# CHAPTER 1

# INTRODUCTION

## 1.1 INTRODUCTION TO ACCIDENT DETECTION AND RESCUE:

In an era marked by rapid technological advancement, ensuring road safety remains a paramount concern. To address this imperative, the Automatic Vehicle Accident Detection system emerges as a pioneering solution, poised to revolutionize the landscape of transportation safety. At its core, this innovative system harnesses an array of sophisticated sensors and modules, including the Arduino Uno, GSM, GPS, LCD, Buzzer, DC motor, Wifi, and Vibration sensor, to deliver unparalleled accident detection and response capabilities.

The system's focal point lies in its real-time accident detection mechanism, fortified by GPS technology for precise location tracking. Upon sensing a collision, the system swiftly initiates a multi-faceted alert system, employing visual, auditory, and digital channels to promptly notify relevant stakeholders. This proactive approach ensures swift assistance to individuals involved in accidents, potentially mitigating the severity of injuries and preventing loss of life.

Moreover, the integration of a Wifi module and Vibration sensor augments the system's functionalities, enhancing its responsiveness and adaptability to diverse scenarios. The Arduino Uno serves as the backbone, facilitating seamless integration and efficient data processing, while the GSM module enables seamless communication with emergency services and designated contacts.

Everything will be based on the Internet of Things (IOT), which is a network of physical items that can be connected and exchange messages without the need for human contact. Because it has been employed in a variety of mediums such as Home Automation System, IOT home security model, raspberry pi, home automation, and smart water metering, it has been formally classified as an "Infrastructure of Information community." Thus, by installing electronic hardware such as sensors, ARDUINO software, and networking gear, a physical object can be given an IP address to facilitate data transmission through an IoT system.

Internet differs from IOT in that it goes beyond Internet connectivity by allowing any object with embedded circuits to communicate with one another using existing Internet infrastructure. Since the scope of IOT has risen exponentially, everything will be based on, IOT by the end of 2020, the technology will have reached possibilities thanks to the Internet of Things. Consumers, on the other hand, have the power to integrate and manage devices for a more customized experience. Manufacturers have a significant impact on how their goods are utilized and performed in the real world, and they are also economically developed.

We can clean the dustbin utilizing IOT in this article. Because accidents are one of the leading causes of death in emerging cities, it is critical to have an accident detection and monitoring system in place. Ultrasonic sensors will be used in this system. This paper presents how to reduce/avoid accidents using IOT devices. This is accomplished by placing IOT sensors in high-risk zones that detect traffic and collect information from the surrounding, a sensor placed on the road identifies a car that is over speeding, any other abnormalities determine the car's position and interacts with the car's IOT device, alerting the driver.

In the event of an accident, the gadget alerts the appropriate authorities for rapid assistance. The remainder of this work is arranged in the following manner. The second section looks at some ofthe relevant studies on this topic. The system design and architecture are presented, the results and findings are discussed.

# CHAPTER 2

# LITERATURE SURVEY

## 2.1 Automatic Vehicle Accident Detection and Messaging System Using GSM and GPS Modem

The Rapid growth of technology and infrastructure has made our lives easier. The advent of technology has also increased the traffic hazards and the road accidents take place frequently which causes huge loss of life and property because of the poor emergency facilities. Our project will provide an optimum solution to this draw back. An accelerometer can be used in a car alarm application so that dangerous driving can be detected.

It can be used as a crash or rollover detector of the vehicle during and after a crash. With signals from an accelerometer, a severe accident can be recognized. According to this project when a vehicle meets with an accident immediately Vibration sensor will detect the signal or if a car rolls over, and Micro electro mechanical system (MEMS) sensor will detect the signal and sends it to ARM controller. Microcontroller sends the alert message through the GSM MODEM including the location to police control room or a rescue team. The police can immediately trace the location through the GPS MODEM, after receiving the information.

## 2.2 Intelligent Automatic Vehicle Accident Detection System Using Wireless Communication

Traffic accidents are one of the leading causes of fatalities. An important indicator of survival rates after an accident is the time between the accident and when emergency medical personnel are dispatched to the accident location. By eliminating the time between when an accident occurs and when the first responders are dispatched to the scene decreases mortality rates, we can save lives. One approach to eliminating the delay between accident occurrence and first responder dispatch is to use in-vehicle automatic accident detection and notification systems, which sense when a traffic accident is likely to occur and immediately notify emergency occurred.

These in-vehicle systems, however, are not available in all cars and are unaffordable to retrofit in older vehicles. In this paper, such a system is described the main application of which is early accident detection. It can automatically detect traffic accidents using accelerometers and immediately notify a central emergency dispatch server after an accident, using GPS coordinates. Along with the data it will send the number of the vehicle too. This paper provides the following contributions to detecting traffic accidents via ARM7 controller. Here it is seen how arm controller, accelerometer, GSM connections, and GPS can be used to provide situational awareness responders. The codes are written and compiled in Keil ARMIDE.

## 2.3 Automatic Accident Detection : Assistance Through Communication Technologies and Vehicles

In this article, e-NOTIFY system is presented, which allows fast detection of traffic accidents, improving the assistance to injured passengers by reducing the response time of emergency services through the efficient communication of relevant information about the accident using a combination of V2V and V2I communications.

The proposed system requires installing OBUs in the vehicles, in charge of detecting accidents and notifying them to an external CU, which will estimate the severity of the accident and inform the appropriate emergency services about the incident. This architecture replaces the current mechanisms for notification of accidents based on witnesses, who may provide incomplete or incorrect information after a long time. The development of a low- cost prototype shows that it is feasible to massively incorporate this system in existing vehicles.

## 2.4 Vehicle Accident Automatic Detection and Remote Alarm Device

The Rapid growth of technology and infrastructure has made our lives easier. The advent of technology has also increased the traffic hazards and the road accident take place frequently which causes huge loss of life and property because of the poor emergency facilities. Our project will provide an optimum solution to this draw back.

An accelerometer can be used in a car alarm application so that dangerous driving can be detected. It can be used as a crash or rollover detector of the vehicle during and after a crash. With signals from an accelerometer, a severe accident can be recognized. According to this project when a vehicle meets with an accident immediately Vibration sensor will detect the signal or if a car rolls over, and Micro electro mechanical system (MEMS) sensor will detect the signal and sends it to ARM controller. Microcontroller sends the alert message through the GSM MODEM including the location to police control room or a rescue team**.**

# CHAPTER 3

## 3.1 VEHICLE ACCIDENT DETECTION AND RESCUE SYSTEM

The Automatic Vehicle Accident Detection system is a comprehensive solution aimed at enhancing road safety and response times during accidents. Leveraging a range of sensors and modules including Arduino Uno, GSM, GPS, LCD, Buzzer, DC motor, WIFI, and Vibration sensor, it provides real-time accident detection and precise location tracking using GPS technology. Upon collision, the system promptly triggers alerts through visual, auditory, and digital channels, ensuring swift assistance. Integration of WIFI and Vibration sensors further augment its capabilities. Arduino Uno facilitates seamless integration and efficient data processing, while the GSM module enables communication with emergency services and contacts. By combining these elements, the system aims to drastically reduce both the severity and frequency of road accidents, ultimately fostering safer roadways and enhancing transportation safety.

## 3.2 BENEFITS

- Real-time accident detection and precise location tracking enable prompt emergency response, minimizing potential injuries and fatalities.
- Immediate alerts through visual, auditory, and digital channels expedite assistance, ensuring swift intervention and support.
- Integration of GSM module facilitates seamless communication with emergency services and designated contacts for timely assistance.
- Integration of multiple sensors and modules ensures thorough monitoring, enabling proactive measures to mitigate accident severity and frequency.

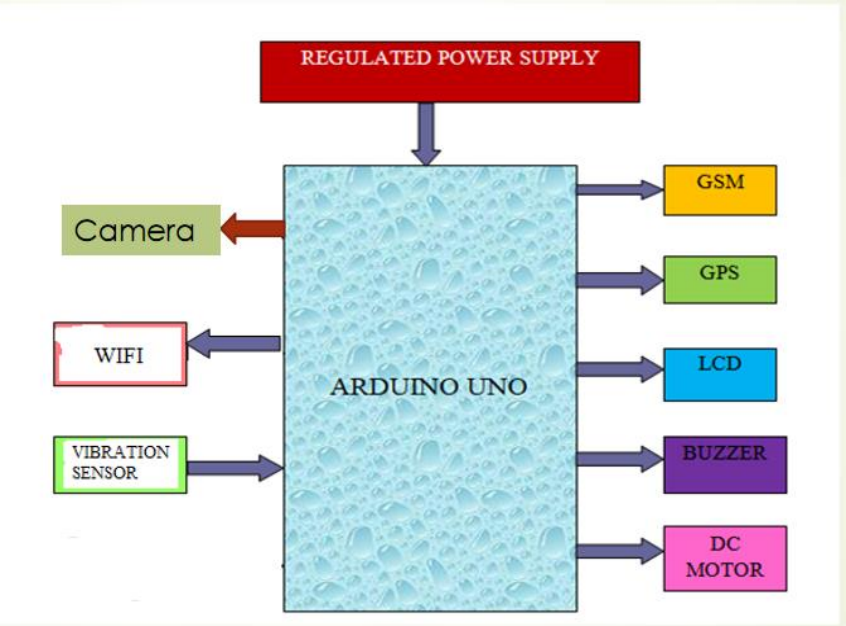



**fig3.1 Block diagram of Accident Detection and Rescue System**

GSM has become the world's fastest growing communications technology of all time and the leading global mobile standard, spanning 218 countries. GSM is an open, digital cellular technology used for transmitting mobile voice and data services. GSM operates in the 900MHz and 1.8GHz bands GSM supports data transfer speeds of up to 9.6 kbps, allowing the transmission of basic data services such as SMS.

GPS (Global Positioning System) technology is used to find the location of any object or vehicle to monitor a child continuously using satellite signals. Three satellite signals are necessary to locate the receiver in 3D space and fourth satellite is used for time accuracy. GPS will give the information of parameters like longitude, latitude and attitude.

Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board. Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs.

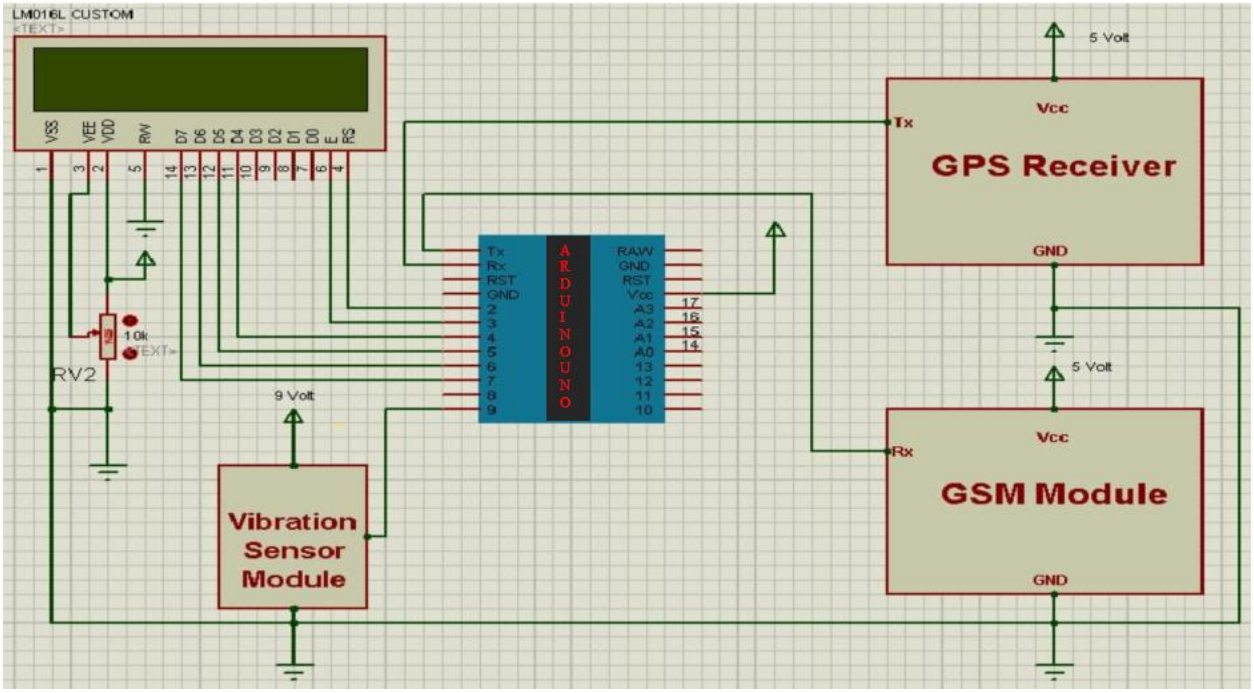



**fig 3.2 Circuit Diagram of Accident Detection and Rescue System**

Accident detection and rescue systems (ADRS) use sensors to detect accidents, and then send messages to emergency services and guardians. The goal of an ADRS is to reduce the time it takes for an ambulance to arrive at an accident site, and to reduce the number of deaths from accidents.

IoT ADRS use accelerometers, GPS, and GSM technologies to detect accidents, and then send messages about the accident to guardians and rescue teams.

The accelerometer sensor detects a sudden change in the vehicle's axis, and then the GSM module sends the accident's location to the emergency services and guardians. The GPS module's latitude and longitude are used to pinpoint the location of the accident, which is sent as a Google Map link.And sends the live video to emergency contact.

# CHAPTER 4

# HARDWARE TOOLS

- ARDUINO UNO
- WIFI
- VIBRATION SENSOR
- GSM
- GPS
- LCD
- BUZZER
- DC MOTOR REGUATED POWER SUPPLY

## DESCRIPTION OF TOOLS

### 4.1 ARDUINO UNO

The most common version of Arduino is the Arduino Uno. This board is what most people are talking about when they refer to an Arduino. The Uno is one of the more popular boards in the Arduino family and a great choice for beginners. There are different revisions of Arduino Uno, below detail is the most recent revision (Rev3 or R3).

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

| | | |
|---|---|---|
| Operating Voltage | : | 5V |
| Input Voltage (recommended) | : | 7-12V |
| Input Voltage (limits) | : | 6-20V |
| Digital I/O Pins | : | 14 (of which 6 provide PWM output) |
| Analog Input Pins | : | 6 |
| DC Current per I/O Pin | : | 40 mA |
| DC Current for 3.3V Pin | : | 50 mA |
| Flash Memory by bootloader | : | 32 KB (ATmega328) of which 0.5 KB used |
| SRAM | : | 2 KB (ATmega328) |
| EEPROM | : | 1 KB (ATmega328) |
| Clock Speed | : | 16 MHz |
| Length | : | 68.6 mm |
| Width | : | 53.4 mm |

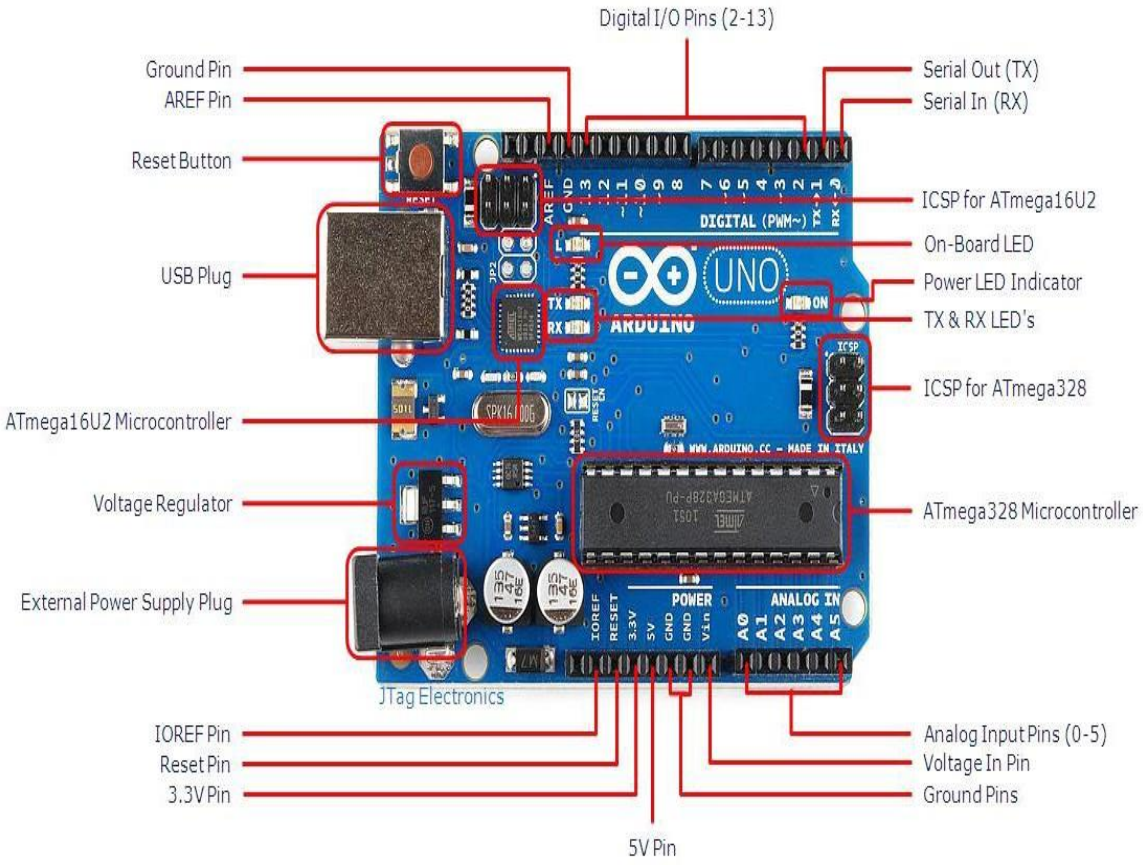



**fig4.1 ArduinoUno R3 Board**

- **USB Plug & External Power Supply Plug**

Every Arduino board needs a way to be connected to a power source. The Arduino Uno can be powered from a USB cable coming from your computer or a wall power supply that is terminated in a barrel jack. The power source is selected automatically. The USB connection is also how you will load code onto your Arduino board. Please on my other post on how to program with Arduino can be found in Installing and Programming Arduino

NOTE: The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts

- **Voltage Regulator**

The voltage regulator is not actually something you can (or should) interact with on the Arduino. But it is potentially useful to know that it is there and what it's for. But it is potentially useful to know that it is there and what it's for. The voltage regulator does exactly what it says – it controls the amount of voltage that is let into the Arduino board. Think of it as a kind of gatekeeper; it will turn away an extra voltage that might harm the circuit. Of course, it has its limits, so don't hook up your Arduino to anything greater than 20 volts.

- **Power Pins**

Voltage In Pin – The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source).

5V Pin – This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 – 12V), the USB connector (5V), or the VIN pin of the board (7-12V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board.

5V Pin – This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 – 12V), the USB connector (5V), or the VIN pin of the board (7-12V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board. It's not recommended.3.3V Pin – A 3.3volt supply generated by the on-board regulator. Maximum current draw is 50 mA.

- **GROUND Pins**

There are several GND pins on the Arduino, any of which can be used to ground your circuit.

- **IOREF Pin**

This pin on the Arduino board provides the voltage reference with which the microcontroller operates.

- **LED Indicators**

Power LED Indicator – Just beneath and to the right of the word "UNO" on your circuit board, there's a tiny LED next to the word 'ON'. This LED should light up whenever you plug your Arduino into a power source. If this light doesn't turn on, there's a good chance something is wrong. Time to re-check your circuit!

On-Board LED – There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off. This useful to quickly check if the board has no problem as some boards has a pre-loaded simple blinking LED program in it.

- **Reset Button:**

Pushing the reset button temporarily connect the reset pin to ground and restart any code that is loaded on the Arduino. This can be very useful if your code doesn't repeat, but you want to test it multiple times.

- **Input and Output Pins**

Each of the 14 digital pins on the Uno can be used as an input or output. They operate at 5 volts. These pins can be used for both digital input (like telling if a button is pushed) and digital output (like powering an LED).

- **Serial Out (TX) & Serial In (RX)**

Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.

- **External Interrupts**

Pins 2 and 3 can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. PWM – You may have noticed the tilde (~) next to some of the digital pins (3, 5, 6, 9, 10, and 11). These pins act as normal digital pins, but can also be used for something called Pulse-Width Modulation (PWM). Think of these pins as being able to simulate analog output (like fading an LED in and out).

SPI – Pins 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). SPI stands for Serial Peripheral Interface. These pins support SPI communication using the SPI library.

Analog Input Pins – Labeled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). These pins can read the signal from an analog sensor (like a temperature sensor) and convert it into a digital value that we can read. By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF Pin (Stands for Analog Reference. Most of the time you can leave this pin alone). Additionally, some pins have specialized functionality:

TWI – Pins A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library.

- **Reset Pin**

Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

## 4.2 WIFI

The **ESP8266** is a low-cost Wi-Fi chip with full TCP/IP stack and MCU (microcontroller unit) capability produced by Shanghai-based Chinese manufacturer, Espressif Systems.

The chip first came to the attention of western makers in August 2014 with the ESP-01 module, made by a third-party manufacturer, AI-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at the time there was almost no English-language documentation on the chip and the commands it accepted. The **ESP8285** is an ESP8266 with 1 MiB of built-in flash, allowing for single-chip devices capable of connecting to Wi-Fi

**Features**

- 32-bit RISC CPU: Tensilica Xtensa L106 running at 80 MHz*
- 64 KiB of instruction RAM, 96 KiB of data RAM
- WEP or WPA/WPA2 authentication, or open networks
- 16 GPIO pins
- SPI
- $I^2C$
- $I^2S$ interfaces with DMA (sharing pins with GPIO)
- UART on dedicated pins, plus a transmit-only UART can be enabled on GPIO2

**fig4.2 WIFI module**

## 4.3 VIBRATION SENSOR

The vibration sensor is also called a piezoelectric sensor. These sensors are flexible devices which are used for measuring various processes. This sensor uses the piezoelectric effects while measuring the changes within acceleration, pressure, temperature, force otherwise strain by changing to an electrical charge.

**fig 4.3 vibration sensor**

**Vibration Sensor Working and Applications**

At present in the industry like research and development, the ability of monitoring, measuring as well as analyzing the vibration is very important. Unfortunately, the suitable techniques for making a measurement system for vibration with precise & repeatable are not always clear to researchers with the shades of test tools & analysis of vibration. There are some challenges related while measuring the vibration which includes a selection of suitable component, the configuration of the system, signal conditioning, analysis of waveform and setup.

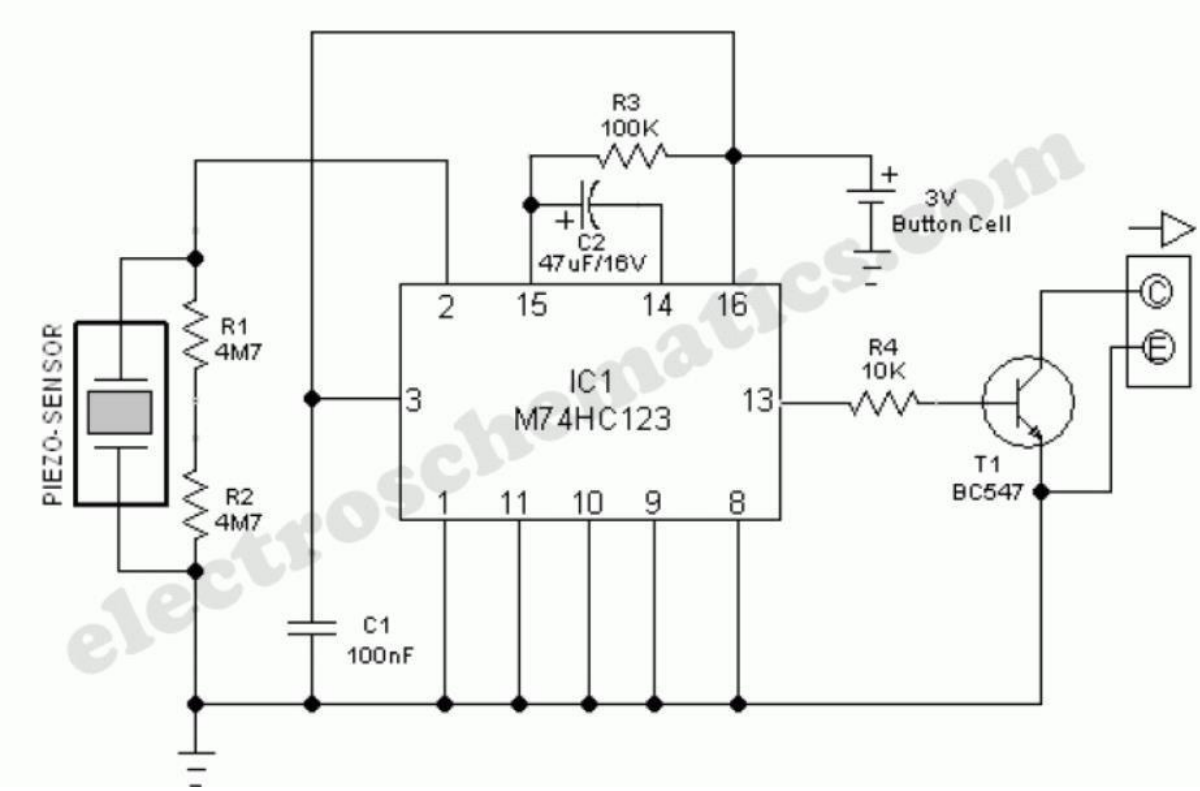



**fig4.4 Circuit Diagram**

The working principle of vibration sensor is a sensor which operates based on different optical otherwise mechanical principles for detecting observed system vibrations. The sensitivity of these sensors normally ranges from 10 mV/g to 100 mV/g, and there are lower and higher sensitivities are also accessible. The sensitivity of the sensor can be selected based on the application. So it is essential to know the levels of vibration amplitude range to which the sensor will be exposed throughout measurements.

## 4.4 GSM (Global System for Mobile Communications)

Global System for Mobile Communications (GSM) modems are specialized types of modems that operate over subscription based wireless networks, similar to a mobile phone. A GSM modem accepts a Subscriber Identity Module (SIM) card, and basically acts like a mobile phone for a computer. Such a modem can even be a dedicated mobile phone that the computer uses for GSM network capabilities.

Traditional modems are attached to computers to allow dial-up connections to other computer systems. A GSM modem operates in a similar fashion, except that it sends and receive data through radio waves rather than a telephone line.

It is widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands.

**Features**

- Improved spectrum efficiency
- International roaming
- Compatibility with integrated services digital network (ISDN)
- Support for new services.
- SIM phonebook management
- Fixed dialing number (FDN)
- Real time clock with alarm management

## GSM Network

GSM provides recommendations, not requirements. The GSM specifications define the functions and interface requirements in detai lbut do not address the hardware.


**fig4.5 GSM Network**

The reason for this is to limit the designers as little as possible but still to make it possible for the operators to buy equipment from different suppliers. The GSM network is divided into three major systems: the switching system (SS), the base station system (BSS), and the operation and support system (OSS).

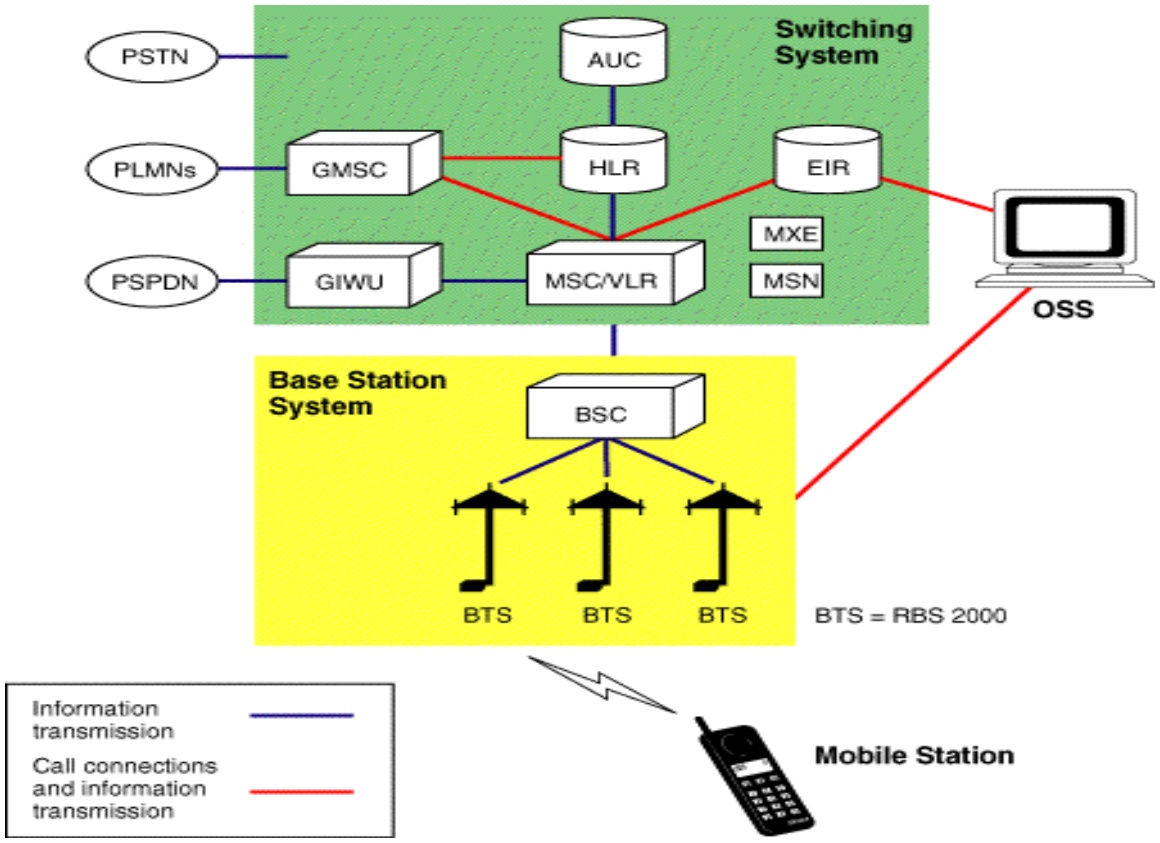



**fig4.6 Block diagram of GSM system**

## 4.5 GPS (GLOBAL POSITIONING SYSTEM)

**Introduction**

The Global Positioning System (GPS) is a satellite based navigation system that can be used to locate positions anywhere on earth. Designed and operated by the U.S. Department of Defense, it consists of satellites, control and monitor stations, and receivers. GPS receivers take information transmitted from the satellites and uses triangulation to calculate a user's exact location. GPS is used on incidents in a variety of ways.

**Fig 4.7 GPS**

GPS is made up of three parts: between 24 and 32 satellites orbiting the Earth, four control and monitoring stations on Earth, and the GPS receivers owned by users. GPS satellites broadcast signals from space that are used by GPS receivers to provide three-dimensional location (latitude, longitude, and altitude) plus the time.

- To determine position locations; for example, you need to radio a helicopter pilot the coordinates of your position location so the pilot can pick you up.
- To navigate from one location to another; for example, you need to travel from a lookout to the fire perimeter.
- To create digitized maps; for example, you are assigned to plot the fire perimeter and hot spots.
- To determine distance between two points or how far you are from another location. monitored and corrected by control stations, are picked up by the GPS receiver.

**Working**

The basis of the GPS is a constellation of satellites that are continuously orbiting the earth. These Satellites, which are equipped with atomic clocks, transmit radio signals that contain their exact location, time, and other information. The radio signals from the satellites, which are Three Segments of GPS monitored and corrected by control stations, are picked up by the GPS receiver.

**Space Segment** — Satellites orbiting the earth

The space segment consists of 29 satellites circling the earth every 12 hours at 12,000 miles in altitude. This high altitude allows the signals to cover a greater area. The satellites are arranged in their orbits so a GPS receiver on earth can receive a signal from at least four satellites at any given time.

Each satellite contains several atomic clocks. The satellites transmit low radio signals with a unique code on different frequencies, allowing the GPS receiver to identify the signals. The main purpose of these coded signals is to allow the GPS receiver to calculate travel time of the radio signal from the satellite to the receiver. The travel time multiplied by the speed of light equals the distance from the satellite to the GPS receiver.

**Control Segment** — The control and monitoring stations

The control segment tracks the satellites and then provides them with corrected orbital and time information. The control segment consists of five unmanned monitor stations and one Master Control Station.

The five unmanned stations monitor GPS satellite signals and then send that information to the Master Control Station where anomalies are corrected and sent back to the GPS satellites through ground antennas.

**User Segment** — The GPS receivers owned by civilians and military

The user segment consists of the users and their GPS receivers. The number of simultaneous users is limitless.

**Applications:**

There are so many devices made with the implementation of Global Positioning System. Google Earth is the most famous application that uses the signals received by the GPS receivers. It enables public also to access the maps which tell the users about the locations all around the world. People use Global Positioning System for several uses.

- Car navigation 37%
- Hand held 26%
- Tracking 10%
- GIS 8%

## GPS Receiver Specifications

## Navigation Features

**Waypoints/icons:** 500 with name and graphic symbol, 10 nearest (automatic), 10 proximity.

**Routes:** Automatic turn-by-turn routes; 20 manual point-to-point routes with up to 50 points each.

**Tracks:** Automatic track log; 10 saved tracks let you retrace your path in both directions

**Trip computer:** Resettable odometer, timers, average and maximum speeds

**Alarms:** Anchor drag, approach and arrival, off course and proximity waypoint

**Tables:** Built-in celestial tables for best times to fish and hunt, sun and moon rise/set based on date and location

**Performance**

**Receiver:** WAAS enabled, 12 parallel channel GPS receiver continuously tracks and uses up to 12 satellites to compute and update your position.

**Acquisition Times:**

- Warm: Approximately 15 seconds
- Cold: Approximately 45 seconds
- AutoLocate®: Approximately 5 minutes

**Update rate:** 1/second, continuous

**GPS Accuracy:**

- Position: < 15 meters, 95% typical*
- Velocity: 0.05 meter/sec steady state

**WAAS accuracy:**

- Position: < 3 meters, 95% typical
- Velocity: 0.05 meter/sec steady state

**Dynamics:** 6g's

**Interfaces:** RS232 with NMEA 0183, RTCM 104 DGPS data format and proprietary Garmin

**Antenna:** Detachable with standard BNC connector

**Differential:** RTCM-104, WAAS

**Physical**

**Size:** 5.0"W x 2.3"H x 1.6"D (12.7 x 5.9 x 4.1 cm)

**Weight:** 9 ounces (255 g) w/batteries

**Display:** 2.2"W x 1.5"H (5.6 x 3.8 cm), 256 x 160 pixels, high-contrast FSTN with bright backlighting. Switchable orientation.

**Case:** Fully gasketed, high-impact plastic alloy, waterproof to IEC 529 IPX7 standards

**Temperature range:** 5° F to 158° F (–15° C to 70° C)

**User data storage:** Indefinite, no memory battery required

**Power Source:** 8-35v DC, 4 “AA” batteries (not included)

## 4.6 LCD(Liquid Crystal Display)

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

### 4.6.1 Introduction of LCD

The most commonly used Character based LCDs are based on Hitachi's HD44780 controller or other which are compatible with HD44580.

A **16x2 LCD** means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc.

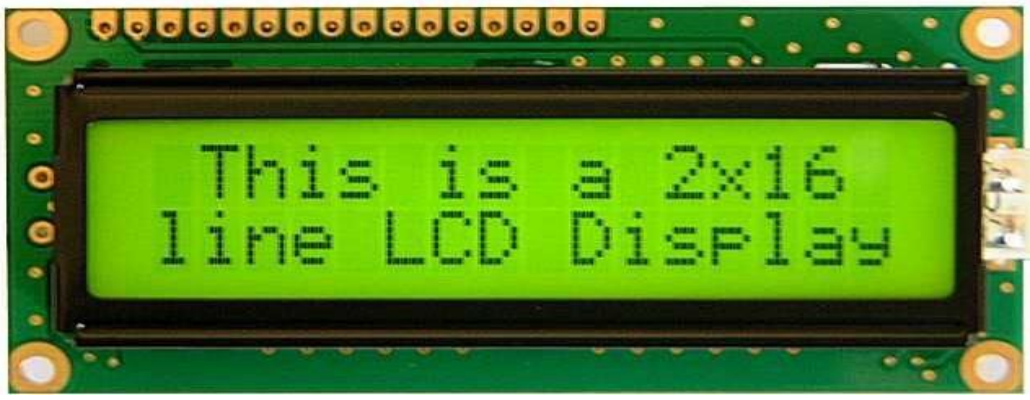



**fig4.8 16x2 LCD display**

**Pin Description of LCD**

Most LCDs with 1 controller has 14 Pins and LCDs with 2 controller has 16 Pins (two pins are extra in both for back-light LED connections). Pin description is shown in the table below.

**Pin Configuration table for a 16X2 LCD character display:-**

| Pin Number | Symbol | Function |
|---|---|---|
| **1** | Vss | Ground Terminal |
| **2** | Vcc | Positive Supply |
| **3** | Vdd | Contrast adjustment |
| **4** | RS | Register Select; 0→Instruction Register, 1→Data Register |
| **5** | R/W | Read/write Signal; 1→Read, 0→ Write |
| **6** | E | Enable; Falling edge |
| **7** | DB0 | Bi-directional data bus, data transfer is performed once, thru DB0 to DB7, in the case of interface data length is 8- bits; and twice, through DB4 to DB7 in the case of interface data length is 4-bits. Upper four bits first then lower four bits. |
| **8** | DB1 | |
| **9** | DB2 | |
| **10** | DB3 | |
| **11** | DB4 | |
| **12** | DB5 | |
| **13** | DB6 | |
| **14** | DB7 | |
| **15** | LED-(K) | Back light LED cathode terminal |
| **16** | LED+(A) | Back Light LED anode terminal |

**Table4.9 : Pin Description of LCD**

**Commands and Instruction set**

Only the instruction register (IR) and the data register (DR) of the LCD can be controlled by the MCU. Before starting the internal operation of the LCD, control information is temporarily stored into these registers to allow interfacing with various MCUs, which operate at different speeds, or various peripheral control devices. The internal operation of the LCD is determined by signals sent from the MCU. These signals, which include register selection signal (RS), read/write signal (R/W), and the data bus (DB0 to DB7), make up the LCD instructions.

There are four categories of instructions that:

- Designate LCD functions, such as display format, data length, etc.
- Set internal RAM addresses
- Perform data transfer with internal RAM
- Perform miscellaneous functions

Although looking at the table you can make your own commands and test them. Below is a brief list of useful commands which are used frequently while working on the LCD.

**Data/Signals/Execution of LCD**

LCD accepts two types of signals, one is data, and another is control. These signals are recognized by the LCD module from status of the RS pin. Now data can be read also from the LCD display, by pulling the R/W pin high. As soon as the E pin is pulsed, LCD display reads data at the falling edge of the pulse and executes it, same for the case of transmission.

LCD display takes a time of 39-43μS to place a character or execute a command. Except for clearing display and to seek cursor to home position it takes 1.53ms to 1.64ms. Any attempt to send any data before this interval may lead to failure to read data or execution of the current data in some devices. Some devices compensate the speed by storing the incoming data to some temporary registers.

| Command | Code | | | | | | | | | | Description | Execution Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | RS | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 | | |
| Clear Display | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | Clears the display and returns the cursor to the home position (address 0). | 82μs~1.64ms |
| Return Home | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | * | Returns the cursor to the home position (address 0). Also returns a shifted display to the home position. DD RAM contents remain unchanged. | 40μs~1.64ms |
| Entry Mode Set | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | I/D | S | Sets the cursor move direction and enables/disables the display. | 40μs |
| Display ON/OFF Control | 0 | 0 | 0 | 0 | 0 | 0 | 1 | D | C | B | Turns the display ON/OFF (D), or the cursor ON/OFF (C), and blink of the character at the cursor position (B). | 40μs |
| Cursor & Display Shift | 0 | 0 | 0 | 0 | 0 | 1 | S/C | R/L | * | * | Moves the cursor and shifts the display without changing the DD RAM contents. | 40μs |
| Function Set | 0 | 0 | 0 | 0 | 1 | DL | N$ | F | * | # | Sets the data width (DL), the number of lines in the display (L), and the character font (F). | 40μs |
| Set CG RAM Address | 0 | 0 | 0 | 1 | $A_{CG}$ | | | | | | Sets the CG RAM address. CG RAM data can be read or altered after making this setting. | 40μs |
| Set DD RAM Address | 0 | 0 | 1 | $A_{DD}$ | | | | | | | Sets the DD RAM address. Data may be written or read after making this setting. | 40μs |
| Read Busy Flag & Address | 0 | 1 | BF | AC | | | | | | | Reads the BUSY flag (BF) indicating that an internal operation is being performed and reads the address counter contents. | 1μs |
| Write Data to CG or DD RAM | 1 | 0 | Write Data | | | | | | | | Writes data into DD RAM or CG RAM. | 46μs |
| Read Data from CG or DD RAM | 1 | 1 | Read Data | | | | | | | | Reads data from DD RAM or CG RAM. | 46μs |
| | I/D = 1: Increment I/D = 0: Decrement<br>S = 1: Accompanies display shift.<br>S/C= 1: Display shift S/C = 0: cursor move<br>R/L= 1: Shift to the right. R/L= 0: Shift to the left.<br>DL = 1: 8 bits DL = 0: 4 bits<br>N = 1: 2 lines N = 0: 1 line<br>F = 1: 5x10 dots F = 0: 5 x 7 dots<br>BF = 1: Busy BF = 0: Can accept data<br>*# Set to 1 on 24x4 modules*<br>*$ With KS0072 is Address Mode.* | | | | | | | | | | DD RAM: Display data RAM<br>CG RAM: Character generator RAM<br>$A_{CG}$: CG RAM Address<br>$A_{DD}$: DD RAM Address Corresponds to cursor address.<br>AC: Address counter Used for both DD and CG RAM address. | Execution times are typical. If transfers are timed by software and the busy flag is not used, add 10% to the above times. |

**Table 4.10: Showing various LCD Command Description**

**Liquid crystal displays interfacing with Controller**

The LCD standard requires 3 control lines and 8 I/O lines for the data bus.

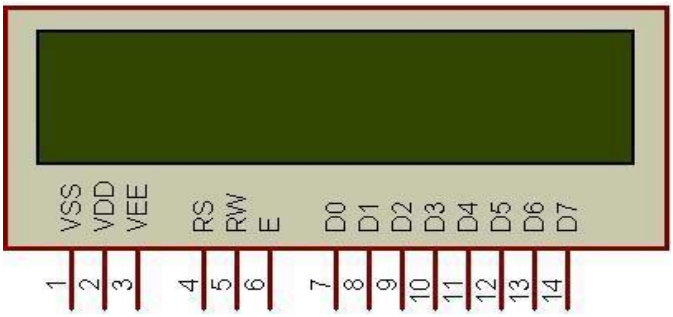



**fig 4.11 : Pins of LCD**

- **8 data pins D7:D0**

  Bi-directional data/command pins

  Alphanumeric characters are sent in ASCII format.

- **RS: Register Select**

  RS = 0 -> Command Register is selected

  RS = 1 -> Data Register is selected

- **R/W: Read or Write**

  0 -> Write,

  1 -> Read

- **E: Enable (Latch data)**

  Used to latch the data present on the data pins. A high-to-low edge is needed to latch the data.

## 4.7 BUZZER

A **buzzer** or **beeper** is an audio signaling device, which may be mechanical, electromechanical, or electronic. Typical uses of buzzers and beepers include alarms, timers and confirmation of user input such as a mouse click or keystroke.

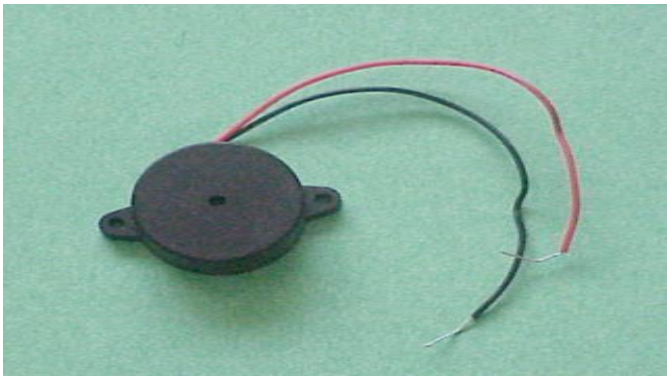


**fig4.12 Buzzer**

**FEATURES**

- The PB series are high-performance buzzers with a unimorph piezoelectric ceramic element and an integral self-excitation oscillator circuit.
- They exhibit extremely low power consumption in comparison to electromagnetic units.
- They are constructed without switching contacts to ensure long life and no electrical noise.
- Compact, yet produces high acoustic output with minimal voltage.

**Mechanical**

A joy buzzer is an example of a purely mechanical buzzer.

**Electromechanical**

Early devices were based on an electromechanical system identical to an electric bell without the metal gong. Similarly, a relay may be connected to interrupt its own actuating current, causing the contacts to buzz. Often these units were anchored to a wall or ceiling to use it as a sounding board. The word "buzzer" comes from the rasping noise that electromechanical buzzers made.

**VOLTAGE BUZZER SOUND CONTROLS**

When resistance is connected in series (as shown in illustrations (a) and (b)), abnormal oscillation may occur when adjusting the sound volume. In this case, insert a capacitor in parallel to the voltage oscillation board (as shown in illustration (c)). By doing so, abnormal oscillation can be prevented by grounding one side. However, the voltage VB added to the voltage oscillation board must be within the maximum input voltage range, and as capacitance of 3.3μF or greater should be connected.

## 4.8 DC MOTOR


**fig4.13 DC motor**

DC motors are configured in many types and sizes, including brush less, servo, and gear motor types. A motor consists of a rotor and a permanent magnetic field stator. The magnetic field is maintained using either permanent magnets or electromagnetic windings. DC motors are most commonly used in variable speed and torque.

Motion and controls cover a wide range of components that in some way are used to generate and/or control motion. Areas within this category include bearings and bushings, clutches and brakes, controls and drives, drive components, encoders and resolves, Integrated motion control, limit switches, linear actuators, linear and rotary motion components, linear position sensing, motors (both AC and DC motors), orientation position sensing, pneumatics and pneumatic components, positioning stages, slides and guides, power transmission (mechanical), seals, slip rings, soleno ids, springs.

## 4.9 REGULATED POWER SUPPLY

All digital circuits require regulated power supply. In this article we are going to learn how to get a regulated positive supply from the mains supply.

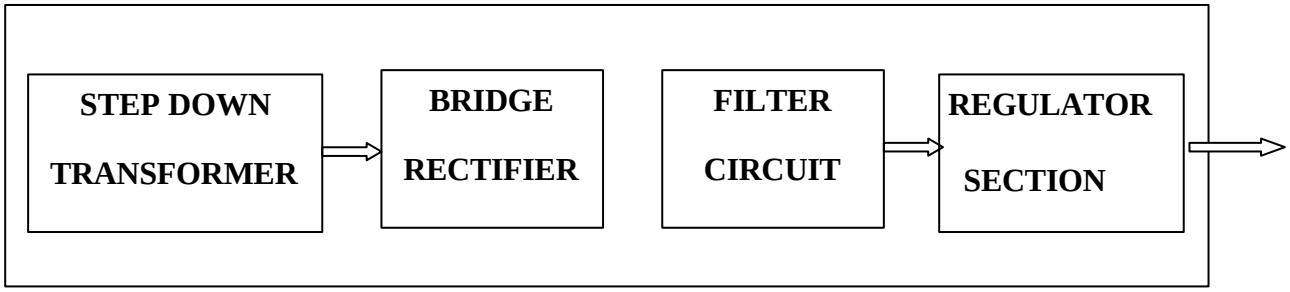
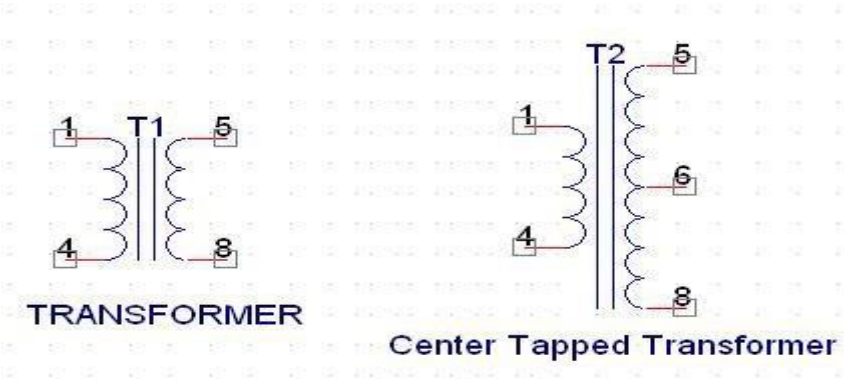



**Fig 4.14 shows the basic block diagram of a fixed regulated power supply**

**TRANSFORMER**




**4.15 Transformer**

**Types of transformer**

A transformer consists of two coils also called as “WINDINGS” namely PRIMARY & SECONDARY.

They are linked together through inductively coupled electrical conductors also called as CORE. A changing current in the primary causes a change in the Magnetic Field in the core & this in turn induces an alternating voltage in the secondary coil. If load is applied to the secondary then an alternating current will flow through the load. If we consider an ideal condition then all the energy from the primary circuit will be transferred to the secondary circuit through the magnetic field.

So the secondary voltage of the transformer depends on the number of turns in the Primary as well as in the secondary.

$$P_{primary} = P_{secondary}$$

**Rectifier**

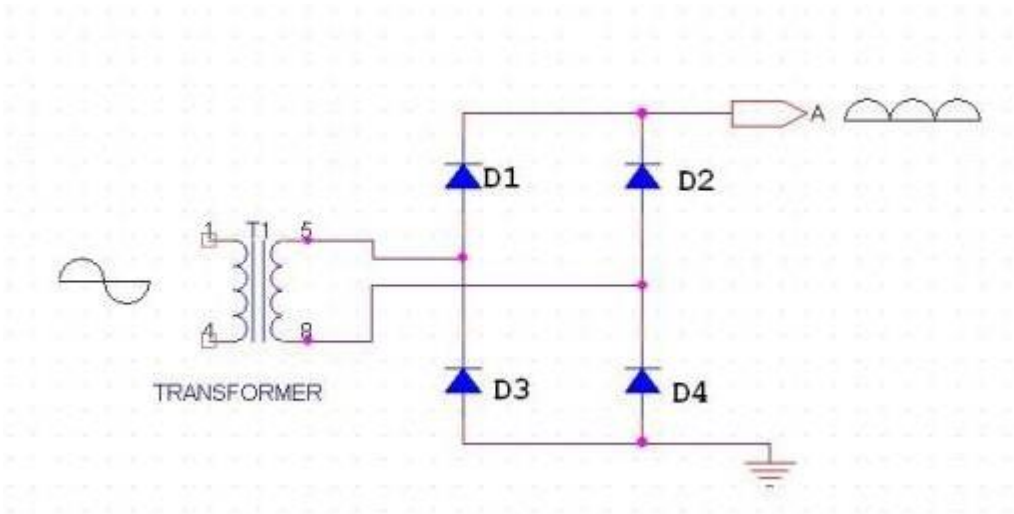
A rectifier is a device that converts an AC signal into DC signal. For rectification purpose we use a diode, a diode is a device that allows current to pass only in one direction i.e. when the anode of the diode is positive with respect to the cathode also called as forward biased condition & blocks current in the reversed biased condition.

$$I_p V_p = I_s V_s$$

$$\frac{V_s}{V_p} = \frac{N_s}{N_p}$$

Rectifier can be classified as follows:

**Bridge Rectifier**.




## 4.16 Bridge rectifier

As the name suggests it converts the full wave i.e. both the positive & the negative half cycle into DC thus it is much more efficient than Half Wave Rectifier & that too without using a center tapped transformer thus much more cost effective than Full Wave Rectifier.

Full Bridge Wave Rectifier consists of four diodes namely D1, D2, D3 and D4. During the positive half cycle diodes D1 & D4 conduct whereas in the negative half cycle diodes D2 & D3 conduct thus the diodes keep switching the transformer connections so we get positive half cycles in the output.

**Half Wave rectifier.**

This is the simplest type of rectifier as you can see in the diagram a half wave rectifier consists of only one diode. When an AC signal is applied to it during the positive half cycle the diode is forward biased & current flows through it. But during the negative half cycle diode is reverse biased & no current flows through it. Since only one half of the input reaches the output, it is very inefficient to be used in power supplies.

**Full wave rectifier.**

Half wave rectifier is quite simple but it is very inefficient, for greater efficiency we would like to use both the half cycles of the AC signal. This can be achieved by using a center tapped transformer i.e. we would have to double the size of secondary winding & provide connection to the center. So during the positive half cycle diode D1 conducts & D2 is in reverse biased condition. During the negative half cycle diode D2 conducts & D1 is reverse biased. Thus we get both the half cycles across the load.

**FILTER CAPACITOR**

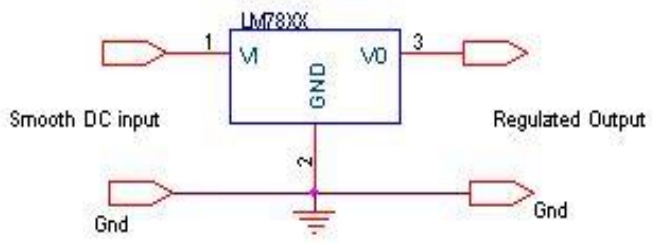
Even though half wave & full wave rectifier give DC output, none of them provides a constant output voltage.This can be done by using a capacitor at the output of the rectifier this capacitor is also called as “FILTER CAPACITOR” or “SMOOTHING CAPACITOR” or “RESERVOIR CAPACITOR”. Even after using this capacitor a small amount of ripple will remain.

**VOLTAGE REGULATOR**

A Voltage regulator is a device which converts varying input voltage into a constant output voltage.Voltage regulator can be of two types

1.Linear Voltage Regulator: Also called as Resistive Voltage regulator because they dissipate the excessive voltage resistively as heat.

2.Switching Regulator: They regulate the output voltage by switching the Current ON/OFF very rapidly.




**4.17 voltage regulator**

# CHAPTER 5

# SOFTWARE DESCRIPTION

1. Arduino ide
2. Embedded c programming
3. Windows OS

## 5.1 CODE

```
#include <LiquidCrystal.h>
LiquidCrystal lcd(2, 3, 4, 5, 6, 7);
#include <SoftwareSerial.h>
#define RX 9
#define TX 10
#define buzzer A0
#define fan 12
int vibrate_sense=8;
String AP = "elegant";       // AP NAME
String PASS = "smartwork"; // AP PASSWORD
String API = "O5GHR8WWNV2JEWH8";   // Write API KEY
String HOST = "api.thingspeak.com";
String PORT = "80";
int countTrueCommand;
int countTimeCommand;
boolean found = false;
int valSensor = 1;
SoftwareSerial esp8266(RX,TX);
void setup()
{
 lcd.begin(16, 2);
 lcd.clear(); lcd.setCursor(2, 0);       lcd.print("  WELCOME");
```

```
  delay(1000);
  lcd.clear();        lcd.print("ACCIDENT DEDECTION");
  lcd.setCursor(0, 1);  lcd.print("RESCUE SYSTEM");
delay(1000);
  pinMode(fan, OUTPUT);
  pinMode(buzzer, OUTPUT);
  Serial.begin(9600);
  esp8266.begin(115200);
  sendCommand("AT",5,"OK");
  sendCommand("AT+CWMODE=1",5,"OK");
 sendCommand("AT+CWMODE=1",5,"OK");
  sendCommand("AT+CWJAP=\""+ AP +"\",\""+ PASS +"\"",20,"OK");
}
void loop()
{
 String getData = "GET /update?api_key="+ API +"&field1="+vibration();
 sendCommand("AT+CIPMUX=1",5,"OK");
 sendCommand("AT+CIPSTART=0,\"TCP\",\""+ HOST +"\","+ PORT,15,"OK");
 sendCommand("AT+CIPSEND=0," +String(getData.length()+4),4,">");
 esp8266.println(getData);delay(1500);countTrueCommand++;
 sendCommand("AT+CIPCLOSE=0",5,"OK");
}
String vibration()
{
  int sensor_data=digitalRead(vibrate_sense);
  if(sensor_data==HIGH)
  {
  lcd.clear();
  lcd.print("     ACCIDENT");
  lcd.setCursor(0,1);
```

```
  lcd.print("     DETECTED");
  digitalWrite(fan,LOW);
  digitalWrite(buzzer,HIGH);
  sms();
  delay(1000);
}
else
{
  lcd.clear();
  lcd.print("NO ACCIDENT");
 lcd.setCursor(0,1);
  lcd.print("     DETECTED");
  digitalWrite(fan,HIGH);
  digitalWrite(buzzer,LOW);
delay(1000);
}
return String(sensor_data);
}
void sms()
{
digitalWrite(fan,HIGH);
 digitalWrite(buzzer,LOW);
delay(1000);
}


return String(sensor_data);
}
void sms()
{Serial.begin(9600); //Baud rate of the GSM/GPRS Module
  Serial.print("\r");
```

```
  delay(1000);
  //Serial.print("AT+CMGF=1\r");
  Serial.print("AT+CMGF=1\r");
  delay(1000);
 // Serial.print("AT + CMGS = \"+919948896119\"\r");
  Serial.print("AT+CMGS=\"+917075161363\"\r");
  delay(1000);
  Serial.print(" Accident dedected at: https://maps.app.goo.gl/fWZPA4DUNmveBSWR6");
  delay(1000);
  Serial.write(0x1A);
  delay(1000);
}
void sendCommand(String command, int maxTime, char readReplay[]) {
  Serial.print(countTrueCommand);
  Serial.print(". at command => ");
  Serial.print(command);
  Serial.print(" ");
  while(countTimeCommand < (maxTime*1))
  {esp8266.println(command);//at+cipsend
    if(esp8266.find(readReplay))//ok
{found = true;
      break;
    }
    countTimeCommand++;
  }
  if(found == true)
  {
    Serial.println("OYI");
    countTrueCommand++;
    countTimeCommand = 0;
```

```
 }
 if(found == false)
 {
  Serial.println("Fail");
  countTrueCommand = 0;
  countTimeCommand = 0;
 }

 found = false;
}
{
    found = true;
    break;
  }
  countTimeCommand++;
 }
 if(found == true)
 {
  Serial.println("OYI");
  countTrueCommand++;
  countTimeCommand = 0;
 }
 if(found == false)
 {
  Serial.println("Fail");
  countTrueCommand = 0;
  countTimeCommand = 0;
 }

 found = false;
}
```

## 5.2 Arduino IDE:

Arduino IDE (Integrated Development Environment) is the software for Arduino.

- It is a text editor like a notepad with different features.
- It is used for writing code, compiling the code to check if any errors are there anduploading the code to the Arduino.
- It is a cross-platform software which is available for every Operating System likeWindows, Linux, mac OS.
- It supports C/C++ languaage
- It supports every available Arduino board including Arduino mega, Arduino Leonardo, Arduino Ethernet and more Word file is called a Document similarly, Arduino file is calleda **Sketch** where the user writes code.
    - It has serial connection (sensors, GPS------- ).
    - Digital I/O pins (LED‘s, Switches).
    - Analog I/O pins (for resistive sensor data).

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward the Uno is thelatest in a series of USB Arduino board.

**5.3 FUNCTIONS OF ARDUINO IDE:**

Arduino IDE consists of:

- Window Bar
- Menu Bar
- Shortcut Buttons
- Text Editor
- Output Panel

**Window Bar**

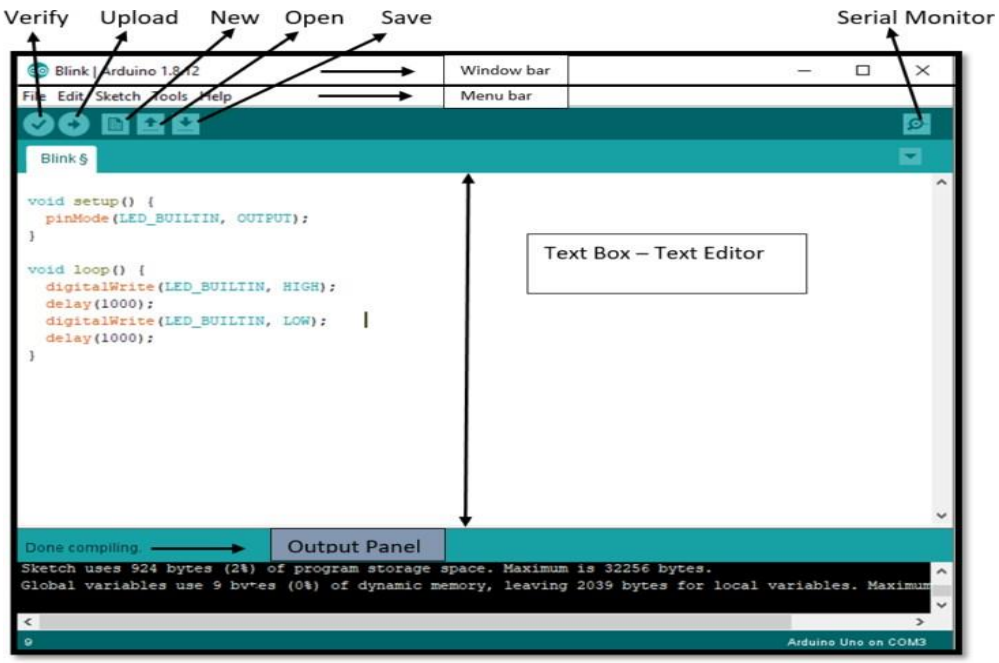
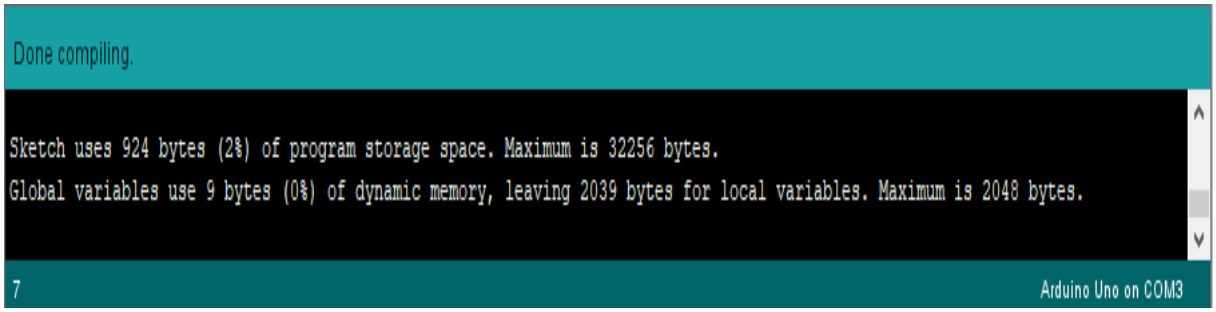



**Fig 5.1 ARDUINO IDE Window Bar**

The window bar consists the name of File and the Arduino IDE software version




## 5.2 Output Panel:

This output panel is used to give comments about the code.If the code is successfully compiled or any error occurs.If the code has been successfully uploaded to the board.

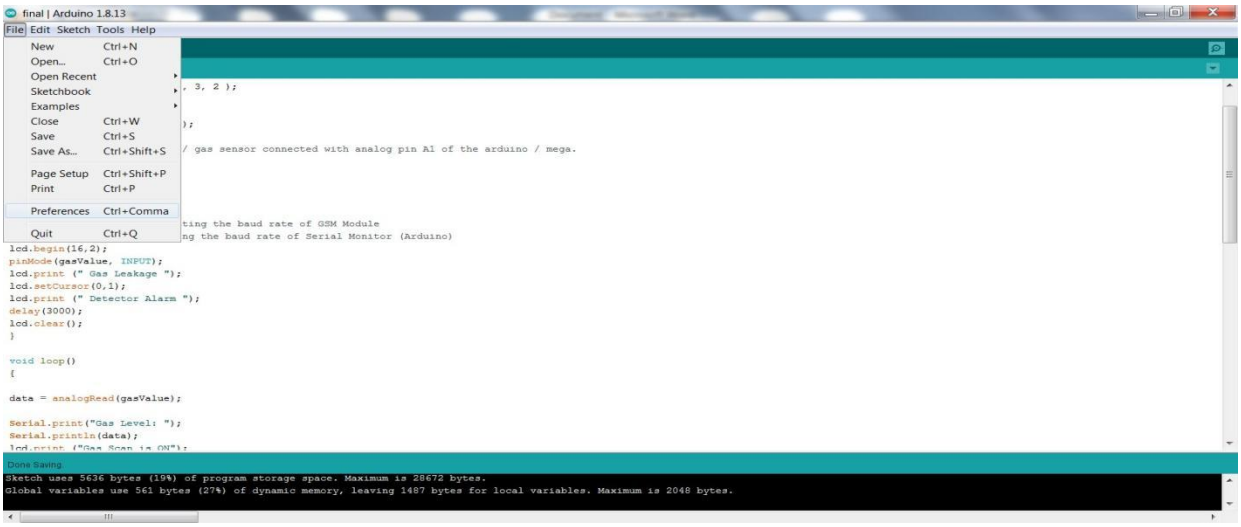



**Fig 5.3 Execution Process**

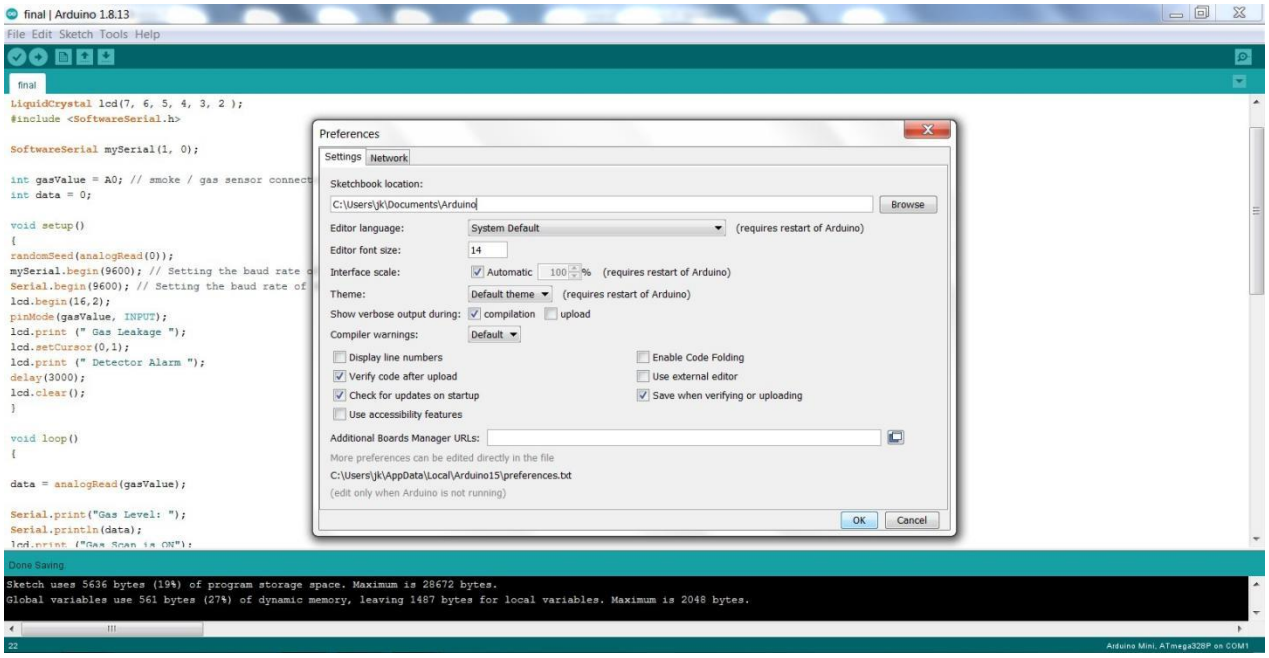



**Fig 5.4 Uploading Program**

Wait a few seconds; you will see the RX and TX LEDs on the board, flashing. If the upload is successful, the message "Done uploading" will appear in the status.

# CHAPTER 6

# RESULTS AND ANALYSIS

## 6.1 Results And Analysis

Fig. 6.2 shows the circuit at initial condition, i.e. when the power is not supplied to the circuit, then it will be as shown below.

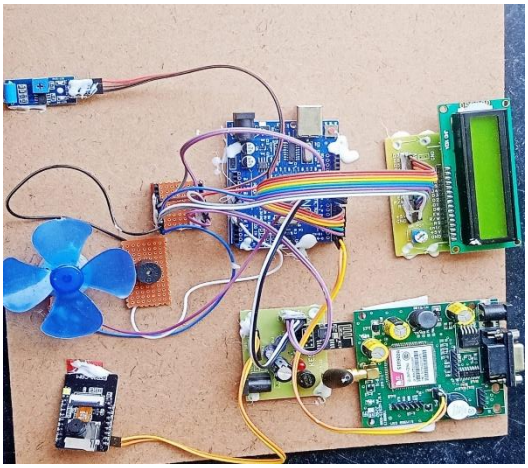


**Fig 6.1 Hardware circuit when power is off**

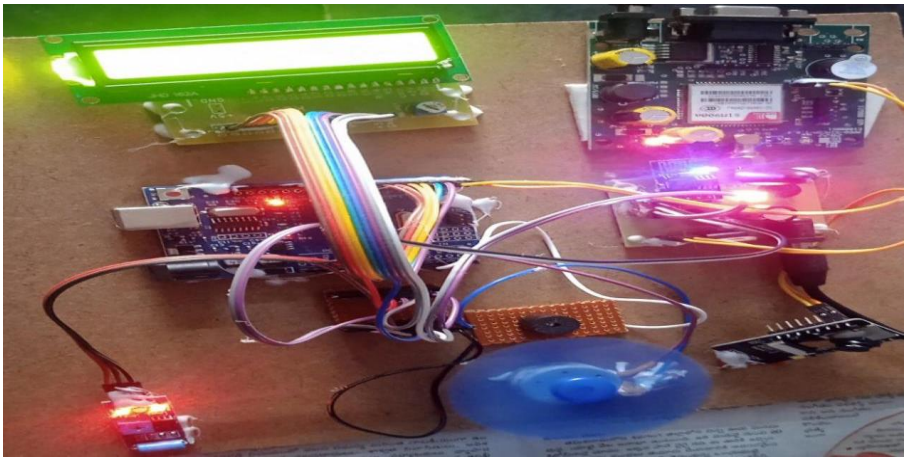


**Fig6.2 Hardware circuit when power is on**


**Fig 6.3 When accident is detected the LCD Display shows "ACCIDENT DETECTED"**

When the Accident is detected , the accelerometers, GPS, and GSM technologies to detect accidents, and then send messages about the accident to guardians and rescue teams.The accelerometer sensor detects a sudden change in the vehicle's axis, and then the GSM module sends the accident's location to the emergency services and guardians. The GPS module's latitude and longitude are used to pinpoint the location of the accident, which is sent as a Google Map link.And sends the live video to emergency contact.


**Fig 6.4 When accident is not detected the LCD Display shows" NO ACCIDENT DETECTED"**

When the sudden jerk happens and accident not occur the Lcd display shows like above.

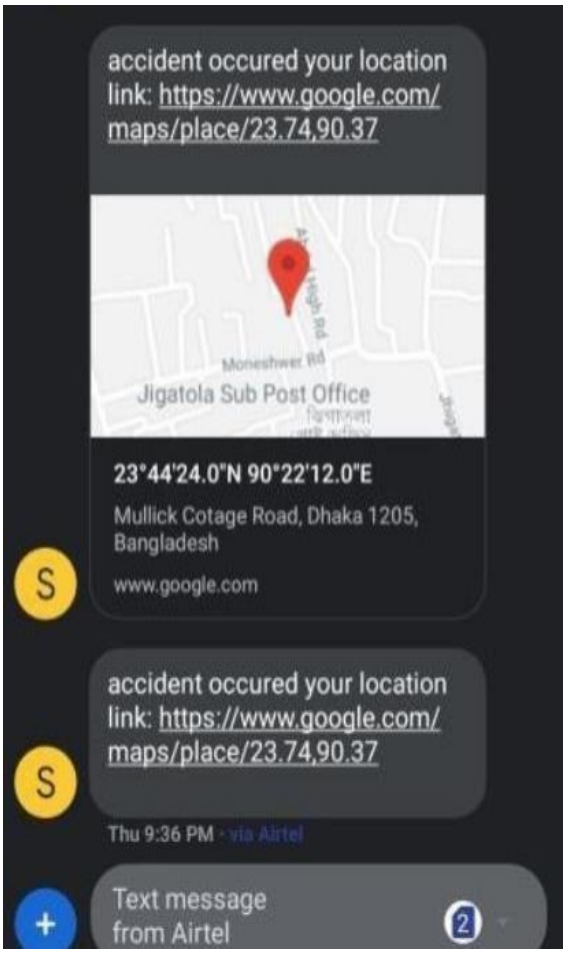



**Fig 6.5 Message alert**

The above Figure represents the message popup, when the accident is detected and shares the live location to the emergency contacts along with live location of the victim, the live video is also shared to the mobile phones of emergency contacts in the victims mobile phone.

The integration of the webcam with this model will help people with real situation of the victim the monitoring system will help to detect any collision happened in the vehicle and by using alert system it is going to access all the contacts and share information about the accident to nearby police stations and rescue system's and even for victim relatives in this way our device helps to detect accidents happened in a vehicle and save user from accident

# CHAPTER 7

## 7.1 CONCLUSION

In conclusion, the Automatic Vehicle Accident Detection system represents a pivotal advancement in road safety technology. By integrating a variety of sensors and modules such as Arduino Uno, GSM, GPS, LCD, Buzzer, DC motor, WiFi, and Vibration sensor, the system offers a comprehensive solution to mitigate the severity and frequency of road accidents. Through real-time accident detection, precise location tracking, and immediate alerts via visual, auditory, and digital channels, it ensures prompt assistance to those involved, potentially saving lives and minimizing injuries.

Furthermore, the system's efficient communication capabilities enable seamless coordination with emergency services and designated contacts, significantly improving response times. By leveraging innovative technology and an integrated approach, this system not only enhances safety on the road but also contributes to the overall improvement of transportation safety standards. It stands as a testament to the potential of technology to address critical challenges and create safer environments for all road users.

## 7.2 FUTURE SCOPE:

Future enhancements could involve integrating advanced machine learning algorithms for more precise accident detection and severity assessment. Incorporating additional sensors such as accelerometers and cameras could provide richer data for analysis and enable features like driver behavior monitoring. Furthermore, cloud connectivity could be leveraged for storing and analyzing vast amounts of collected data, facilitating continuous system optimization and the development of predictive maintenance algorithms to ensure system reliability.

# REFERENCES

[1] C.Prabha , R.Sunitha , R.Anitha "Automatic Vehicle Accident Detection and Messaging System Using GSM and GPS Modem" in journal International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering Vol. 3, Issue 7, July 2014, DOI: 10.15662/ijareeie.2014.0307062

[2] A.Rajkiran , M.Anusha "Intelligent Automatic Vehicle Accident Detection System Using Wireless Communication" in journal International Journal of Research Studies in Science, Engineering and Technology Volume 1, Issue 8,

November 2014, PP 98-101, https://www.ijrsset.org/pdfs/v1-i8/12.pdf

[3] Manuel Fogué; Piedad Garrido; Francisco J. Martinez; Juan-Carlos Cano; Carlos T. Calafate; Pietro Manzoni "Automatic Accident Detection: Assistance Through Communication Technologies and Vehicles" in journal Published in: IEEE Vehicular Technology Magazine ( Volume: 7, Issue: 3, September 2012),

DOI: 10.1109/MVT.2012.2203877

[4] Jules White, Chris Thompson, Hamilton Turner, Brian Dougherty & Douglas C. Schmidt "WreckWatch: Automatic Traffic Accident Detection and Notification with Smartphones" in journal Mobile Networks and Applications Published: 22 March 2011 Volume 16, https://link.springer.com/article/10.1007/s11036-011-0304-8

[5] Varsha Goud, V.Padmaja "Vehicle Accident Automatic Detection and Remote Alarm Device" in journalInternational Journal of Reconfigurable and Embedded Systems(IJRES)Vol.1,No.2,July2012,https://download.garuda.kemdikbud.go.id/article.php?article=1493682&val=152&title=Controller%20for%20Network%20Interface%20Card%20on%20FPG

[6] Al Wadhahi, N.T.S., Hussain, S.M., Yosof, K.M., Hussain, S.A. and Singh, A.V., 2018, August. "Accidents Detection and Prevention System to reduce Traffic Hazards using IR Sensors". In 2018 7th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions)(ICRITO) (pp. 737-741). IEEE.

[7] Kota, V.K., Mangali, N.K., Kanakurthi, T.K., Kumar, A.R. and Velayutham, T., 2017, March. "Automated accident detection and rescue system". In 2017 International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET) (pp. 1437-1441). IEEE.

[8] Sanjana, K.R., Lavanya, S. and Jinila, Y.B., 2015, March." An approach on automated rescue system with intelligent traffic lights for emergency services". In 2015 International Conference on Innovations in Information, Embedded and Communication Systems (ICIIECS) (pp. 1-4). IEEE.

[9] Khalil, U., Javid, T. and Nasir, A., 2017, November." Automatic road accident detection techniques": A brief survey. In 2017 International Symposium on Wireless Systems and Networks (ISWSN) (pp. 1-6). IEEE.

[10] Anil, B.S., Vilas, K.A. and Jagtap, S.R., 2014, April." Intelligent system for vehicular accident detection and notification". In 2014 International Conference on Communication and Signal Processing (pp. 1238-1240). IEEE.

[11] Ali, A. and Eid, M., 2015, May." An automated system for accident detection". In 2015 IEEE International Instrumentation and Measurement Technology Conference (I2MTC) Proceedings (pp. 1608-1612). IEEE.

[12] Liao, C., Shou, G., Liu, Y., Hu, Y. and Guo, Z., 2017, December." Intelligent traffic accident detection system based on mobile edge computing". In 2017 3rd IEEE International Conference on Computer and Communications (ICCC) (pp. 2110-2115

[13] Daxin Tian, Chuang Zhang, Xuting Duan and Xixian Wang, "An automatic car accident detection method based on cooperative vehicle infrastructure systems", IEEE Access, vol. 7, pp. 127453-127463, 2019.

[14] Elie Nasr, Elie Kfoury and David Khoury, "An iot approach to vehicle accident detection reporting and navigation", 2016 IEEE International Multidisciplinary Conference on Engineering Technology (IMCET), pp. 231-236, 2016.

[15] Arsalan Khan, Farzana Bibi, Muhammad Dilshad, Salman Ahmed, Zia Ullah and Haider Ali, "Accident detection and smart rescue system using android smartphone with real-time location tracking", International Journal of Advanced Co

[16] Adnan Bin Faiz, Ahmed Imteaj and Mahfuzulhoq Chowdhury, "Smart vehicle accident detection and alarming system using a smartphone", 2015 international conference on computer and information engineering (ICCIE), pp. 66-69, 2015.

[17] Fizzah Bhatti, Munam Ali Shah, Carsten Maple and Saif Ul Islam, "A novel IOT enabled accident detection and reporting system for smart city environments", vol. 19, no. 9, pp. 2071, 2019.

[18] Shaik, A., Bowen, N., Bole, J., Kunzi, G., Bruce, D., Abdelgawad, A. and Yelamarthi, K., 2018,December. Smart car:" An IoT based accident detection system". In 2018 IEEE Global Conference on Internet of Things (GCIoT) (pp. 1-5). IEEE.

[19] Kattukkaran, N., George, A. and Haridas, T.M., 2017, January." Intelligent accident detection and alert system for emergency medical assistance". In 2017 International Conference on Computer Communication and Informatics (ICCCI) (pp. 1-6). IEEE.

[20] Faiz, A.B., Imteaj, A. and Chowdhury, M., 2015, November. "Smart vehicle accident detection and alarming system using a smartphone". In 2015 International Conference on Computer and Information Engineering (ICCIE) (pp. 66-69). IEEE