Human Life Safety System with Electrical Information using GSM & GPS

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***Abstract* -Running an electrical current through the body causes an electric shock. The lowest current a person is thought to be capable of feeling is one milliamp ere (mA). Possible side effects include tingling, muscular spasms, tissue damage, cardiac fibrillation, unconsciousness, and even death. The strength and duration of the current, the area of the body through which it passes, and whether or not the individual is grounded or isolated from the earth all have an impact on these effects. Housing supports a device that permits discharge and a grounded object to allow current to be transmitted at a low enough rate to prevent shock, protecting the user from an unpleasant static shock. An electric shock preventer shields users from electrical shock with a transceiver module and a shock sensor element. An embedded-based control system will be used to introduce the electrical shock early warning and control approach.**

Keywords - Arduino UNO Board, Sensing elementZigbee, CCS compiler, Embedded C programming, PIC KIT 2

I. INTRODUCTION

Running an electrical current through the body causes an electric shock. The lowest current a person is thought to be capable of feeling is one milliamp ere (mA). Possible side effects include tingling, muscular spasms, tissue damage, cardiac fibrillation, unconsciousness, and even death. The strength and duration of the current, the area of the body through which it passes, and whether or not the individual is grounded or isolated from the earth all have an impact on these effects. Housing supports a device that permits discharge and a grounded object to allow current to be transmitted at a low enough rate to prevent shock, protecting the user from an unpleasant static shock. An electric shock preventer shields users from electrical shock with a transceiver module and a shock sensor element. An embedded-based control system will be used to introduce the electrical shock early warning and control approach. A device providing for discharging static electricity between a person and an grounded object to prevent un pleasant static shock to the person includes an insulated housing supporting a first contact arranged for manual engagement, a second contact for contacting the grounded object and a conductor of high resistance there between for allowing transmission of current at a rate which is sufficiently low to avoid shock. An electric shock preventer provides electrical shock protection for human, which consist of shock sensing element and transceiver module.

A current sensing circuit includes a power transistor, a sensing transistor configured to copy a current flowing through the power transistor at a predetermined ratio, a current sensing resistor configured to detect a voltage from the current copied by the sensing transistor, an input resistor configured to convert an input voltage to a current, a cross self-biasing cascade block configured to adjust currents at both ends of the input resistor, and a common gate transistor and a reference resistor configured to convert a current output of the input resistor to a final sense voltage. The RF Transceiver uses RF modules for high speed data transmission in the digital-RF architecture work at speeds up to 433MHZ.

II LITERATURESURVEY

a) *AN EMBEDDED BASED ELECTRIC SHOCK PREVENTION FOR HUMAN SAFETY*
Author Name: Dr.P.BalaShanmugaVadivuand Dr.S.Ponlatha. (2021)
The conductors are protected against Overload by over current devices such as Fuses or circuit breakers. This circuit Protection primarily protects wire Insulation from overheating because of Excess current. They offer no protection against electrocution where lethal current is about 100 math main supply is coming from the EB to the energy meter. It is used to measure the amount of energy will be utilized. Basically rotating iron type of energy meter is suitable for measuring, energy utilization measurement is depend upon the number of disc rotation. After that the meter MCB (miniature circuit breaker) is connected. The MCB act as a one kind of protective device, any fault occurs in the system the MCB will be tripped off .The whole structure of the system is connecting through MCB .And output of the MCB is connected to the load. In Electrical system there are basically three kinds of loads are used. They are resistive, inductive and capacitive load. These kinds of loads are used for requirement. Any fault detected in the supply line the MCB will be tripped off and isolating the load from the main supply through the energy meter.

b) *AN IOT BASED SMART ELECTRIC SHOCK PREVENTING SYSTEM*
Author Name: Amoral, V.S.Priyangaa, S.Revathi, K.Sampath, Dr.K.Sivasubramanian (2018)
When human gets electrified and it is detected. Then it is transmitted using RF transmitter. RF receiver receives the signal and given as the input to the microcontroller. Using relay, microcontroller makes the main broad to drip. Then message is passed to the authorized person using GSM module and alarm also sounds. Location is detected using GPS. Microcontroller is a small computer on a single integrated circuit containing a processor core, memory, programmable input and output peripherals. Microcontroller boards are digital devices and interactive objects that can sense and control objects. Microcontrollers are used in automatically controlled products and devices. Using relay, microcontroller makes the main broad to drip. The GPS is a space-based navigation system that provides exact location and time information in all weather conditions anywhere around earth. The GPS system does not require the user to transmit any data and it operates independently. The GSM modem is a device that modulates an analog carrier signal to encode digital information, and also demodulates such a carrier signal to decode transmitted information. The working of modem are voice calls, short message service, GSM data calls, General Packet Radio Service.

c) *SMART COMMUNICATION SYSTEM FOR HUMAN LIFE SAFETY SYSTEM WITH ELECTRICAL INFORMATION*
Author Name: S. Saravanan, I. Govindharaj, V.Mohanaprasath, B. Prashant, A. Uthiraprakash(2021)
A device providing for discharging and a grounded object to prevent unpleasant static shock to the person includes housing supporting a first contact arranged for manual engagement. A second contact for contacting the grounded object and a conductor of high resistance there between for allowing transmission of current at a rate which is sufficiently low to avoid shock. An electric shock preventer provides electrical shock protection for human, which consist of shock sensing element and transceiver module. An IOT based control system will introduce the early warning and control technique for the electrical shock.

d) *PROBLEM STATEMENT*

The conductors are protected against overload by over current devices such as fuses or circuit breakers. This circuit protection primarily protects wire insulation from overheating because of excess current. They offer no protection against electrocution where lethal current is about100 mA.

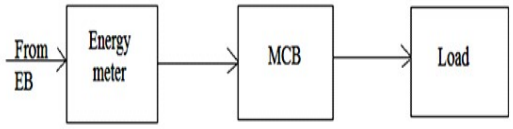


Fig1.Existing System Block Diagram

The main supply is coming from the EB to the energy meter. It is used to measure the amount of energy will be utilized. Basically rotating iron type of energy meter is suitable for measuring, energy utilization measurement is depend upon the number of disc rotation. After that the meter MCB (miniature circuit breaker) is connected. The MCB act as a one kind of protective device any fault occurs in the system the MCB will be tripped off. The whole structure of the system is connecting through MCB. And output of the MCB is connected to the load.
In Electrical system there are basically three kinds of loads are used. They are resistive, inductive and capacitive load. These kinds of loads are used for requirement. Any fault detected in the supply line the MCB will be tripped off and isolating the load from the main supply through the energy meter.

III PROPOSEDSYSTEM

Whenever you work with power tools or on electrical circuits, there is a risk of electrical hazards, especially electrical shock. Anyone can be exposed to these hazards at home or at work. Workers are exposed to more hazards because job sites can be cluttered with tools and materials, fast-paced, and open to the weather. Risk is also higher at work because many jobs involve electric power tools.
Electrical trade's workers must pay special attention to electrical hazards because they work on electrical circuits. Coming in contact with an electrical voltage can cause current to flow through the body, resulting in electrical shock and burns. Serious injury or even death may occur. As a source of energy, electricity is used without much thought about the hazards it can cause. Because electricity is a familiar part of our lives, it often is not treated with enough caution. As a result, an average of one worker is electrocuted on the job every day of

every year.

Fig2.Electricity is dangerous

a) PROPOSED BLOCK DIAGRAM

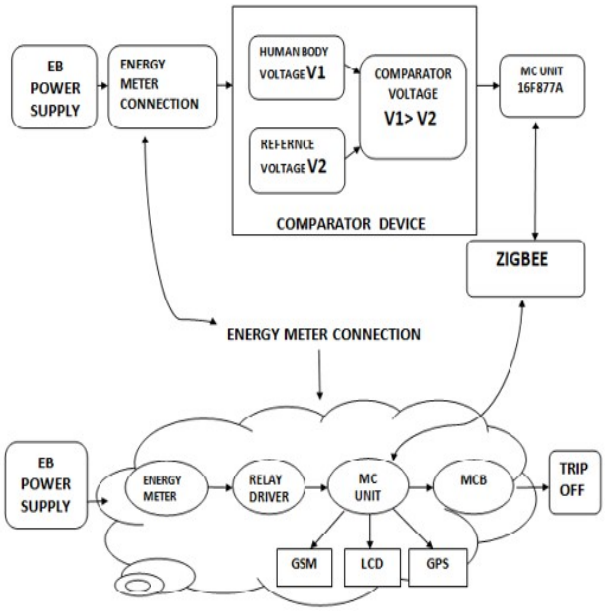


Fig.3: Proposed Block Diagram

The power supply unit is used to gives the operating voltage for the constrained device as comparator, voltage sensing unit and reference unit. Then the comparator act the major role in this circuit. It is used to compare the two voltage level they are human body voltage (v1) and Reference voltage (v2). When the v1 voltages are greater than the v2 voltage. In this condition the comparator is produced the output signal. This signal is goes to microcontroller unit PIC16F877A.The input signal is flowing through the microcontroller in continuously. In this condition the microcontroller is generating the controlling signal. And this signal is applied to the relay drive. The relay drive is used to drive the relay unit. The relay is got any input signal through the relay drives. It will be tripped off during fault condition.

b) TRANSMITTER BLOCK DIAGRAM

This transmitter circuit is used sense the fault and transmit the signal to receiver through ZIGBEE. This circuit contains power supply, sensing unit, comparator, reference voltage, pic16F877A and ZIGBEE. Then the power supply unit is used to give operating voltage for whole system. Comparators have the two input. The first pin connected to the reference second was connected to the sensor. Reference unit gives the reference voltage and sensor is used to sense the faulted voltage and gives to comparator. When the sensing voltage is greater than the reference voltage output will produced in comparator to pic16F877A and encode the input signal. And the encoded signal is gives to transmitter.

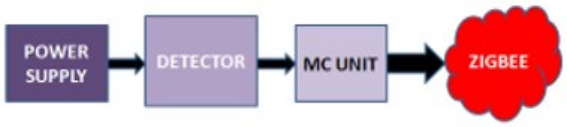


Fig.4: Transmitter Block Diagram

c) RECEIVER-1 BLOCK DIAGRAM

Transmitted signal will be received by ZIGBEE receiver. These ZIGBEE module act for both transmitter and receiver. Received signal gives to pic16F877A and input signal is decoded for required relay drive voltage. When the input signal was sensed through the relay was tripped off and disconnect load from the main supply. In case any fault like discontinuous in conductor or short circuit occurs before the energy meter, also the fault was sensed and transmit through same ZIGBEE.

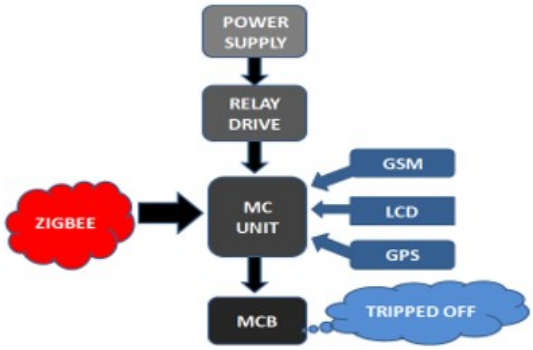


Fig.5: Receiver1Block Diagram

d) HARDWARE REQUIREMENTS

e)

➢ *Voltage Regulator:* Electronic voltage regulators operate by comparing the actual output voltage to some internal fixed reference voltage. Voltage Regulator (regulator), usually having three legs, converts varying input voltage and produces a constant regulated output voltage. They are available in a variety of outputs. The most common part numbers start with the numbers 78 or 79 and finish with two digits indicating the output voltage. The number 78 represents positive voltage and 79 negative one. The 78XX series of voltage regulators are designed for positive input. And the 79XX series is designed for negative input.

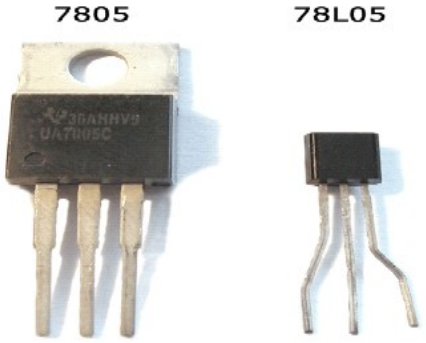


Fig.6: Voltage Regulator

➢ *Potential Sensor:* In potential sensor module we are using comparator for sensing the voltage level. Then the one type of potential sensor is explained in following details.

➢ *Relay***:** A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and most have double throw (changeover) switch contacts as shown in the diagram. Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits; the link is magnetic and mechanical.

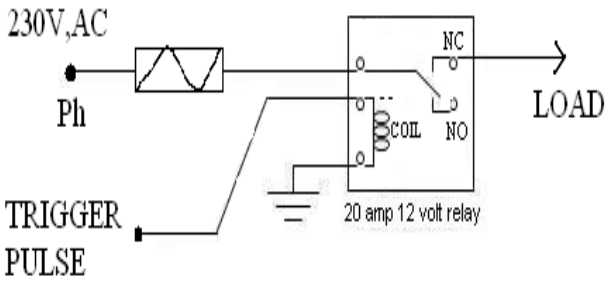


Fig.7: Relay overview diagram

The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil. The maximum output current for the popular 555 timer IC is 200mA so these devices can supply relay coils directly without amplification. Relays are usually SPDT or DPDT but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available. For further information about switch contacts and the terms used to describe them please see the page on switches.

Transistors and ICs must be protected from the brief high voltage produced when a relay coil is switched off. The diagram shows how a signal diode (egg 1N4148) is connected 'backwards' across the relay coil to provide this protection.

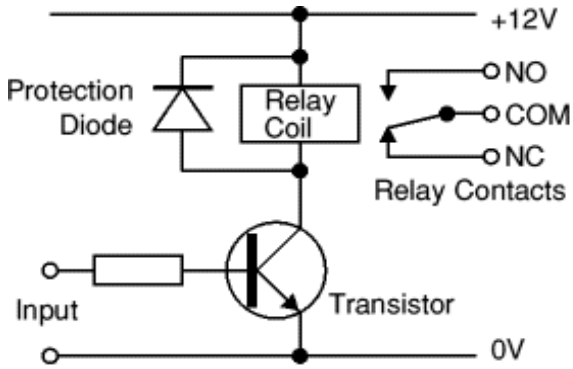


Fig.8: Protection Diodes For Rely

Transistors amplify current, for example they can be used to amplify the small output current from a logic IC so that it can operate a lamp, relay or other high current device. In many circuits a resistor is used to convert the changing current to a changing voltage, so the transistor is being used to amplify voltage. A transistor may be used as a switch (either fully on with maximum current, or fully off with no current) and as an amplifier (always partly on).

The amount of current amplification is called the current gain, symbol hFE..

- *Micro Controller*

✔ PIC16F877A
✔ PIC16F872

PIC16F877A: PIC is a family of modified Harvard architecture microcontrollers made upon by a Microchip Technology, derived from the PIC1650 originally developed by General Instrument's Microelectronics Division. The name PIC initially referred to "Peripheral Interface Controller". PICs are popular with both industrial developers and hobbyists alike due to their low cost, wide availability, large user base, extensive collection of application notes, availability of low cost or free development tools, and serial programming (and re-programming with flash memory) capability.

Peripheral Features

- Timer0: 8-bit timer/counter with 8-bit presales.
- Timer1: 16-bit timer/counter with presales.
- Timer2:8-bit timer/counter with 8-bit period register, presales and post sales.
- It has a Capture, Compare, PWM (CCP) module. Capture is of 16-bit and it has a maximum resolution of 12.5

ns. Compare is of 16-bit and it has a maximum resolution of 200ns.Pulse Width Modulation has a maximum resolution of 10-bit.8-bit.

- 8 channel analog-to-digital converter with 10 bit each.
- It has a Synchronous Serial Port (SSP) with SPI (Master/Slave) and I2C, USART with 9 bit detection. It also has a Brown-out detection circuitry for Brown-out Reset (BOR).

Pin Diagram

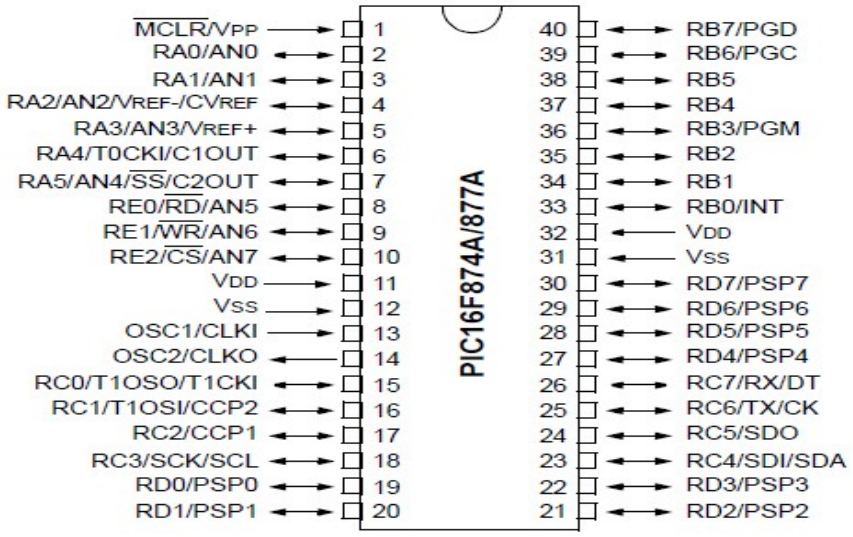


Fig.9: Pin Diagram of Pic16f877a

PIC16F872: This document contains device specific information about the PIC16F872 microcontroller. Additional information may be found in the PIC micro™ Mid-Range Reference Manual (DS33023), which may be obtained from your local Microchip Sales Representative or downloaded from the Microchip website. The Reference Manual should be considered a complementary document to this data sheet, and is highly recommended reading for a better understanding of the device architecture and operation of the peripheral modules.

Peripheral Features:

- High Sink/Source Current: 25 mA
- Timer0: 8-bit timer/counter with 8-bit pre scalar
- Timer1: 16-bit timer/counter with pre scalar, can be incremented during SLEEP external crystal/clock
- Timer2: 8-bit timer/counter with 8-bit period register, pre scalar and post scalar
- One Capture, Compare, PWM module
- Capture is 16-bit, max. resolution is 12.5 ns
- Compare is 16-bit, max. resolution is 200 ns
- PWM max. resolution is 10-bit
- 10-bit, 5-channel Analog-to-Digital converter (A/D)
- Synchronous Serial Port (SSP) with SPI™ (Master mode) and I2C™ (Master/Slave)
- Brown-out detection circuitry for Brown-out Reset (BOR)
- High Sink/Source Current: 25 mA
- Timer0: 8-bit timer/counter with 8-bit pre scalar
- Timer1: 16-bit timer/counter with pre scalar, can be incremented during SLEEP external crystal/clock
- Timer2: 8-bit timer/counter with 8-bit period register, pre scalar and post scalar
- One Capture, Compare, PWM module
- Capture is 16-bit, max. resolution is 12.5 ns
- Compare is 16-bit, max. resolution is 200 ns
- PWM max. resolution is 10-bit
- 10-bit, 5-channel Analog-to-Digital converter (A/D)
- Synchronous Serial Port (SSP) with SPI™ (Master mode) and I2C™ (Master/Slave)
- Brown-out detection circuitry for Brown-out Reset (BOR)

Pin Diagram

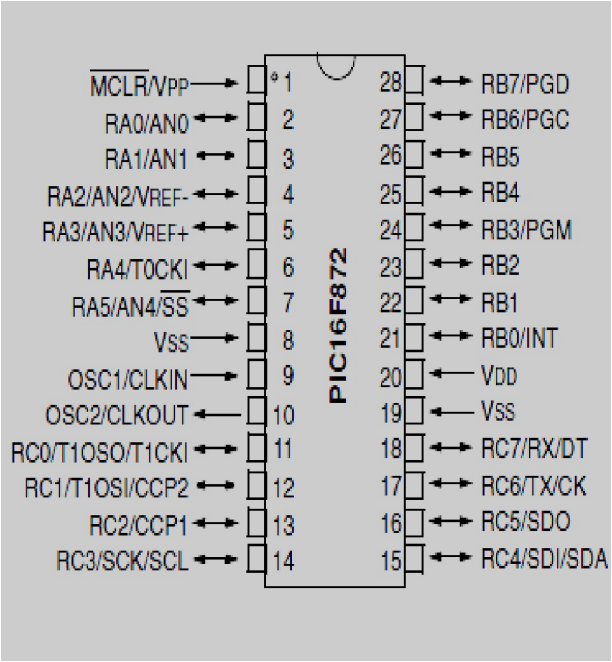


Fig.10: Pin Diagram of Pic16f872

➢ *GSM*: This GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily. The modem can either be connected to PC serial port directly or to any microcontroller. It can be used to send and receive SMS or make/receive voice calls. It can also be used in GPRS mode to connect to internet and do many applications for data logging and control. In GPRS mode you can also connect to any remote FTP server and upload files for data logic. This GSM modem is a highly flexible plug and play quad band GSM modem for direct and easy integration to RS232 applications. Supports features like Voice, SMS, Data/Fax, GPRS and integrated TCP/IP stack.

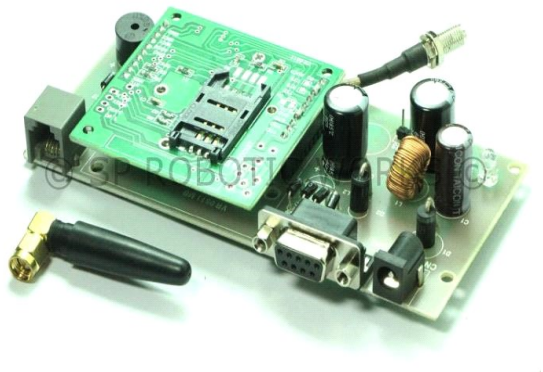


Fig.11: GSM Diagram

- *Zig bee:* Zig bee is a specification for a suite of high-level communication protocols used to create personal area networks built from small, low-power digital radios. Zig bee is based on an IEEE 802.15.4 standard. Though its low power consumption limits transmission distances to 10–100 meters line-of-sight, depending on power output and environmental characteristics,[1] Zig bee devices can transmit data over long distances by passing data through a mesh network of intermediate devices to reach more distant ones. Zig bee is typically used in low data rate applications that require long battery life and secure networking (Zig bee networks are secured by 128 bit symmetric encryption keys.) Zig bee has a defined rate of 250 Kbit/s, best suited for intermittent data transmissions from a sensor or input device. Applications include wireless light switches, electrical meters with in-home-displays, traffic management systems, and other consumer and industrial equipment that require short-range low-rate wireless data transfer. The technology defined by the Zig bee specification is intended to be simpler and less expensive than other wireless personal area networks (WPANs), such as Bluetooth or Wi-Fi.

Zig bee is a low-cost, low-power, wireless mesh network standard targeted at wide development of long battery life devices in wireless control and monitoring applications. Zig bee devices have low latency, which further reduces average current. Zig bee chips are typically integrated with radios and with microcontrollers that have between 60-256 KB flash memories. Zig bee operates in the industrial, scientific and medical (ISM) radio bands: 2.4 GHz in most jurisdictions worldwide; 784 MHz in China, 868 MHz in Europe and 915 MHz in the USA and Australia. Data rates vary from 20 Kbit/s (868 MHz band) to 250 Kbit/s (2.4 GHz band).The Zig bee network layer natively supports both star and tree networks, and generic Mesh networking. Every network must have one coordinator device, tasked with its creation, the control of its parameters and basic maintenance. Within star networks, the coordinator must be the central node. Both trees and meshes allow the use of Zig bee routers to extend communication at the network level.Zigbee is one of the global standards of communication protocol formulated by the relevant task force under the IEEE 802.15 working group. The fourth in the series, WPAN Low Rate/Zig bee is the newest and provides specifications for devices that have low data rates, consume very low power and are thus characterized by long battery life.

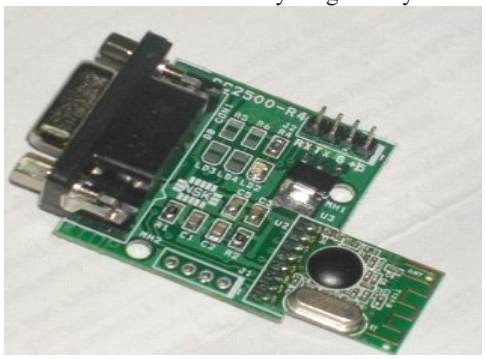


Fig.12: Zig bee

- **IR Sensor**: This Medium Range Infrared sensor offers simple, user friendly and fast obstacle detection using infrared; it is noncontact detection. The implementations of modulated IR signal immune the sensor to the interferences caused by the normal light of a light bulb or the sun light.

Infrared (IR) technology addresses a broad variety of wireless applications, especially in the areas of sensing and remote control. Today's newest products such as cell phones, digital cameras, and DVD players as well as remote controls for every market segment rely on IR sensing and control devices. The implementations of modulated IR signal immune the sensor to the interferences caused by the normal light of a light bulb or the sun light. ROHM Semiconductor has been driving technology advances that have led to a growing number of IR sensing and communication applications for over 40 years.

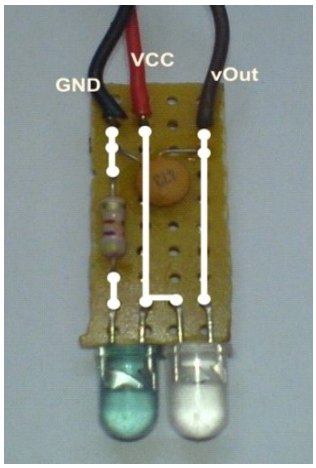


Fig.13: IR sensor

➢ **LCD Display: The** most commonly used Character based LCDs are based on Hitachi's HD44780 controller or other which are compatible with HD44580. we will discuss about character based LCDs, their interfacing with various microcontrollers, various interfaces (8-bit/4-bit), programming, special stuff and tricks you can do with these simple looking LCDs which can give a new look to your application. For Specs and technical information HD44780 controller.

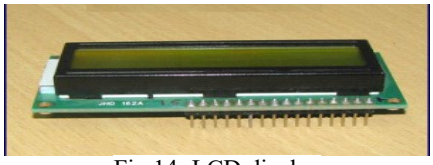


Fig.14: LCD display

Pin Description **:**The most commonly used LCDs found in the market today are 1 Line, 2 Line or 4 Line LCDs which have only 1 controller and support at most of 80 characters, whereas LCDs supporting more than 80 characters make use of 2 HD44780 controllers. 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.

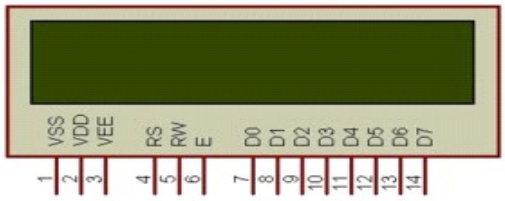


Fig.15: Character LCD type HD44780 Pin diagram

Instruction and Data Register: There are two 8-bit registers in HD44780 controller Instruction and Data register. Instruction register corresponds to the register where you send commands to LCD e.g LCD shift command, LCD clear, LCD address etc. and Data register is used for storing data which is to be displayed on LCD. when send the enable signal of the LCD is asserted, the data on the pins is latched in to the data register and data is then moved automatically to the DDRAM and hence is displayed on the LCD. Data Register is not only used for sending data to DDRAM but also for CGRAM, the address where you want to send the data, is decided by the instruction you send to LCD. We will discuss more on LCD instruction set further in this tutorial.

*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

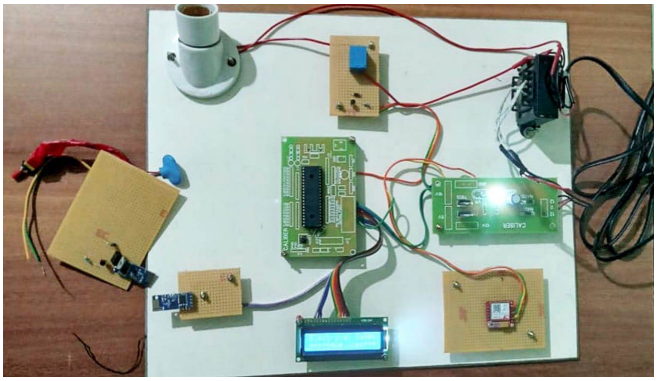
Although looking at the table you can make your own commands and test them. Below is a brief list of useful commands which are used frequently while working on the LCD.

LCD Initialization: Before using the LCD for display purpose, LCD has to be initialized either by the internal reset circuit or sending set of commands to initialize the LCD. It is the user who has to decide whether an LCD has to be initialized by instructions or by internal reset circuit. we will discuss both ways of initialization one by one.

SENDING COMMANDS TO LCD: To send commands we simply need to select the command register. Everything is same as we have done in the initialization routine. But we will summarize the common steps and put them in a single subroutine.

IV RESULTS

➢ *TESTING*



V.CONCLUSION

As a result, the anticipated work is planned and carried out, and the neighbors are informed through alarm. The signal is sent from the RF transmitter to the RF receiver. The microcontroller is interfaced with GSM and GPS devices. GPS tracks the location, and GSM assists in sending the message to the appropriate party. Information about electric shocks is stored for data records utilizing IoT technology.

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