Smart Car Parking System Using Arduino



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Declaration

It is declared hereby that this project paper or any part of it has not been submitted to anywhere else for the award of any degree.

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Certification

This is to certify that this project entitled **"Smart Car Parking System Useing Arduino"**is done by the following students under my direct supervision. This project work has been carried out by them in the laboratories of the Department of Electrical and Electronic Engineering under the Faculty of Engineering, Sonargaon University (SU) in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering.

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ABSTRACT

Traffic Jam is one of the most irritation problems in Bangladesh. Everyone feels it but none seems to think over this unhappy situation as prevails in Bangladesh. Car Parking managers have failed to do anything about this problem and the situation is going from bad to worse day by day. Automatic car parking system has an important role. This project paper puts forward a proposal of an improved ‘‘Design & Construction of a Smart car parking system.” to receive maximum car that has been designed and implemented by using “Light Dependent Resistor (LDR)” sensors, Microcontroller and Servo motors to make the tracking system simple. Important points of this design are using security system and short technical know to parking zone is free or block. High security locking with SMS password. By using SMS service, user can easily get information, about parking system (available or not).The work that has been done by us to park the vehicle. We are slightly worried for the purpose of the security of the vehicles especially. The security system has been developed by using a specially password. The other activities will controlled by a Microcontroller. Over all parking system can be use hose parking, apartment parking zone, office and many other things. Everyone wants to protect their property safely. For this purpose this project plays a vital role.

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CHAPTER 1
Introduction

1.1 Introduction

With the growth of economy, vehicle has become a necessity in our daily life making the vehicle quantity increase dramatically. Vehicle brings convenience to people, yet parking causes serious problems because of poor management at the same time. For drivers and managers, traditional parking management hasn't met their needs in efficiency, security and performance. Therefore, the need for an intelligent parking system with high efficiency, low cost and high security is indispensable for people in the modern society. Global System for Mobile Communication (GSM) is a digital mobile communication network which has developed rapidly in recent years. It is used widely in mobile device standards. Because GSM network has almost covered the whole country, there is no need to set up another network when using wireless technology. Consequently, it can reduce the cost of construction and service which heightens economic benefit. Subscribers access GSM network freely, without any limitation. As the most basic business of GSM network, Short Message Services (SMS) has become more attractive than ever before. At present, in most intelligent parking system, drivers need to take an IC card when entering into a parking lot and read the card when getting out. In this paper, we have designed a novel intelligent parking system based on GSM module, it is easy to operate and people with cell phones can use it without any difficulty. Drivers can park conveniently as long as they send a message to the system. The system cuts off complicated operation and makes pa rking simple, people no longer need to implement complex operation in parking procedure.



Fig 1.1: Format of Smart car parking system

1.2 Objectives

a) High security locking with SMS password.
b) By using SMS service, user can easily get information, about parking system (available or not).

1.3 Background Study

With the growth of economy, vehicle has become a necessity in our daily life making the vehicle quantity increase dramatically. Vehicle brings convenience to people, yet parking causes serious problems because of poor management at the same time. For drivers and managers, traditional parking management hasn't met their needs in efficiency, security and performance. Therefore, the need for an intelligent parking system with high efficiency, low cost and high security is indispensable for people in the modern society. Global System for Mobile Communication (GSM) is a digital mobile communication network which has developed rapidly in recent years. It is used widely in mobile device standards. Because GSM network has almost covered the whole country, there is no need to set up another network when using wireless technology.

1.4 Methodology

1. Information was collected from related reference books and websites to find out the possible improvement.
2. It was designed on paper on the basis of background research.
3. Components were collected from local electronic market.
4. Worked on building the project and experimental verification.

CHAPTER 2

Project Overview

2.1 Introduction

Parking system manufacturer & solutions supplier indicator light LDR Sensor central controller. Used to component LDR Sensors, Indicator Light, Central Controller, Available Parking Lot Display, GSM module, Microcontroller (Ardunio Nano), Servo Motor.

2.2 Block Diagram of Smart car parking system

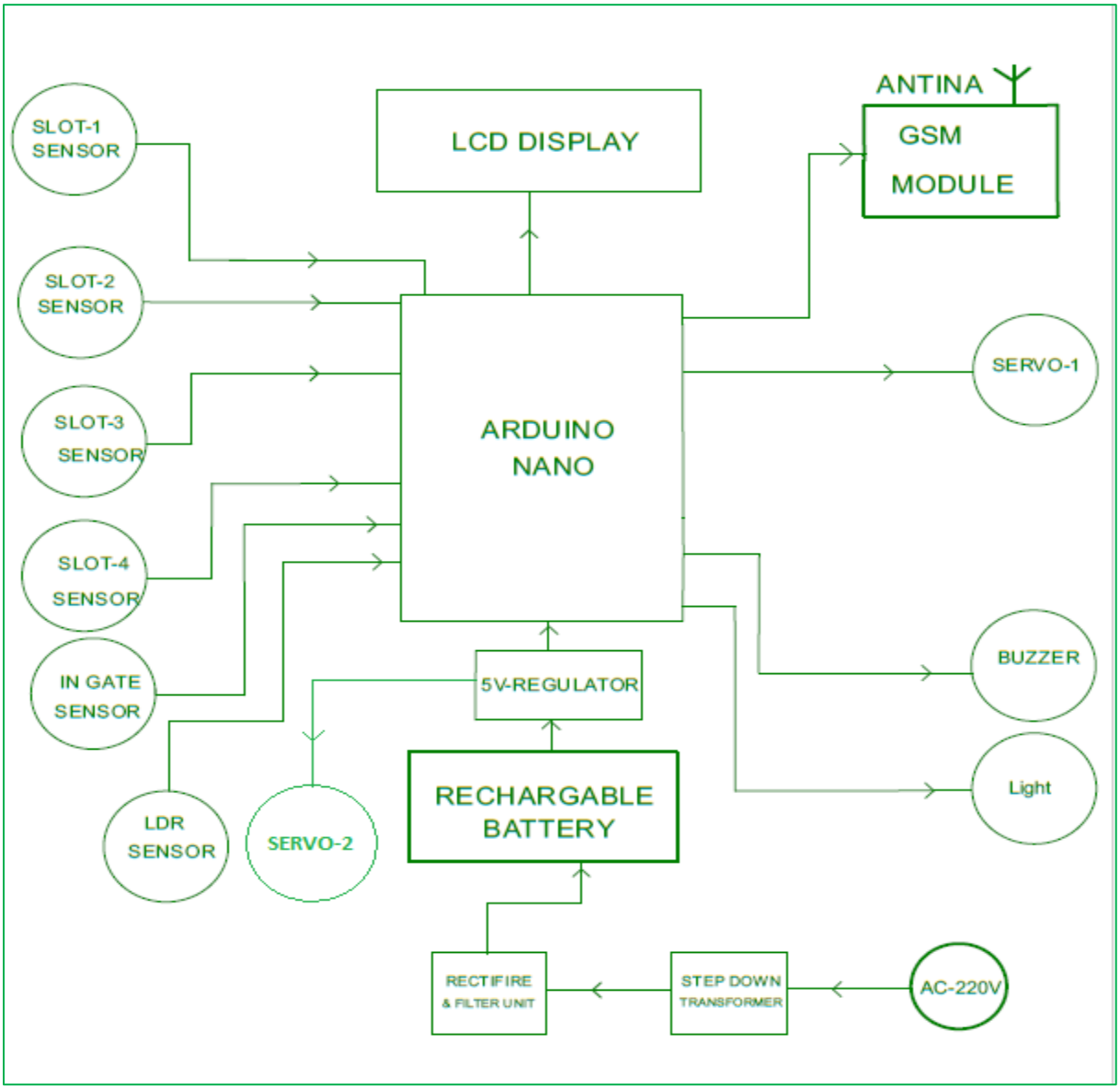


Fig.2.1: Block Diagram of Smart car parking system

2.2.1 Description the block of Smart car parking system

a) Arduino Nano microcontroller (all posses controlling and handling Arduino Nano).

b) LCD display (show the process slot available or not, bill, parking time).

c) Power stage (total power supply all component).

d) Global System for Mobile Communication (SMS system controlled).

e) Servo motor (All gate controlled).

2.3 Working Principle

This component connected to Arduino Nano, LCD Display, GSM Module, Servo motor, Buzzer, sensor etc. First of all this project shows how to connect the Arduno Nano software and how to install programming code. This project is working step by step procedure.

2.3.1 First Step

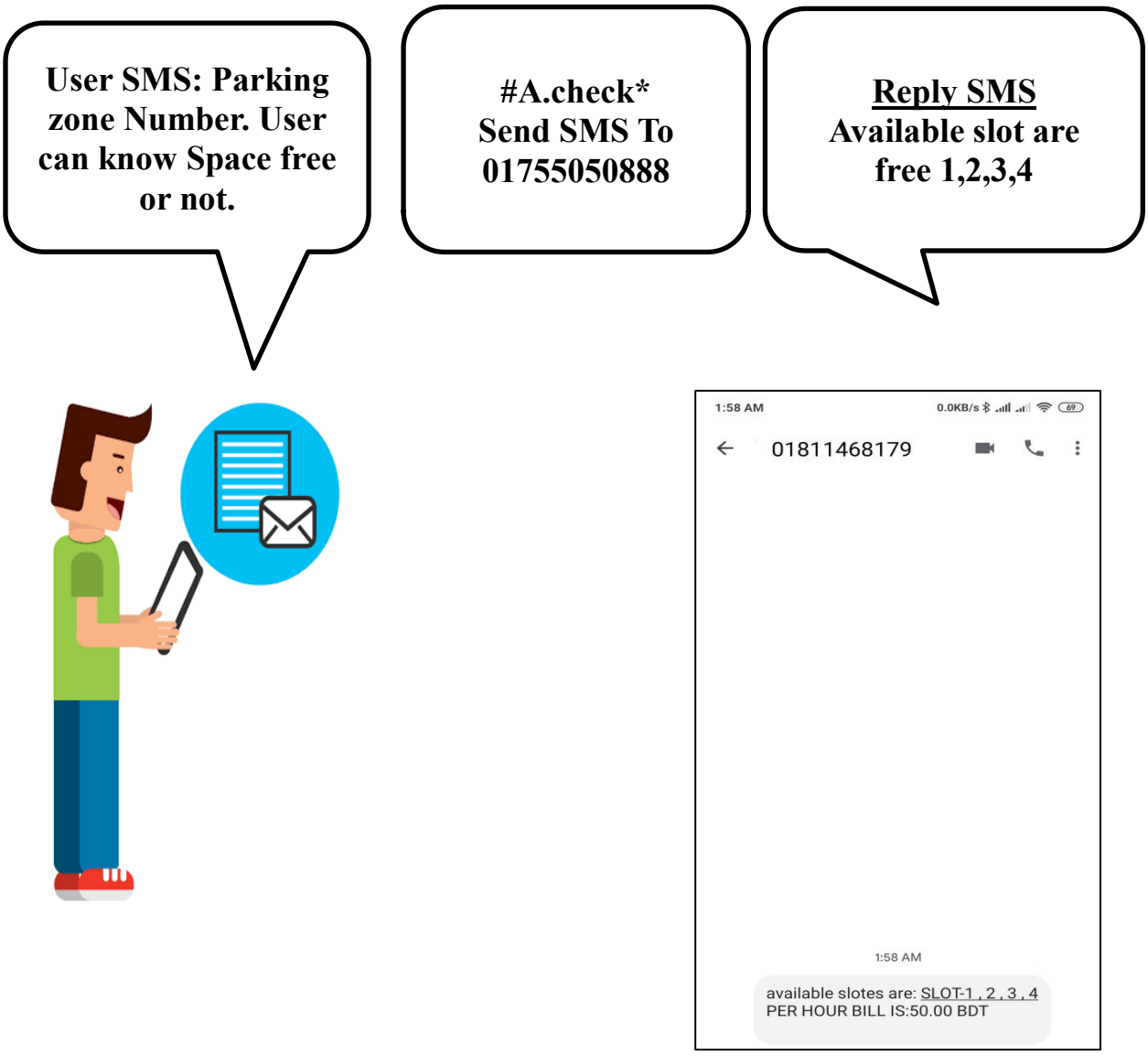


Fig.2.2: User and parking zone operating system first case.

1st process when a user SMS to GSM module then reply SMS to user. This parking zone is full or free. If parking slot is free space then return SMS this slot is free space welcome to the parking zone. If parking slot is full then return SMS this slot is full sorry to this zone is not available.

User <SMS option < type< #A. check*

Parking zone replay< available slot are free 1, 2, 3, 4. If not available then< sorry this space are not available.

2.3.2 Second Step

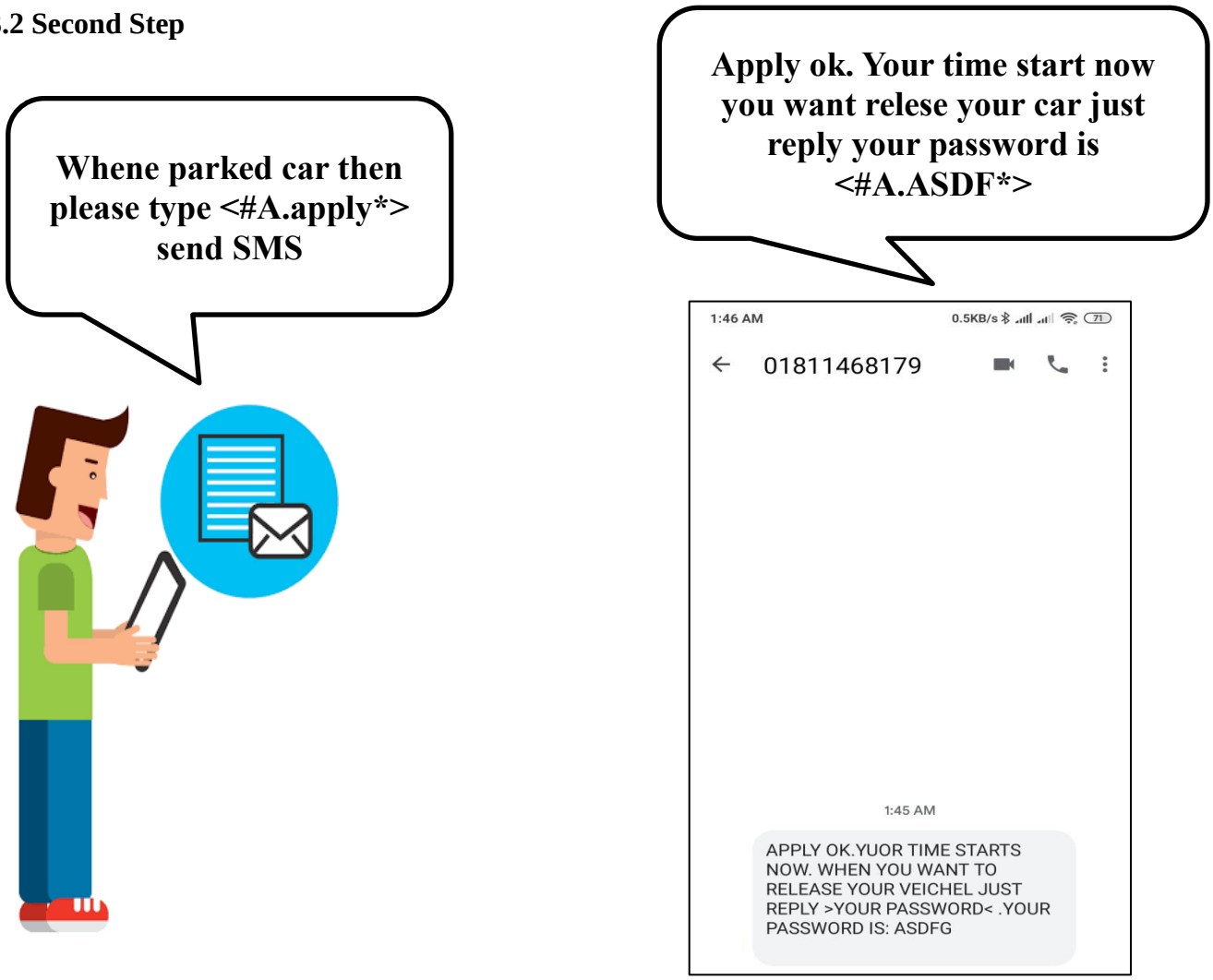




Fig.2.3: User and parking zone operating system second case

.

2nd process when user car go to parking zone parked to car and sent a SMS parking zone number then security gate lock. Then GSM sent SMS to user this SMS is verification password automatic system. User < type<#A. apply*<sent to parking zone number Parking zone replay < APPLY OK.YOUR TIME START NOW. YOU WANT RELEASE YOUR CAR JUST REPLY >YOU'RE PASSWORD<YOUR PASSWORD IS #A.ASDFG*.

2.3.3 Third Step

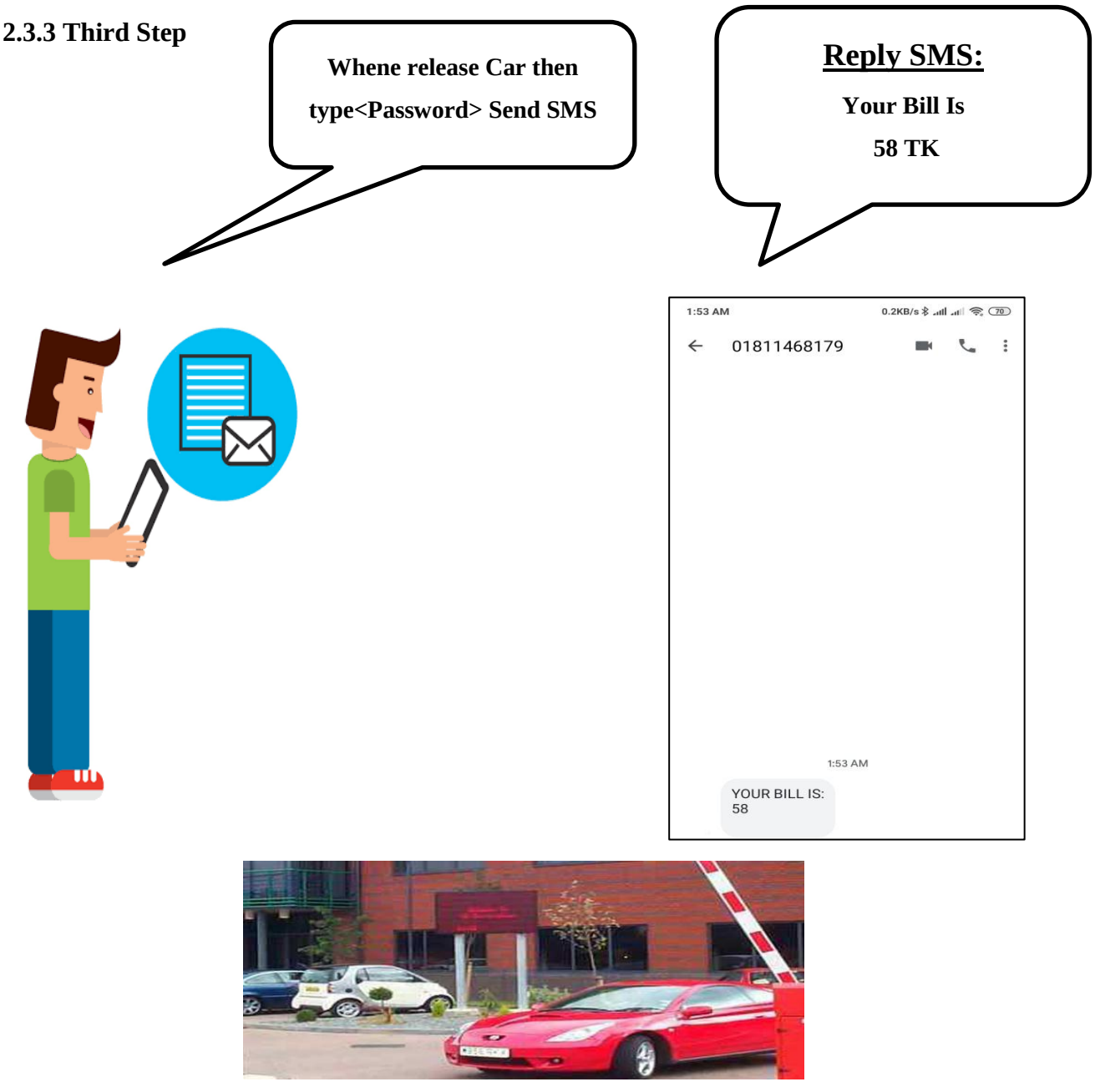


Fig. 2.4: User and parking zone operating system third case.

3rd process pass the few time that user come to parking zone and go out with car, then SMS to user phone and press to password go out the parking zone and paid bill to the counter. User <type < #A.ASDFG*<sent to parking zone number. Parking zone replay < your bill is…….. Tk. sent user number.

2.4 Advantage:

1. High security locking with SMS password.
2. By using SMS service, user can easily get information, about parking system (available or not)
3. The system is efficient in terms of cost.

2.5 Limitations:

1. The project is designed for toy cars. In real systems, many complications will arise. For example, in real system, a single small LDR is not enough to find whether a car is present or absent in the slot.

2. Setting reference voltage for the system is complicated task. It may change with the environment.

2.6 Applications

1. Smart car parking system can be used in a big apartment.
2. It can be used in a large shopping complex.
3. It can also, be used vehicle terminal.
4. It can be used in big corporate office.

CHAPTER 3

Description of Component

3.1 Components list

Sl. no.	Components Name
1.	Arduino Nano (Micro controller) **(Model ABX00012)**
2.	Servo Motor **(Model sg90g)**
3.	LDR
4.	LCD Display **(Model 2*16)**
5.	Some Register
6.	Diode
7.	GSM Module **(SIM800L)**
8.	Voltage Regulator
9.	Vero board
10.	IC**(Model 555)**
11.	Variable resistor
12.	Buzzer
13.	Connector
14.	AC to DC Power supply
15.	Some wires
16.	Model board, Structure and etc
17.	Capacitor
18.	Center tap transformer(I/P220V-O/P12V,600mA)
19.	Rechargeable battery
20.	Switch
21.	LED

3.2 Arduino Nano USB Microcontrollers

The Arduino Nano USB Microcontroller is a breadboard ready version of the Arduino Mini 05 Microcontroller Module with integrated USB. The Nano has more analog input pins as compared to most Arduino boards and an onboard +5V AREF jumper.

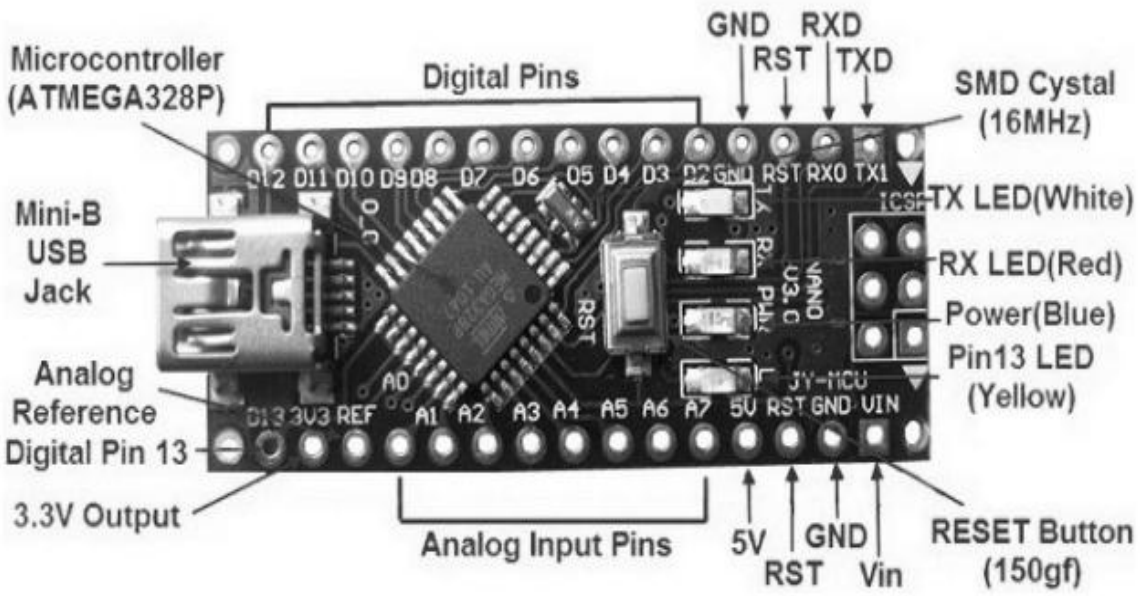


Fig. 3.1: Arduino Nano pin configuration.

3.2.1 Install Arduino Software

Install the Arduino. This is a complete environment that provides a compiler so you can quickly get started developing and running code on your Arduino. Mac Download it from the Arduino website. Unzip it and drag the Arduino App into your Applications folder and run it from there. Windows: Download it from the Arduino website. Run the installer and the Arduino IDE should be accessible from the start menu.This depends on which distribution you run in the terminal and presses enter a few times to download and install it. For other
distributions of Linux, Google around because there is likely an active community already on the internet. Otherwise find YouTube for help. Run Arduino from the terminal by typing ‘arduino’.

If it ever complains about permissions when uploading a sketch, then quit and run ‘sudoarduino’ instead. Otherwise, find YouTube for help.Embedded electronics is all about interlinking circuits (processors or other integrated circuits) to create a symbiotic system. In order for those individual circuits to swap their information, they must share a common communication protocol. Hundreds of communication protocols have been defined to achieve this data exchange, and, in general, each can be separated into one of two categories: parallel or serial [2].

3.2.2 Arduino Pin Diagram

A typical example of Arduino board is Arduino Uno. It consists of ATmega328- a 28 pin microcontroller.

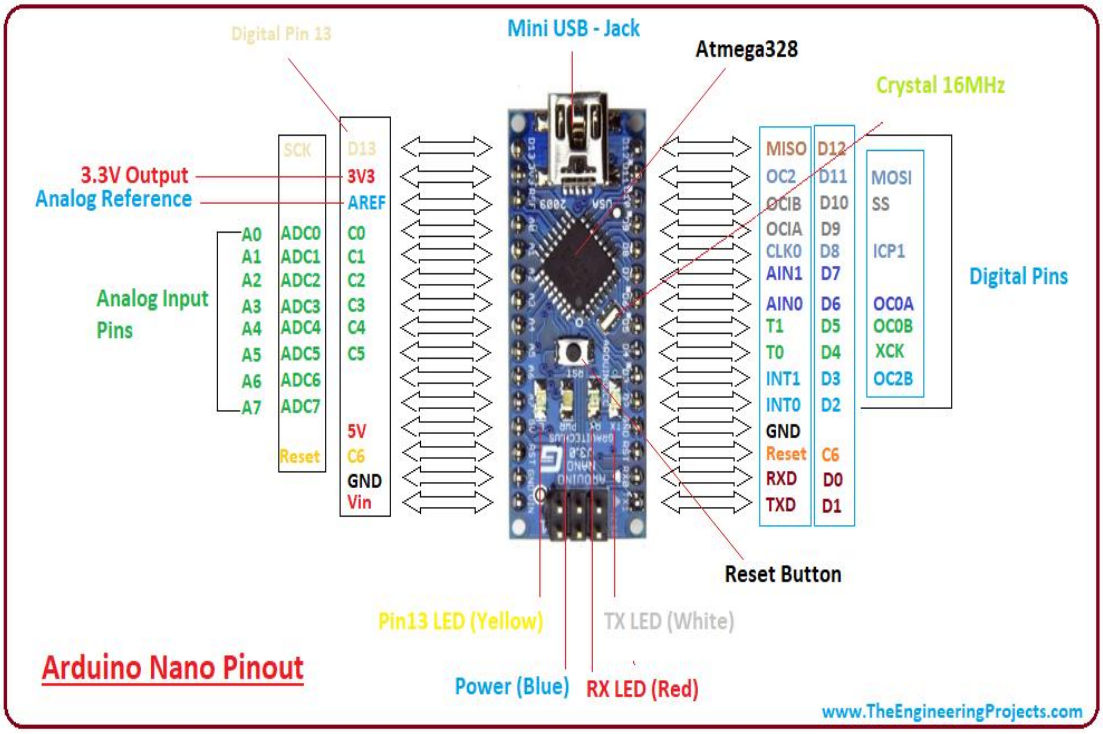


Fig.3.2: Arduino Pin diagram

3.2.3 Pin Descriptions of Arduino

Table 3.1: Pin Descriptions of Arduino

Microcontroller Atmel	ATmega328
Operating Voltage (logic level)	5 V
Input Voltage (recommended)	7-12 V
Input Voltage (limits)	6-20
V Digital I/O	Pins 14 (of which 6 provide PWM output)
Analog Input Pins	8
DC Current per I/O Pin	40 mA
Flash Memory	16 KB (ATmega168) or 32 KB (ATmega328) of which 2 KB used by boot loader.
SRAM	1 KB (ATmega168) or 2 KB (ATmega328)
EEPROM	512 bytes (ATmega168) or 1 KB (ATmega328)
Clock Speed	16 MHz
Dimensions	0.73" x 1.70"

3.2.4 Parallel vs Serial

Parallel interfaces transfer multiple bits at the same time. They usually require **buses** of data - transmitting across eight, sixteen, or more wires. Data is transferred in huge, crashing waves of 1's and 0's.

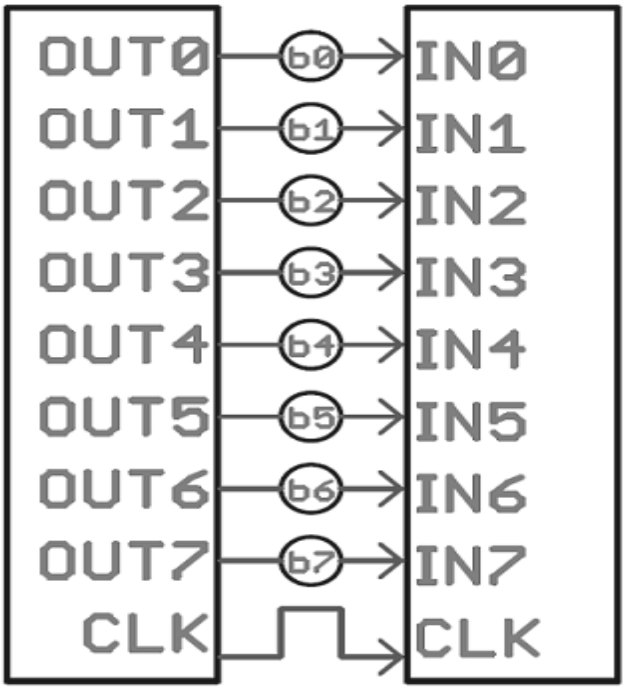


Fig. 3.3: Parallel port for Arduino Nano

An 8-bit data bus, controlled by a clock, transmitting a byte every clock pulse. 9 wires are used.Serial interfaces stream their data, one single bit at a time. These interfaces can operate on as little as one wire, usually never more than four [5].

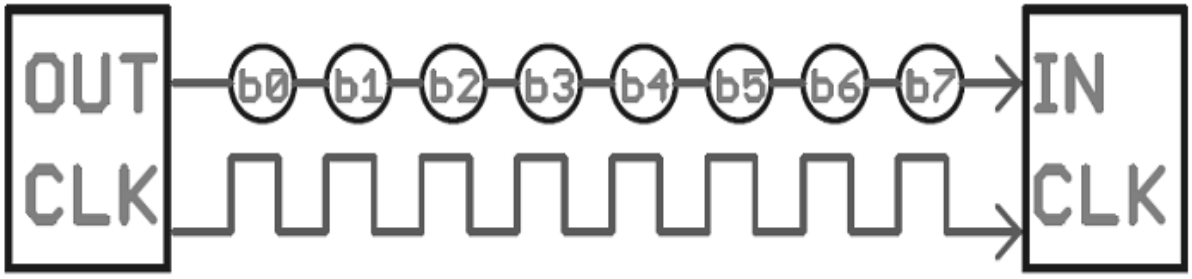


Fig. 3.4: Serial port for Arduino Nano.

Think of the two interfaces as a stream of cars: a parallel interface would be the 8+ lane mega-highway, while a serial interface is more like a two-lane rural country road. Over a set amount of time, the mega-highway potentially gets more people to their destinations, but that rural two-liner serves its purpose and costs a fraction of the funds to build.Speed for pin real estate.

3.2.5 Asynchronous Serial

A synchronous serial interface always pairs its data line(s) with a clock signal, so all devices on a synchronous serial bus share a common clock. This makes for a more straightforward, often faster serial transfer, but it also requires at least one extra wire between communicating devices. Examples of synchronous interfaces include SPI, and IIC [9].Asynchronous means that data is transferred Parallel communication certainly has its benefits. It's fast, straightforward, and relatively easy to implement. But it requires many more input/output (I/O) lines. If you've ever had to move a project from a basic Arduino Nano to a Mega, you know that the I/O lines on a microprocessor can be precious and few. So, we often opt for serial communication, sacrificing potential **without support from an external clock signal**. This transmission method is perfect for minimizing the required wires and I/O pins, but it does mean we need to put some extra effort into reliably transferring and receiving data. The serial protocol we'll be discussing in this tutorial is the most common form of asynchronous transfers. It is so common, in fact, that when most folks say "serial" they're talking about this protocol.

The clock-less serial protocol we'll be discussing in this tutorial is widely used in embedded electronics. If you're looking to add a GPS module, Bluetooth, Xebec's, serial LCDs, or many other external devices to your project, you'll probably need to whip out some serial-fu.

3.2.6 Wiring and Hardware

A serial bus consists of just two wires - one for sending data and another for receiving. As such, serial devices should have two serial pins: the receiver, **RX**, and the transmitter, **TX.**

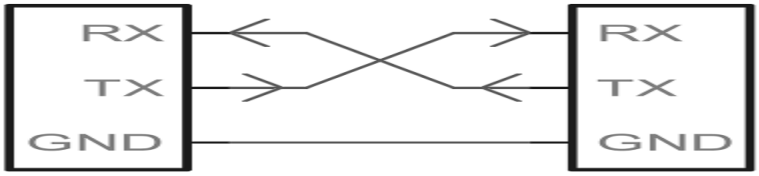


Fig. 3.5: Transmitting receiving port for Arduino Nano

A serial interface where both devices may send and receive data is either **full-duplex or half-duplex.** Full-duplex means both devices can send and receive simultaneously. Half-duplex communication means serial devices must take turns sending and receiving. Some serial busses might get away with just a single connection between a sending and receiving device. For example, our Serial Enabled LCDs are all ears and don't really have any data to relay back to the controlling device. This is what's known as **simplex** serial communication. All you need is a single wire from the master device's TX to the listener's RX line [2].

3.2.7 Install USB Serial Driver

The Arduino Nano we use in 6.101 comes with a CH340G serial chip. This is a cheaper version of the same chip that a company named FTDI sells for a lot of money. In order for your computer to talk with our cheap Arduino (it was just $5!) you need to install a driver for the CH340G. Drivers on http://web.mit.edu/6.101/www/s2017/drivers/ have been tested. - CH341SER_MAC: OSX Yosemite, El Capitan - CH34x_Install_Windows_v3_4.zip: Windows 7 - CH340_LINUX.zip: Usutu 14.04. Other drivers are available from http://sparks.gogo.co.nz/ch340.html If you run Linux, then you probably already have it so don't bother If it asks you to restart, then do it or else the driver will not work (they are usually activated on boot-up) [1].

3.2.8 Program the Arduino

Open up the Arduino program and start a new sketch. Arduinos, and most other microcontrollers, are programmed in C. Thankfully, the Arduino developers have done a great job with the APIs so they're very easy to use and in-depth knowledge of C is not required. It might be a good idea to open the Binky example sketch and just modify it instead of starting from scratch. There are 2 functions your Arduino must contain setup () and loop (). The setup () function contains code that should only be run once when the Arduino is turned on. This is because setup () is only called once. The loop () function gets called as fast as possible for as long as the Arduino is on. You should assume that as soon as it returns, it just gets called again. There is code you can copy/paste below but you should try and write it out yourself because it's good practice.

3.2.9 Block diagram for Arduino

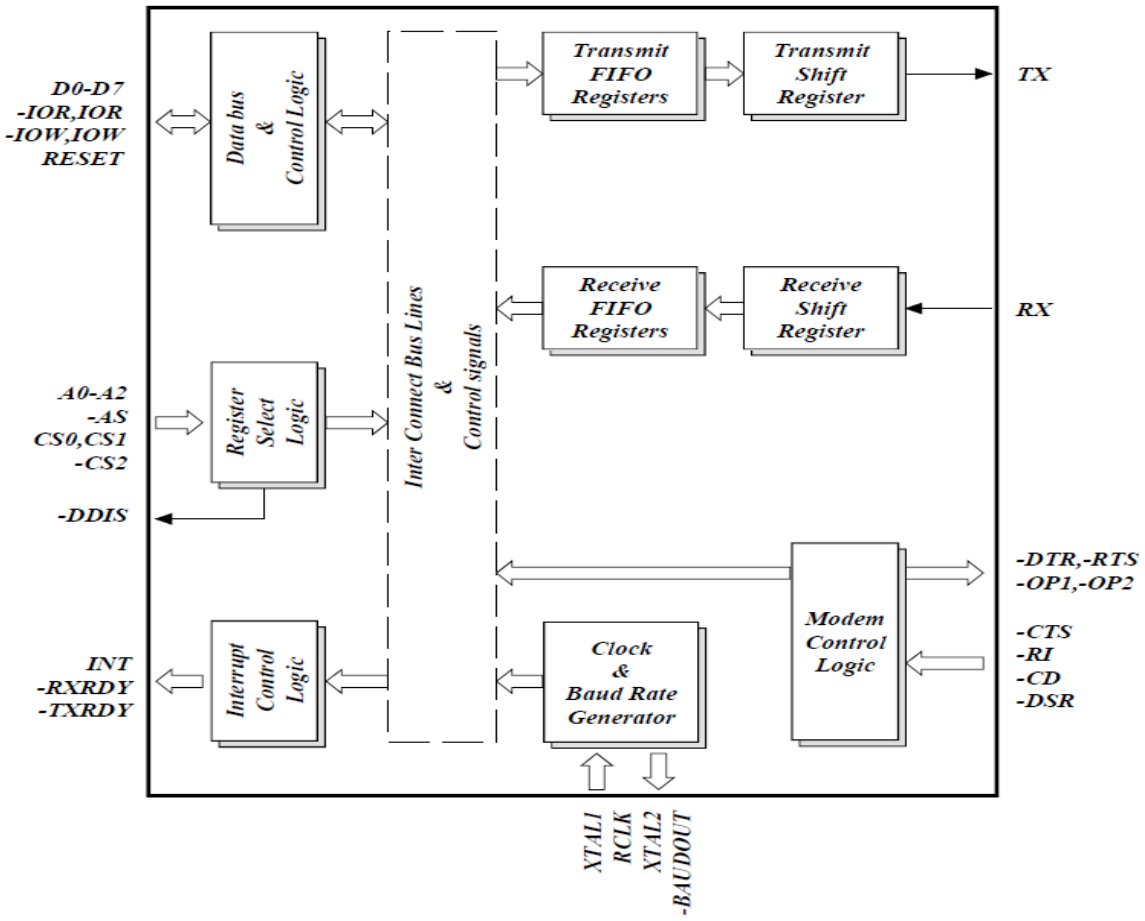


Fig. 3.6: Block diagram of Arduino.

Upload Your Program

Go to Tools->Board and select Arduino Nano

Go to Tools->Processor and select ATmega328

Go to Tools->Port and select the correct serial port. A quick way to figure this out is to unplug your USB cable and see which option disappeared.

Click the 'Play' button which is actually the upload button. If all goes well, you should be able to push the button and have the LED blink [6].

3.2.9.1 Circuit Diagram of Arduino

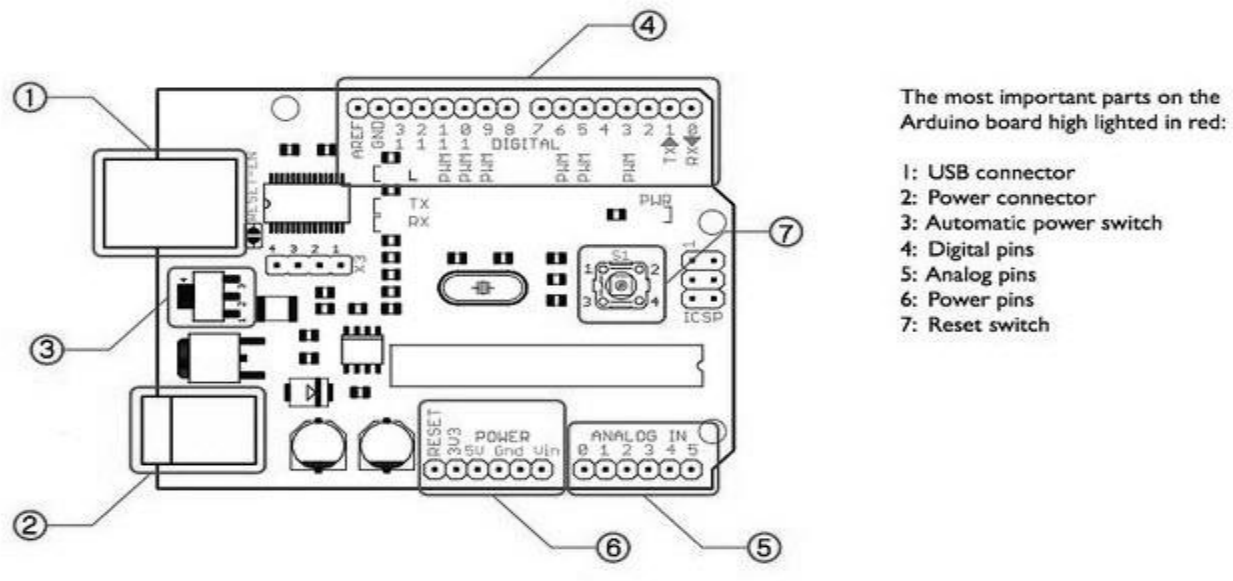


Fig. 3.7: Circuit Diagram of Arduino.

3.2.9.2 Assemble the Circuit

Pick a digital pin on the Arduino to use as an input and assemble your circuit such that this pin can read the state of the button. Since the button produces either a short circuit or an open-circuit it will be necessary to use a pull up / pull down resistor on your input pin. The Arduino Nano has built-in 20K pull up resistors on every digital pin. One elegant configuration is to position the button so that it is centered on the D2 pin [8].

3.2.9.3 Setup () Function

If you centered the button on the D2 pin, then there are just two pins to configure: the LED pin and the D2 pin. In setup (), make D2 an input with a pull up resistor and make the LED an output. You can use the predefined variable LED_BUILTIN to refer to the LED pin [6].

3.2.9.4 Loop () Function

The main job of the Arduino is to make the LED state follow the button state. This requires reading the value of the button and then writing it out to the LED. The built-in functions digital Read () and digital Write () should prove useful [6].

3.3 LDR (Light Dependent Resistor)

LDR (Light Dependent Resistor) is called as light detecting sensor to build solar track which has included phototransistors, photodiodes and LDR. It is a made up of semiconductor materials which has high resistance. LDR is the most common in electronics and it is spread used in many types of electronics. LDR can use for street lamp, outside lights, a number of indoor home appliances, and so on. It is utilize the light sensor circuit for automatic switch OFF the loads based on daylight's intensity by helping of a light sensor. In daylight the rays of sun falls on the photovoltaic panel and photo resistor and when the light falls on the resistor, then the resistance changes. This resistor's has different functions and resistance. Using LDR in a circuit or in a electronics project it is make circuit effective and the collection of LDR parts of the circuit are easily available and accuracy of this circuit is more than accuracy of other circuits. It is so much helpful for saving energy. When the light falling on the zigzag lines on the sensor (which is made of CDS) causes the resistance of the device to fall.

There are two types of photo resistor based on material used and they are Intrinsic Photo Resistors and Extrinsic Photo Resistors. Intrinsic Photo Resistors are made up of pure

Semiconductor devices like silicon or germanium. When the light falls on the Intrinsic Photo Resistors, the electrons get excited from the valence band to the conduction band and number of charge carriers increases on a resistor. Extrinsic Photo Resistors are doped with impurities and this impurity creates a new energy bands above the valence band [7].

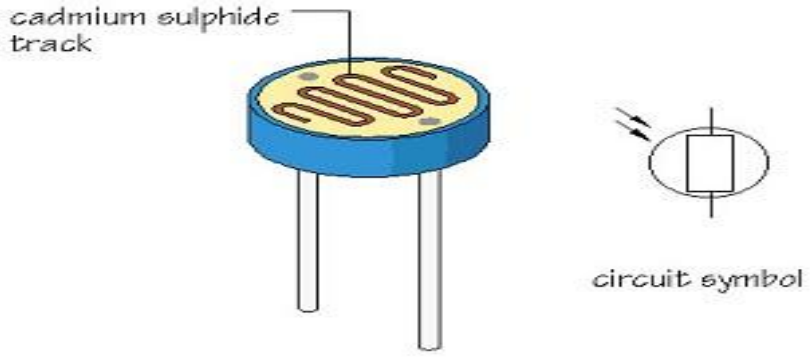


Fig. 3.8: Light Dependent Resistor

3.3.1 LDR Features

- Can be used to sense Light
- Easy to use on Breadboard
- Easy to use with Microcontrollers or even with normal Digital/Analog IC
- Small, cheap and easily available

3.3.2 Applications

- Automatic Street Light
- Detect Day or Night
- Automatic Head Light Dimmer
- Position sensor
- Used along with LED as obstacle detector and Automatic bedroom Lights

3.3.3 Working Principle of LDR

Photo Conductivity is the main principle of the light depended resistor. Photo conductivity is an optical method, which the material's conductivity is increased when light is absorbed by the materials. When the light (photon) falls on the materials, the electrons in the valence band of the semiconductor material are excited to the conduction band. These photons in the

Incident light should have energy greater than the band gap of the semiconductor material to make the electrons jump from the valence band to the conduction band. The result of this process is more and more current starts flowing through the device when the circuit is closed and hence it is said that the resistance of the device has been decreased. This causes the free electrons or holes to conduct electricity and thus dropping the resistance (< 1 Kilo ohm). This is the working principle of light dependent resistor. The equation to show the relation between resistance and illumination can be written as:

$R = A.E^{a}$

Where E – Illumination (lux)

R – Resistance (Ohms)

A, a – constants

The value of 'a' depends on the CDS used and on the manufacturing process. Values usually range between 0.7 and 0.9 [3].

3.3.4 The Characteristics Curve of LDR (Photoconductive Cell)

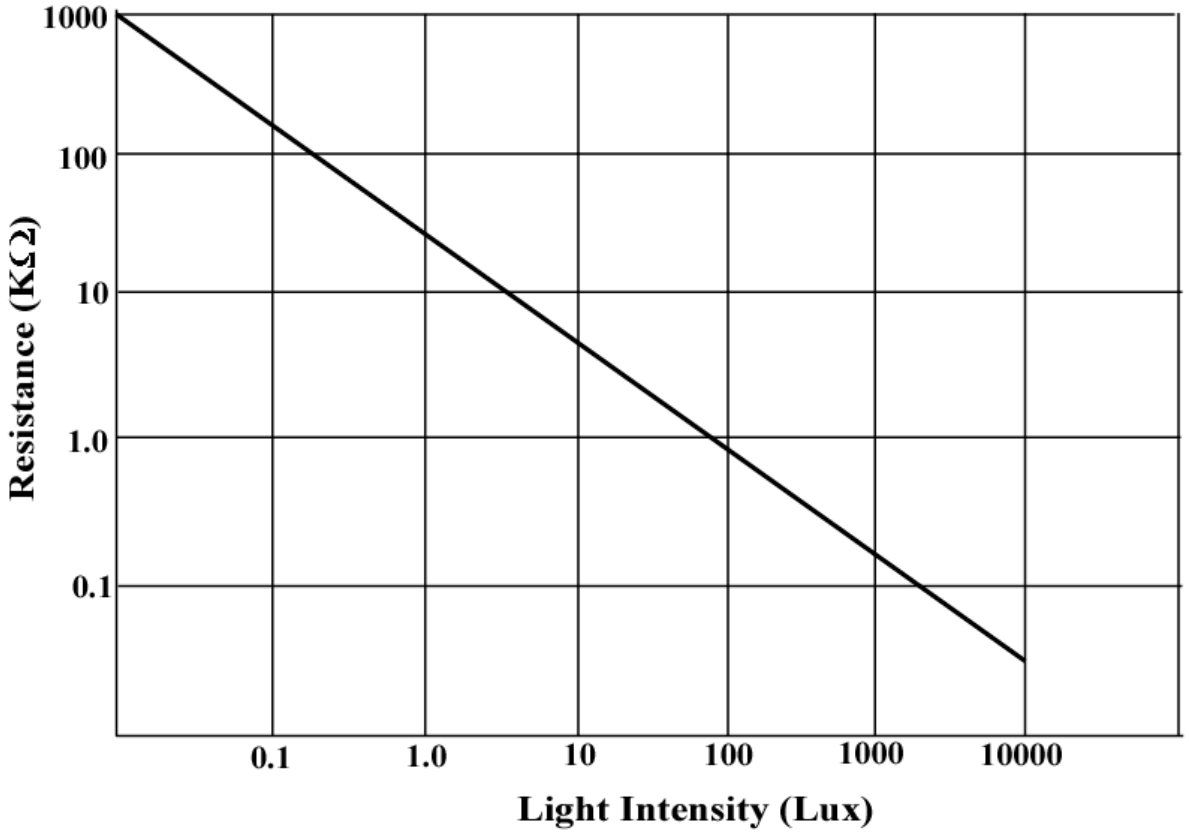


Fig 3.9: Characteristics Curve of LDR (Photoconductive Cell)

The typical characteristics curve of LDR is shown in the above figure from which it is obvious that when the cell is not illuminated its resistance may be up to 1000 KΩ. This resistance is called the dark resistance. Here the independent value light intensity (Lux) is shown towards x-axis and dependent value resistance (KΩ) is shown towards y-axis. When light intensity is 0.1 lux then the resistance is around 200 KΩ, when light intensity increases to 100 lux then the resistance is around 0.9 KΩ, when light intensity is 10000 lux then the resistance is below 0.1 KΩ. When the light decreases the resistance increases and when the light increases the resistance decreases. This is the typical characteristics of LDR which is shown in this curve [4].

3.3.5 Basic diagram of LDRs

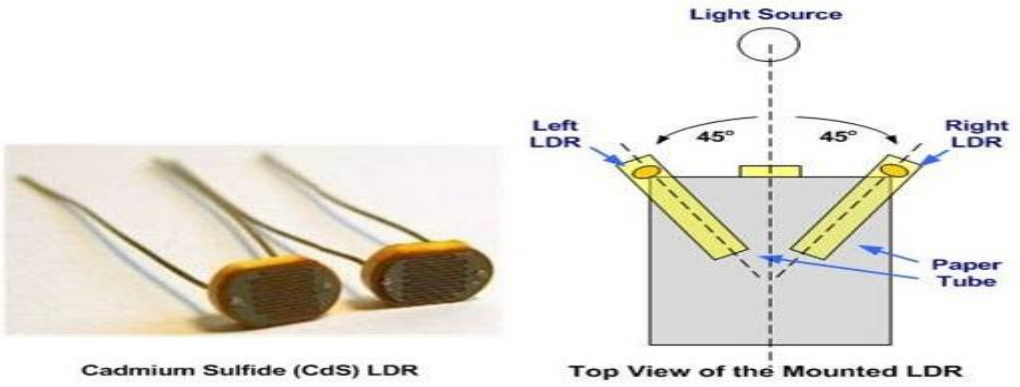


Fig. 3.10: Quadrant wise LDR positioning

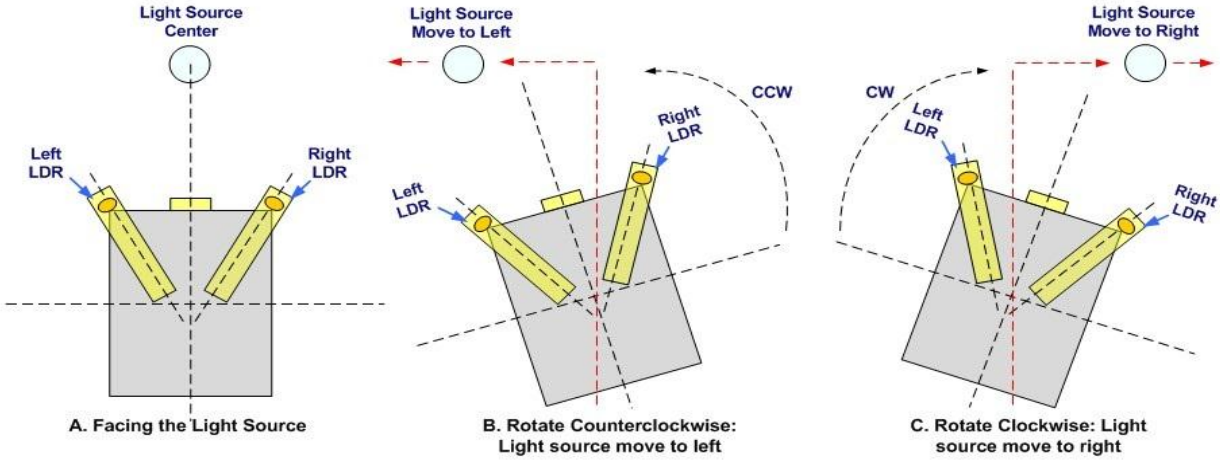


Fig. 3.11: The Sensing Element and Signal Processing

There are several method was proposed and used to track the position of sun light. We used four LDRs to track our module properly. A Light Dependent Resistor separated by a small plate to act as a shield to sunlight, as shown in the next figures. The two LDRs are connected to a bridge and the output of the bridge is connected to a comparator (the analog comparator of the microcontroller is used) [2].

Light-dependent resistors LDR0 through LDR2 are used as sensors to detect the panel's position relative to the sun. 3 LDRs are fixed at the top edge of the solar panel along the X and Y axis, and connected to the microcontroller. Here LDR0 is common. LDR0 and LDR1 are used to track horizontal axis (x-axis). When LDR0 receives more light than LDR1, it offers lower resistance than LDR1, providing a high input at pin 2. As a result, output pin 14

goes high to rotate motor M1 in one direction (clockwise) and turn the solar panel. When LDR1 receives more light than LDR0, it offers lower resistance than LDR0, giving low input to pin 2. As the result, output pin 14 goes go low to rotate motor M1 in opposite direction (anti-clockwise) and the solar panel turns [1].

Similarly, LDR0 and LDR2 track the sun along Y axis.

The minimum light detectable Equation

It's a circuit used to detect the condition when there is no sunlight to turn off the tracking system It uses a summing op. amp. Circuit it's output is given by:

By calculating the value of V (AIN0) and V (AIN1) at sunset and adjusting RV2 the output

$$V_{AIN0} + V_{AIN1} - 5\left(\frac{RV2}{RV2 + R6}\right) = 1.23\,V$$

Where 1.23V is the internal band gap reference used by the analog comparator in the UC

Of the comparator can be used to turn on or turn off the solar tracking system [1].

3.4 Schematic diagram LCD (2 Line 16 Carriers)

LCD (Liquid Crystal Display) screen is an electronic display module. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on [8].

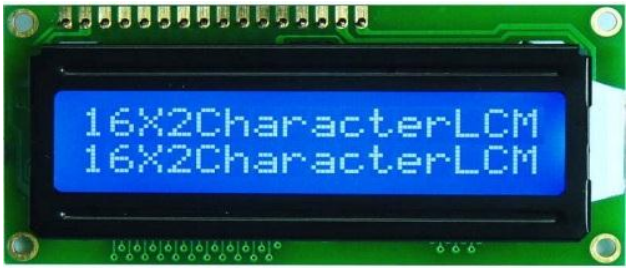


Fig. 3.12: Schematic diagram of LCD

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command

and Data. A register which commanded storage the command instructions to the given LCD like initializing it, clearing its screen, setting the cursor position, controlling display etc.The data register stores the data to be displayed on the LCD.

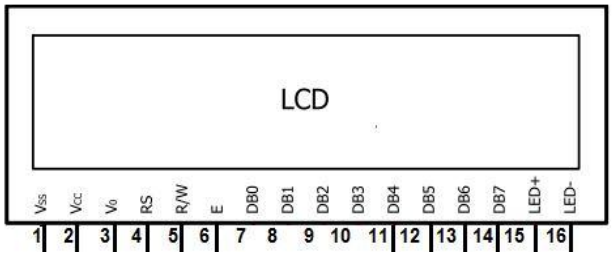


Fig. 3.13: LCD (2*16) Pin

3.4.1 Pin Features

- 5*8 Dots with cursor
- 16 Characters *2 line display
- 4-bit or 8-bit MPU interfaces
- Display mode & Backlight Variations
- ROHS Compliant

3.4.2 Pin Description

Table 3.2: Pin Descriptions of LCD (2*16)

Pin No.	Faction	Name
1	Ground (0V)	Ground
2	Supply voltage; 5V (4.7-5.3)	V_{CC}
3	Constant adjustment; through a variable register	V_{EE}
4	Select command register when low; and data register high	Register select
5	Low to write to the register; high to read from the register	Read/Write
6	Sends data to data pins when a high to low pulse in given	Enable
7	8 bit data pins	DB0
8		DB1
9		DB2
10		DB3
11		DB4
12		DB5
13		DB6
14		DB7
15	Back light V_{CC} (5V)	LED+
16	Back light Ground (0V)	LED-

3.5 Servo Motor

Servo motor is a self-contained electric devices and simple electrical motor, which is controlled with the help of servomechanism. It is a motor which has a output shaft and can be moved to a specific angular position by sending it a coded signal. The servo motor will maintain the position of the shaft .When we changed the coded signal, the angular position of the shaft will changed. Servo motors are used for various applications. They are normally small in size and have good energy efficiency. The cost of this motor also less than others motors and also simple to used. Servos are found in many places from toys to home electronics to cars and airplanes. Servos also appear behind the scenes in devices we use every day.



Fig. 3.14: Standard Servo Motor SG-90

Servo motor also used in robotic projects for every moving of their joint. The servo circuitry is built inside the motor unit and comes with a position able shaft that is fitted with a gear. The motor is controlled with an electric signal that determines the amount of shaft movement. In a market there are found two types of servo motor, one are made up of metal gear and another are made up of plastic gear. The metallic one is much heavier than other gear one. The size of metallic gear servo motor is also bigger than plastic gear servo motor [1].

3.5.1 Components of servo motor SG-90



Fig. 3.15: Physical Construction of Servo SG-90

In our work we used SERVO MOTOR SG90 and it's easy to use because it is small in size which makes our work comfortable. In briefly below we discussed on SG90.

SERVO MOTOR SG-90

It is tiny and lightweight with high output power. This servo can rotate approximately 180 degrees and it works just like the standard kinds

Specifications:

- Weight: 9 gm
- Dimension: 22.2 x 11.8 x 31 mm approx.
- Stall torque: 1.8 kgf cm.
- Operating speed: 0.1 s/60 degree.
- Operating voltage: 4.8 V (~5V).
- Dead band width: 10 μs.

How the servo is controlled:

Servos are sent through sending electrical pulses of variable width, or pulse width modulation (PWM), through the control wire. There is a minimum pulse, maximum pulse and a repetition rate. Servos can usually turn only 90 degrees in either direction for a total of 180 degrees movement. The neutral position of the motor is defined as that where the servo has the same amount of potential rotation in both the clockwise and counter-clockwise direction.

The PWM sent to the motor determines the position of the shaft, and based on the duration of the pulse sent through the control wire the rotor will turn to the position that is desired .The servo motor expects to see a pulse after every 20 milliseconds and the length of the pulse will determine how far the motor will turn. For instance, a 1.5ms pulse makes the motor to turn in the 90 degrees position. If the pulse was shorter than

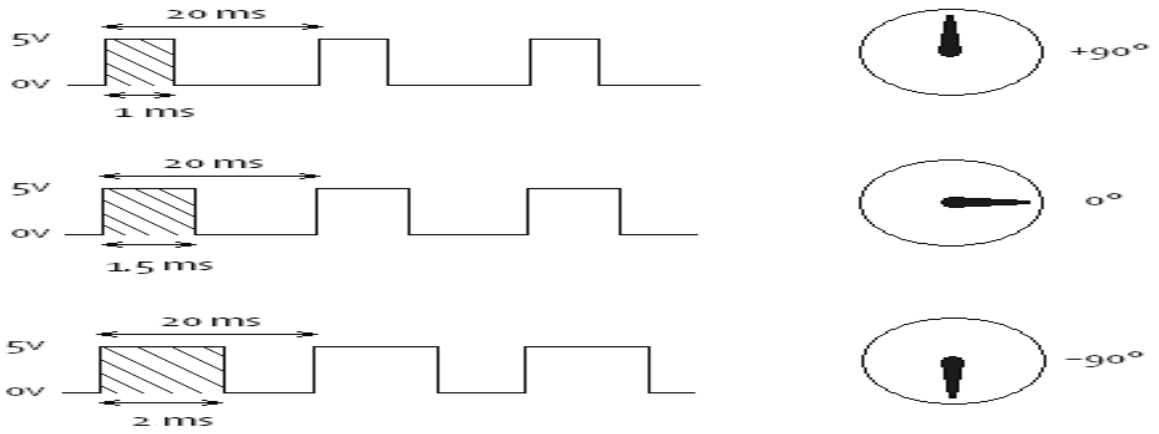


Fig. 3.16: Variable Pulse Width Control Servo Position

For applications where there is requirement of high torque, servos are preferable. They will also maintain the torque at high speeds, up to 90% of the rated torque is available from servos at high speeds. Their efficiencies are between 80 to 90%.

A servo is able to supply approximately twice their rated torque for short periods of time, offering enough capacity to draw from when needed. In addition, they are quiet, are available in AC and DC, and do not suffer from vibrations [9].

3.5.2 Advantages & Disadvantages of using Servo motor

There are some advantages and disadvantages of using servo motor. In below we discussed about advantages and disadvantages of servo motor.

Advantages:

- Servo motors are the better option for high speed and high torque.
- Servo motors are available at much faster speed.
- Servo motors are accurate positioning.
- Servo motors also maintain torque at high speed, up to 90%.
- Servo has efficiency of about 80-90%.
- Servo motors are small is size.
- Servo motor has a resonance and vibration free operation.

Disadvantages:

- Servo motors are expensive to buy.
- Servo motors have requires setup to stabilize feedback loop. Servo motor can be damaged for overloading.
- Servo motor has poor motor cooling. Servo motor design more mechanically complex.
- Servo motor maintenance requirements will also increase.

3.6 Global System for Mobile communication (GSM) module

GSM module is used to establish communication between a computer and a GSM system. Global System for Mobile communication (GSM) is an architecture used for mobile communication in most of the countries and use to SMS part.

GSM can be derived as Global System for Mobile Communication. GSM is used for the communication between the computer and GSM system. GSM is used in most of the countries. It requires a SIM card just like a mobile phone to activate communication with the networks. They have IMEI number which is used for the identification.

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Fig. 3.17: Global System for Mobile communication (GSM) module

The GSM system uses TDMA to split a frequency into time slots. Probably the most useful thing to know about the Global System for Mobile communications (GSM) is that it is an international standard. If you travel in Europe and many other parts of the world, GSM is the only type of cellular service available

3.6.1 Block Diagram of GSM system

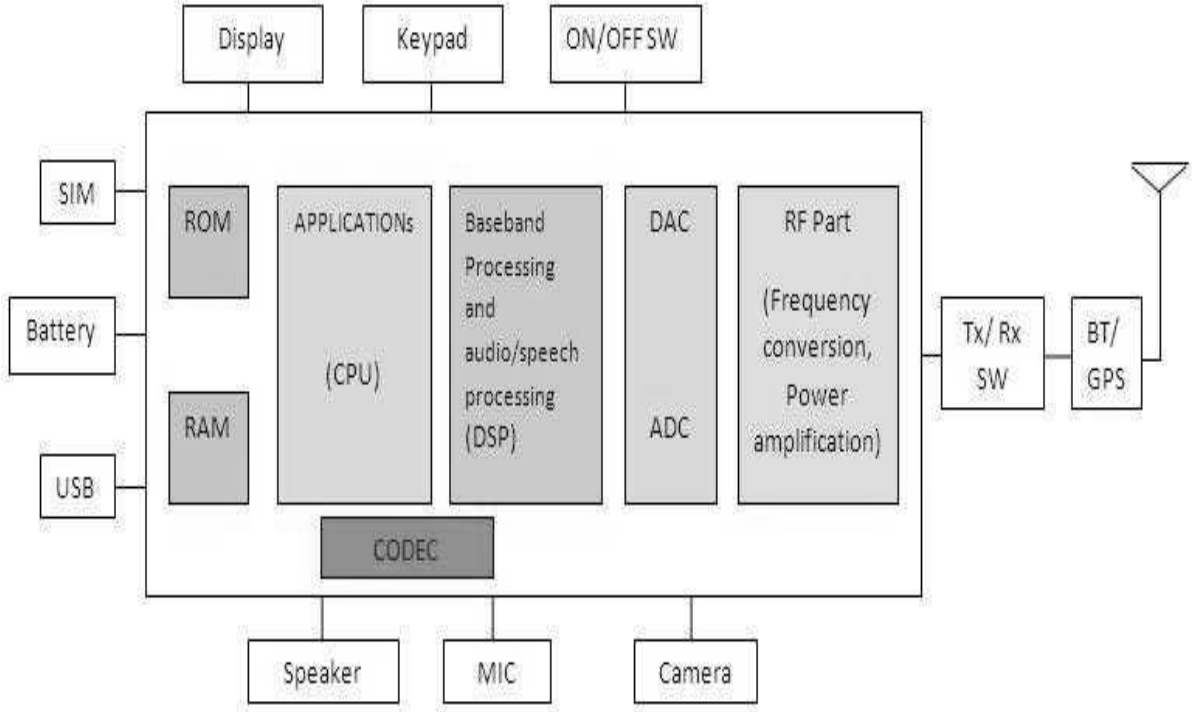


Fig. 3.18: Block Diagram of GSM module

Describe the block diagram

As mentioned above in GSM-GPRS-EDGE networks, handset transmitted power is dependent on the distance between mobile and base station, as it happens in CDMA/WCDMA systems. The Probability distribution function" for the output power of RF PA represents for how long and at which level is the power transmitted when considering a sufficiently wide observation time windows while the handset is used in a real network . PDF is well known for CDMA/WCDMA systems and is shown in Figure for urban and suburban scenarios (density of base stations' positioning and handover mechanism are different for both cases). One could see that PA is operating at much less than maximum output power in

most the time. For GSM-GPRS-EDGE handsets, similarly, the PA operates most the time somehow in the middle of a full power range required by Standard. PDF function for different modes is presented conditionally with normal Gaussian distribution over power in logarithmic scale in the figure [9].

Transmit:-Transmit diversity schemes can be divided into three categories: closed loop transmit diversity. Space-time coding and transparent transmits diversity. Closed loop transmit diversity schemes adapt the transmitted signals to the radio channel, relying on feedback of channel state information from the receiver to the transmitter. Space-time coding schemes obtain diversity by encoding the transmitted signal across all base station antennas, and require space-time decoding algorithms in the terminal. The third category, transparent transmit diversity, consists of transmit diversity schemes which are transparent to the terminal, i.e. schemes which do not require any special receiver algorithms in the terminals. The closed loop schemes, which require channel feedback to the transmitter, are not feasible for GSMIEDGE, mainly because of the independently fading channels created by Frequency Hopping (FH). Space-time codes, which do not require channel knowledge in the transmitter, could be applied to GSMIEDGE. The main disadvantage of space-time codes, though, is that they require both standardization, and new terminals with special space-time decoding algorithms. The transparent transmit diversity schemes, on the other hand, can he implemented in the base stations within the existing GSMIEDGE standard, and employed for all existing terminals since no new receiver algorithms are required. This is a major advantage over space-time coding schemes [9].

Receiving:-The name itself would tell you that this system uses mobile phone technology. Basically, this receiver is programmed to be linked to a mobile number. This number can then call the receiver, prompting it to open the gate remotely. And because the call is dropped the moment the gate opens, no extra charges will be added to your mobile phone bill. You can program the GSM receiver to be accessed by up to 250 different numbers, which is perfect for huge events that you're hosting. Of course, each number can easily be deleted once the access is no longer needed. The biggest advantage that a GSM receiver has is its ability to open the gate by a simple signal from your phone no matter where you are around the world. This means that any delivery you expect can be brought straight to your door regardless of where you are [9].

3.7 Voltage regulator

A voltage regulator generates a fixed output voltage of changes to its input voltage or load conditions. The voltage regulator must be stable with its condition. Here we use IC 7805 voltage Regulator. IC 7805 is a 5V Voltage Regulator that restricts the voltage output to 5V and draws 5V regulated power supply. The voltage source in a circuit may have fluctuations and would not give the fixed voltage output. The voltage regulator IC maintains the output voltage at a constant value.

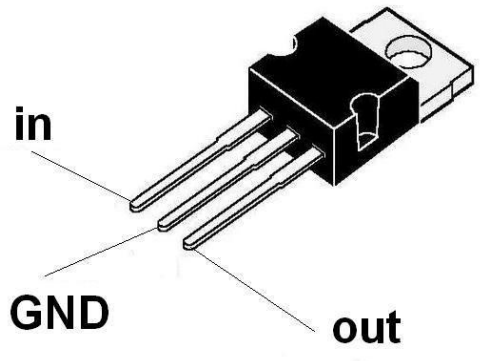


Fig. 3.19: Voltage Regulator

IC 7805 is a 5V Voltage Regulator that restricts the voltage output to 5V and draws 5V regulated power supply. It comes with provision to add heat sink. The maximum value for input to the voltage regulator is 35V. It can provide a fixed steady voltage flow of 5V for higher voltage input till the threshold limit of 35V. If the voltage is near to 7.5V then it does not produce any heat and hence no need for heat sink. If the voltage input is more, then excess electricity is liberated as heat from 7805.It regulates a steady output of 5V if the input voltage is in rage of 7.2V to 35V. Hence to avoid power loss try to maintain the input to 7.2V. In some circuitry voltage fluctuation is fatal (for e.g. Microcontroller), for such situation to ensure constant voltage IC 7805 Voltage Regulator is used. IC 7805 is a series of 78XX voltage regulators. The name the last two digits 05 denotes the amount of voltage that it regulates. Hence a 7805 would regulate 5v and 7806 would regulate 6V and so on. The schematic given below shows how to use a 7805 IC, there are 3 pins in IC 7805, pin 1 takes the input voltage, GND of both input and out are given to pin 2, pin 3 produces the output voltage.

3.7.1 Pin Description

Table 3.3: Pin Description of IC 7805

Pin no.	Function	Name
1	Input voltage (5V-18V)	Input
2	Ground (0V)	Ground
3	Regulated output; 5V (4.8V-5.2V)	Output

3.8 Capacitor

Capacitor is an essential component of our project. We can use the capacitor in different many applications. Using capacitor in a microcontroller its must because of the microcontroller is a digital device with fast switching edges which uses a large amount of current for a very short period of time at each transition. The capacitors supply the large amount of current needed so that the power supply doesn't sag during that time creating noise. The main function of a capacitor is storing electric charge. A charged capacitor could be used as a voltage source. It is always best to use a variety of capacitors on the power supply pins of the microcontroller to provide a low impedance wideband supply. In our work we used variable value of capacitors and they are 10 µF (6 Pcs) & 100µF (1Pc). Capacitors are used for several purposes like timing, smoothing power supply, coupling, filtering, tuning for radio system, storing energy etc.

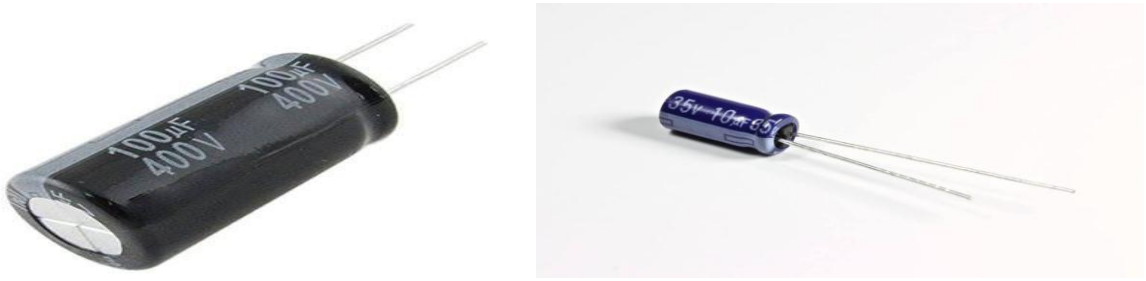


Fig. 3.20: 100µF & 10µF Capacitors

3.9 Stapes down Transformers

6-0-6 it’s a good quality transformer, power supplies for all kinds of project & circuit boards. It is step down 230V AC to 6V with a maximum of 200mA current. We should use this transformer to get AC current and which converted to DC current with a help of converter.

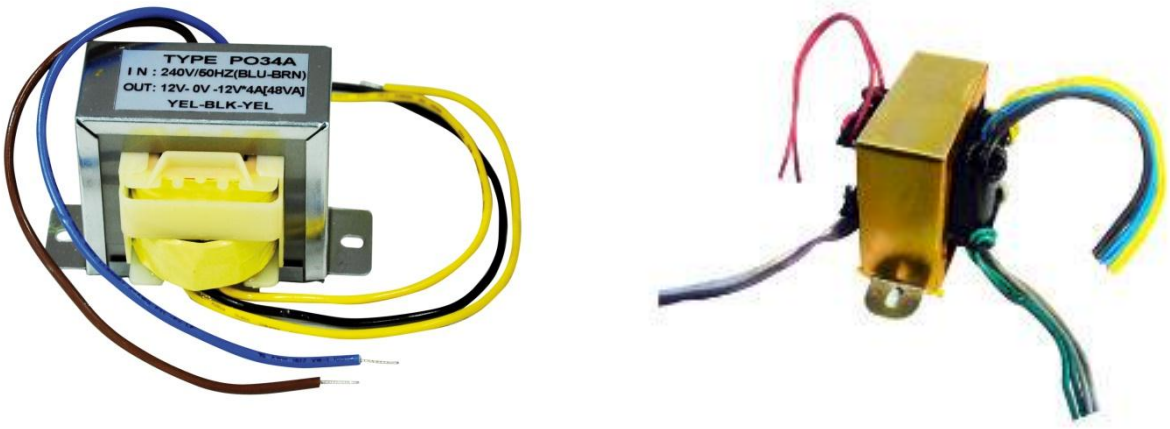


Fig.3.21: Stapes down Transformers

3.10 Soldering Wire

Solder is basically metal wire with a "low" melting point, where low for our purposes means low enough to be melted with a soldering iron. For electronics, it is traditionally a mix of tin and lead. When the soldering wire cooled off an electrical connection will conduct. This is getting a good mechanical connection between the wires. The filaments of each wire should be twisted together, behave more like a single entity. First step is to prepare the wires then tinning the wears, next to join the wires and solder splice together.



Fig. 3.22: Soldering two wires

3.11 Center tapped Rectifier

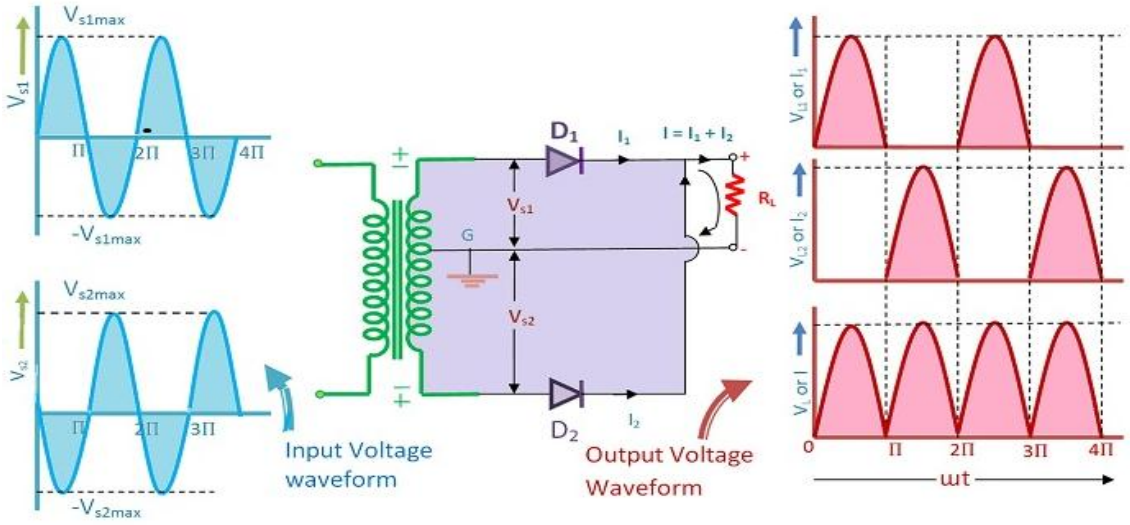


Fig.3.23: Center tape Rectifier

A center-tapped rectifier is a type of full-wave rectifier that uses two diodes connected to the secondary of a center-tapped transformer, as shown in Figure. The input voltage is coupled through the transformer to the center-tapped secondary. A center tapped full wave rectifier is a type of rectifier which uses a center tapped transformer and two diodes to convert the complete AC signal into DC signal. The AC source is connected to the primary winding of the center tapped transformer.

Working Principle of a Centre Tapped Transformer. A Centre Tapped transformer works in more or less the same way as a usual transformer. The difference lies in just the fact that its secondary winding is divided into two parts, so two individual voltages can be acquired across the two line ends.

Advantage: - The need for center tapped transformer is eliminated. The output is twice that of the center-tap circuit for the same secondary voltage. The PIV is one half that of the center taps circuit. The only Disadvantage of using Bridge rectifiers is that it requires four Diodes.

Disadvantage:-The main disadvantage of a bridge rectifier is that it needs four diodes, two of which conduct in alternate half-cycles. Because of this the total voltage drop in diodes becomes double of that in case of centre-tap rectifier, losses are increased and rectification efficiency is somewhat reduced.

3.12 Five Volt Battery



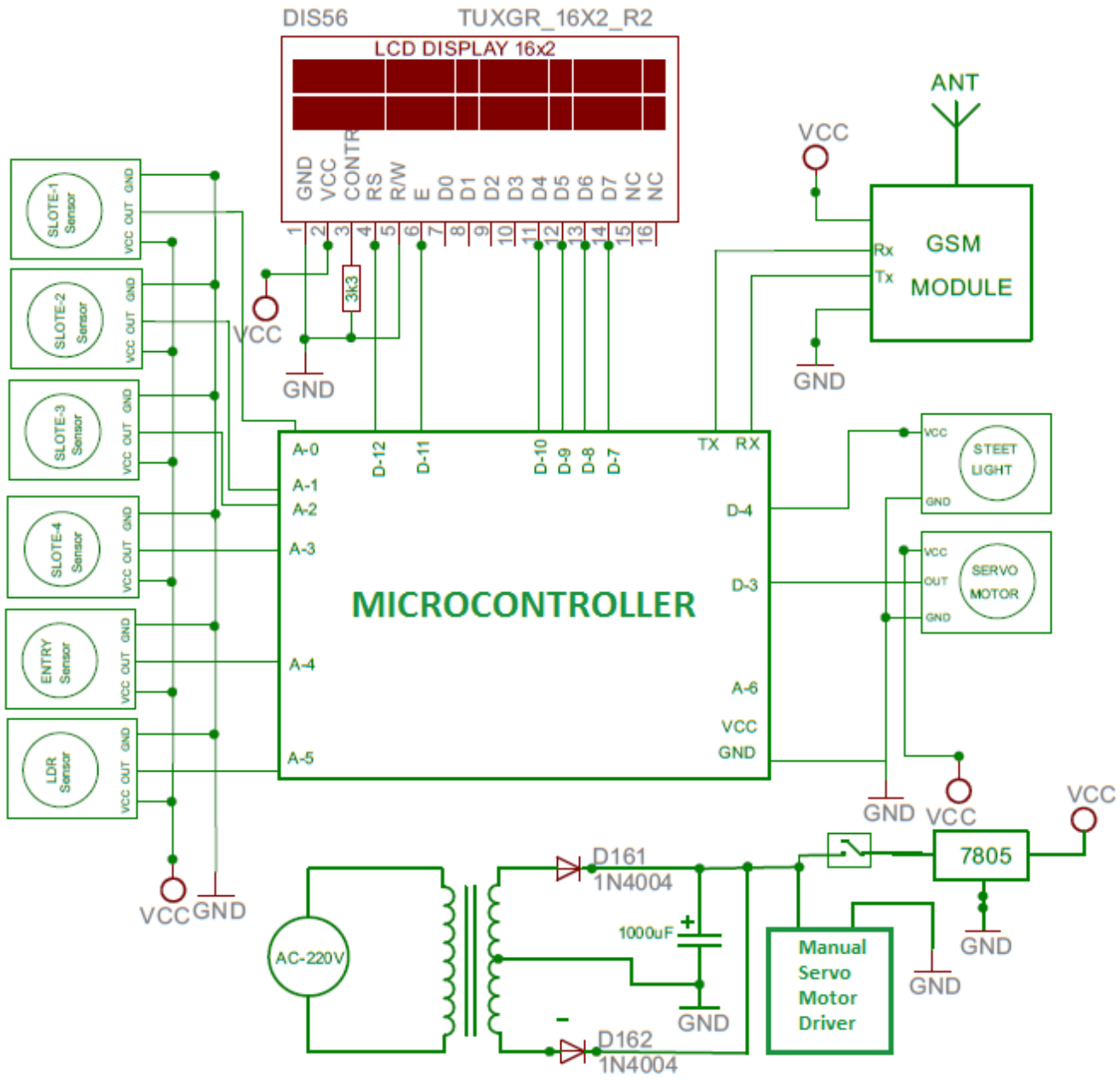
Fig. 3.24: Five Volt Battery

A rechargeable battery,storage battery, secondary cell, or accumulator is a type of electrical battery which can be charged, discharged into a load, and recharged many times, as opposed to a disposable or primary battery, which is supplied fully charged and discarded after use. Rechargeable batteries produce less waste because they can be recharged with a simple battery charger and reused hundreds of times. They also use less energy because recharging batteries with a battery charger is more energy efficient than the cost and energy of making new batteries.

CHAPTER 4

Design and Implement

4.1 Circuit Diagram of Smart car parking system



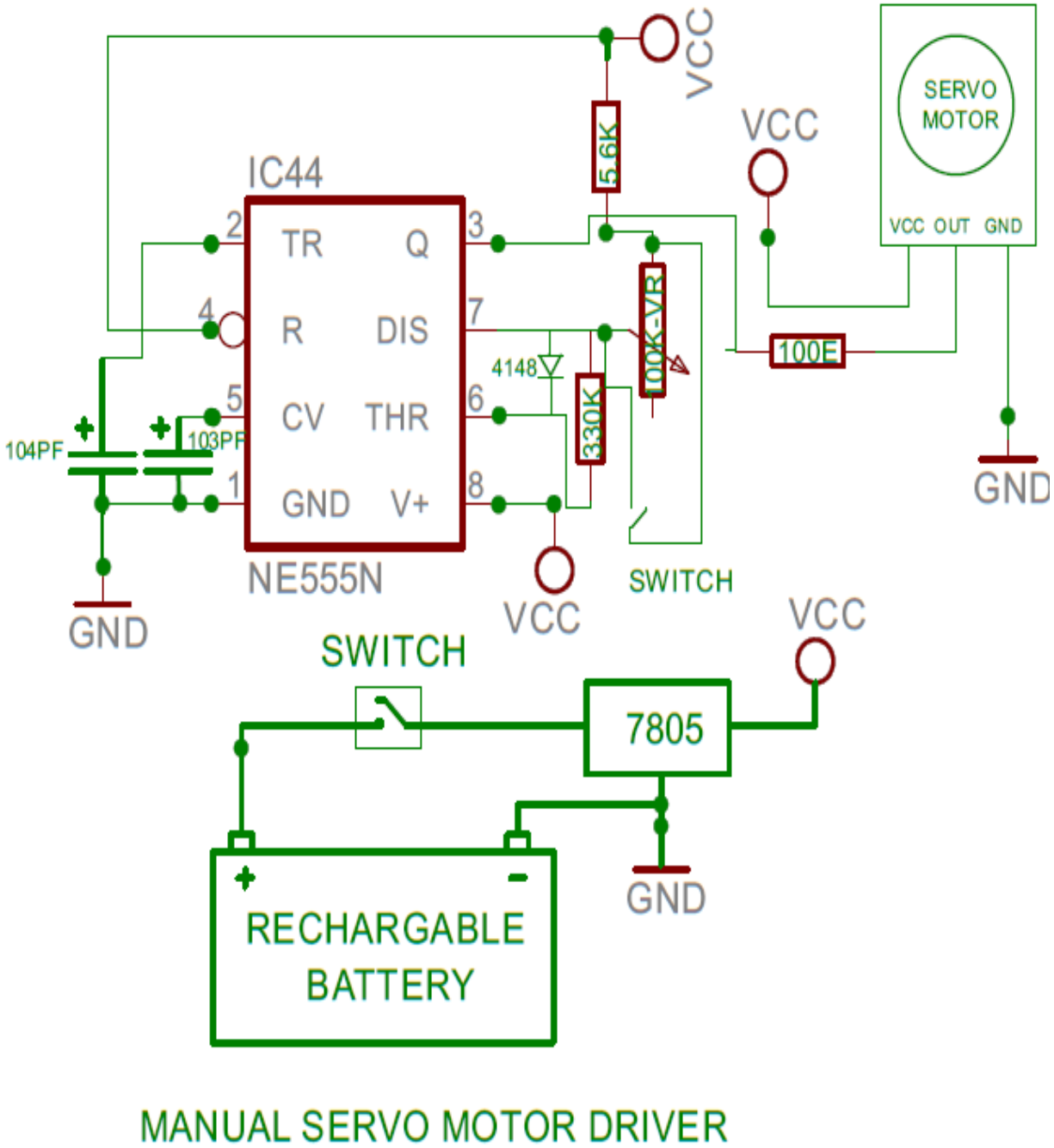


Fig. 4.1: Circuit Diagram of Smart car parking system

4.2 Project Construction

1st step: - Parking zone is available.

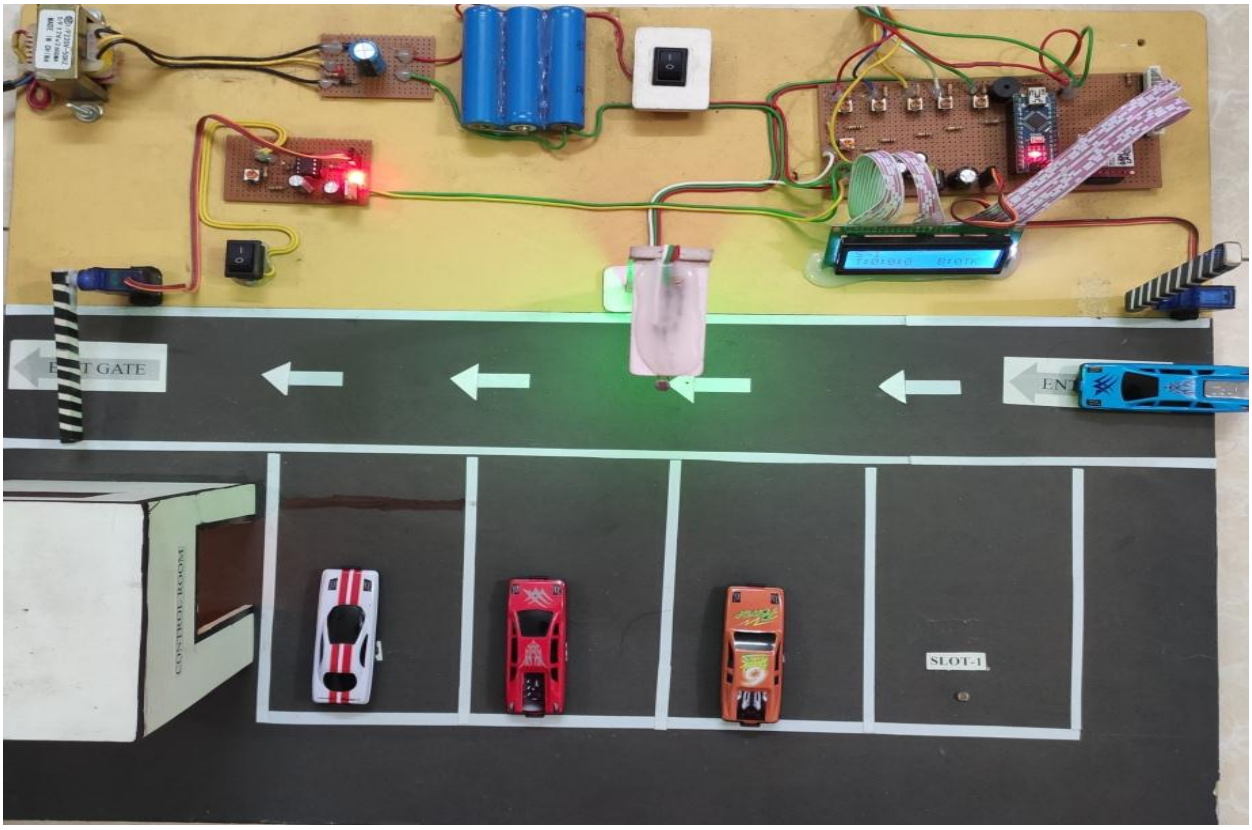




Fig.4.2: Final Result of 1st step

2nd step: - Car is parking.

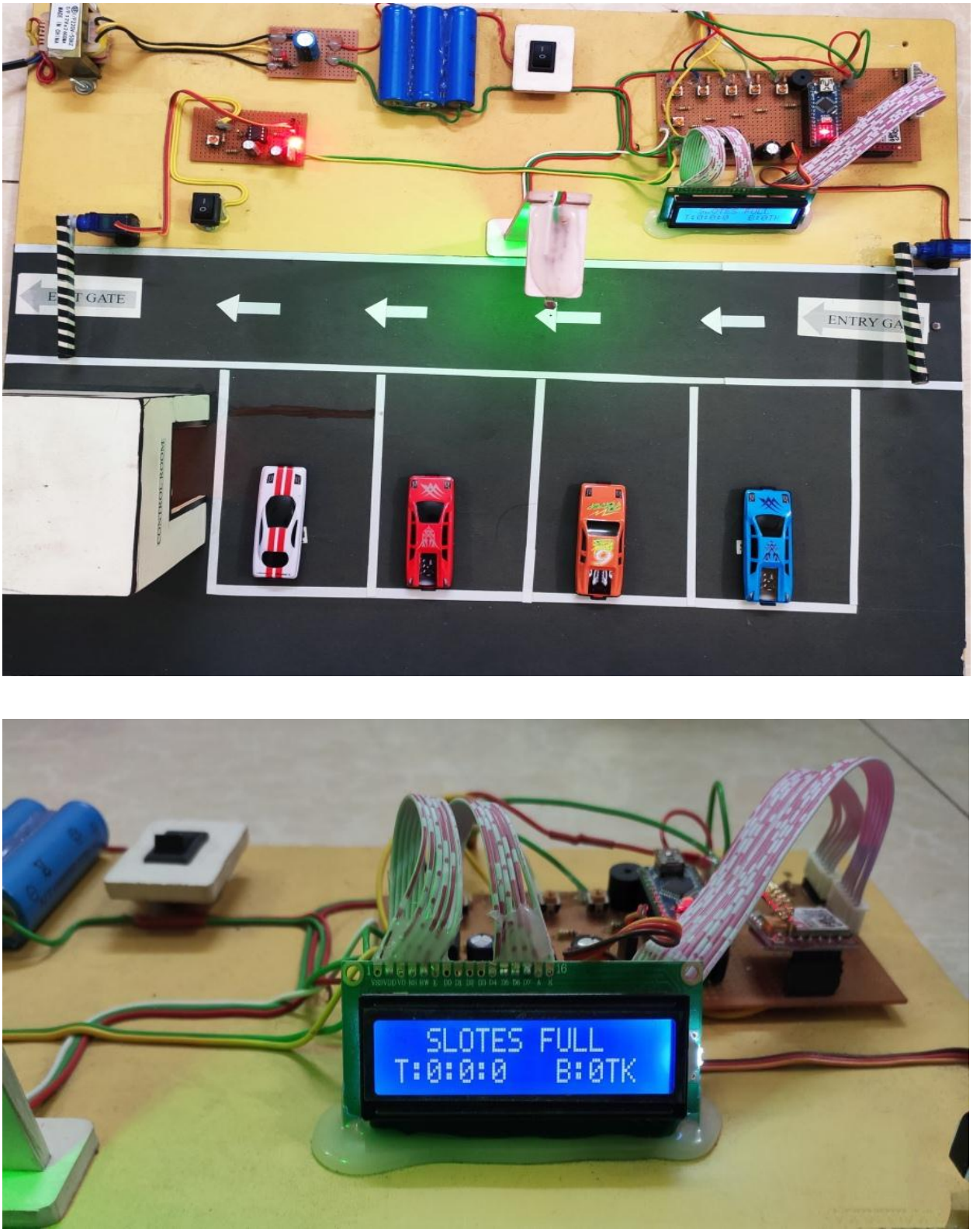
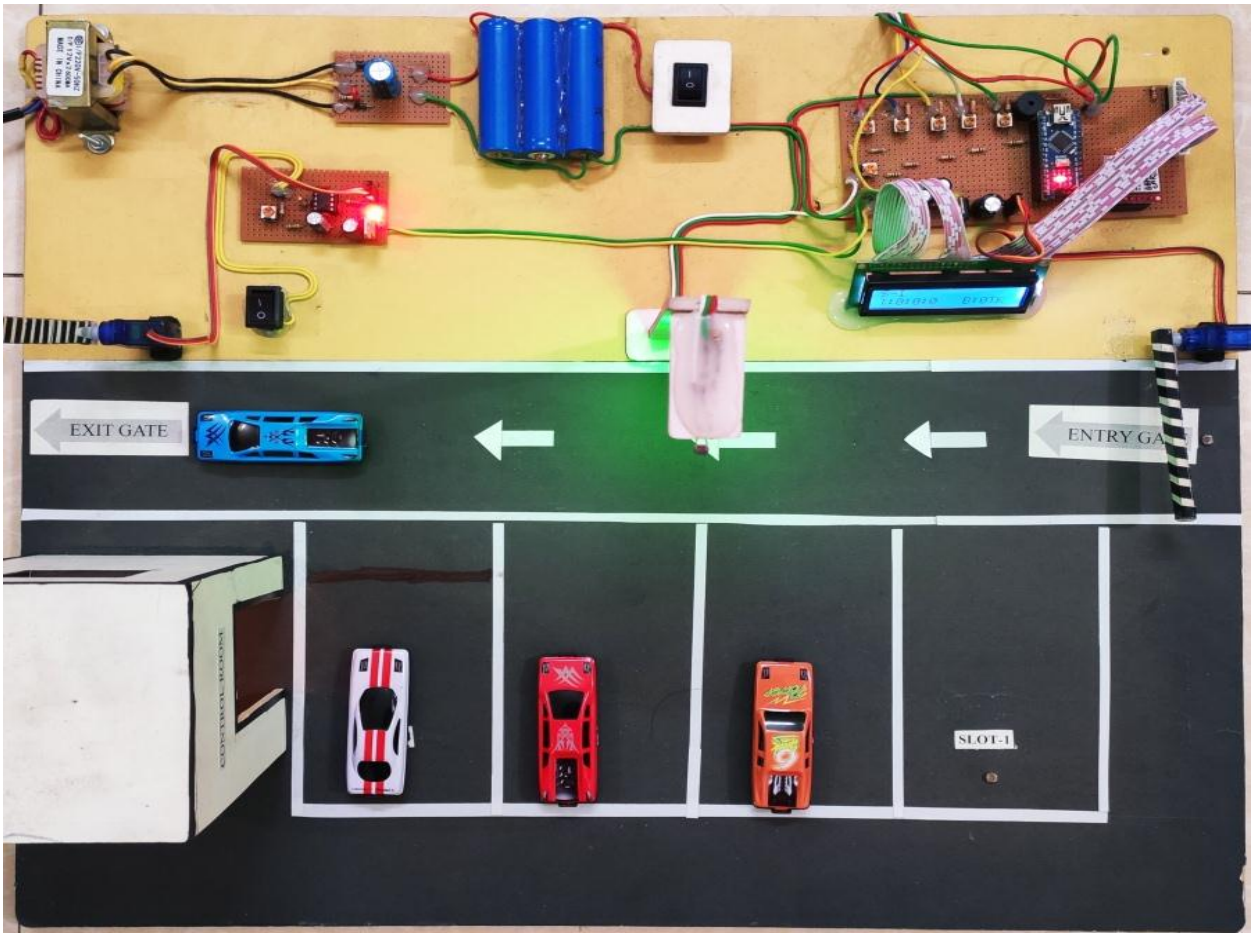


Fig.4.3: Final Result 2nd step

3rd step: - Paid bill and go out the car.



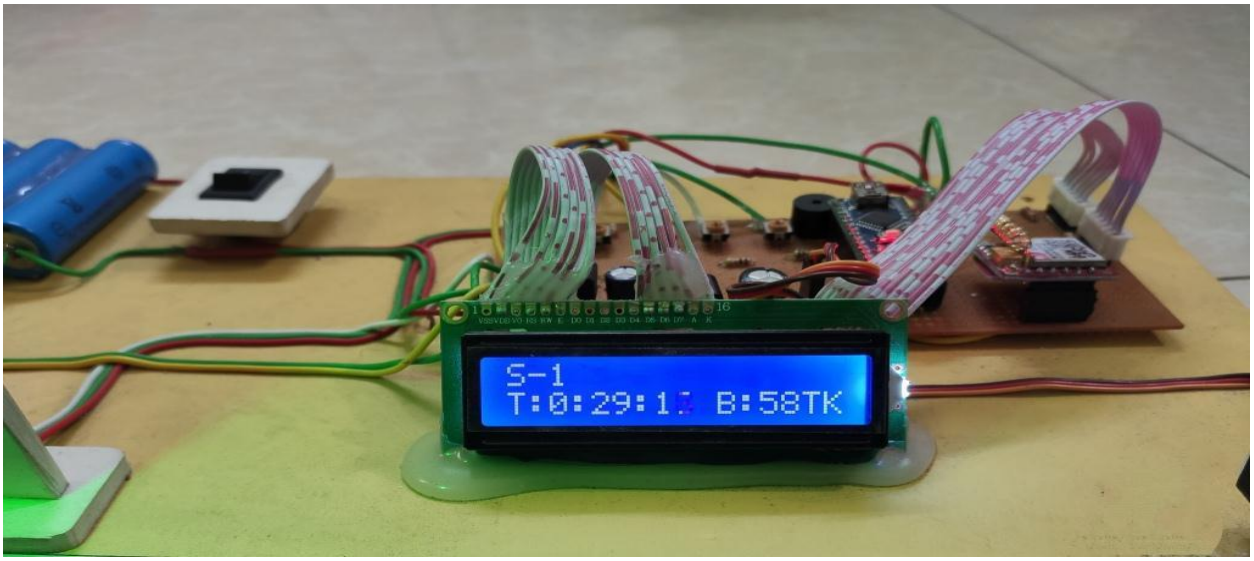


Fig.4.4: Final Result 3rd step

4.3 Cost of Project

Sl. no.	Name	Model	Quantity	Total price (Tk.)
1.	Microcontroller	Arduino Nano	1	490
2.	Servo Motor	(sg90g)	2	500
3.	LDR		6	150
4.	LCD Display	(2*16)	1	350
5.	Some Register		20	50
6.	Diode		3	35
7.	GSM Module	SIM800L	1	850
8.	Voltage Regulater	7805	3	286
9.	Veroboard		2	80
10.	IC	555	1	100
11.	Variable resistor		7	175
12.	Buzzer		1	40
13.	Connector		1	20
14.	AC to DC Power supply	220V to 12V	1	200
15.	Some wires			40
16.	Model board, Structure and etc		1	1600
17.	Capacitor		6	180
18.	Rechargeable battery	3.7V	3	300
19.	Switch		2	30
20.	LED		5	25
Total				5501 Tk.

CHAPTER 5

Conclusion

5.1 Conclusion

In conclusion we can see that the paper introduced a designed intelligent parking system based on GSM module. Compared with traditional parking system, it is a real sense of intelligent parking system and brings people with convenience, high stability and practical utility. It can use to high and strong security system. A cell phone can realize self-service parking easily. It needs to cooperate and coordinate with mobile operator when deducting expenses. We intend to improve the procedure and make it perfect so that the system can be widely used in the society.

5.2 Future works

1. By include mobile apps with internet server this project can be modified, to get information of parking system in easy way.
2. By include finger print security system this project could be improved to enhance security.
3. In our project we use manual payment system; by including online card payment services such as debit/credit card this project could be improved.

References

[1] Controlled parking for self-driving cars Shahroz Tariq; Hyunsoo Choi; C.M. Wasiq; Heemin Park 2016 IEEE International Conference on Systems, Man, and Cybernetics (SMC) Year: 2016

[2] An automated vehicle parking monitoring and management system using ANPR cameras Mohammed Y Aalsalem; WazirZada Khan ; Khalid Mohammed Dhabbah 2015 17th International Conference on Advanced Communication Technology (ICACT) Year: 2015

[3] IoT based sensor enabled smart car parking for advanced driver assistance system B M Mahendra ; SavitaSonoli ; NagarajBhat ; Raju ; T Raghu 2017 2nd IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT) Year: 2017

[4] Automatic car parking system with visual indicator along with IoT Sarthak Mendiratta; DebopamDey; Deepika Rani Sona 2017 International conference on Microelectronic Devices, Circuits and Systems (ICMDCS) Year: 2017 P.P.no.1 - 3 IEEE Conferences

[5] Wireless Mobile-Based Shopping Mall Car Parking System (WMCPS) Soh Chun Khang ; TeohJie Hong ; Tan Saw Chin; Shengqiong Wang 2010 IEEE Asia-Pacific Services Computing Conference Year: 2010 P.P.no.573 - 577

[6] Autonomous parallel parking of a car-like mobile robot by a neuro-fuzzy behavior-based controller M. Khoshnejad; K. Demirli NAFIPS 2005 - 2005 Annual Meeting of the North American Fuzzy Information Processing Society Year: 2005 P.P.no.: 814 - 819

[7] Smart parking system for commercial stretch in cities DharminiKanteti; D. V. S. Srikar; T. K. Ramesh 2017 International Conference on Communication and Signal Processing (ICCSP) Year: 2017 P.P.no. 1285 – 1289

[8] Smart parking system for commercial stretch in cities DharminiKanteti ; D. V. S. Srikar; T. K. Ramesh 2017 International Conference on Communication and Signal Processing (ICCSP) Year: 2017 P.P.no.1285 – 1289

[9] Intelligent Parking Negotiation Based on Agent Technology Li Yang; Ma Rongguo; Wang Longfei 2009 WASE International Conference on Information Engineering Year: 2009, Volume: 2 P.P.no.265 - 268

Appendix

Our project programming code

```
#include<LiquidCrystal.h>
LiquidCrystal lcd(12,11,10,9,8,7);
#define BUZ 13
#define STRL 4
#define SV2 2
int SEC,MIN,HR,BILL;
int LDR0=200,LDR1,LDR2,LDR3,LDR4,LDR5,SPOS=0,SVF1=0,SVF2=0;
void setup()
{
  pinMode(A0,INPUT);
  pinMode(A1,INPUT);
  pinMode(A2,INPUT);
  pinMode(A3,INPUT);
  pinMode(A4,INPUT);
  pinMode(A5,INPUT);
  pinMode(2, OUTPUT);
  pinMode(3, OUTPUT);
  pinMode(4, OUTPUT);
  pinMode(5, OUTPUT);
  pinMode(BUZ, OUTPUT);
   lcd.setCursor(0,0);
  lcd.print(" GSM BASED CAR      ");
  lcd.setCursor(0,1);
  lcd.print(" PARKING SYSTEM     ");
  digitalWrite(BUZ, LOW);
  delay(2500);
 lcd.setCursor(0,0);
  lcd.print(" SUBMITTED BY:     ");
  lcd.setCursor(0,1);
  lcd.print("                   ");
```

```
  delay(1500);
  lcd.setCursor(0,0);
  lcd.print("   RATUL       ");
  lcd.setCursor(0,1);
  lcd.print("   SHAKIL      ");
  delay(2500);
  lcd.setCursor(0,0);
  lcd.print("   REMON       ");
  lcd.setCursor(0,1);
lcd.print("   SUJON       ");
delay(2500);
lcd.setCursor(0,0);
lcd.print("   MAKBUL      ");
lcd.setCursor(0,1);
lcd.print("               ");
delay(1000);
  SendMessage1();
}
void loop()
{
  DISPLAY1();
LDR0 = analogRead(A4);
LDR1 = analogRead(A0);
LDR2 = analogRead(A1);
LDR3 = analogRead(A2);
LDR4 = analogRead(A3);
LDR5 = analogRead(A5);
SEC++;
if(SEC >59)
{SEC=0;MIN++;BILL=(BILL+2);}
if(MIN > 59)
{ MIN=0;HR++; }
```

```
if( LDR5 < 100)
digitalWrite(STRL, LOW);
if( LDR5 > 150)
digitalWrite(STRL, HIGH);
if( LDR0 > 650)
{
SRV1.write(100);
 }if( LDR0 < 650)
{
SRV1.write(0);
}
void DISPLAY1()
{
lcd.setCursor(0, 1);
lcd.print("T:");
lcd.print(HR);
lcd.print(":");
lcd.print(MIN);
lcd.print(":");
lcd.print(SEC);
lcd.setCursor(9, 1);
lcd.print(" B:");
lcd.print(BILL);
lcd.print("TK");
lcd.setCursor(0, 0);
if( (LDR1 > 650) && (LDR2 > 650) && (LDR3 > 650) && (LDR4 > 650) )   // STEP=0
{
SPOS=0;
lcd.print("  SLOTES FULL   ");
}
lcd.setCursor(0, 0);
if( (LDR1 < 650) && (LDR2 > 650) && (LDR3 > 650) && (LDR4 > 650) )   // STEP=1
```

```
{
SPOS=1;
lcd.print("S-1             ");
}
lcd.setCursor(0, 0);
if( (LDR1 > 650) && (LDR2 < 650) && (LDR3 > 650) && (LDR4 > 650) )   // STEP=2
{
SPOS=2;
lcd.print("    S-2         ");
}
lcd.setCursor(0, 0);
if( (LDR1 < 650) && (LDR2 < 650) && (LDR3 > 650) && (LDR4 > 650) )   // STEP=3
{
SPOS=3;
lcd.print("S-1 S-2         ");
}
lcd.setCursor(0, 0);
if( (LDR1 > 650) && (LDR2 > 650) && (LDR3 < 650) && (LDR4 > 650) )   // STEP=4
{
SPOS=4;
lcd.print("        S-3     ");
}
lcd.setCursor(0, 0);
if( (LDR1 < 650) && (LDR2 > 650) && (LDR3 < 650) && (LDR4 > 650) )   // STEP=5
{
SPOS=5;
lcd.print("S-1     S-3     ");
}
lcd.setCursor(0, 0);
if( (LDR1 > 650) && (LDR2 < 650) && (LDR3 < 650) && (LDR4 > 650) )   // STEP=6
{
SPOS=6;
lcd.print("    S-2 S-3     ");
}
lcd.setCursor(0, 0);
if( (LDR1 < 650) && (LDR2 < 650) && (LDR3 < 650) && (LDR4 > 650) )   // STEP=7
{
SPOS=7;
lcd.print("S-1 S-2 S-3     ");
}
lcd.setCursor(0, 0);
if( (LDR1 > 650) && (LDR2 > 650) && (LDR3 > 650) && (LDR4 < 650) )   // STEP=8
{
```

```
SPOS=8;
lcd.print("           S-4 ");
}
lcd.setCursor(0, 0);
if( (LDR1 < 650) && (LDR2 > 650) && (LDR3 > 650) && (LDR4 < 650) )   // STEP=9
{
 SPOS=9;
 lcd.print("S-1        S-4 ");
 }
 lcd.setCursor(0, 0);
 if( (LDR1 > 650) && (LDR2 < 155) && (LDR3 > 650) && (LDR4 < 650) )   // STEP=10
 {
 SPOS=10;
 lcd.print("    S-2     S-4 ");
 }
 lcd.setCursor(0, 0);
 if( (LDR1 < 650) && (LDR2 < 650) && (LDR3 > 650) && (LDR4 < 650) )   // STEP=11
{
SPOS=11;
lcd.print("S-1 S-2     S-4 ");
}
lcd.setCursor(0, 0);
if( (LDR1 > 650) && (LDR2 > 650) && (LDR3 < 650) && (LDR4 < 650) )   // STEP=12
{
SPOS=12;
lcd.print("       S-3 S-4 ");
}
lcd.setCursor(0, 0);
if( (LDR1 < 650) && (LDR2 > 650) && (LDR3 < 650) && (LDR4 < 650) )   // STEP=13
{
SPOS=13;
lcd.print("S-1     S-3 S-4 ");
}
lcd.setCursor(0, 0);
 if( (LDR1 > 650) && (LDR2 < 650) && (LDR3 < 650) && (LDR4 < 650) )   // STEP=14
{
SPOS=14;
lcd.print("    S-2 S-3 S-4 ");
```

```
}
lcd.setCursor(0, 0);
if( (LDR1 < 650) && (LDR2 < 650) && (LDR3 < 650) && (LDR4 < 650) )   // STEP=15
{
SPOS=15;
lcd.print("S-1 S-2 S-3 S-4 ");
}

void check()
{
if(!(strncmp(str,"#A.check *",5)))
{
SendMessage3();
}
else if(!(strncmp(str,"#A.apply*",5)))
{
SRV2.write(170);
SendMessage2();
}
else if(!(strncmp(str,"#A.ASDFG*",5)))
{
TF=0;
SendMessage4();
SRV2.write(90);
TF=0;
}
void SendMessage1()
{
 Serial.println("AT+CMGF=1");
 Serial.println("AT+CMGS=\"+8801755050888\"\r");
 delay(100);
 Serial.println("SYSTEM READY...");
 delay(100);
 Serial.println((char)26);
 delay(2000);
}
void SendMessage2()
 Serial.println("AT+CMGF=1");
 delay(100);
```

```
 Serial.println("AT+CMGS=\"+8801755050888\"\r");
 delay(100);
 Serial.println("APPLY OK.YOUR TIME STARTS NOW. WHEN YOU WANT TO RELEASE
YOUR VEICHEL JUST REPLY >YOUR PASSWORD< .YOUR PASSWORD IS: ASDFG");
 delay(100);
 Serial.println((char)26);
 delay(2000);
 TF=1;BILL=0;
}
void SendMessage3()
{
Serial.println("AT+CMGF=1");
delay(100);
Serial.println("AT+CMGS=\"+8801755050888\"\r");
delay(100);
if(SPOS==0)
Serial.println("No slots are available");
else if(SPOS==1)
Serial.println("available slots are: SLOT-1");
else if(SPOS==2)
Serial.println("available slots are: SLOT-2");
else if(SPOS==3)
Serial.println("available slots are: SLOT-1 , 2");
else if(SPOS==4)
 Serial.println("available slots are: SLOT-3");
 else if(SPOS==5)
 Serial.println("available slots are: SLOT-1 , 3");
 else if(SPOS==6)
Serial.println("available slots are: SLOT-2 , 3");
 else if(SPOS==7)
 Serial.println("available slots are: SLOT-1 , 2 , 3");
 else if(SPOS==8)
```

```
 Serial.println("available slots are: SLOT-4");
 else if(SPOS==9)
 Serial.println("available slots are: SLOT-1 , 4");
 else if(SPOS==10)
 Serial.println("available slots are: SLOT-2 , 4");
 else if(SPOS==11)
 Serial.println("available slots are: SLOT-1 , 2 ,4");
 else if(SPOS==12)
 Serial.println("available slots are: SLOT-3 , 4");
 else if(SPOS==13)
 Serial.println("available slots are: SLOT-1 ,3 , 4");
 else if(SPOS==14)
 Serial.println("available slots are: SLOT-2 , 3 ,4");
 else if(SPOS==15)
 Serial.println("available slots are: SLOT-1 , 2 , 3 , 4");

 Serial.println("PER HOUR BILL IS:50.00 BDT");

 delay(100);
 Serial.println((char)26);
 delay(2000);
}
void SendMessage4()
{
 Serial.println("AT+CMGF=1");
 delay(100);
 Serial.println("AT+CMGS=\"+8801755050888\"\r");
//Serial.println("AT+CMGS=\"+8801618322212\"\r");
 delay(100);
 Serial.println("YOUR BILL IS:");
 Serial.println(BILL);
 delay(100);
 Serial.println((char)26);
 delay(2000);
 TF=0;
}
```