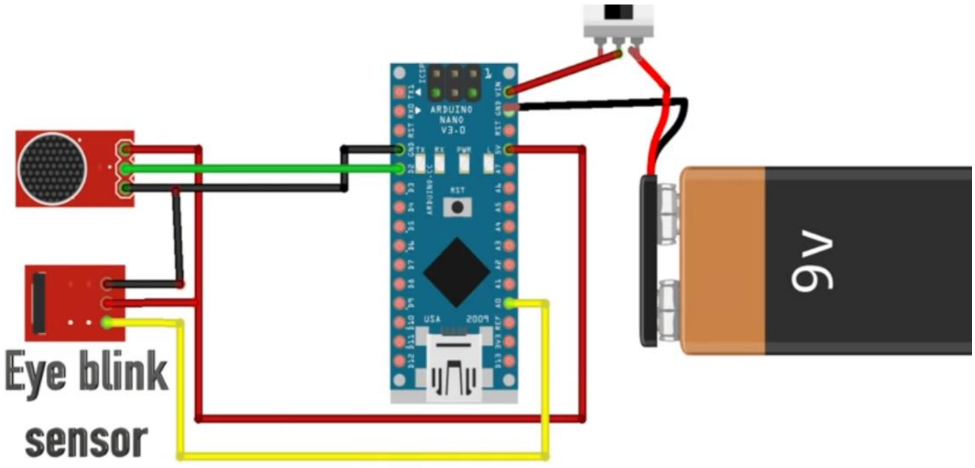


Figure:7.12 Eyes Blink Sensor

- The eye blink sensor is an infrared sensor. It contains two parts. A transmitter and a receiver. The transmitter continuously emits infrared waves onto the eye. While the receiver continuously looks for variations in the reflected waves which indicates that the eye has blinked.
- If the eye is closed that means it will give high output. If the eye is open then it will give a low output.
- This sensor can be used in a very different variety of robotics and mechatronics projects as it provides excellent results and is very economical.

- **SOFTWARE SPECIFICATIONS**
- **Arduino IDE**

The software used to program the esp32 microcontroller is the Arduino IDE. Arduino is an open-source computer hardware and software company, project and user community that designs and manufactures kits for building digital devices and interactive objects that can sense and control the physical world. Arduino boards may be purchased preassembled, or as do-it-yourself kits; at the same time, the hardware design information is available for those who would like to assemble an Arduino from scratch.

The project is based on a family of microcontroller board designs manufactured primarily by Smart Projects in Italy, and also by several other vendors, using various 8-bit Atmel AVR microcontrollers or 32-bit Atmel ARM processors. These systems provide sets of digital and analogy I/O pins that can be interfaced to various extension boards and other circuits. The boards feature serial communications interfaces, including USB on some models, for loading programs from personal computers. For programming the microcontrollers, the Arduino platform provides an integrated development environment (IDE) based on the Processing project, which includes support for C and C++ programming languages. The Arduino board is connected to pc and the program is burnt onto the microcontroller board. The figure below shows the Arduino integrated development environment for compiling and uploading the programs to Arduino board.

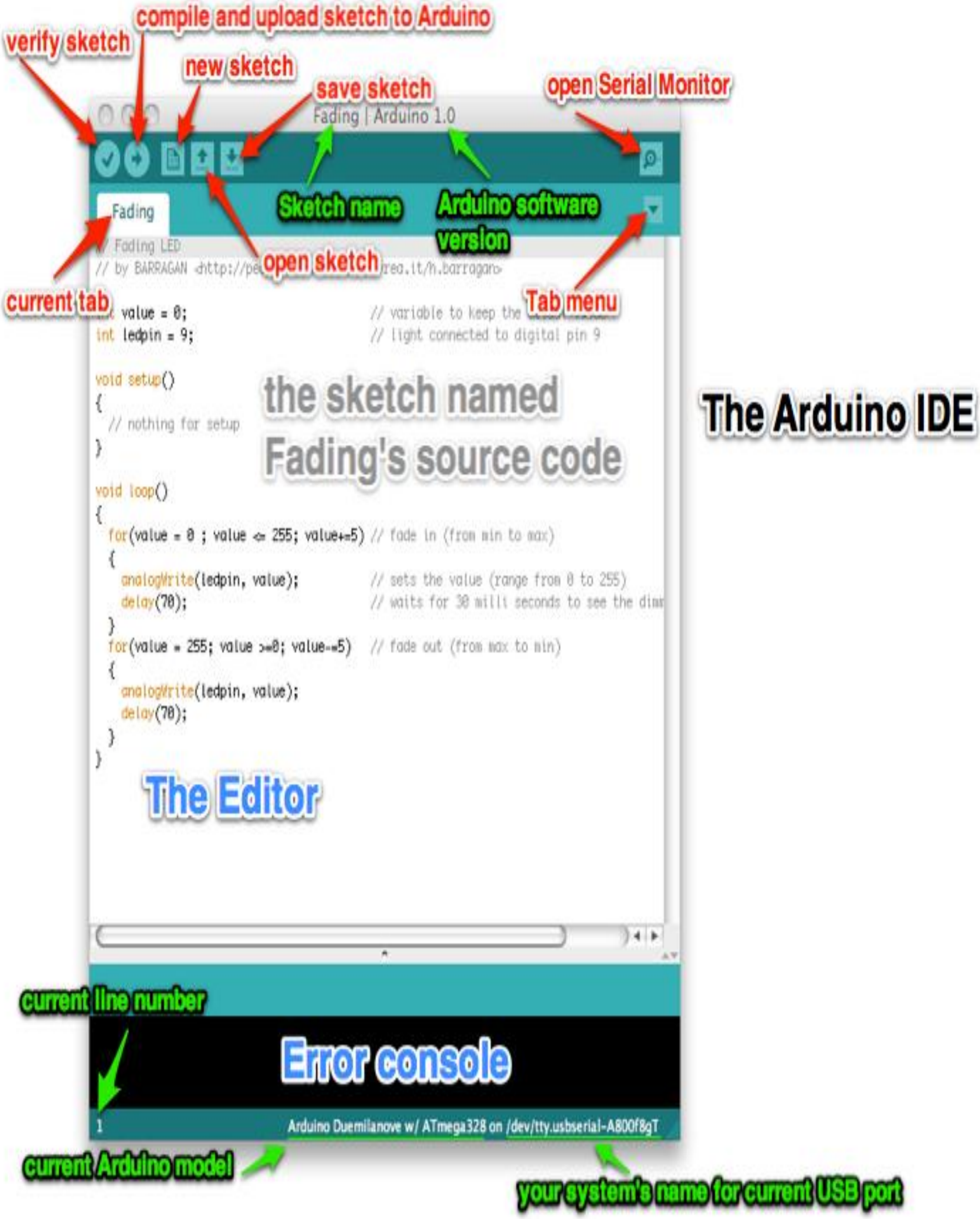
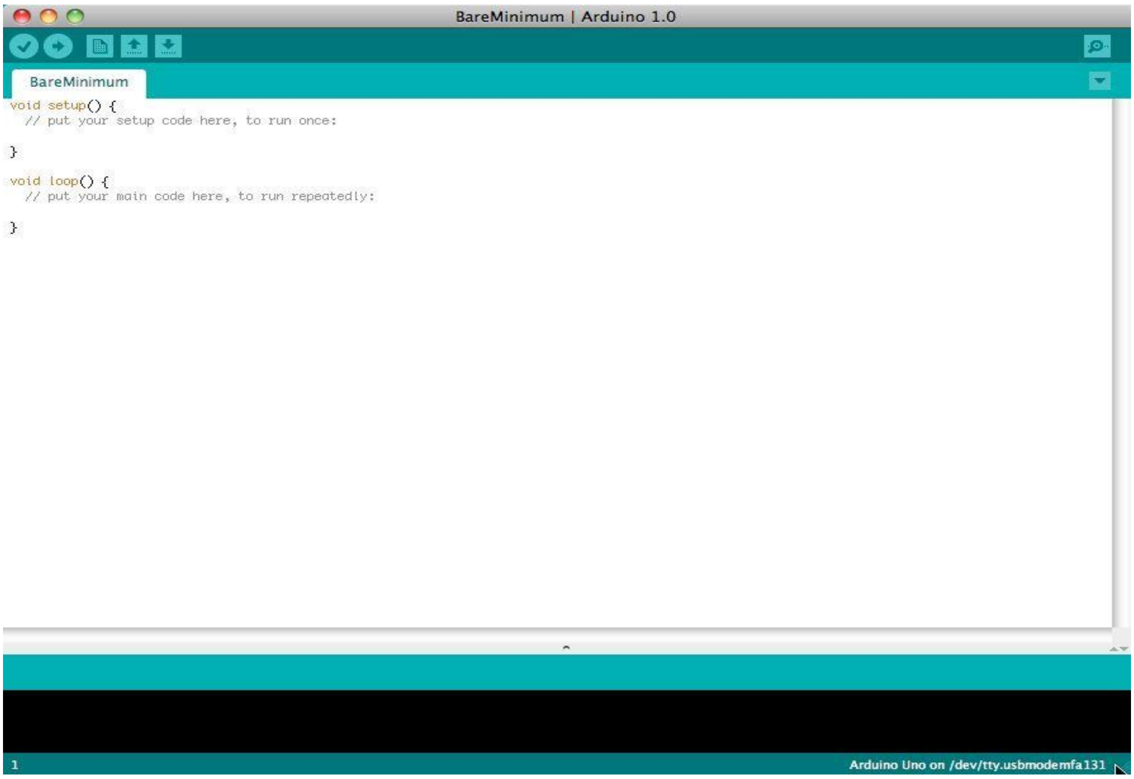
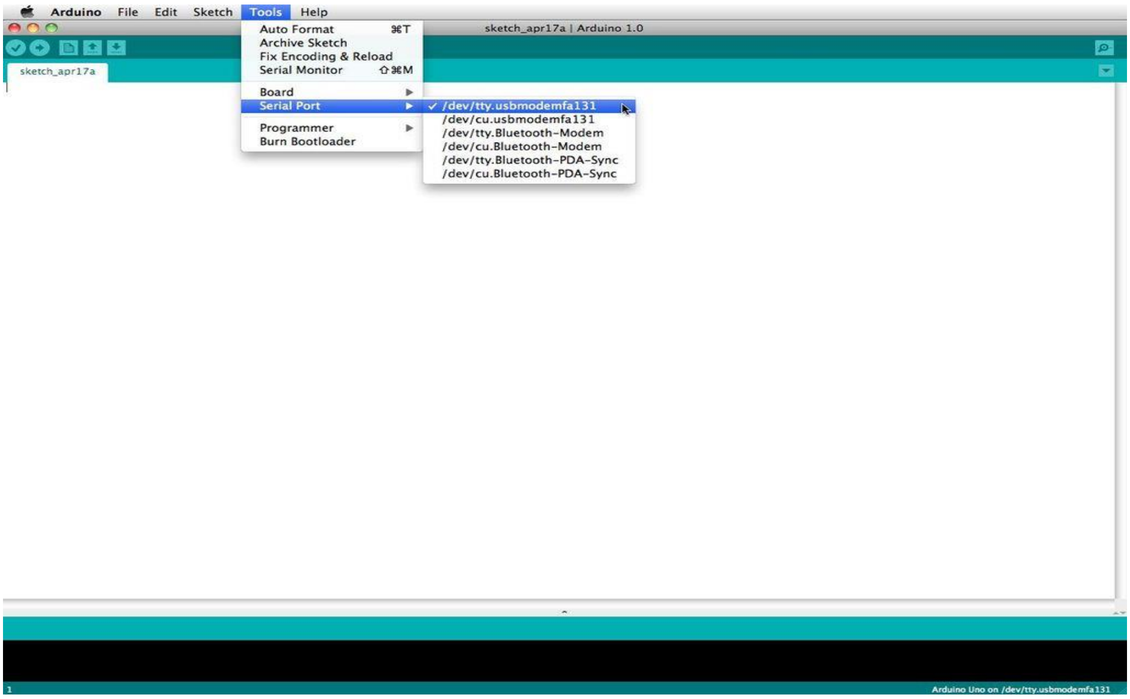


Figure 7.13 Arduino IDE

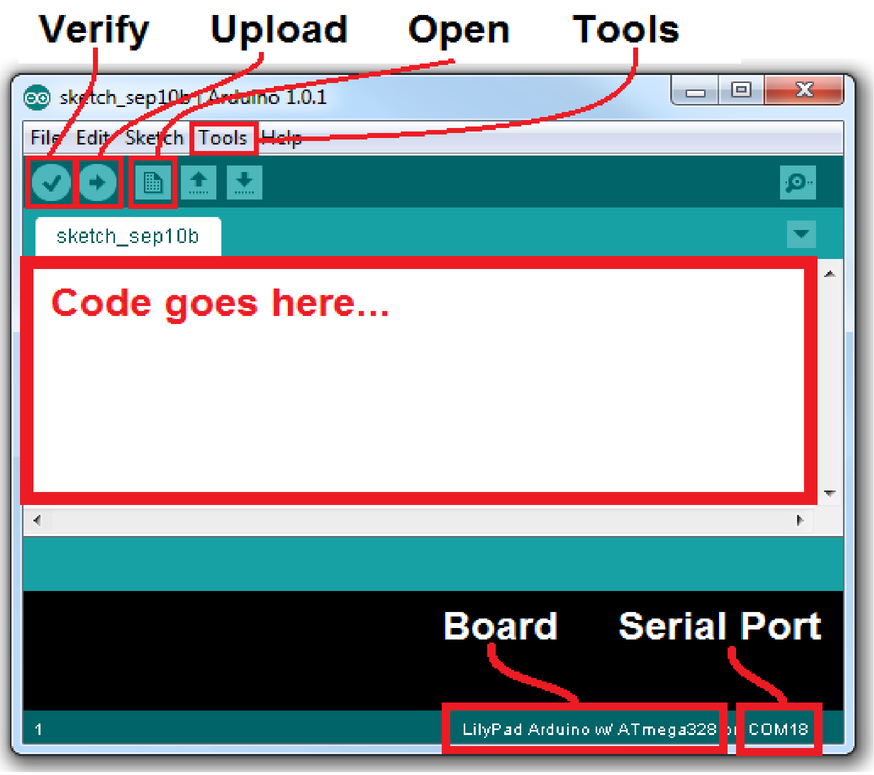


Before you can start doing anything with the Arduino, you need to download and install the Arduino IDE (integrated development environment). From this point on we will be referring to the Arduino IDE as the Arduino Programmer. The Arduino Programmer is based on the Processing IDE and uses a variation of the C and C++ programming languages Plug your Arduino to your computer using the programmer as shown before. Select the board. Before compiling the programmer and feeding it onto the Arduino board you need to select the appropriate board into which you are feeding the program. To set the board, go to the following:

Tools – Boards: Since we are using Arduino mega in our project selected Arduino mega To set the serial port, go to the following: Tools -->**Serial Port**



Compile and upload the sketch to Arduino board



CHAPTER – 8

HARDWARE IMPLEMENTATION

Before start designing of PCB, it is a good idea to make schematic of your circuit. The schematic is served as a blueprint for laying out the traces and placing the components on the PCB. The PCB editing software can import all the component, footprints and wires into the PCB files, which will make the design process easier.

Pin Diagram:

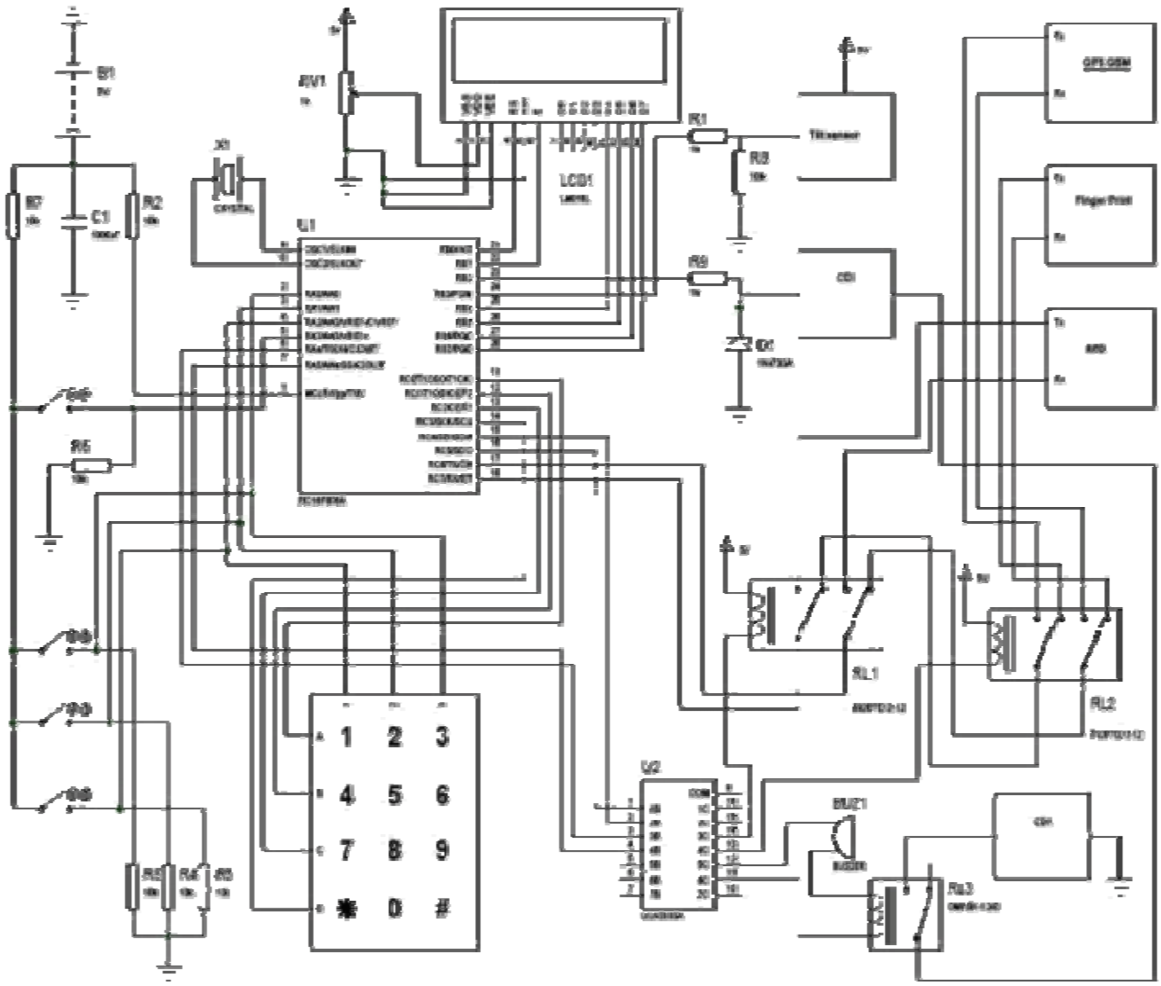


Figure:8.1 Pin Diagram

PCB Layout:

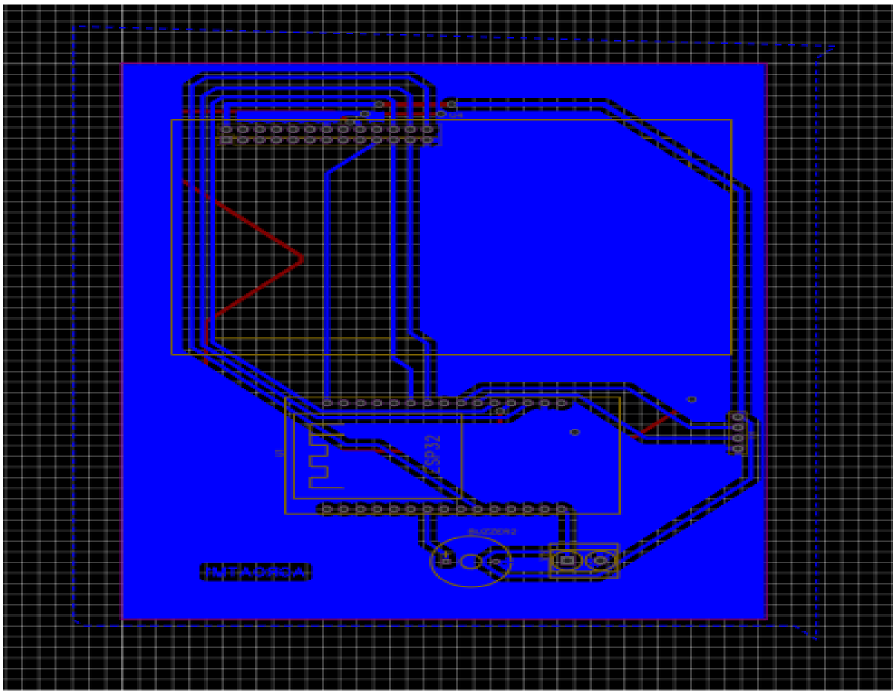


Figure 8.2 PCB Layout

Once the PCB layout is designed the PCB is assembled and fabricated. The Figures below show the PCB Fabrication and Assembly details:

CHAPTER – 9

➢ ADVANTAGES

- **Collision Avoidance:** Wireless systems help riders avoid accidents by alerting them to nearby vehicles or obstacles.
- **Improved Awareness:** Riders receive real-time information about traffic, road conditions, and upcoming hazards.
- **Health Monitoring:** Wireless devices can track the rider's health, detecting fatigue or health issues and sending alerts.
- **Reduced Human Error:** Automatic systems can help avoid accidents by reacting faster than humans in emergency situations.
- Through implementation of this project we can prevent 10% to 15 % of road accident.

➢ APPLICATION:

- A wireless Safety control for rider of two-wheeler is
- used to protect the rider.
- To reduce the accident.
- To send the message to parents, police, friends
- through GSM.
- To send the live location through GPS.

CHAPTER – 10

➢ EXPECTED OUTCOMES

The outcome of a wireless Safety control for rider of two-wheeler project is to reduce the number of accidents and injuries by Encouraging safe behavior The system can prevent the bike from starting if the rider violates traffic rules or doesn't wear a helmet. Sending emergency alerts In the event of an accident, the system can send an SMS with the rider's location to emergency contacts. Detecting alcohol The system can detect alcohol in the rider's breath hand prevent the bike from starting if the rider is drunk. Detecting falls The system can detect if the rider has fallen from the bike and send a message to emergency contacts.

➢ FUTURE SCOPE

1. **Integration with Smart Helmets**

- Development of helmets equipped with wireless connectivity (Bluetooth, IoT sensors) for automatic alerts, crash detection, and hands-free communication.
- Features such as voice-activated controls, HUD (Head-Up Display) integration, and GPS navigation within the helmet.

2. AI-Powered Safety Systems

- AI-based systems can analyse rider behaviour, road conditions, and vehicle performance in real-time to provide predictive safety alerts.
- Machine learning algorithms can detect risky riding patterns and suggest corrective actions.

3. Vehicle-to-Everything (V2X) Communication

- Enabling two-wheelers to communicate with other vehicles (V2V), infrastructure (V2I), and pedestrians (V2P) to prevent collisions.
- Integration with smart traffic systems to ensure better road safety and traffic management.

4. Automatic Emergency Response Systems

- Wireless safety control can include crash detection and automatic emergency contact features, alerting nearby hospitals or emergency services.

5. Smartphone App Integration

- Enhanced mobile apps can allow riders to monitor real-time safety statistics, receive alerts, and control safety features via their phones.
- Features like remote ignition lock, speed monitoring, and parental controls for younger riders.

6. Wearable Technology Integration

- Smart wearables such as jackets or gloves equipped with haptic feedback and wireless communication to enhance rider awareness.
- Biometric monitoring to track rider fatigue, heart rate, and alert in case of health issues.

7. Advanced Rider Assistance Systems (ARAS)

- Adaptive cruise control, lane departure warnings, blind-spot detection, and automatic braking systems can be integrated via wireless control.
- Proximity sensors to prevent collisions with nearby objects.

8. Cloud-Based Data Analytics

- Wireless connectivity allows data collection from various sensors for analysis, offering insights into rider behaviour and vehicle health.
- Predictive maintenance alerts based on usage patterns and sensor feedback.

CHAPTER – 11

RESULT

Figure 9.1 Result

CHAPTER - 12

CONCLUSION

In conclusion, the Wireless Safety Control for Rider of Two-Wheeler project not only demonstrates the feasibility of using wireless technology to improve rider safety but also lays the foundation for future innovations in two-wheeler safety systems. With continuous refinement and broader adoption, this system could play a critical role in reducing road accidents and enhancing the overall safety of motorcyclists and cyclists.

The implementation of a wireless safety control system for two-wheeler riders presents a significant advancement in road safety and accident prevention. By integrating wireless technologies such as Bluetooth, GPS, and IoT sensors, this system enhances rider awareness, provides real-time alerts, and ensures proactive safety measures. The system can detect potential hazards, monitor rider behaviour, and communicate with emergency services in case of accidents, thereby reducing response times and minimizing injury severity.

Overall, the proposed solution offers a reliable and user-friendly approach to improving two-wheeler safety, addressing key challenges such as over speeding, sudden braking, and unauthorized access. With further research and technological advancements, such a system can be widely adopted, contributing to safer roads and a reduction in two-wheeler-related accidents.

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