

GSM BASED HOME AUTOMATION

A Project submitted in partial fulfillment of the requirements for the Award of Degree of Bachelor of Science in Electrical and Electronic Engineering.

Submitted By

Md. Mostafa Kamruggaman

ID: 153-33-2936

Md. Mahmudul Hasan

ID: 153-33-2935

Supervised by:

Professor Dr. M. Shamsul Alam

Dean

Faculty of Engineering



**DEPARTMENT OF ELECTRICAL AND ELECTRONIC
ENGINEERING**

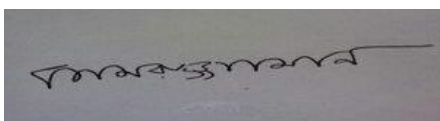
FACULTY OF ENGINEERING

DAFFODIL INTERNATIONAL UNIVERSITY

18 December 2018

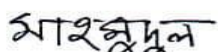
DECLARATION

We hereby declare that, this project has been done by us under the supervision of Prof. Dr. M. Shamsul Alam co-supervision of AKM Ahasan Habib, RA, Dept. of EEE Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of BSc in EEE degree.



Md. Mostafakamruggaman

ID: 153-33-2936



Name: Md. Mahmudul Hasan

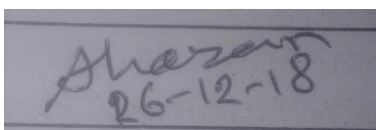
ID: 153-33-2935

Professor Dr. M. Shamsul Alam

Dean

Faculty of Engineering

Daffodil International University



A K M Ahsan Habib

RA

Department of EEE

Daffodil International University

The project entitled —"GSM Based Home Automation", submitted by Md. Mostafakamruggaman, ID No: 153-33-2936, Md. Mahmudul Hasan, ID No: 153-33-2935, Has been accepted as satisfactory in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering.

BOARD OF EXAMINERS

Dr. Engr. ...

Chairman

Professor

Department of EEE, DIU

Dr. Engr. ---

Internal Member

Professor

Department of EEE, DIU

Dr. Engr. ---

Internal Member

Professor

Department of EEE, DIU

Dedicated to
Our Parents and Teachers

CONTENTS

List of Figures	viii
List of Tables	ix
List of Abbreviations	x
List of Symbols	xi
Acknowledgment	xii
Abstract	xiii

Chapter 1:	INTRODUCTION	1-3
1.1	Introduction	1
1.2	Problem Statement	1
1.3	Objectives	2
1.4	Scopes	2
1.5	Methodology	2
1.6	Project Outline	3
Chapter 2:	LITERATURE REVIEWS	4-6
2.1	Introduction	4
2.2	Literature Contributions	4
2.3	Literature Survey	5
2.4	Summary	6
Chapter 3:	ANALYSIS AND SIMULATION	7-21
3.1	Introduction	7
3.2	Define GSM	7
3.3	Overview	8
3.3.1	Topics	8
3.4	Two Thirds of World's Population Now Connected, According to GSMA Intelligence	8

3.5	The GSM Network	10
3.5.1	The Switching System	10
3.6	The Base Station System (BSS)	11
3.7	The Operation and Support system	11
3.7.1	Additional Functional Elements	12
3.8	GSM Network Areas	12
3.9	GSM Specification	14
3.10	Supplementary Services	15
3.11	Universal Synchronous Asynchronous Receiver Transmitter (USART)	16
3.12	Using Programming System	17
3.13	Softer Analysis	17
3.14	Block Diagram	18
3.15	Flow Chart	19
3.16	Circuit Diagram	20
3.17	PCB Layout	21
3.18	PCB 3D View	21
Chapter 4:	HARDWARE DEVELOPMENT	22-39
4.1	Introduction	22
4.1.1	The methodology followed in our project is as follows	22
4.2	Different Types of Hardware Equipment list and Costing Sheet	23
4.2.1	Capacity Elements	24
4.3	SIM 800L GSM Module	25
4.3.1	SIM 800L GSM Module Description	25
4.3.2	About the antenna	26
4.3.3	Atmega328-PU	27
4.3.4	Description	27

4.4	Pin Diagram of Arduino (At mega 328)	30
4.4.1	Pin Description of At mega 328	30
4.4.2	Arduino Works	32
4.5	LCD Display (16×2)	32
4.5.1	Pin Configuration	32
4.6	Feature of (16×2) LCD Module	34
4.7	DC-DC Buck Converter LM2596S	34
4.8	Resistor	35
4.9	Capacitor	36
4.10	Transistor	36
4.11	Crystal	37
4.12	Relay	37
4.13	12V Power Supply	38
4.14	Diode	39
Chapter 5:	RESULTS AND DISCUSSIONS	40-44
5.1	Introduction	40
5.2	Hardware Result	40
5.2.1	Android Apps	44
5.3	Summary	44
Chapter 6:	CONCLUSION AND RECOMMENDATION	
6.1	Conclusion	45
6.2	Limitations of the Work	45
6.3	Future Scopes	45
6.4	Advantages	46
6.5	Disadvantage	47
6.6	References	48
6.7	Appendix-A	49

LIST OF FIGURES

Figure No.	Figure Caption	Page No.
3.1	Global System for Mobile Communication(GSM) System Diagram	8
3.2	GSM Network Elements	10
3.3	Network Areas	13
3.4	Location Area	13
3.5	MSC/VLR Service Areas	14
3.6	PLMN Network Areas	14
3.7	Softer Analysis Step	17
3.8.	Block Diagram	18
3.9	Flow Chart	19
3.10	Circuit Diagram	20
4.1	SIM800L GSM MODULE	25
4.2	Atmega328-PU	27
4.3	Pin Diagram of Arduino (At mega 328)	29
4.4	LCD Display 16×2	32
4.5	Buck Module	34
4.6	Figure of Resistor	35
4.7	Figure of Capacitor	36
4.8	Figure of Transistor	36
4.9	Crystal	37
4.10	12v Relay	37
4.10.1	Internal Connection	38
4.11	12 v Power Supply	38
4.12	Diode	39
5.1	Starting.....	40
5.2	when all load off	41
5.3	Load-1 ON	42
5.4	Load-1 and Load-3 ON	42
5.5	All Load ON (Auto)	43
5.6	All Load ON (Manual)	43
5.7	Android App	44

LIST of TABLES

Table No.	Table Caption	Page No.
3.1	Unique Mobile Subscribers by Global region, into 2017	9
4.1	Equipment List	23
4.1.1	Cost Analysis	23
4.2	Specs	28
4.3	Pin description of At mega 328	30
4.4	Pin Configuration	32

List of Abbreviation

Name	Elaborations
GSM	Global System for Mobile Communication
SIM	Subscriber Identity Module
LCD	Liquid Crystal Display
GPRS	General Packet Radio Service
AC	Alternating Current
LED	Light Emitting Diodes
DC	Direct Current
SIM	Subscriber Identity Module
IC	Integrated Circuit
PCB	Printed Circuit Board

SMS	Short Message service
USART	Universal Synchronous Asynchronous Receiver Transmitter
BPS	Bits Per Second
MXE	Message Center
BSS	Base Station System
AUC	Authentication Center

List of Symbols

λ	Wavelength
λ_B	Bragg wavelength
n_{eff}	Effective index
Z	Position along the grating
N	Mode index
F	Fundamental Frequency
ω	Angular frequency
M	Modulation Index
T	Fundamental Time Period
V	Voltage
I	Current
P	Power
W	Watt

ACKNOWLEDGEMENT

First of all, we give thanks to Allah. Then we would like to take this opportunity to express our appreciation and gratitude to our project co-supervisor **A K M Ahasan Habib, RA, Department of EEE** for being dedicated in supporting, motivating and guiding us through this project. This project can't be done without his useful advice and helps. Also thank you very much for giving us opportunity to choose this project.

We also want to convey our thankfulness to **Professor Dr. M. Shamsul Alam, Dean, and Faculty of Engineering (FE) and Professor Dr. Md. Shahid Ullah, Head, Department of EEE** for his help, support and constant encouragement.

Apart from that, we would like to thank our entire friends of DIU for sharing knowledge; information and helping us in making this project a success. Also thanks for lending us some tools and equipment.

Finally we beloved to our family, we want to give them love in the core of our heart and respect their inspiration and encouragement during our studies in this University.

ABSTRACT

This paper represents the advancement of GSM-based both home and field appliance control for application system. The main goal of the advancement is to decrease electricity wastage. GSM module is used for receiving short message service (SMS) from user's mobile apps that automatically enable the controller to take any other operation such as to switch ON and OFF the home appliances such as light, fan, television, air-conditioner, many others type and field appliance outdoor system. The system is compact with microcontroller and GSM network interface using C language. Essay EDA software was exploited to accomplish the integration. The system is activated when the sender click ON/OFF option on apps at house. when receiving the SMS command, the microcontroller unit automatically controls the electrical home appliances by switching ON or OFF the device according to the user direction. In other words, the home appliances are controlled by the home server, which operates according to the user commands.

CHAPTER– 1

INTRODUCTION

1.1 Introduction:

Home automation is the control of any electrical device in our home or office, whether we are there or not. The advantage of technology makes our life simpler and easier. Automation presents the outbound applications of the GSM technology. Using the mobile GSM networks, an electrical device and home appliance control has been designed, implemented and turned. Through the project we have tried to show automatic control of a house or industry.

The design of the automation system that can monitor and control system locally using built- in input and output peripherals is presented. The system allows the user or from out land any space monitoring and controlling the house appliances or out from any distance via the smart or cellular phone set by sending commands in the form of SMS messages and receiving the appliances message Total system showing in the LCD such as command L1 for ON, L0 for OFF and step by step each load control. The GSM module provides the communication media between the user and the device by means of SMS messages. The system software is also developed using an interactive C programming language platform.

1.2 Problem statement:

Literature inspection to comprehend the constraints and requirements of our smart an electrical device and automatic control system.

- (a) Attainment of chips and ICs
- (b) Simulation of the microcontroller system using Easy EDA
- (c) Program burning in the microcontroller and hard ware implementation

1.3 Objective:

The followings are the objectives of this Major Project to ensure it meets the goal.

- a) To design a circuit that can expert and self-acting read the position of the different electrical device appliances connected to the control system.
- b) To design a control system for modern home application using GSM network
- c) To design a circuit that can automatically switch ON / OFF the electrical device and outdoor appliances control using GSM module.
- d) To experiment our designed system with a wide range of electrical and electronic equipment and troubleshoot any errors.

1.4 Scopes:

It is an automation of home. Home automation may use control all of the home appliances. Electrical and Electronic environment with favor to this context is any situation which consists of appliances such as motors, television sets, fan, air conditioners, heater, lighting systems, wateringetc. Home automation is such a field where we always want to make easiest and comfortable so, we look forward to a system to install in our home so that we can easily communicate with our daily used device wherever we live. So that this project is getting the opportunity to implement each and every house.

1.5 Methodology:

Electricity is an essential part of our life. We can't think of our modern life without electricity. It is becoming the restrict source now. So, we can't afford to abuse any fraction of it. If we accidentally leave any of the electrical device and irrigation appliances (bulb, microwave oven, TV, fan, pump etc.) switched on, we can access them remotely through our cell phone and switch it off through SMS. It's not always possible to be physically near to the home still sometimes it's very necessary to control the machinery for many purposes So the remote controlling takes the control of the house beyond the house and to the hands of the public. If a simple mobile phone takes the added liability to control the smart system then the control is available from almost everywhere people travels and lives on universe. Nowadays most of the people are using mobile services. So, inventing a system which can control home

weapons from remote places using SMS can benefit a large population which may not be possible using other facility like internet.

1.6 Project Outline:

This Project is organized as follows:

Chapter 1: Introduction, Problem statement, Objectives, Scope, Approach, Project outline.

Chapter 2: Reviews the literature Introduction, Literature contributions, project summary, Mobile telephony system.

Chapter 3: Analyzes and simulates the theoretical model such as introduction, Features of microcontroller, Peripheral features, Special microcontroller, Device overview, Memory organization, USART, A/D module,

Chapter 4: Describes the hardware development part of Introduction, Pin diagram, program, Relay driver, Relay, Oscillator configuration, Circuit diagram, SIM300 module, Product concept, Application interface, Serial interface etc.

Chapter 5: Presents the result and its discussions such as Simulation result & Hardware result.

Chapter 6: Concludes with some recommendations are Limitations of work, Future scopes.

CHAPTER-2

LITERATUREREVIEWS

2.1 Introduction:

The need for systems that make our life easier and more comfortable has increased within the past few years. The ability to conserve two of the most essential resources of a user. In the scope of industrialization and automation A system that provides this ability to through the use of efficient and reliable way such as wireless networking, GSM, SMS technologies and easily available mobile phone devices is certain to help the user get a better facility and on a larger scale, help the automation and economic growth of the country involves LCD display, GSM. So LCD will be on field display purpose. GSM module will take on a Subscriber Identity Module (SIM) user can communicate with this SIM-Number. When the specific command activated or given by the user, instantly the corresponding GSM system will activates and reads the existent reading and without delay sends results to the same user mobile and displays in the LCD panel in the field. Instantly user will take the essential action if required. All these devices are linked to the Arduino.GSM is used for communication purpose, with the help of Library (attention)-Commands we can communicate with the equipment's. Wearer using smart phone. This system is designed for controlling device with the help of mobile network

2.2Literature Contributions:

within the literature, there are several contributions cited in current years in cell to-machine or machine-to- mobile or device-to-gadget, conversation. these encompass: introduction prototype included cellular telem edicine system interfaced with sensors to a affected person's body the use of GSM simulation[10]; scheming mobile gadget with wi-fi LAN [11]; enforcing size gadget to supervision the ambient air ability using GPS, GPRS modem and superior RISC device [12]; designing faraway control of sensors and actuators the use of GSM module [13]; and designing stand-by myself humane warmth and blood stress system the usage of microcontroller with embedded

software [14]. meantime, the machine developed through [15] is automating the strength analyzing meter to ship the power wasted to e-billing machine at accepted office. The gadget works by means of integrating the GSM module that become connected with digital kWh energy meter. It utilizes the GSM network to send energy usage studying the usage of SMS to the permitted office. The legal office takes out and function the acquired SMS message carries the meter analyzing to provide the billing value and ship again the price to the respective customer thru SMS. The paintings offered by means of [16] is ready the improvement of incorporated Water Billing machine with SMS capability. The gadget is designed to simplify the Water authorized to manage the monthly billing machine without the usage of human offerings. The system gets SMS from the meter to significant databases. Then the records acquired is processed to supply contemporary billing. The machine once more sends a SMS notification to the person concerning the full quantity that has been billed. The machine changed into performed the usage of visible fundamental and database a good way to perform the prototype and the tool works efficiently in sending SMS to person for notification. vehicle velocity Detection using SMS [17], represented the design of the black box for caution machine to control the excessive velocity of explicit bus thru SMS

2.3 Literature Survey:

The home automation gadget is the machine that allow us to govern and operate all the house equipment when we are far from domestic. the home automation machine can connect more than one devices home protection, light, Fan, get entry to manipulate system, air conditioner and so on. It presents consolation, suitability and protection to domestic proprietors. there are such a lot of technology which are used for domestic automation. The system is useful for aged human beings and to shop electricity. It partner to nearly all the tool and manipulate remotely. The person will ship SMS which is obtained via GSM module and Microcontroller is figuring out the orders from SMS and do motion according to command. all of the over system have some downside. some gadget have instrument connectivity problem or a few are high-priced or some other may have protection trouble. The paper consists of the famous technology of use in home automation and digitalization.

2.4 Summary:

The device includes three most important elements that's microcontroller circuit or Arduino, relay using circuit and GSM unit. on this mission we used Arduino, A6 GSM Module and the usage of Library software program for the programming. The intention of this undertaking is to restrict the express bus driving force from using over the authorized velocity restrict in addition to to educate the power to obey the law; consequently the coincidence can be avoided as nicely. This assignment improved clean EDA software for programming. on the same time the % circuit will routinely interface to the mobile phone and ship topics sage to the consumer. in line with these works, we designed a low-cost and easy manner to designing sensible domestic gadget using the concept of system-to- mobile and mobile-to- system communique. First, we raised a general purpose electronic circuit layout that can control and monitor a difference domestic equipment with interface that may be plugged into GSM modulo unit. The layout construct of microcontroller, model circuit, electricity circuit. Then, we attempted to improve prototype home appliance control machine with devices as an utility instance of the designed device.

CHAPTER-3

ANALYSIS AND SIMULATION

3.1 Introduction:

This paper represents the theoretical information of this project that connects to the particular application and the air interface. All useful components of this project are presented in great detail. This paper can help us quickly understand all device interface conditions, electrical and mechanical details. With the help of this paper and other A6 GSM application notes, user manual, we can use A6 GSM Module to design and set up mobile application swiftly.

3.2 Define GSM:

worldwide device for cellular communication (GSM) is a huge vicinity wi-fi communications gadget that uses virtual radio transmission to provide voice, data, and multimedia conversation services. A GSM machine compeers the communication between a mobile stations), base stations base (cellular web site) and switching gadget. GSM was basically named institution unique cell. GSM is the name of a standardization group founded in 1982 to create a commonplace european cell phone trendy that would formulate specs for a pan-european cellular cellular radio gadget working at 900 MHZ. it is calculated that many countries beside of Europe will join the GSM partnership.

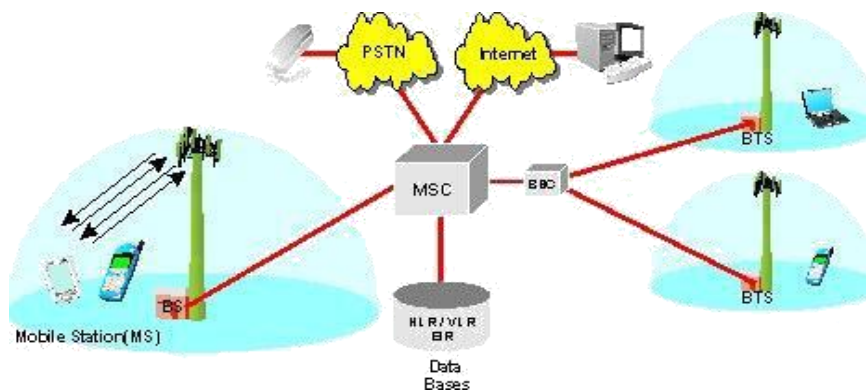


Figure 3.1: Global System for Mobile Communication(GSM) System Diagram.

3.3 Overview:

This document provides an introduction to initial GSM concepts, specifications, networks, and services. A short story of network evolution is provided in order set the context for accessing GSM.

3.3.1 Topics:

- Introduction: The Evolution of Mobile Telephone Systems
- The GSM Network
- GSM Network Ares
- GSM Specifications

3.4 Two-Thirds of World's Nation Now Involved, According to GSMA Intelligence:

The GSMA represents the interests of mobile operators widespread, combining nearly 800 operators with almost 300 agencies within the wide mobile atmosphere, alongside handset and tool makers, software corporations, instrument carriers and net groups, as well as organizations in adjacent industry division. The GSMA also produces industry-guidance occasions together with cellular global Congress, cellular global Congress Shanghai, cellular global Congress Americas and the cell 360 collection of convention. cellular is one of the fastest, easiest growing and maximum stressful telecommunications applications. these days, it offering the platform for a new virtual

globe as we enter the 5G area currently there are greater than forty five million mobile subscribers global, and almost 50 percent of those subscribers are situated in the u.s.a.. it is forecasted that cell approach using a virtual generation will become the customary system of telecommunications. Subscriber growth advantages over the imminent years will be prophecy on connecting mainly rural, low- earnings international locations; operators are growing a range of sustainable solutions to supply reasonable connectivity to underserved communities,” introduced Granary. “in the meantime, in mature markets wherein subscriber progress is slowing, operators are evolving their commercial enterprise models to acceptance rising cost within the increasing cellular surroundings.

Table 3.1: Unique Mobile Subscribers by Global Region, into Q2 2018 [7]

Region	Unique mobile subscribers (millions)	%ofglobal subscriber base	Subscriber penetration (% of population)
Asia Pacific	2,765	55%	68%
China	1,081	21%	78%
India	730	14%	54%
Europe	465	9%	86%
Latin America	459	9%	71%
Sub-Sahara Africa	436	9%	44%
Middle East & North Africa	391	8%	63%
North America	292	6%	80%
CIS	227	5%	79%
TOTAL:	5,035	100%	67%

3.5 The GSM Network:

GSM provides recommendations, not necessity. The GSM specifications identify the functions and interface reasons in detail but do not trace the hardware. The reason for this is to limit the designers as small as feasible but still to make it feasible for the operators to buy materials from different suppliers. The GSM network is divided into three main parts: The switching system(SS), The base station system(BSS), and the operation and support system(OSS).

The basic GSM network elements are shown in Figure:

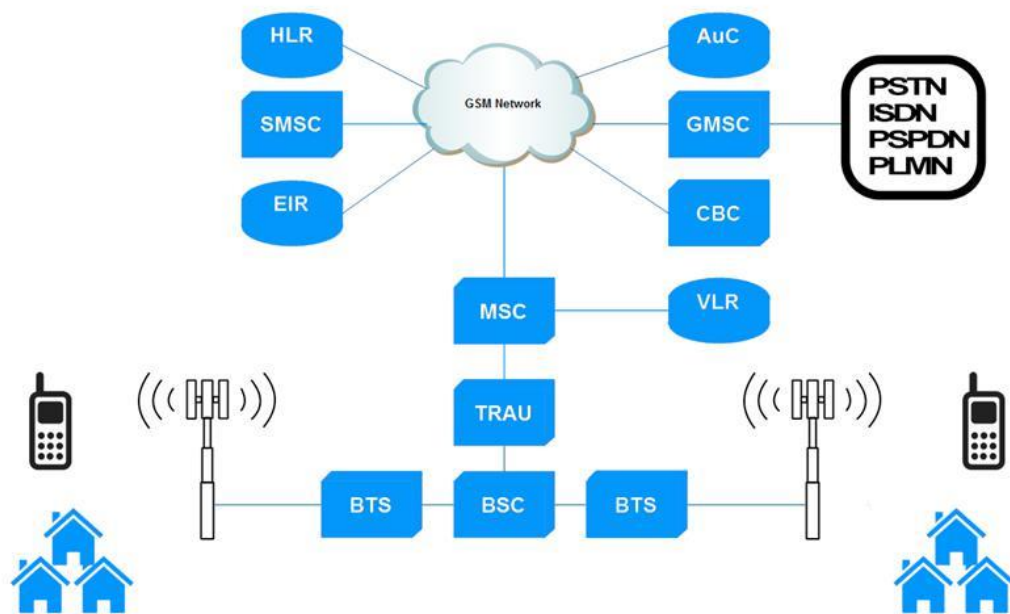


Figure: 3.2 GSM Network Elements

3.5.1 The Switching System:

The switching system (SS) is liable for performing call processing and subscriber-related operations. The switching system involves the following functional units:

- **Home Location Register (HLR).** The HLR is a database used for storage and administration of subscriptions. The HLR is calculated the most important database, as it stores fixed data about subscribers, including a subscriber's service profile, location information, and movement status. When a separate buy a subscription from one of the PCS operators, he or she is affixed in the HLR of that operator.
- **Mobile Services Switching Center (MSC)**—The MSC execute the telephony switching actions of the system. It monitoring calls to and from other telephone and

data systems. It also monitoring such functions as toll ticketing, network interfacing, general channel signaling, and others.

- **Visitor Location Register (VLR)**—The VLR is a database that contains transient information about subscribers that is wanted by the MSC in order to service visiting subscribers. The VLR is always integrated with the MSC. When a mobile station ramble into a new MSC area, the VLR connected to that MSC will request data about the mobile position from the HLR. Later, if the mobile station makes a call, the VLR will have the information needed for call setup without having to examine the HLR each time.
- **Authentication Center (AUC)**—A unit called the AUC provides authentication and encryption parameters that confirm the user's identity and assure the confidentiality of each call. The AUC protects network operators from various types of fraud found in today's cellular world.
- **Equipment Identity Register (EIR)**—The EIR is a database that contains information about the identity of mobile material that confine calls from stolen, unrecognized, or defective mobile stations. The AUC and EIR are accomplished as stand-alone nodes or as attached AUC/EIR node.

3.6 The Base Station System (BSS):

All radio-related functions are accomplished in the (BSS), which contains of base station controllers (BSCs) and the base transceiver stations (BTSSs)

- **BSC**—The BSC contribute all the control functions and physical links between the MSC and BTS. It is a high-capacity switch that contribute functions such as handover, cell configuration data, and monitoring of radio frequency (RF) power levels in base transceiver stations. A number of BSCs are enforced by an MSC.
- **BTS**—The BTS controls the radio interface to the mobile station. The BTS is the radio instrument (transceivers and antennas) needed to service each cell in the network. A group of BTSs are conducted by a BSC.

3.7 The Operation and Support System:

The operations and maintenance center (OMC) is connected to all equipment in the switching system and to the BSC. The implementation of OMC is called the operation and support system (OSS). The OSS is the functional entity from which the network

operator monitors and controls the system. The purpose of OSS is to offer the customer cost-effective support for centralized, regional and local operational and maintenance activities that are required for a GSM network. An important function of OSS is to provide a network overview and support the maintenance activities of different operation and maintenance organizations.

3.7.1 Additional Functional Elements:

Another functional elements shown in Figure 2 are as follows;

- **Message Center (MXE)**—The MXE is a node that contribute integrated voice, fax, and data messaging. Particularly, the MXE operate short message service, cell broadcasting, voice mail, fax mail, e-mail, and notification.
- **Mobile Service Node (MSN)**—The MSN is the node that operates the mobile intelligent network (IN) services.
- **Gateway Mobile Services Switching Center (GMSC)**—A entrances a node used to interconnect two networks. The entrance is often performed in an MSC. The MSC is then mentioned to as the GMSC.
- **GSM Interworking Unit (GIWU)**—The GIWU contains of both hardware and software that provides an interface to different networks for data communications. By the GIWU, users can alternate between speech and data during the similar call. The GIWU hardware instrument is physically located at the MSC/VLR..

3.8 GSM Network Areas:

The GSM network is made up of geographical areas. As shown in Figure 3, this area cover cells, location areas (LAs), MSC/VLR service areas, and public land mobile network (PLMN) areas.

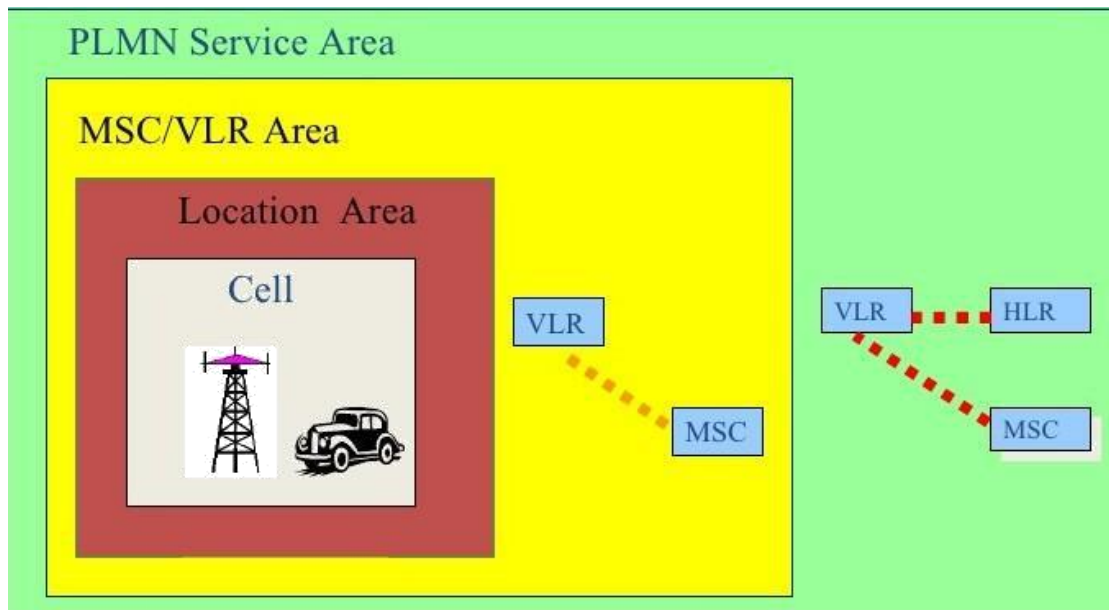


Figure:3.3 Network Areas

The cell is the field given radio coverage by one base transceiver station. The GSM network defines each cell via the cell global identity (CGI) number assigned to each cell. The position area is a group of cells. It is the area in which the contributor paged. Each LA is served by one or more base station controllers, yet only by a single MSC. Each LA is assigned a location area identity (LAI) number

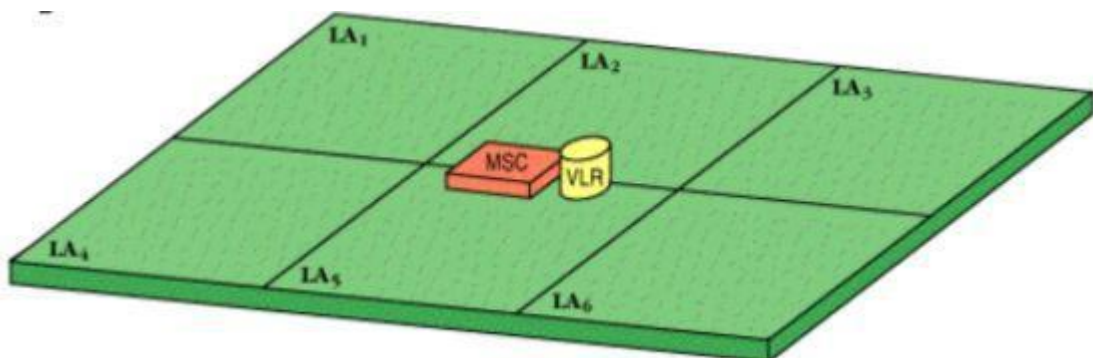


Figure: 3.4 Location Area

An MSC/VLR service area presents the part of the GSM network that is covered with one MSC and which is reachable, as it is registered in the VLR of the MSC (see Figure).

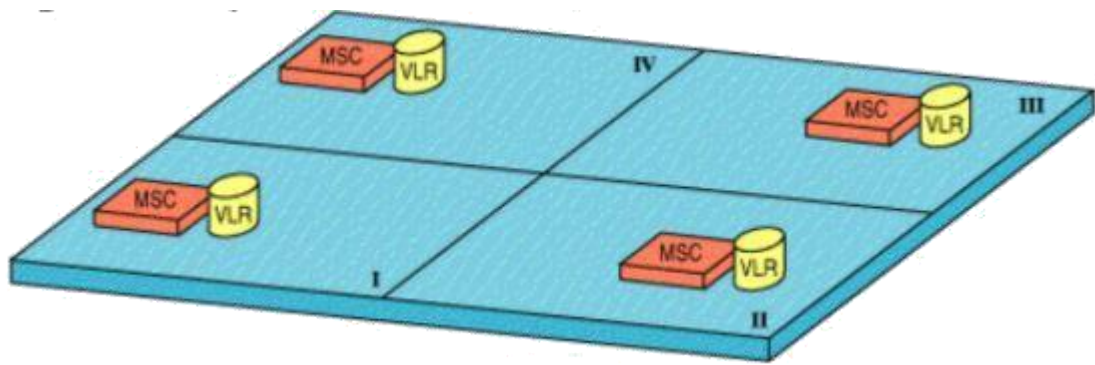


Figure 3.5: MSC/VLR Service Areas

The PLMN service area is an area served by one network operator (see Figure).



Figure3.6 PLMN Network Areas

3.9 GSM Specifications:

Before looking at the GSM specifications, it is necessary to understand the following basic terms:

- **Bandwidth**—The range of a channel's border; the broader the bandwidth, the faster data can be sent.
- **Bits per second (bps)**—A single on-off pulse of data; eight bits are similar to one byte.
- **Frequency**—The number of cycles per unit of time; frequency is measured in hertz (Hz).
- **Kilo (K)**—kilo is the term for 1,000; the abbreviation kbps represents 1k bits per second.
- **Mega Hertz (MHz)**—1,000,000 hertz (cycles per second)

- **Mille Seconds (MS)**—One-thousandth of a second

- **Watt (W)**—A measure of power of a transmitter

particular for different personal communication services (PCS) systems vary among the various PCS networks. Listed below is a statement of the specifications and characteristics for GSM.

- **Frequency Band**—The frequency range embarked for GSM is 1,850 to 1,990 MHz(mobile station to base station).

- **Duplex Distance**—The duplex distance is 80 MHz Duplex distance is the distanceamong the uplink and downlink frequencies. A channel has two frequencies, 80 MHz apart.

- **Channel Separation**—The separation among adjacent carrier frequencies. In GSM this is 200 kHz.

- **Modulation**—Modulation is the process of sending a signal by switching thecharacteristics of a carrier frequency. This is done in GSM via Gaussian minimum shift keying(GMSK).

- **Transmission Rate**—GSM is a digital process with an over-the-air bit rate of 270kbps.

- **Access Method**—GSM utilizes the time division multiple access (TDMA)conception. TDMA is a technique in which several variety calls may share the same carrier. Each call is imposed a particular time slot.

- **Speech Coder**—GSM uses linear predictive coding (LPC). The purpose of LPC isto decrease the bit rate. The LPC delivers parameters for a filter that mimics the vocal tract. The signal takes across this filter, leaving behind a residual signal. Speech is encoded at 13 kbps.

3.10 Supplementary Services:

GSM supports an extensive set of supplementary services that can implement and support both telephony and data services. Supplementary services are specified by GSM and are characterized as revenue- generating specialty .Some listing of supplementary services follows.

- **Call Forwarding**—This service gives the subscriber the capability to forwardincoming calls to another number if the called mobile unit is not reachable, if it is busy, if there is no reply, or if call forwarding is approved unconditionally.

- **Barring of Outgoing Calls**—this service makes it possible for a mobile subscriber to confine all outgoing calls.
- **Barring of Incoming Calls**—This function allows the subscriber to confine incoming calls. The following two terms for incoming call barring exist: barring of all incoming calls and barring of incoming calls when roaming outside the home PLMN.
- **Advice of Charge (AoC)**—The AoC service provides the mobile subscriber with a calculation of the call charges. There are two types of AoC information: one that provides the subscriber with a calculation of the bill and one that can be used for instantly charging purposes. AoC for data calls is provided on the basis of time assessments.

3.11 Universal Synchronous Asynchronous Receiver Transmitter (USART):

The Universal Synchronous /Asynchronous Receiver Transmitter (USART) module is a type of two serial I/O communications hardware. USART is also known as a Serial Communications Interface (SCI). The USART can be embedded as a full duplex asynchronous system that can communicate with other peripheral devices, such as CRT terminals and personal computers, or it can be configured as a half-duplex synchronous system that can communicate with peripheral devices, such as A/D or D/A integrated circuits (IC), serial EEPROMs, etc. The USART can be configured in the following types:

- Asynchronous (full duplex)
- Synchronous - Master (half duplex)
- Synchronous - Slave (half duplex)

Bit SPEN (RCSTA<7>) and bits TRISC<7:6> have to be set in order to configure pins RC6/TX/CK and RC7/RX/DT as the Universal Synchronous Asynchronous Receiver Transmitter(USART).

3.12 Using Program System:

These commands are used to this project (`#include "SIM900.h"`, `#include <SoftwareSerial.h>`)

A6 GSM Module. (Send SMS) is used to SMS send and (Get SMS) is used to receive SMS. AT commands with a GSM can be used to access following information and services:

1. Information and configuration concerning to mobile device or SIM card.
2. SMS services.

3.13 Software Analysis:

Arduino Uno software works with two function setup and loop

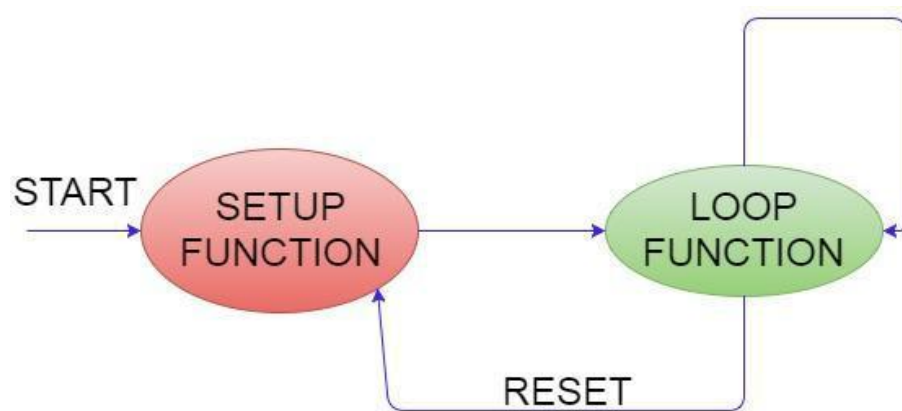


Figure:3.7 Softer Analysis Step

3.14 Block Diagram:

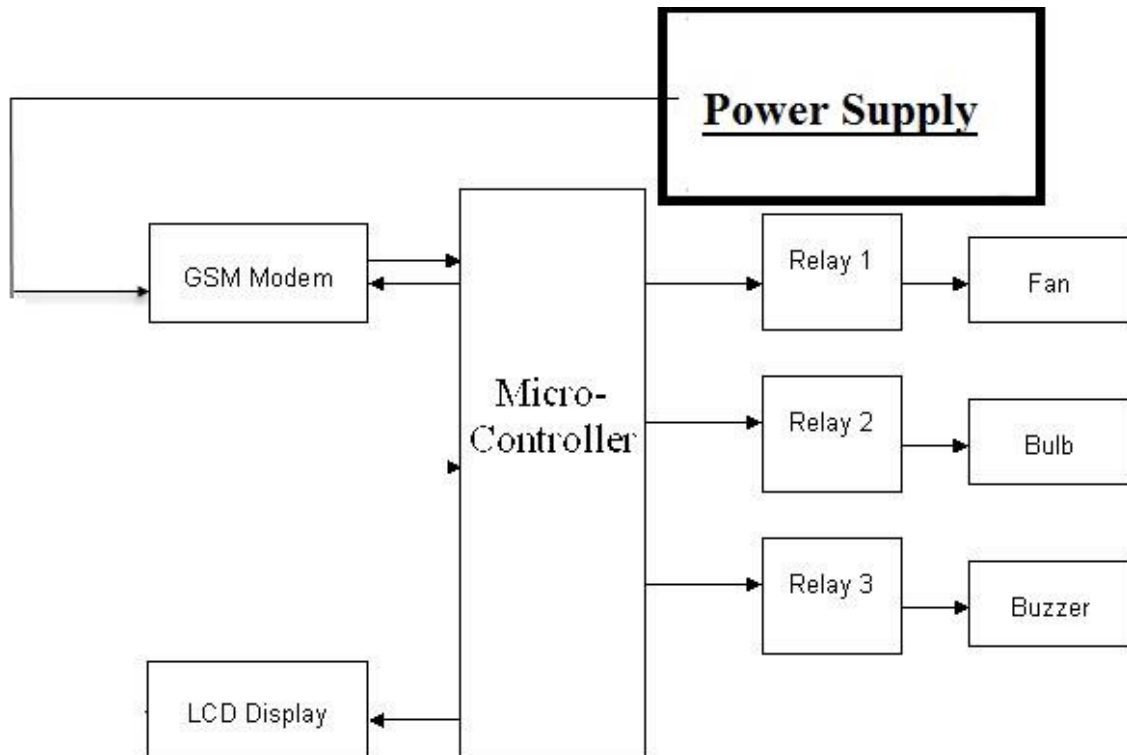


Figure:3.8 Block Diagram

Connect with GSM network, then input signal receive from GSM, if incase, system ready will be shown in LCD. Message is send to return ALLON or ALLOFF and step by step. Message is convert to digital or data binary data. Relay is one kind of switching device, which control the all loads.

3.15 Flow Chart:

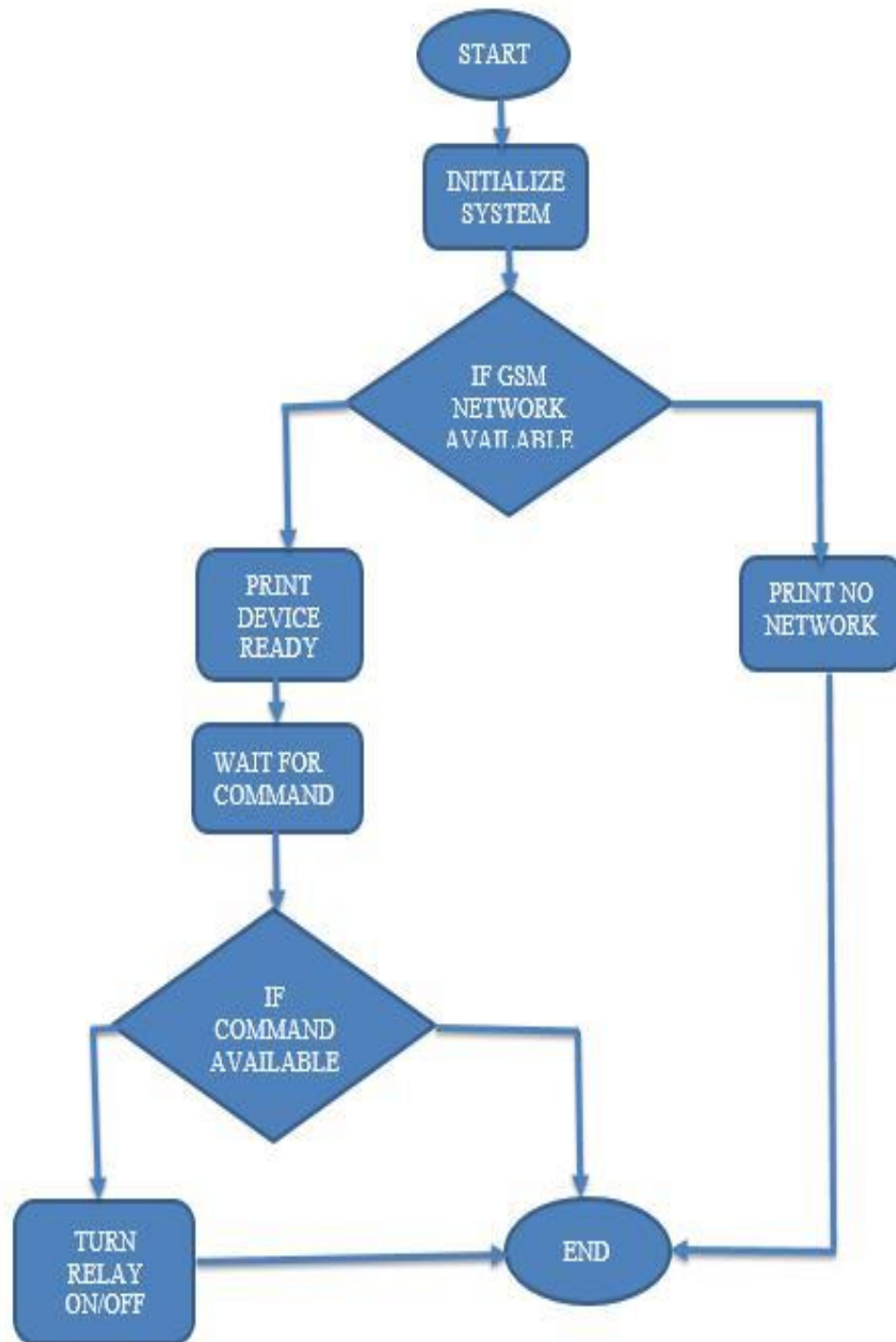


Figure:3.9 Flow Chart

Start the system is become to ready. Initialize the system check the GSM network. Incoming message contain command is load turn ON/OFF relay into end point. The network is not given properly by this system. Directly come into end point, never print no network.

3.16 Circuit Diagram:

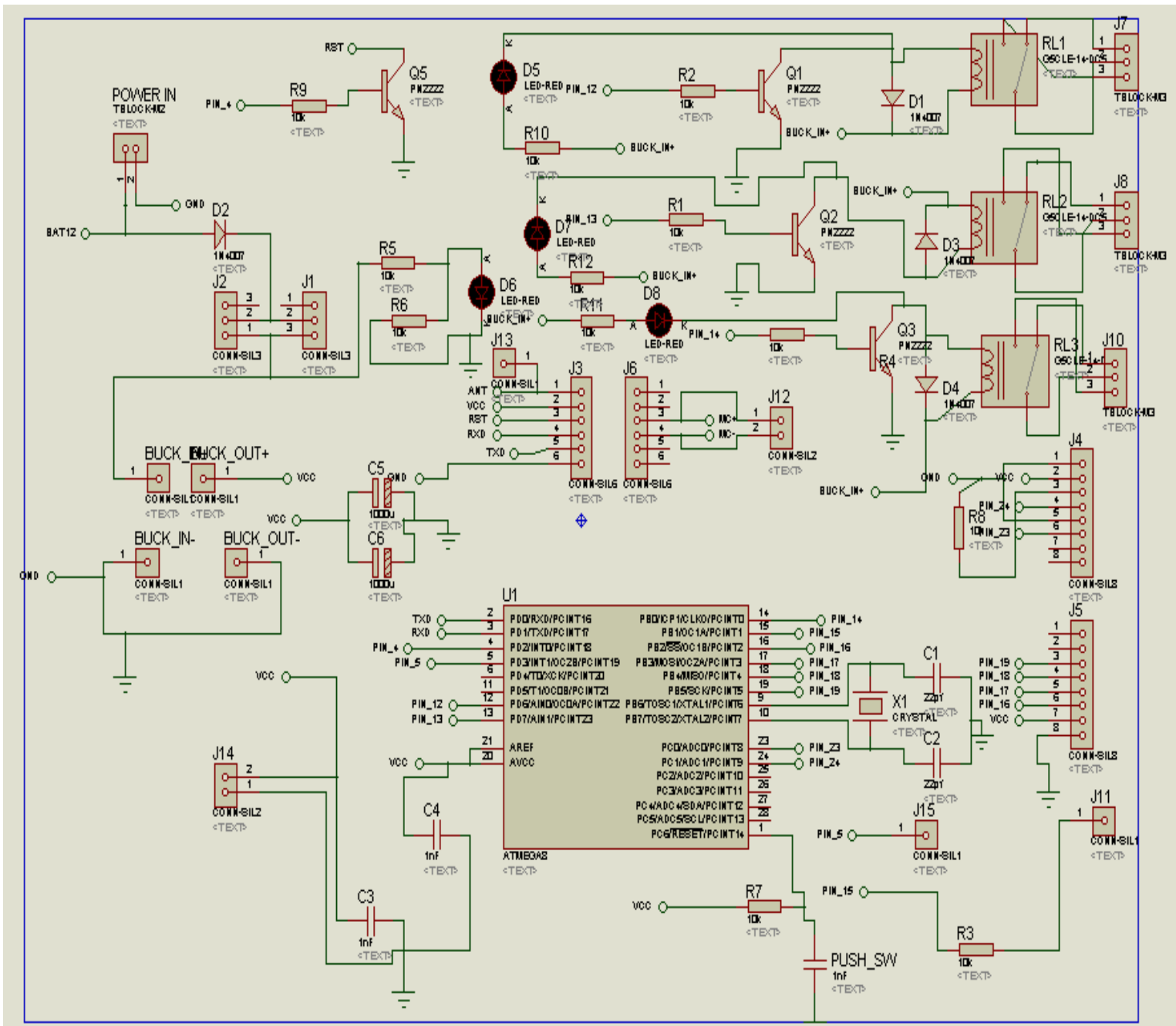
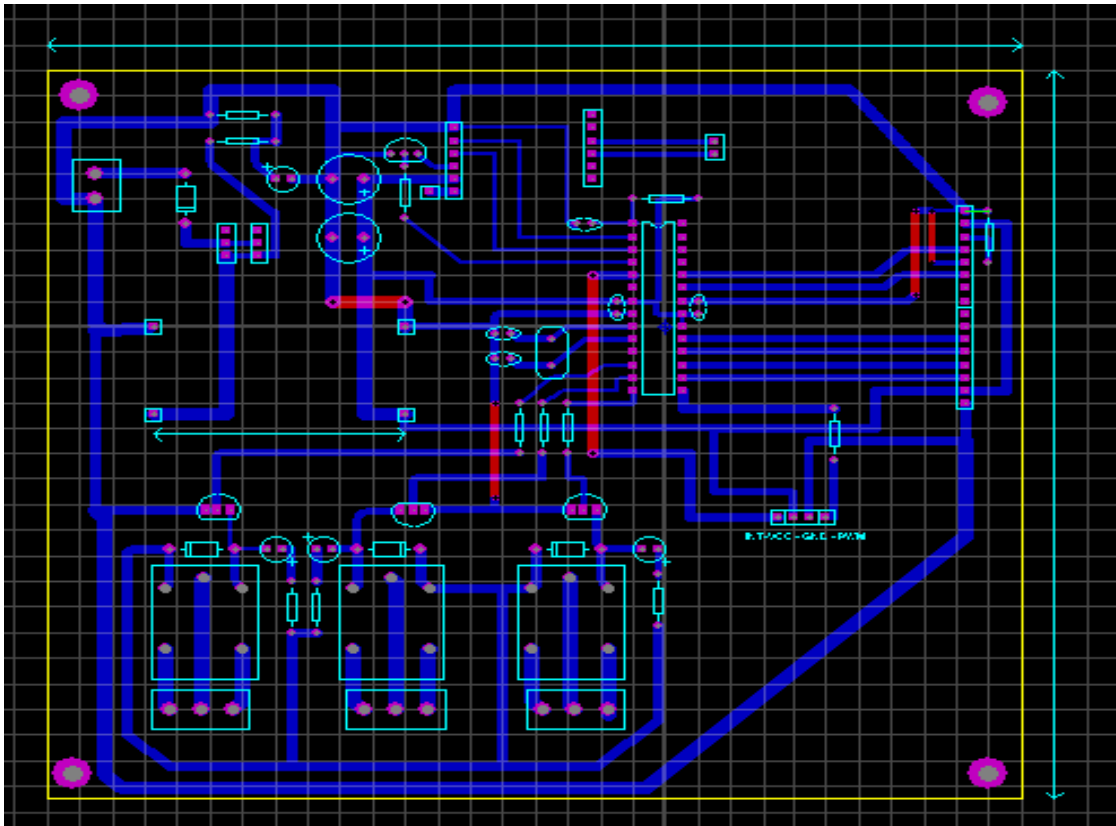
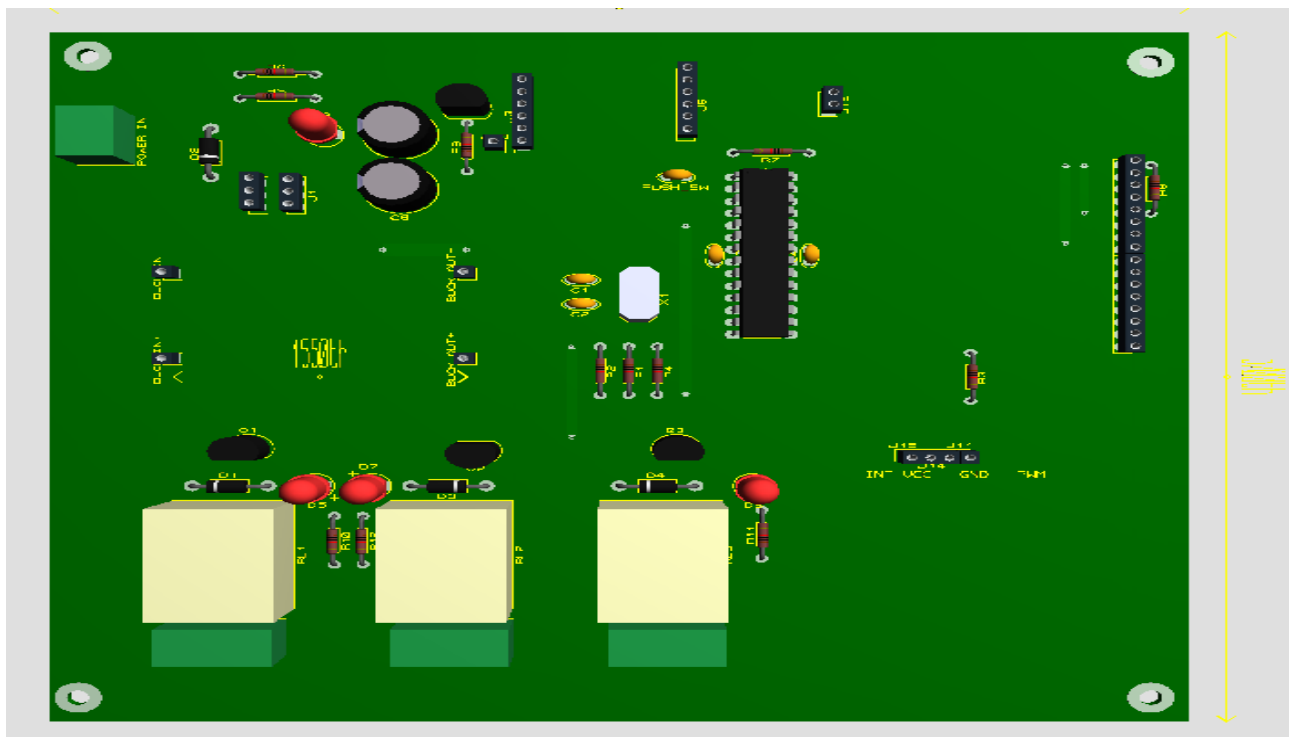


Figure: 3.10 Circuit Diagram

3.17 PCB Layout



3.18 PCB 3D View



CHAPTER-4

HARDWARE DEVELOPMENT

4.1 Introduction:

In this project a microcontroller or Arduino with UART circuit is connected with Library supporting GSM module sends SMS to the mobile to control the electrical devices. The Arduino decodes the received message and does the required action. The protocol used for the communication between the two Library operator. The microcontroller pulls the SMS received by GSM module and decodes it, recognizes the mobile number and then switches on the relays attached to its port to control the devices. After successful operation, microcontroller sends back the acceptance to the user,,s mobile through SMS.SMS will be directly ignored if the mobile number is unauthorized.

4.1.1 The methodology followed in our project is as follows:

- a. GSM module tests are run in order to check the hardware support. The process calls GSM modem and it get activated.
- b. After reactive the Modem checks for hardware support. If the hardware is missing or another hardware problem there is error, outcome in communication failure and the application is terminated.
- c. If device responds then the serial port is opened for communication and GSM hardware approve transmission of SMS.
- d. The system is then connected and after connection installation the system is able to switch ON and OFF and similarly the system will update status of apparatus by receiving SMS from the pre-defined cell number.
- e. Automation system is properly control in any outline conditions.

4.2 Different Types Equipment List and Cost:

Table: 4.1 Equipment List:

Hardware					Software
ATmega328	Adapter	Iron	PCB Board	Resistor	Compiler Arduino
GSM	LED	Holder	Soldering paste	Capacitor	
Relay Shield	PCB	Bulb	Soldering lead	Diode	
LCD	Rail Connector	Switch	BUCK Module	Connector	

Table: 4.1.1 Cost:

Equipment Name	Costing(TK)
ATmega328	170
GSM	400
LCD	120
Adapter	120
Relay	54
PCB	400
Rail Connector	10
Holder	90
Bulb	60
LED	2
Crystal	7
Transistor	6
Power switch	5

Soldering Lead	20
Capacitor	10
Connector	10
Resistor	5
Diode	4
Buck Module	70
12v DC Pump	450
Total Cost	

4.2.1 Capacity Elements:

- i. Total Relay 4,
Relay = 250V, 10A
Relay $P = VI \cos \phi = 250 \times 10 \times 0.8 = 2000W$ For 3Relay = 250V, 30A
 $P = 250 \times 30 \times 0.8 = 6000W$ Total
Relay Capacity = 8000W
- ii. Load controller up to 20 devices
- iii. Transformer – 6V, 2A
- iv. IC LM7805
- v. LCD - 16 pin, using 12 pin
- vi. Arduino – 20mA, 5V
Output Up-gradable

4.3 SIM 800L GSM MODULE:

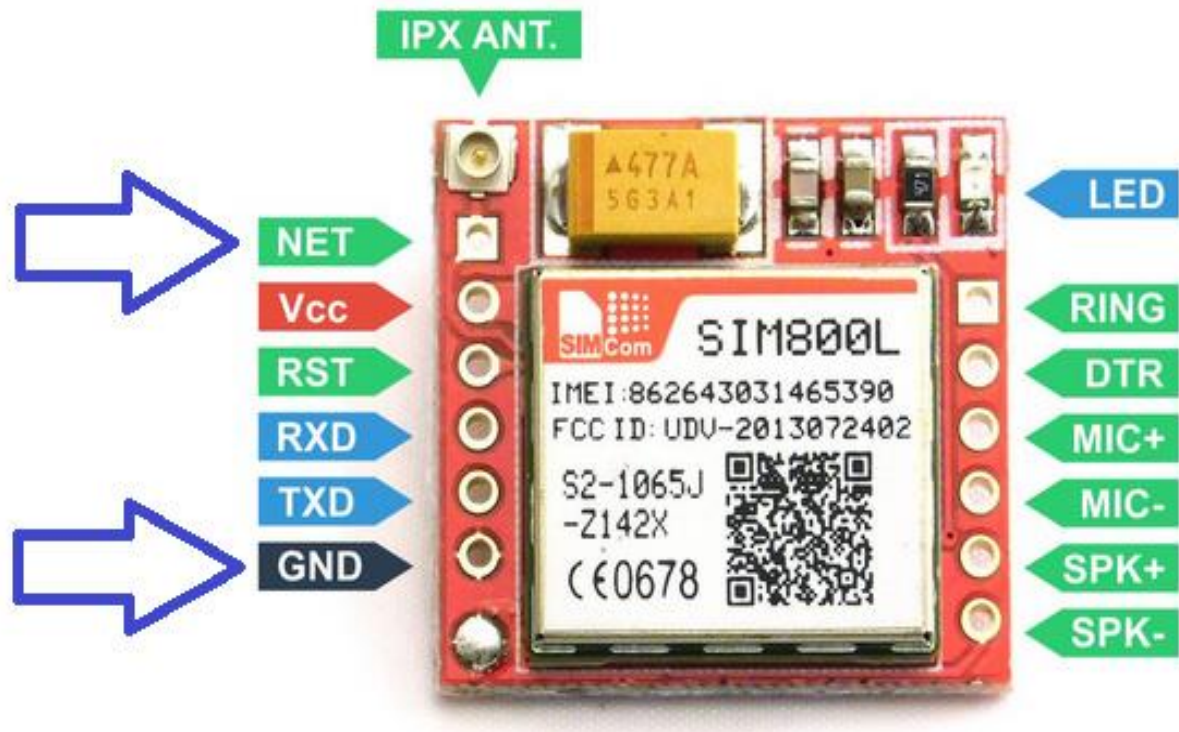


Figure: 4.1 SIM800L GSM MODULE

4.3.1 SIM800L Module Description:

Mini GSM / GPRS breakout board is based on SIM800L module, supports quad-band GSM/GPRS network, to be had for GPRS and SMS message records remote transmission.

The board capabilities compact length and coffee modern consumption. With electricity saving method, the current consumption is as little as 1mA in sleep mode.

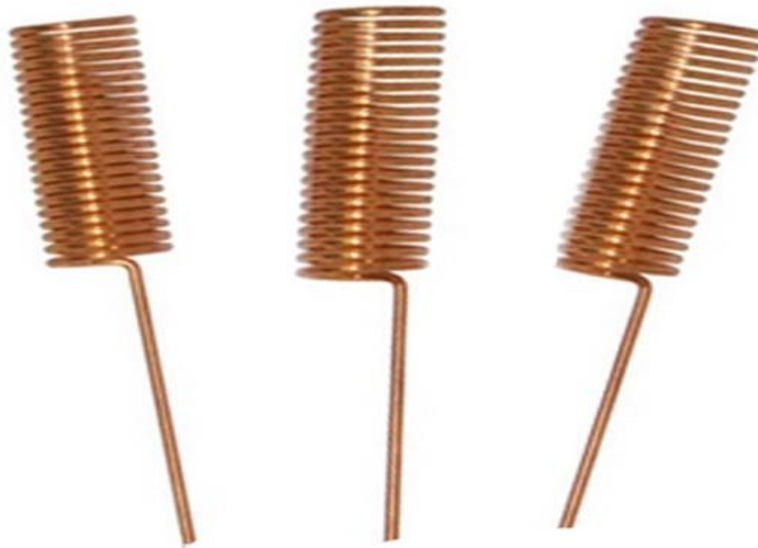
It communicates with microcontroller through UART port, helps command which include 3GPP TS 27.007, 27.1/2 and SIMCOM improved AT commands.

Features:

- Quad-band 850/900/1800/1900MHz
- Connect onto any global GSM network with any 2G SIM (in the USA, T-Mobile is suggested)
- Make and receive voice calls using a headset or an external 8 speaker and electret microphone
- Send and receive SMS messages
- Send and receive GPRS data (TCP/IP, HTTP, etc.)
- Scan and receive FM radio broadcasts
- Lead out buzzer and vibrational motor control port
- AT command interface with "auto baud" detection

4.3.2 About the antenna:

- i. Suitable for SIM800L GSM modules / Arduino SIM900 GPRS Shield.
- ii. Frequency: 780MHz ~ 960MHz, 1710MHz ~ 2170MHz
- iii. Antenna gain: $+2.0 \pm 0.7$ dBi @ 880 MHz, $+2.0 \pm 0.7$ dBi @ 1800 MHz
- iv. - S.W.R ≤ 2.0 @ 2100 MHz ~ 2500 MHz
- v. - Output impedance: 50 Ohm
- vi. Antenna interface: SMA



4.3.3 Atmega328-PU:



Figure: 4.2Atmega328-PU

4.3.4 Description:

The excessive-overall performance Microchip eight-bit AVR RISC-based microcontroller combines 32KB ISP flash reminiscence with study-while-write competencies, 1KB EEPROM, 2KB SRAM, 23 fashionable cause I/O strains, 32 fashionable reason operating registers, three bendy timer/counters with compare modes, inner and external interrupts, serial programmable USART, a byte-orientated 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and 5 software selectable strength saving modes. The device operates between 1.eight-five.volt.

with the aid of executing powerful instructions in a single clock cycle, the tool achieves throughputs drawing close 1 MIPS in keeping with MHz, balancing power consumption and processing speed.

Table 4.2:Specs

Microcontroller	ATmega328
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	32 KB (ATmega328) of which 0.5 KB used by boot loader
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	

4.4 Pin Diagram of ATmega 328

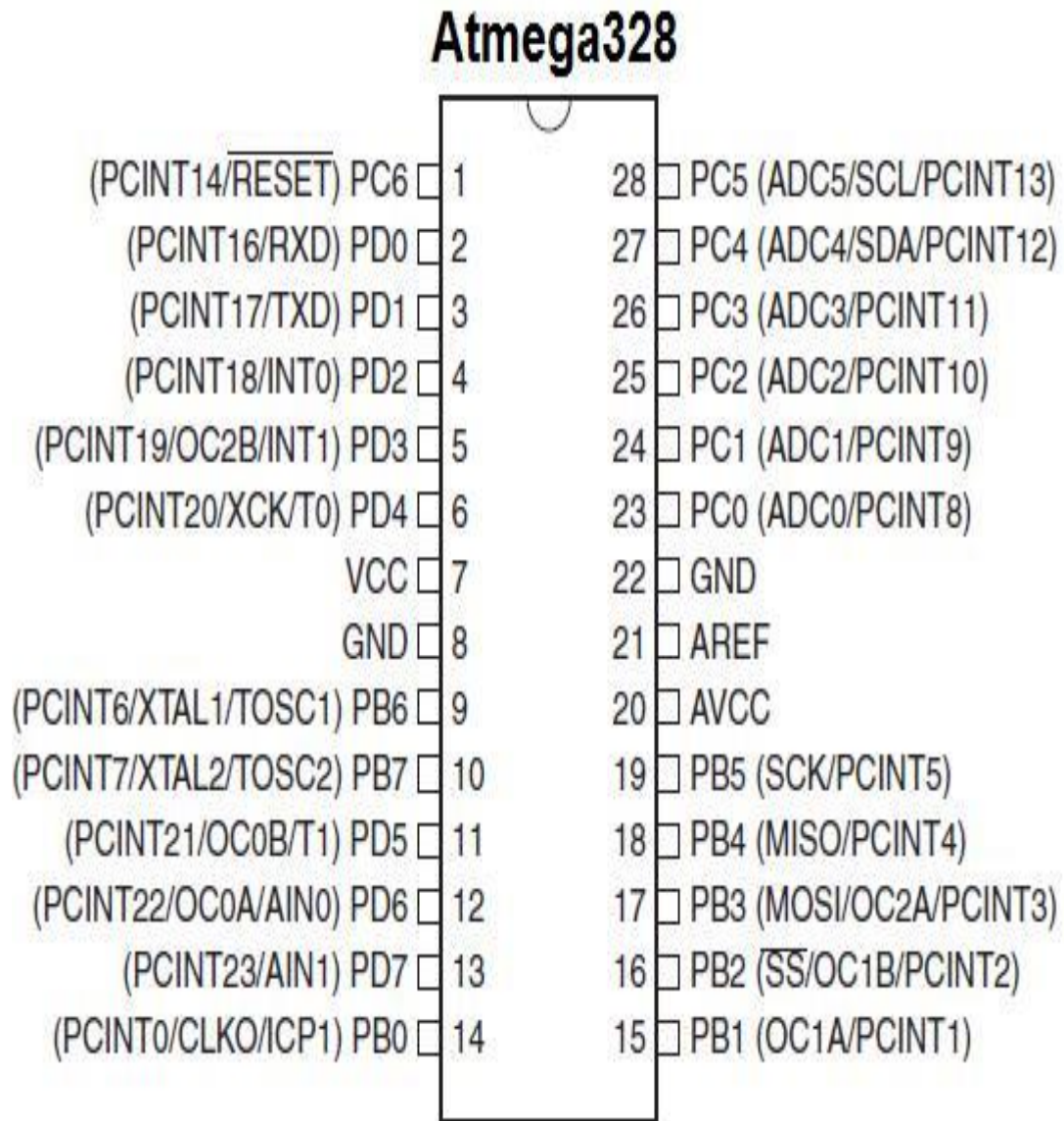


Figure: 4.3 Pin Diagram of Arduino (At mega 328)

4.4.1 Pin description of Atmega 328:

Table:4.3 Pin description of Atmega 328

Pin Number	Description	Function
1	PC6	Reset
2	PD0	Digital Pin (RX)
3	PD1	Digital Pin (TX)
4	PD2	Digital Pin
5	PD3	Digital Pin (PWM)
6	PD4	Digital Pin
7	Vcc	Positive Voltage (Power)
8	GND	Ground
9	XTAL 1	Crystal Oscillator
10	XTAL 2	Crystal Oscillator
11	PD5	Digital Pin (PWM)
12	PD6	Digital Pin (PWM)
13	PD7	Digital Pin
14	PB0	Digital Pin
15	PB1	Digital Pin (PWM)
16	PB2	Digital Pin (PWM)
17	PB3	Digital Pin (PWM)
18	PB4	Digital Pin
19	PB5	Digital Pin
20	AVCC	Positive voltage for ADC (power)
21	AREF	Reference Voltage
22	GND	Ground

23	PC0	Analog Input
24	PC1	Analog Input
25	PC2	Analog Input
26	PC3	Analog Input
27	PC4	Analog Input
28	PC5	Analog Input

4.5 LCD Display (16×2):

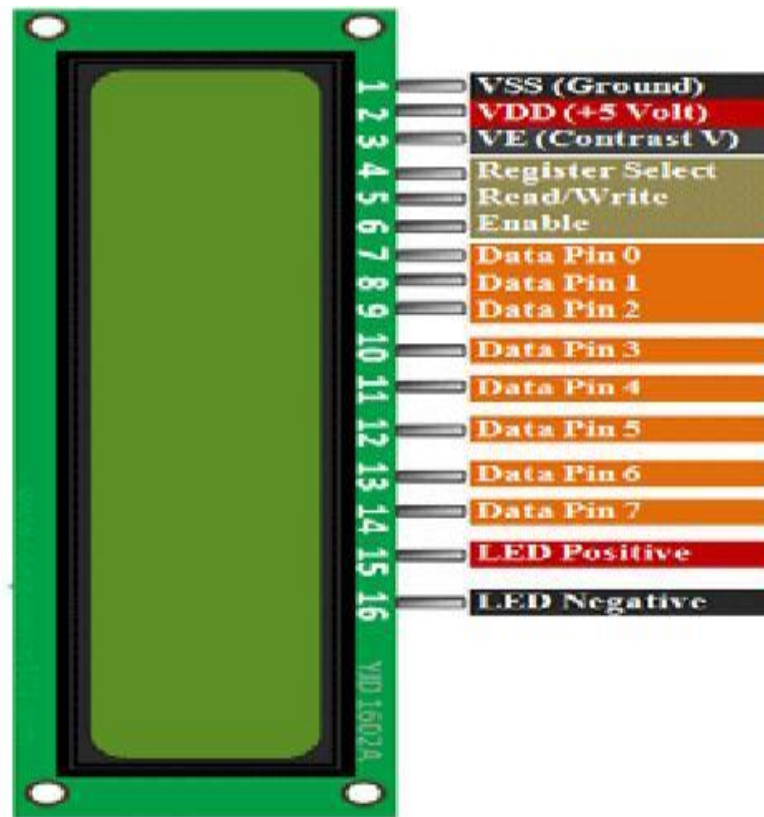


Figure: 4.4 LCD Display 16×2

4.5.1 Pin Configuration:

Table 4.4: Pin configuration

Pin No:	Pin Name:	Description
1	Vss (Ground)	Ground pin connected to system ground
2	Vdd (+5 Volt)	Powers the LCD with +5V (4.7V – 5.3V)
3	VE (Contrast V)	Decides the contrast level of display. Grounded to get maximum contrast.

4	Register Select	Connected to Microcontroller to shift between command/data register
5	Read/Write	Used to read or write data. Normally grounded to write data to LCD
6	Enable	Connected to Microcontroller Pin and toggled between 1 and 0 for data acknowledgement
7	Data Pin 0	Data pins 0 to 7 forms a 8-bit data line. They can be connected to Microcontroller to send 8-bit data. These LCD's can also operate on 4-bit mode in such case Data pin 4,5,6 and 7 will be left free.
8	Data Pin 1	
9	Data Pin 2	
10	Data Pin 3	
11	Data Pin 4	
12	Data Pin 5	
13	Data Pin 6	
14	Data Pin 7	
15	LED Positive	Backlight LED pin positive terminal
16	LED Negative	Backlight LED pin negative terminal

4.6 Features of 16×2 LCD Module:

- Operating Voltage is 4.7V to 5.3V
- Current consumption is 1mA without backlight
- Alphanumeric LCD display module, meaning can display alphabets and numbers
- Consists of two rows and each row can print 16 characters.
- Each character is build by a 5×8 pixel box
- Can work on both 8-bit and 4-bit mode
- It can also display any custom generated characters
- Available in Green and Blue Backlight

16x2 Display Equivalents:

Dot Matrix LED Display, 7-Segment LED Display, OLED Display, TFT LCD Screen Display

4.7DC-DC Buck Converter LM2596S:

finding electricity supplies for your venture can be quite hard and time ingesting, especially in case your venture requires a number of additives with various voltages, The DC-DC buck Converter LM2596s solves this by using converting higher voltage to lower voltage without the need for a further power supply. This DC to DC buck Converter LM2596S is a step-down strength module with adjustable voltage variety, capable of riding a load as much as 3A with excessive efficiency. using this module with present day above 2.5A (or output strength more than 10W), calls for the additon of heatsink to prevent overheating. If you are seeking to boom or step-up the voltage, we have the DC-DC raise Converter LM2577.

Specifications

- Input voltage: 4V-35V
- Output voltage: 1.23V to 30V
- Input Current: 3A (maximum)
- Maximum Power Dissipation: 10 watts (WithoutHeatsink)
- Overall dimensions: 48mm x 23 mm



Figure: 4.5Buck Module

4.8 Resistor:

A resistor carries a given measure of competition in a circuit. Obstruction is a percentage of how the stream of electrical strength is antagonistic or "stood up to." it's miles characterised by way of Ohm's law which says the competition counterparts the voltage separated through the flow.

Resistance= voltage/cutting-edge or $R = V/I$.

resistance is envisioned in Ohms. The Ohm is often exhibited with the aid of the omega image Ω .

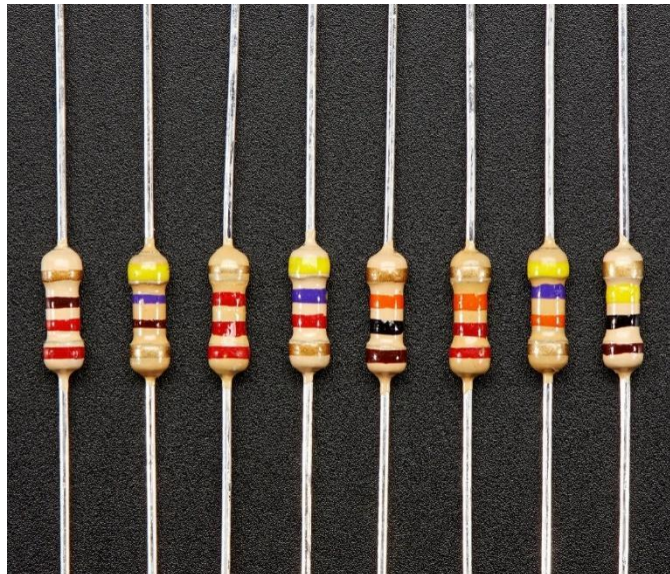


Figure: 4.6 Figure of Resistor

The symbol for resistance is a sinuous line as shown below. The "R" characters are used in equation.

4.9 Capacitor:

A capacitor shows up the quantity of capacitance in a circuit. The capacitance is the ability of a cloth to save an electrical rate. it's far the "capacity" to save a fee. The capacitance represents with the aid of the equation $C = q/V$ wherein the charge of coulombs and V is the voltage.

In a DC circuit a capacitor becomes an open circuit obstacle any DC present day from transferring the capacitor. simplest AC current will skip via a capacitor. Capacitance is measured in Farads. The sign for capacitance is two parallel strains. every so often one of the lines is curved as proven parent. The letter "C" is used for equations.

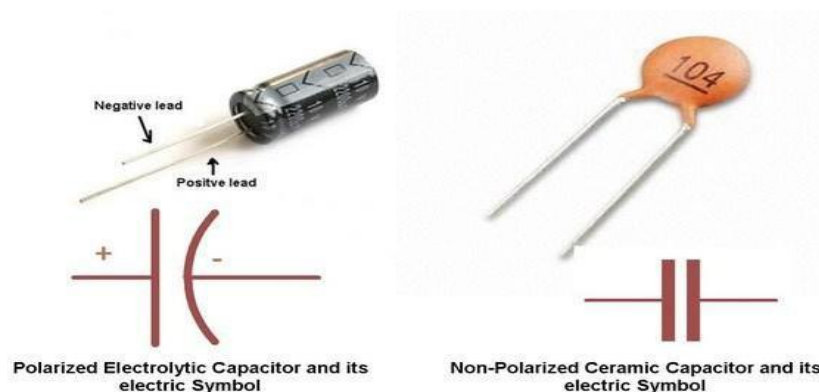


Figure: 4.7 Figure of Capacitor

4.10 Transistor:

2N2222A is a NPN transistor as a result the collector and emitter can be left open (reverse biased) whilst the bottom pin is held at floor and can be closed (ahead biased) whilst a signal is supplied to base pin. 2N2222A has a advantage cost of one hundred ten to 800, this fee determines the amplification potential of the transistor. The maximum quantity of present day that would waft via the Collector pin is 800mA, for this reason we cannot connect masses that eat greater than 800mA the use of this transistor. To bias a transistor we ought to supply cutting-edge to base pin, this modern-day (IB) have to be restrained to 5mA.

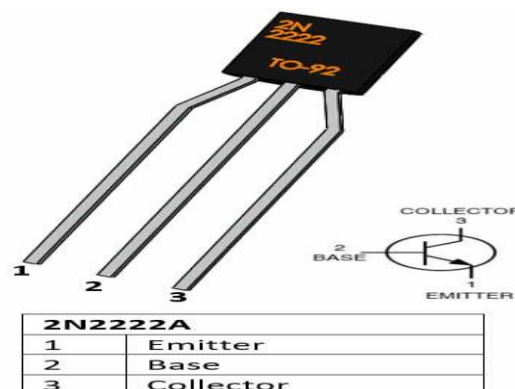


Figure: 4.8 Transistor

4.11 Crystal:

16 MHz Crystal Oscillator. Crystal oscillators are oscillators where the primary frequency figuring out detail is a quartz crystal. because of the inherent traits of the quartz crystal the crystal oscillator may be held to excessive accuracy of frequency balance. Temperature reimbursement may be implemented to crystal oscillators to improve thermal balance of the crystal oscillator. Crystal oscillators are normally, fixed frequency oscillators in which balance and accuracy are the number one considerations. as an instance it's miles almost impossible to design a stable and accurate LC oscillator for the higher HF and higher frequencies without resorting to a few form of crystal manage. consequently the motive for crystal oscillators.

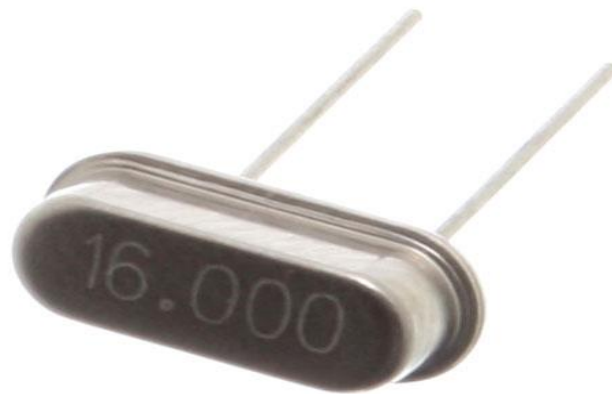


Figure: 4.9 Crystal

4.12 Relay:

A relay is an electrically operated transfer. Many relays use an electromagnet to routinely perform a transfer, but different working concepts are also used, such as stable-kingdom relays. here used in 3 relay 12v.



Figure: 4.1012vRelay

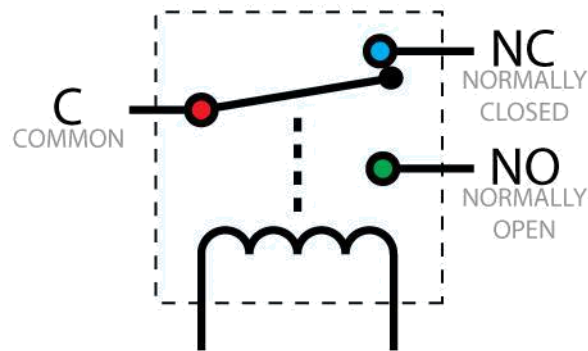


Figure: 4.10.1 Internal Connection

4.13 12V Power Supply:

2V energy elements (or 12VDC energy resources) are one of the most common strength materials in use nowadays. In preferred, a 12VDC output is obtained from a 120VAC or 240VAC enter using a aggregate of transformers, diodes and transistors. 12V power elements can be of kinds: 12V regulated energy materials, and 12V unregulated strength components. 12V regulated strength supplies are available in 3 patterns: Switching regulated AC to DC, Linear regulated AC to DC, and Switching regulated DC to DC.

Switching regulated 12VDC energy substances, every so often referred to as SMPS electricity materials, switchers, or switched mode energy materials, regulate the 12VDC output voltage the usage of a complex high frequency switching approach that employs pulse width modulation and feedback. Acopian switching regulated electricity elements also appoint big EMI filtering and protective to minimize each common and differential mode noise conducted to the line and cargo. Galvanic isolation is preferred in our 12VDC switchers, affording our users enter to output and output to floor isolation for maximum versatility.



Figure: 4.11 12V Power Supply

4.14 DIODE:

A diode includes two electrodes that act in much the identical conduct as semiconductors. The superb or p-kind is generally the anode and the bad or n-type is the cathode. In other palms, the cathode is negatively charged in comparison to the anode. If the cathode is charged at the identical or very similar voltage to the anode, present day will now not waft.

In electronics, a diode acts in addition to price vendors. Diodes can also be as compared to test valves or switches. If liquid or water were related as opposed to contemporary, it might basically be similar to water flowing upstream or downstream. placedtruely, a diode supervised to permit for upstream to downstream glide however not the alternative way around.

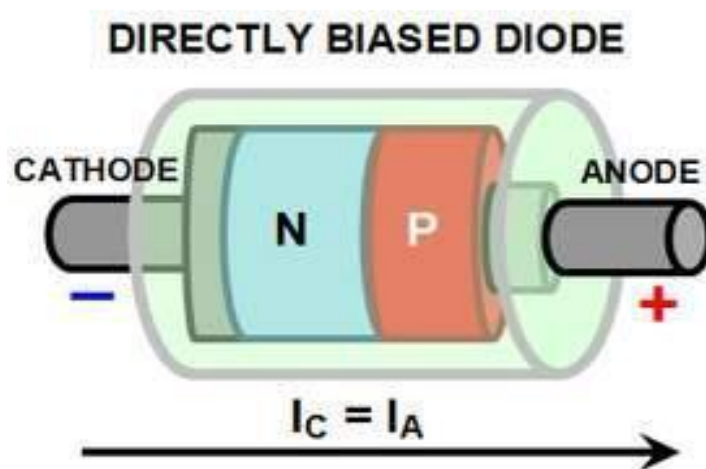


Figure: 4.12 Diode

To modify the path of the float, the cathode need to be charged at a greater voltage than the anode. that is referred to as avalanche voltage, however notwithstanding the call, it does not always require a huge range of volts to trade the path. it may in truth be a difference of only a few voltages.

CHAPTER-5

RESULTS AND DISCUSSIONS

5.1 Introduction:

The packages of GSM based totally electric tool control are pretty numerous. there are many actual- lifestyles conditions that require manage of different devices remotely and to offer security. There might be instances in which a stressed out connection between a far off appliance/device and the manage unit might not be possible due to structural troubles. In such cases a wireless connection is a better choice. domestic appliance has been a primary problem where crime is growing and everybody wants to take right measures to save you intrusion. similarly, there may be need to automate domestic in order that the user can take the gain of technological advancement. This undertaking presents a model a good way to provide manage to their domestic, workplace or cabin or define in firm paintings, through SMS using GSM technology.

5.2 Hardware Result:

All the components were connected as per the circuit diagram. The figures below show the hardware connection and the output obtained.

Step 1: Power supply into the device and showing Starting.....

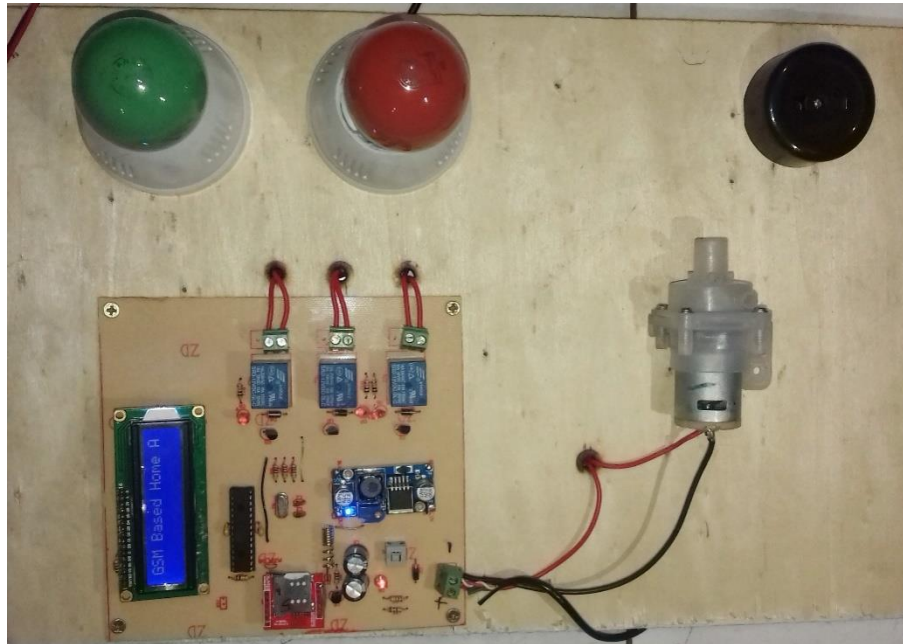


Figure: 5.1 Starting...

Step 2: Device is ready to take command

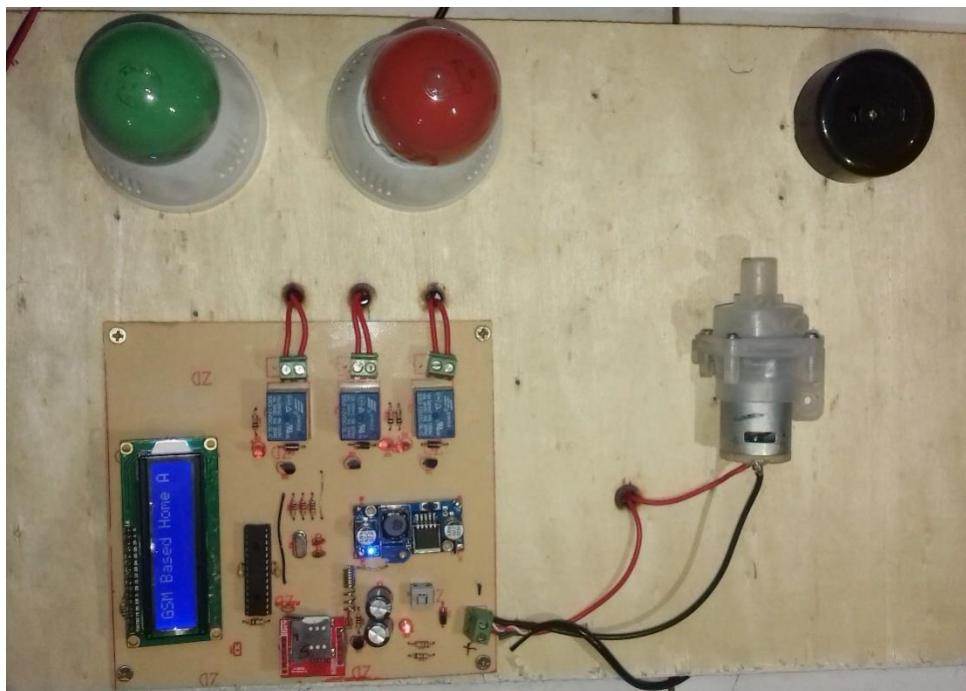


Figure: 5.2 when all load off

Step 3: Load-1 ON and Load-2, Load-3 OFF

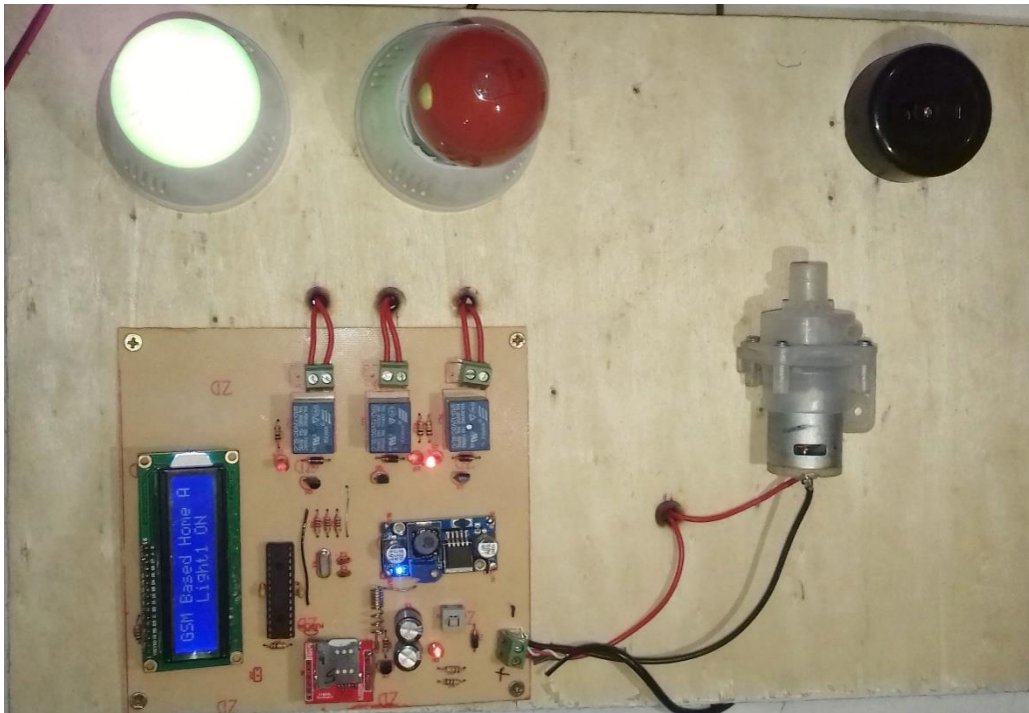


Figure: 5.3 Load-1 ON

Step 4: Load-1 and Load-3 ON, Load-2 OFF

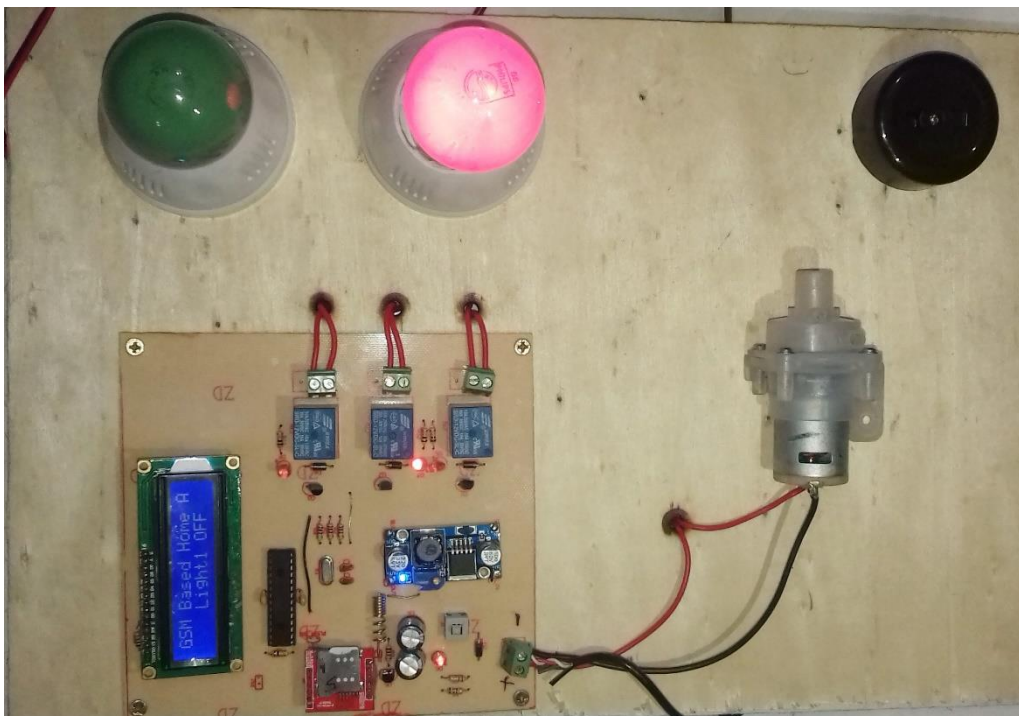


Figure: 5.4 Load-1 and Load-3 ON

Step 5:Load-1,Load-2 and Load-3 ON

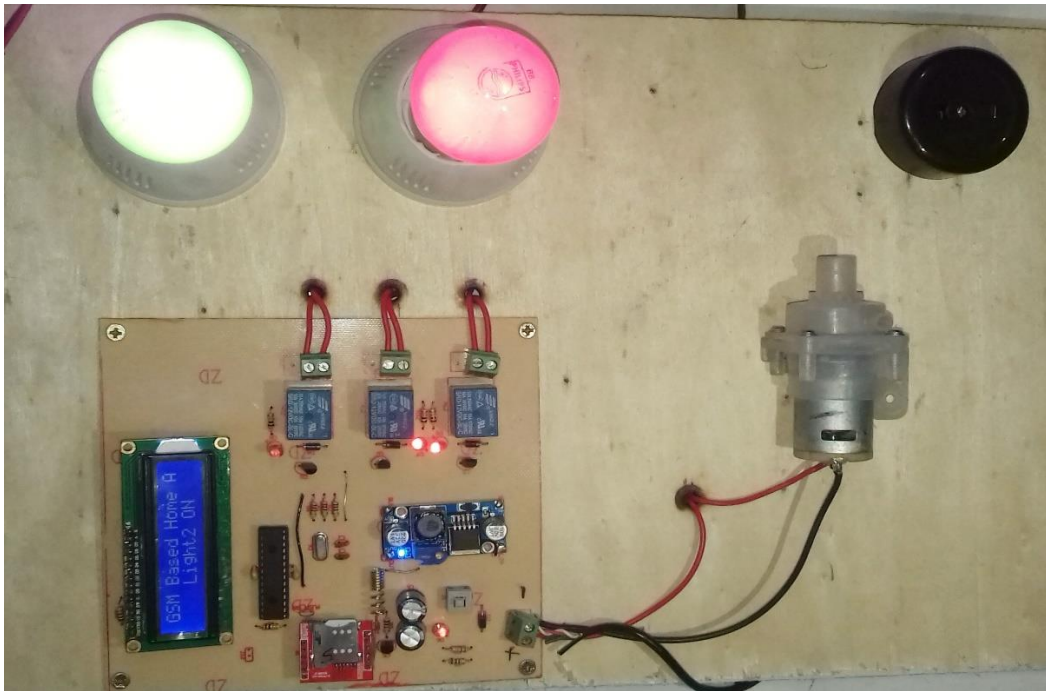


Figure: 5.5 All Load ON (Auto)

Step 6:Load-1,Load-2 and Load-3 ON

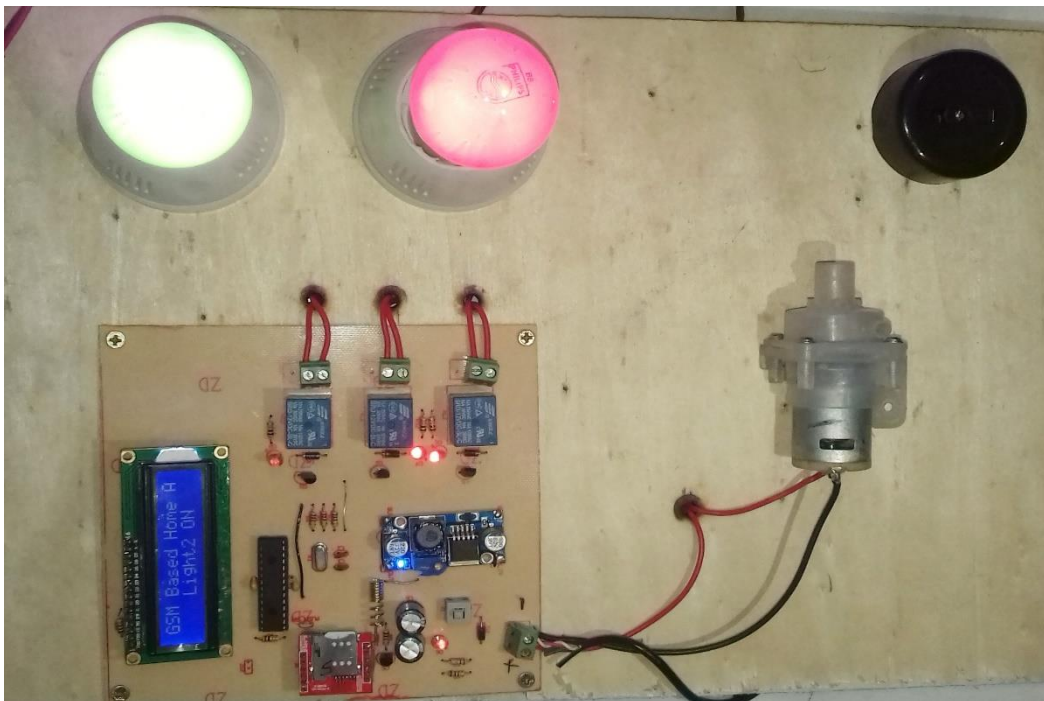


Figure: 5.6 All Load ON (Manual)

5.2.1: Android Apps

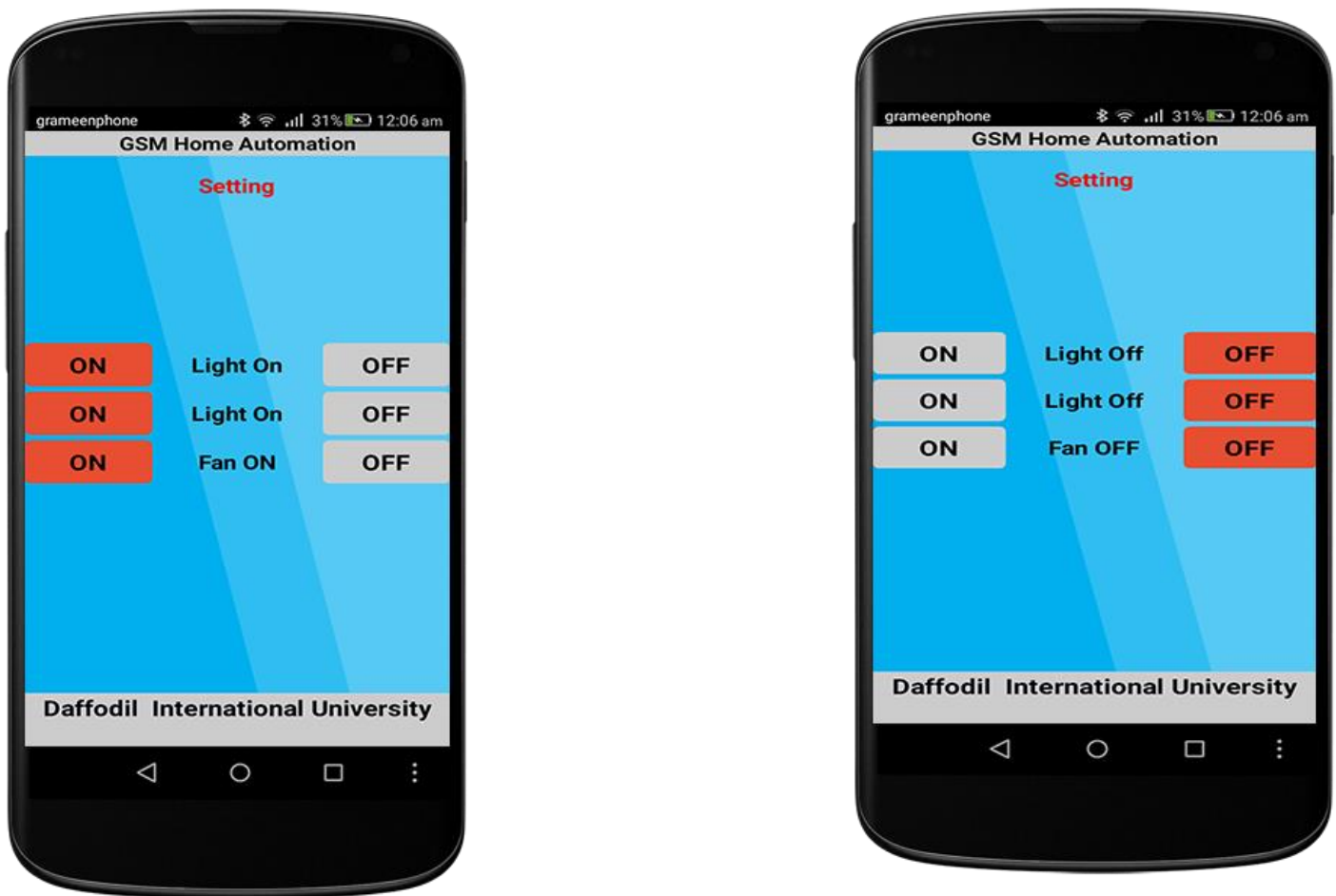


Figure: 5.7 Android Apps

5.3 Summary

Android App based electrical device control device is potential of controlling of the home equipment from any place in the world in which GSM carrier is available. The coupling of the hardware offers the very last layout. The smooth EDA provides the level for simulating this system at the hardware already designed and troubleshooting of the whole design. There were some problems encountered in our mission improvement which may be stated as underneath:

- i. SIM800L GSM module is used this project
- ii. Problem with device improvement in laptops with 64-bit Operating System
- iii. Unavailability of components in the local market.
- iv. Coding issues relating to efficient memory usage.

CHAPTER- 6

CONCLUSIONS

AND RECOMMENDATIONS

6.1 Conclusion:

on this venture a low-fee and easy method to design an shrewd load manage machine and using the idea of mobile-to- machine and machine-to- cell verbal exchange is designed. We enhance a widespread cause digital circuit layout that may manage and reveal a variety of load manage gadget and description firm work with interface that may be plugged into A6 GSM module. The challenge is effectively progressed and met the said goals. The system can automatically switch on and off the devices the usage of SMS and manually. in addition, the gadget is very realistic whilst the person is far from home or out of domestic; via it the user can monitoring and controlling the electric home home equipment remotely as long as the cellular phone receives the coverage.

6.2 Limitations of the Work:

The working process of this project is very easy but we are facing some restriction to doing this project. Such as coding problem, program writing, connecting to PCB board, command, network problem do for ON or OFF following etc.

6.3 Future Scopes:

The machine specification suggests the description of the feature and the overall performance of gadget and the consumer. The possibility of our task layout & production of GSM based electrical tool and industrial load control machine is substantial. The destiny implementations of the mission are very huge considering the quantity of time and sources it saves. The venture we've undertaken can be used as a reference or as a

base for realizing a scheme to be carried out in different assignment of greater degree including weather forecasting, temperature update, device synchronization, and many others. The project itself may be develop to acquire a complete device manage home or define firm paintings so that it will then create a platform for the person to interface between himself and family.

6.4 Advantages:

The blessings of this system are it has an capability to manipulate the user home equipment via SMS, can simulate live in conditions while the residence is depart unattended throughout vacations, and in control of domestic circumstance with the aid of SMS. The main powerful benefit of home Automation is:

device can be controlled for long distance. it is made economic layout.

The system may be effortlessly carried out in homes. can be utilized by everybody with simply the understanding of sending textual content SMS.

1.Comfort: an automatic gadget affords unheard of comfort to the proprietor. by means of having a dwelling location this is self-sufficient to automatically perform habitual capabilities throw a easy get admission to panel or without you click of buttons a whole lot of convenience to the circle of relatives members. you could activate your water heater, ac, even cast off the lighting fixtures, which might be you still on while you came out. you can additionally close the window curtains, carry your espresso inside the espresso maker or activate the smart home theatre, or even sense your tub even earlier than reaching your private home.

2. keep electricity payments. with using superior domestic Automation, you could additionally reduce down for your cost for power. that is very a great deal possible as you don't need to preserve your refrigerator on, AC running at home to make you experience at comfort. with use of Such home Automation answer, you can manage many function of your property and operate them to run on most reliable strength necessities. this way, now not handiest you shop your valuable household system's, but additionally help to reduce your electricity price and shop the countrywide interest as nicely.

3. however use of domestic automation gadget is notably powerful and may be beneficial in term of planning for a current house. with is the usage of automatic gadget, Duke and Shirley having a exceptional overall performance of your strength consumption as well as keep dollars on that.

and lighting device thru such smart solution. This gives you flexibility of makes use of in addition to comfort of operation as you now not need to hurry to any unique device to exchange that of.

4. enhance lifestyles fine and keeping ourselves away from any electrical dangers.

6.5 Disadvantages:

1. It depends on power if any power schedule of hours then the system will collapse.
2. The system is network dependent.
3. Network sometimes fails due to GSM shield.
4. System has some delay due to receiving SMS.

REFERENCES

- [1] <http://www.wisegeek.org/what-is-a-diode.htm> on 4 December 2017
- [2] <https://www.electrical4u.com/what-is-transformer-definition-working-principle-of-transformer> on 7 December 2017
- [3] http://www.ducksters.com/science/physics/resistors_capacitors_and_inductors.php on 10 December 2017
- [4] https://en.wikipedia.org/wiki/Arduino#cite_note-66 on 1 January 2018
- [5] <https://www.adafruit.com/product/5> on 5 January 2018
- [6] <https://www.aliexpress.com/store/product/GPRS-A6-Serial-GPRS-GSM-Module-Core-Development-Board/911111111/3283283> on 10 January 2018
- [7] <https://www.gsm.com/newsroom/press/number-mobile-subscribers-worldwide-hits-5-billion/> on 7 January 2018
- [8] <https://www.arduino.cc/en/Tutorial>HelloWorld> on 25 January 2018
- [9] <https://github.com/cristiansteib/Sim800L> on 20 January 2018
- [10] Paper of MJ Vanderwerff on 'activation of home automation system via mobile technology' on 15 December 2018
- [11] Wikipedia-GSM technology. on 10 January 2018
- [12] Data sheet of ATMEGA 168. on 12 January 2018
- [13] www.motorola.com interfacing device information. on 5 January 2018
- [14] Dr. Aditya Trivedi-Pro.IIT Gwalior. on 9 January 2018
- [15] Labsguru Workshop-programming details. On 20 December 2017
- [16] www.mlabsbd.com on 14 January 2018
- [17] <http://www.projectsof8051.com/gsm-based-home-security-system/> on 17 January 2018

Appendix-A

Code used in our project:

```
#include <LiquidCrystal.h>
LiquidCrystal lcd(A1, A0, 13, 12, 11, 10);
String phone;
bool nextLineIsMessage = false;
char currentLine[500] = "";
int currentLineIndex = 0;
int S1 = 6;
int S2 = 7;
int S3 = 8;

void setup()
{
  lcd.begin(16, 2);
  lcd.print("GSM Home Automation");

  phone.reserve(20);
  Serial.begin(57600);

  delay(10000);
  Serial.println("ATS0=2\r\n");
  delay(500);
  Serial.println("AT+CMGF=1\r");
  delay(500);
  Serial.println("AT+CNMI=2,2,0,0,0\r");
  delay(500);
  pinMode(S1, OUTPUT);
  digitalWrite(S1, LOW);
  pinMode(S2, OUTPUT);
  digitalWrite(S2, LOW);
  pinMode(S3, OUTPUT);
  digitalWrite(S3, LOW);
}

void loop()
{
  smsread_and_print_number();
  callandsms();
}

void smsread_and_print_number()
{
  if (Serial.available()) {
    char lastCharRead = Serial.read();
    if (lastCharRead == '\r' || lastCharRead == '\n') {
      String lastLine = String(currentLine);
      if (lastLine.startsWith("+CMT:")) {
        phone = lastLine.substring(lastLine.indexOf("+CMT: ") + 7, lastLine.indexOf("+CMT: ") + 21);
        Serial.println(phone);
        nextLineIsMessage = true;
      }
      else if (lastLine.length() > 0) {
        if (nextLineIsMessage) {
          Serial.println(lastLine);
        }
        if (lastLine.indexOf(" ONE") >= 0) {
          digitalWrite(S1, HIGH);
        }
      }
      lcd.setCursor(0, 1);
      lcd.print("  Light1 ON  ");
    }
  }
}
```

```

}
else if (lastLine.indexOf("TWO") >= 0)
{
digitalWrite(S1, LOW);

lcd.setCursor(0, 1);
lcd.print("  Light1 OFF  ");
}
else if (lastLine.indexOf("THREE") >= 0)
{
digitalWrite(S2, HIGH);

lcd.setCursor(0, 1);
lcd.print("  Light2 ON  ");
}
else if (lastLine.indexOf("FOUR") >= 0)
{
digitalWrite(S2, LOW);

lcd.setCursor(0, 1);
lcd.print("  Light2 OFF  ");
}
else if (lastLine.indexOf("FIVE") >= 0)
{
digitalWrite(S3, HIGH);

lcd.setCursor(0, 1);
lcd.print("  FAN ON  ");
}
else if (lastLine.indexOf("SIX") >= 0)
{
digitalWrite(S3, LOW);

lcd.setCursor(0, 1);
lcd.print("  FAN OFF  ");
}
}

```