

An Iot Based Smart Electric Shock Preventing System

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Abstract: *Due to the electrical shock, hundreds of workers were injured and killed each year. Death or injury is not caused by the voltage, the damage is caused by the amount of current that flows through the body. An electric shock is due to the electric leakage which results lot of damage to appliances and also causes injury to humans even leads to death. Forty-two percentage of total fires occur due to electrical sources and eight percentage of deaths that occurs in Indian factories are due to electrocution. When a part of body gets conduct between two conductors or between conductor and a grounding source, it forms a complete circuit and results in electrical shock. Each year, result of electrical accidents, is more than 12,306 crores in property damage in home and industry. To overcome these problem, our project gives better solution. Electric shock or accidents can be prevented by the proposed system. Whenever the human is electrocuted, the electric shock is detected and then the sensed signal is transmitted to the microcontroller using RF transmitter and receiver. Arduino microcontroller is used to detect the signal from RF receiver and then the microcontroller pass the control to relay which will trip the main board. Then the alarm sounds as it is alert for the nearby*

users. It also gives the alert message to the authorised person using GSM. With the help of IoT technology, the exact location and time information can be found and the

electric shock information are stored for data records. This proposed system helps to find the electric shock and to avoid the untoward incident happening in home or industry and saves the human life.

Keywords: *Internet of Things, Arduino Nano, GSM/GPRS &GSM M590E Module.*

I. INTRODUCTION

Electric injury is a physiological reaction caused by electric current passing through the human body. Electric shock occurs upon contact of a human body part with any source of electricity that causes a sufficient magnitude of current to pass through the victim's body. Physical contact with energized wiring or devices is the most common cause of an electric shock. In the cases of exposure to high voltages, such as on a power transmission tower, physical contact with energized wiring or objects may not be necessary to cause electric shock, as the voltage may be sufficient to jump the air gap between the electrical device and the victim. The injury related to electric shock depends on the magnitude of the current. Very small currents may be imperceptible or produce a light tingling sensation. A shock caused by low current that would normally be harmless. Stronger currents may cause some degree of discomfort or pain, while more intense currents may induce involuntary muscle contractions, preventing the victim from breaking free of the source of electricity.

Electric shock or accidents can be prevented by our proposed system. Arduino microcontroller is used to detect the electric current and then the microcontroller passes the control to relay which will trip the main board. By the help of IoT technology, the exact location and time information can be found. Then the alarm sounds as it is alert for the nearby users.

II. PROBLEM DEFINITION

An electric shock is due to the electric leakage which results lot of damage to appliances and also causes injury to humans even leads to death. Thus our proposed system gives a solution to this problem for humans and saves the human life with the help of GSM, GPS module.

III. PROPOSED SYSTEM

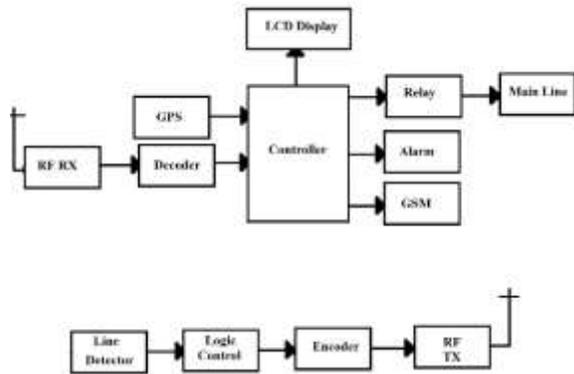


Figure 1.1 Block Diagram of Smart Electric Shock Preventing System

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.

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.

IV. IMPLEMENTATION METHODOLOGY

HARDWARE DESCRIPTION

A) POWER SUPPLY

Power supply is an integral part which plays a vital role in every electronic system and hence their design constitutes a major part in every application. In order to overcome mal-operation which results due

to fluctuations in the load and discontinuity in the supply proper choice of power supply is a great need.

The power supply circuit is built using filters, rectifiers, and then voltage regulators. Starting with analog voltage, typically 220 Volts, is connected to a transformer, which steps that ac voltage down to the level for the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation. A regulator circuit can use this dc input to provide a dc voltage that not only has much less ripple voltage but also remains the same dc value even if the input dc voltage varies somewhat, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of a number of popular voltage regulator IC units.

B) MICROCONTROLLER

Arduino Nano (ATmega328) consist of 14 digital input/output pins (of which 6 can be used as PWM outputs), 8 analog inputs, a USB connection, a power jack, a reset button and more. It contains everything that is needed to support the microcontroller, simply it is connected to a computer with a USB cable or power it with the AC-to-DC adapter or battery to get started. Operating voltage is 5V. Input voltage (recommended) is 7V to 12V. Input voltage (limits) is 6-20V. Flash memory for ATmega328 is 32KB of which 2KB used by boot loader. SRAM is 2KB and EEPROM is 1KB. Clock speed is 16MHz. The Arduino Nano has the number of facilities for communicating with a computer, another Arduino or other microcontrollers. ATmega328 provide URAT TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1(TX). The Arduino software includes a serial monitor which allows a simple textual data to be sent to and from the Arduino board. The Rx and TX LEDs on the board will flash when data is being transmitted via the FTDI chip and USB connection to the computer (but not for serial communication on pins 0&1).A software serial library allows for serial communication on any of the Nano digital pins. ATmega328 also support I2C and SPI communication. The Arduino software includes a wire library to simplify use of the I2C bus. The Arduino Nano can be programmed with the Arduino software. The ATmega328 on the Arduino Nano comes preburned with a boot loader that allows uploading new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol. Rather than requiring a physical press of the reset button before

an upload, the Arduino Nano is designed in a way that allows it to be reset by software running on connected computer.

C) GPS TECHNOLOGY

GPS (Global Positioning System) is a satellite navigation system. GPS provides specially coded satellite signals that can be processed in GPS receiver, enabling the receiver to computer position, velocity and time. Four GPS satellite signals are used to compute position in three dimensions and the time offset in the receiver clock. The GPS system consists of three segments. These are space segment, the control segment, and the user segment. The GPS is used to create digitized maps. In this project we are using ultra high sensitivity and low power GPS receiver module. The model number used is SKG13C. The SKG13C is a complete GPS engine module that features super sensitivity, ultra-low power and small form factor. The GPS signal is applied to the antenna input of the module, and a complete serial data message with position, velocity and time information is presented at the serial interface with NMEA protocol or custom protocol. It is based on the high performance features of MediaTek MT3339 single chip architecture, its -165dBm tracking sensitivity extends positioning coverage. The small form factor and low consumption make the module easy to integrate into portable devices. It is used for variety of application like LBS (Location Based Service), PND (Portable Navigation Device), vehicle navigation system, mobile phone. The SKG13C GPS module offers many features there are extremely fast TTFF at low signal level and Indoor and outdoor multi-path detection and Compensation.

D) GSM TECHNOLOGY

GSM (Global System for Mobile communication) is the most popular standard for mobile phone in the world. GSM is used for over 3 billion people across more than 212 countries. Its ubiquity makes international roaming very common between mobile phone operators, enabling subscribers to use their phones in many parts of the world. GSM is a cellular network, which means that mobile phones connect to it by searching for cells in the immediate vicinity. GSM networks operate in four different frequency ranges. The coverage area of each cell varies according to the implementation environment. Cell horizontal radius varies depending on antenna height, antenna gain and propagation conditions from a couple of hundred meters to several tens of kilometres. The structure of GSM network is

divided into number of sections. These are the base station subsystem and the network and switching subsystem and the GPRS core network. All the elements in the system combine to produce many GSM services such as voice calls and SMS. One of the key features of GSM is Subscriber Identity Module (SIM). The SIM is detachable smart card containing the user's subscription information and phone book. GSM was designed with a moderate level of security. This system was designed to authenticate the subscriber using a pre shared and challenge response. Communication between the subscriber and the base station can be encrypted. In this project we are using M590E type GSM module. This M590E model provides good network compatibility and high reliability. Its supports for various protocols like TCP/UDP/FTP/DNS. Operating temperature for this GSM model is -40 to +80 degree Celsius.

E) WI-FI MODULE

In this project we are using ESP8266EX WI-FI module. ESP8266EX offers a complete and self-contained Wi-Fi networking solution. It can be used to host the application or to offload Wi-Fi networking functions from another application processor. When ESP8266EX hosts the application, it boots up directly from an external flash. It has integrated cache to improve the performance of the system in such applications. ESP8266EX is among the most integrated Wi-Fi chip in the industry; it integrates the antenna switches, RF balun, power amplifier, low noise receive amplifier, filters, power management modules, it requires minimal external circuitry and the entire solution, including front-end module, is designed to occupy minimal PCB area. ESP8266EX also integrates an enhanced version of Ten silica's L106 Diamond series 32-bit processor, with on-chip SRAM, besides the Wi-Fi functionalities. The ESP8266EX Wi-Fi module consist of three parameters. These are Wi-Fi parameters, hardware and software parameters. It has totally 18 pins and provides two modes of operation. The ESP8266 requires 3.3v power and needs to communicate via serial at 3.3v and does not have 5v tolerant inputs. Its protocol version is 802.11 b/g/n.

F) ALARM AND TRIPPING CIRCUIT

The circuit is designed to control the buzzer. The buzzer ON and OFF is controlled by the pair of switching transistors (BC 547). The buzzer is connected in the transistor collector terminal. In the same operation tripping circuit is designed. The main board is tripped using relay.

G) RF TRANSMITTER AND RECEIVER MODULE

Whenever the high output pulse is given to base of the transistor BF 494, the transistor is conducting so tank circuit is oscillated. The tank circuit consists of L2 and C4 generating 433 MHz carrier signal. Then the modulated signal is given LC filter section. After the filtration the RF modulated signal is transmitted through antenna.

The RF receiver is used to receive the encoded data which is transmitted by the RF transmitter. Then the received data is given to transistor which acts as amplifier. Then the amplified signal is given to carrier demodulator section in which transistor Q1 is turn on and turn off conducting depends on the signal. Due to this the capacitor C14 is charged and discharged so carrier signal is removed and saw tooth signal is appears across the capacitor. Then this saw tooth signal is given to comparator. The comparator circuit is constructed by LM558. The comparator is used to convert the saw tooth signal to exact square pulse. Then the encoded signal is given to decoder in order to get the decoded original signal.

H) LCD MODULE

Liquid crystal displays (LCDs) have materials which combine the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an ordered form similar to a crystal. When the LCD is in the off state, light rays are rotated by the two polarisers and the liquid crystal, such that the light rays come out of the LCD without any orientation, and hence the LCD appears transparent. The power supply should be of +5V, with maximum allowable transients of 10mv. To achieve a better / suitable contrast for the display, the voltage (VL) at pin 3 should be adjusted properly. All the characters of a single line display, as in CDM 16108. The first eight characters of a single line display, operated in the two-line display mode, as in CDM 16116. The first and third line of characters of a four-line display operated in the two-line display mode, as in CDM 20416. If the above mentioned does not occur, the module should be initialized by software. Make sure that the control signals E, R/W and RS are according to the interface timing requirements. The controller IC has two 8 bit registers, an instruction register (IR) and a data register (DR). The IR stores the instruction codes and address information for display data RAM (DD RAM) and character generator RAM (CG RAM). The IR can be written, but not read by the MPU.

SOFTWARE DESCRIPTION

A) ARDUINO SOFTWARE IDE

A program for Arduino may be written in any programming language with compilers that produce binary machine code for the target processor. Atmel provides a development environment for their microcontrollers, AVR studio and the newer Atmel studio. The Arduino project provides the Arduino integrated environment (IDE) which is a cross platform application written in the programming language java. It originated from the IDE for the languages processing and wring. A program written with the IDE for Arduino is called a sketch. Sketches are saved on the development computer as text files with the file extension.ino. The Arduino IDE supports the languages C and C++ using special rules of code structuring. User written code only requires two basic functions for starting the sketch and the main program loop, that are compiled and linked with a program stub main() into an executable cyclic executive program with the GNU tool chain, also included with the IDE distribution.

V. CONCLUSION

Thus, the proposed work is designed and implemented, in which alarm is used to intimate the neighbours. RF transmitter is used to send the signal to the RF receiver. GSM and GPS modules are interfaced to the Arduino microcontroller. GPS tracks the location and with help of GSM, the message is send to authorized person. By using the IoT technology, electric shock details are stored for data records.

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