Design & Implementation of Microcontroller BasedAutomated Smart Dustbin

A project report submitted to the department of Electrical and Electronic Engineering (EEE), Sonargaon University (SU), for partial fulfillment of the requirements for the Bachelor degree of Science in Electrical and Electronic Engineering

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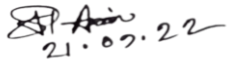
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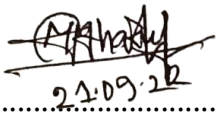


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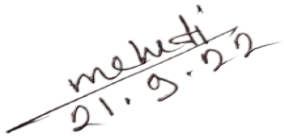
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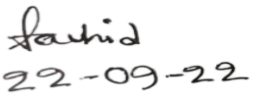
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Certification

This is to certify that this project entitled "**Design & Implementation of Microcontroller based Automated Smart Dustbin**" 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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The report titled as on **Design & Implementation of Microcontroller based Automated Smart Dustbin**" has been prepared to fulfill the requirement of our practicum program. In the process of doing and preparing our practicum report, we would like to pay our gratitude to some persons for their enormous help and vast co-operation.

At first, we would like to show our gratitude to the University authority to permit us to do our practicum. Specially, we would like to thank to our honorable teacher **Md. Iqbal Kabir,** Lecturer, Department of Electrical & Electronics Engineering, SU– Sonargaon University, Dhaka, for his valuable and patient advice, sympathetic assistance, co-operation, contribution of new idea. Deep theoretical and hardware knowledge & keen interest of our supervisor in this field influenced us to carry out this project. His endless patience, scholarly guidance, continual encouragement, constant and energetic supervision, constructive criticism, valuable advice, reading many inferior draft and correcting them at all stage have made it possible to complete this project.

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We are, indeed, grateful to all those from whom we got sincere cooperation and help for the preparation of this report.

ABSTRACT

The main objective of the project is to design a smart dustbin which will help in keeping our environment clean and also eco-friendly. Nowadays technologies are getting smarter day-by-day so, as to clean the environment we are designing a smart dustbin by using Arduino. This smart dustbin management system is built on the microcontroller based system having ultrasonic sensors on the dustbin. If dustbin is not maintained than these can cause an unhealthy environment and can cause pollute that affect our health. In this proposed technology we have designed a smart dustbin using ARDUINO UNO, along with ultrasonic sensor, servo motor, and battery jumper wire. After all hardware and software connection, now Smart Dustbin program will be run. Dustbin lid will when someone comes near at some range than wait for user to put garbage and close it. It's properly running or not. For social it will help toward health and hygiene, for business for we try to make it affordable to many as many possible. So that normal people to rich people can take benefit from it.

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CHAPTER I

INTRODUCTION

1.1 Introduction

The rate increasing population in our country has increasing rapidly and also we have increase in garbage which have increased environmental issue. Dustbin is a container .which collects garbage's or stores items which recyclable or non-recyclable, decompose and non-decompose. They are usually used in homes, office etc, but in case they are full no one is there to clean it and the garbage are spilled out. The surrounding of a dustbin is also conducive for increasing the pollution level. Air pollution due to a dustbin can produce bacteria and virus which can produce life harmful diseases for human. Therefore, we have designed a smart dustbin using ARDUINO UNO, ultrasonic sensorwhich will sense the item to be thrown in the dustbin and open the lid with the help of the motor. It is an IOT based project that will bring a new and smart way of cleanliness. It is a decent gadget to make your home clean, due to practically all offspring of home consistently make it grimy and spread litter to a great extent by electronics, rappers and various other things. Since the smart dustbin is additionally intriguing and children make fun with it so it will help to maintain cleanliness in home. It will be applied for various type of waste. Dustbin will open its lid when someone/object is near at some range then it will wait for given time period than it will close automatically. Here lid will close when you don't want to use and it will only open when it require

1.2 Objectives

Smart Dustbin as its name represents it works smartly or we can say that it is an automatic dustbin. it works like when you will come in front of this dustbin it will open automatically with the help of a servo motor. so there is some sensor work to detect the object in front of the dustbin.smart Dustbin is a very good project from the Arduino board. it works likewise smart things. we can say that, It is a decent gadget to make your home clean and attractive.

1.3 Methodology

SMART DUSTBIN USING ARDUINO based project. Here we are using arduino for code execution, for sensing we used ultrasonic sensor which will open lid and wait for few moment. It will bring drastic changes in tern of cleanliness with the help of technology. Everything is getting with smart technology for the betterment of human being. So this help in maintaining the environment clean with

the help of technology. It is a sensor based dustbin so it would be easy to access/use for any age group. Our aim is also to make it cost effective so that many numbers of people can get the benefit from this. And it should be usable to anyone and helpful for them.To complete our project, we require some software as well as some hardware.ARDUINO UNO ULTRASONIC SENSOR SERVO MOTOR,9V BATTERY,DUSTBIN Mini GSM/GPRS module.

CHAPTER II

THEORY OF THE PROJECT

2.1 Introduction

This chapter includes the total over view of the device. In this chapter we have followed-up the theory of Arduino Uno,Mini GSM\GPR5 MODULE,Ultrasonic Sensor,Servo Motor,Breadboard, and other components. Here we can know that the total system overview of the projects. And we will also know that how the equipment are working with each other.

2.2 Theory

The main concept behind the Smart Dustbin using Arduino project is Object Detection. We have already used Ultrasonic Sensor in Object Avoiding Robot, where upon detecting an object, the Robot will change its course of direction.A similar methodology is implemented here, where the Ultrasonic Sensor is placed on top of the dustbin's lid and when the sensor detects any object like a human hand, it will trigger Arduino to open the lid.

2.3 Mini GSM/GPRS module

SIM800L is a miniature cellular module which allows for GPRS transmission, sending and receiving SMS and making and receiving voice calls. Low cost and small footprint and quad band frequency support make this module perfect solution for any project that require long range connectivity. After connecting power module boots up, searches for cellular network and login automatically. On board LED displays connection state (no network coverage - fast blinking, logged in - slow blinking).

NOTICE: Be prepared to handle huge power consumption with peek up to 2A. Maximum voltage on UART in this module is 2.8V. Higher voltage will kill the module.
Two antennas!
This module have two antennas included. First is made of wire (which solders directly to NET pin on PCB) - very useful in narrow places. Second - PCB antenna - with double sided tape and attached pigtail cable with IPX connector. This one have better performance and allows to put your module inside a metal case - as long the antenna is outside.

2.3.1 Specification

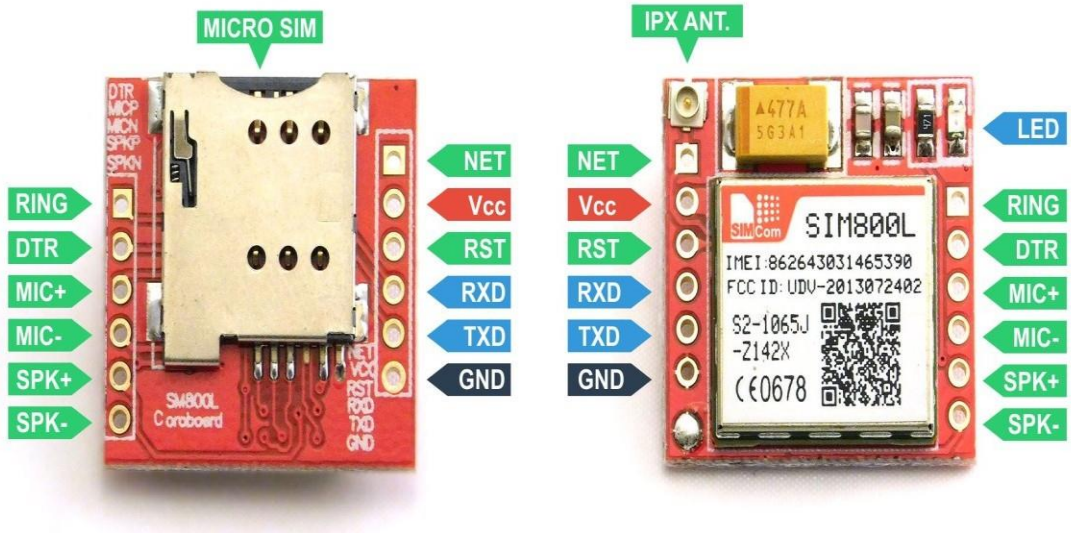
Supply voltage: 3.8V - 4.2V
Recommended supply voltage: 4V
Power consumption:

sleep mode < 2.0mA
idle mode < 7.0mA
GSM transmission (avg): 350 mA
GSM transmission (peek): 2000mA
Module size: 25 x 23 mm
Interface: UART (max. 2.8V) and AT commands
SIM card socket: microSIM (bottom side)
Supported frequencies: Quad Band (850 / 950 / 1800 /1900 MHz)
Antenna connector: IPX
Status signaling: LED
Working temperature range: -40 do + 85 ° C

Set includes:

SIM800L module
goldpin headers
wire antenna
PCB antenna with pigtail and IPX connector

2.4 Module pinout



2.4.1 Pinout (bottom side - left):

RING (not marked on PBC, first from top, square) - LOW state while receiving call

DTR - sleep mode. Default in HIGH state (module in sleep mode, serial communication disabled). After setting it in LOW the module will wake up.

MICP, MICN - microphone (P + / N -)
SPKP, SPKN - speaker (P + / N -)

2.4.2 Pinout (bottom side - right):

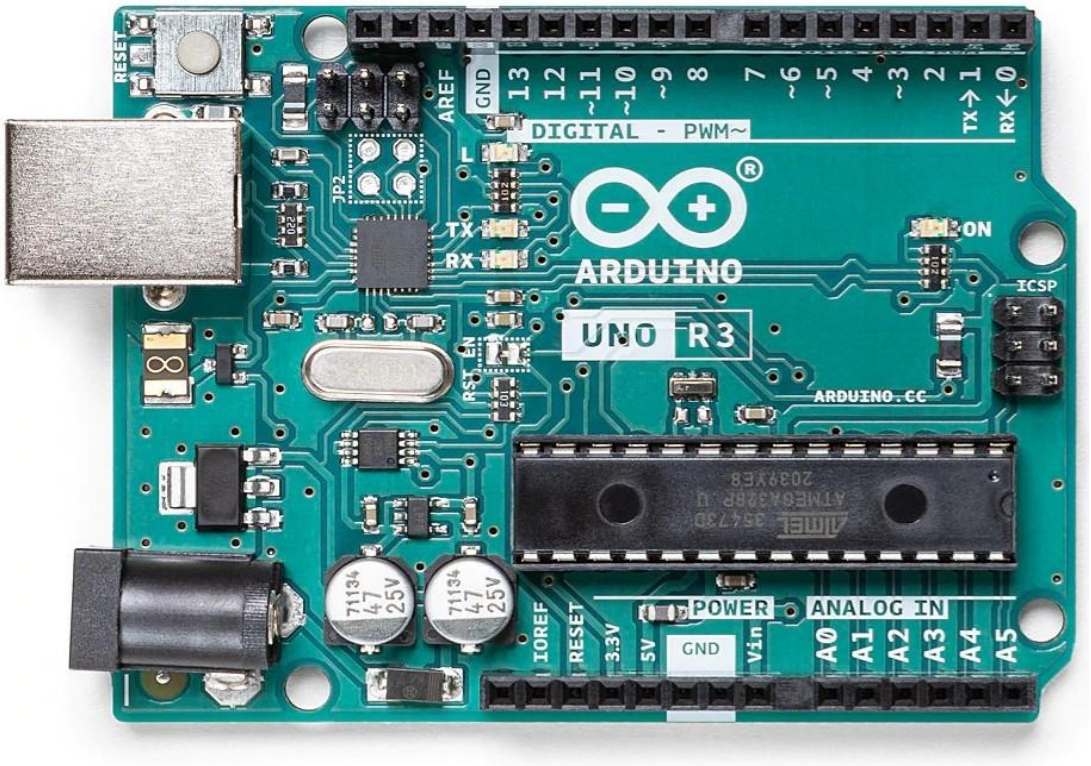
NET - antenna
VCC - supply voltage
RESET - reset
RXD - serial communication
TXD - serial communication
GND – ground

2.5 Arduino Uno

The most commonly used board among the Arduino family is the Arduino Uno as it is easy to use and suitable for beginner and medium level projects. This board is equipped with a microcontroller of ATMEGA328P which belongs to ATMEL family. This board can operate on

Pin category	Representation	Description
Power pins of Arduino Uno	5v, RESET, 3.3V, GND (3), Vin, AREF, IOREF	Pins used to deliver power to the device connected with Arduino
Digital pins of Arduino Uno	0 to 13	Pins used for digital input and outputs of Arduino
PWM pins of Arduino Uno (Digital pins)	11,10, 9, 6, 5, 3	Pins used to generate the pulsating signal
Analog pins of Arduino Uno	A0 to A5 (A5 for SCL and A4 for SDA)	Pins used for analog inputs and outputs of Arduino
Miscellaneous pins of Arduino Uno	Additional pins for SCL and SDA (One not connected pin [NC])	SCL is the clock pin and the SDA is the data pin for I2C and TWI communication devices
12 header pins of Arduino Uno	ICSP	Pins used to reprogram the Arduino

the voltage of 5-volts and has flash memory of 32 kilobytes. Whereas the static ram of the controller is 2 kilobytes and the EEPROM has memory of 1 kilobyte. The clock speed of the ATMEGA328P is 16 hertz. Below is the image of the Arduino Uno board.



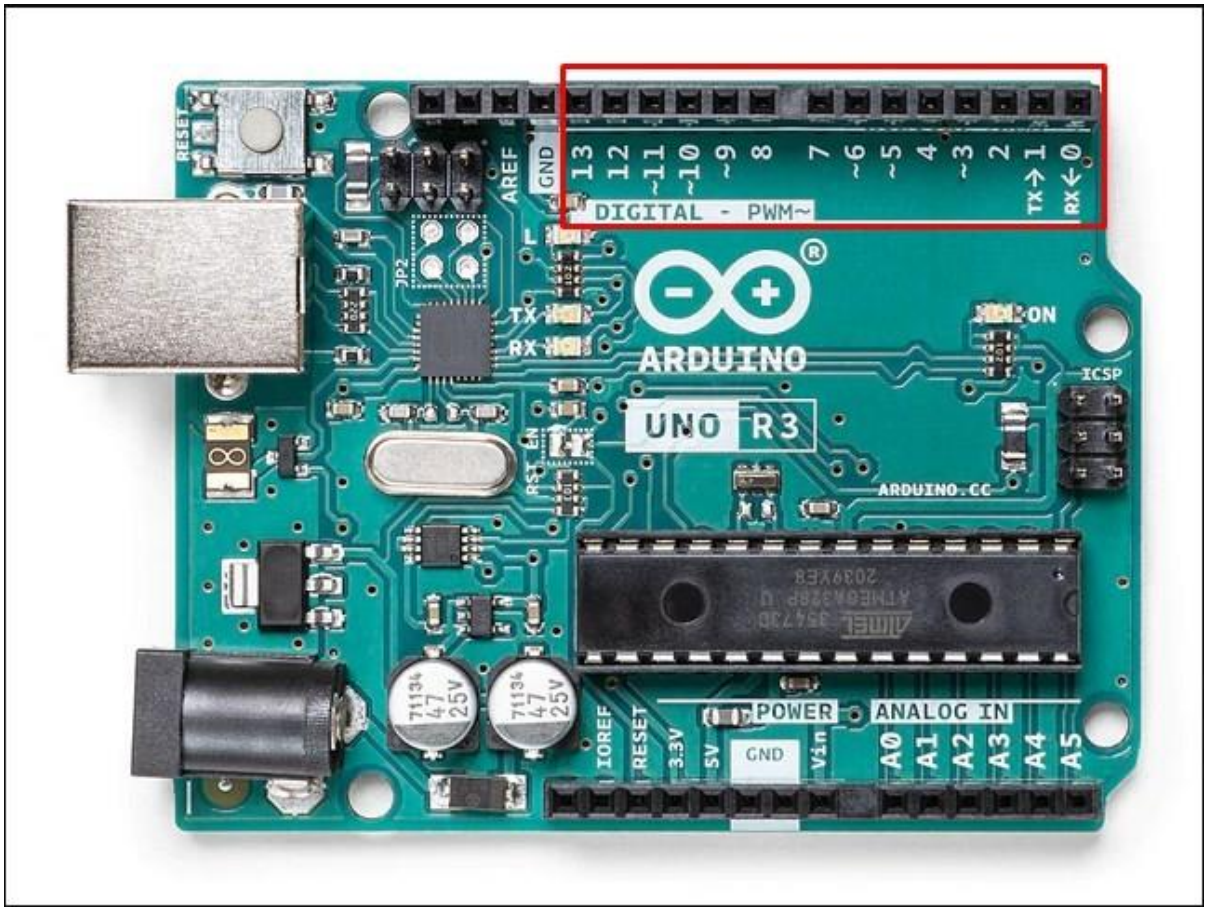
2.5.1 Arduino Uno pinout

The Arduino Uno has a total of 31 pins among which the 13 pins the digital pins that can be used for digital inputs and output. 6 of them are the analog pins that can be used for analog inputs and outputs and there are 10 pins that can be used to supply power to the connected devices.

2.5.2 Digital pins of the Arduino Uno

There are a total of 13 digital pins of the Arduino which can be used for connecting the devices that require digital input from the Arduino Uno and give the digital output as well. *For the digital we mean that the information will be in the form of zero and one. The 0 and 1* pins in the digital pins are the communication pins of the Arduino labeled as TX and RX. Through these pins the Arduino communicates with the different communication devices and is also used when uploading the code to the Arduino board.

There is a built-in LED in the Arduino Uno that is connected to pin 13 but we can use this pin to connect other devices as well.

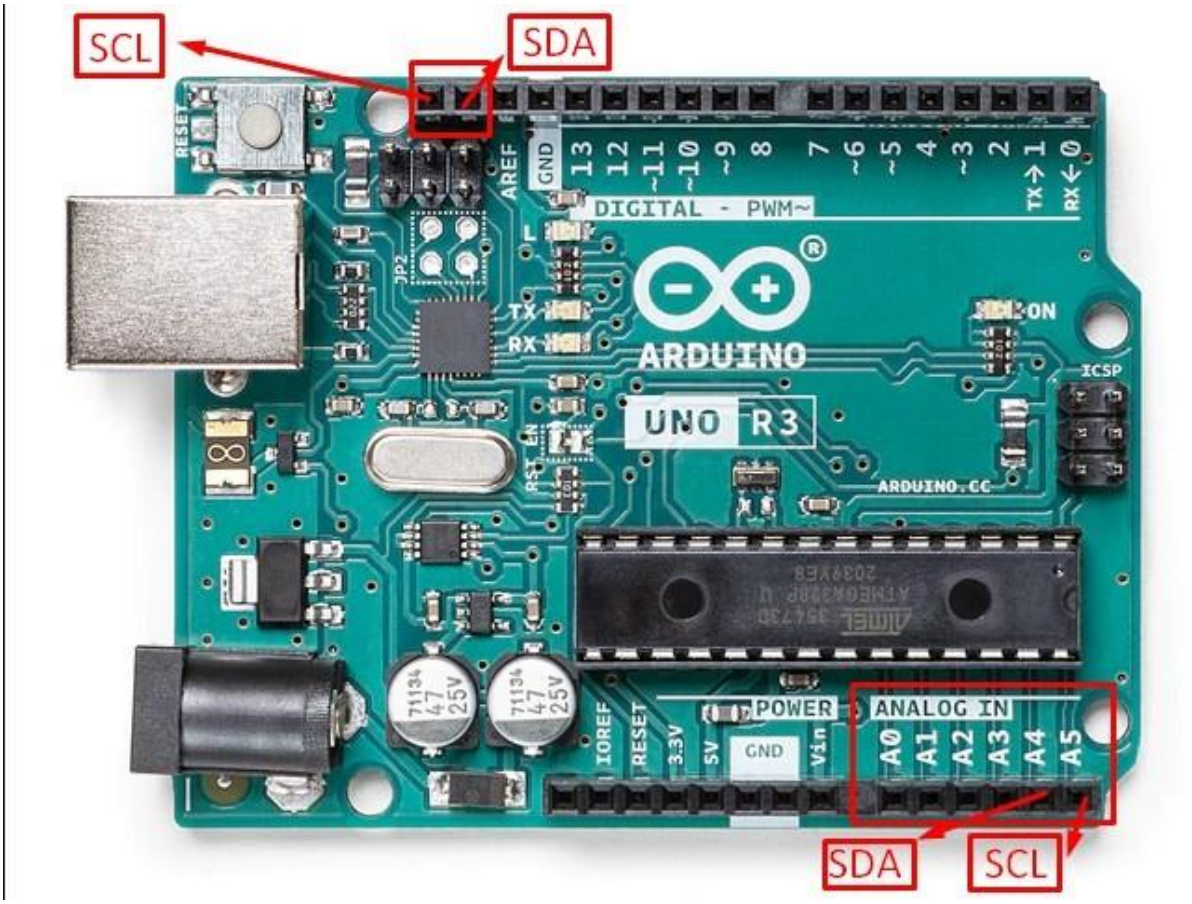


2.5.3 Analog pins of Arduino Uno

The Arduino Uno has 6 analog pins that are mainly used to connect the analog devices and have the resolution of 0 to 1024 that is 2^10. This means that the values will be in between 0 and 1024 and in terms of voltage the 5 volts will be 1024.

The pins A4 and A5 can be used as the SDA and SCL pins for the devices that used I2C and TWI (Two Wire Interface) communication protocols. The SDA pin is the data line for the connected device and SCL is the clock pin of the connected device. Similarly there are two other pins next to the AREF pin that can be used for the data line and clock of the I2C devices as well.

The figure attached below shows the analog pins of the Arduino by highlighting it in red.

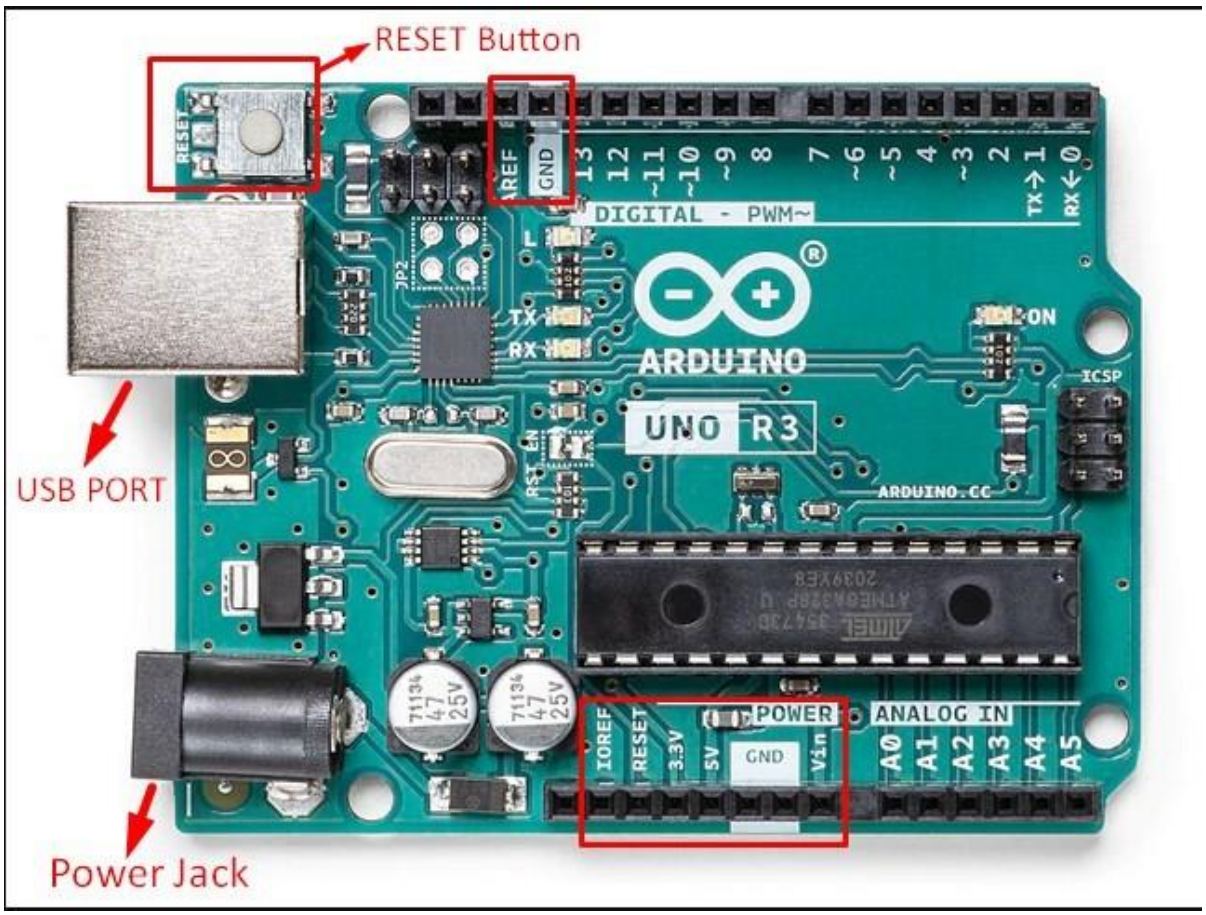


Power pins of Arduino Uno

The Arduino Uno has a total of 10 pins that are used for supplying power to the devices connected with Arduino. The maximum voltage the Arduino Uno can supply is 5 volts and minimum voltage of 3.3 volts and there are four ground pins in the board.

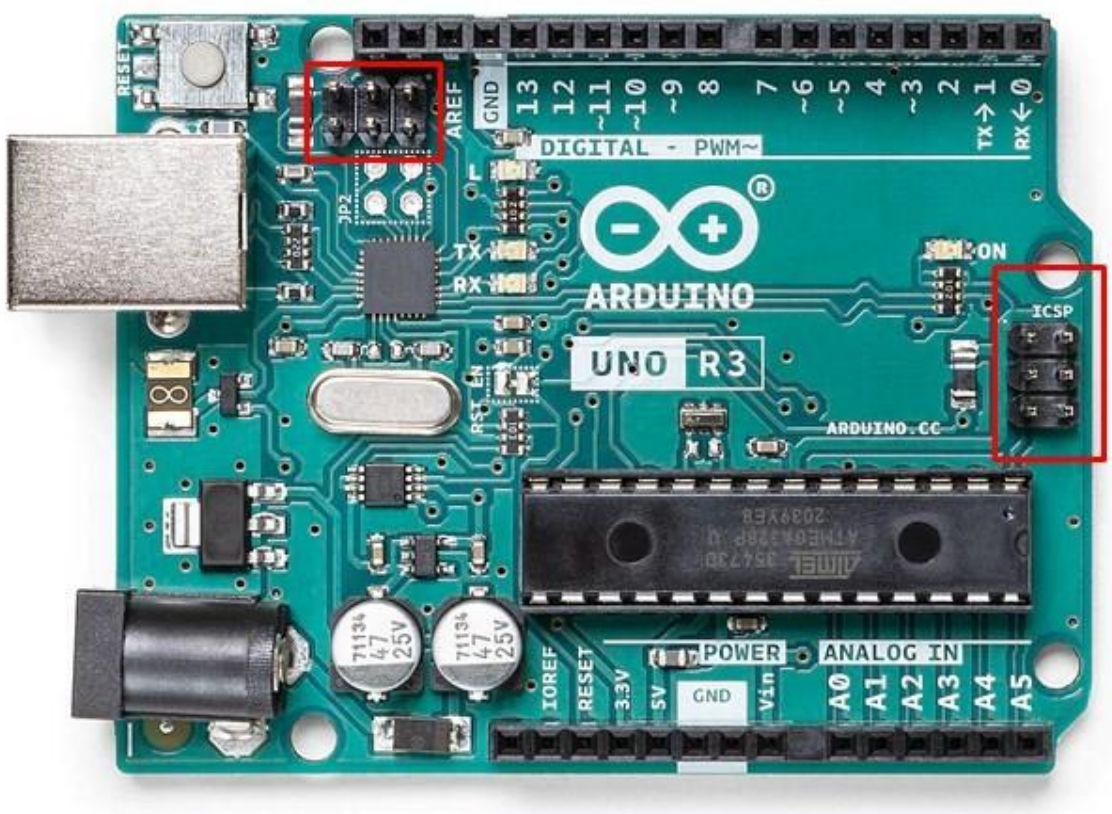
Similarly, there are IOREF and AREF pins that are used to provide reference voltage for the devices connected to Arduino Uno. The AREF is the voltage reference for the analog devices whereas the IOREF is the reference voltage to the other digital devices. There is also a reset pin given in the board to RESET the Arduino Uno using an external button. However, there is a dedicated RESET button given on the Arduino Uno board.

To connect the Arduino board with the supply voltage there is one USB port and a jack for power supply is also provided. The USB port can be used for power as well as to upload the code to the Arduino Uno. Whereas the jack provided for the supply is mostly used when the Arduino has to function in standalone mode. The image below shows the power supply pins and the RESET button of the Arduino u



2.5.4 ICSP header pins of the Arduino Uno

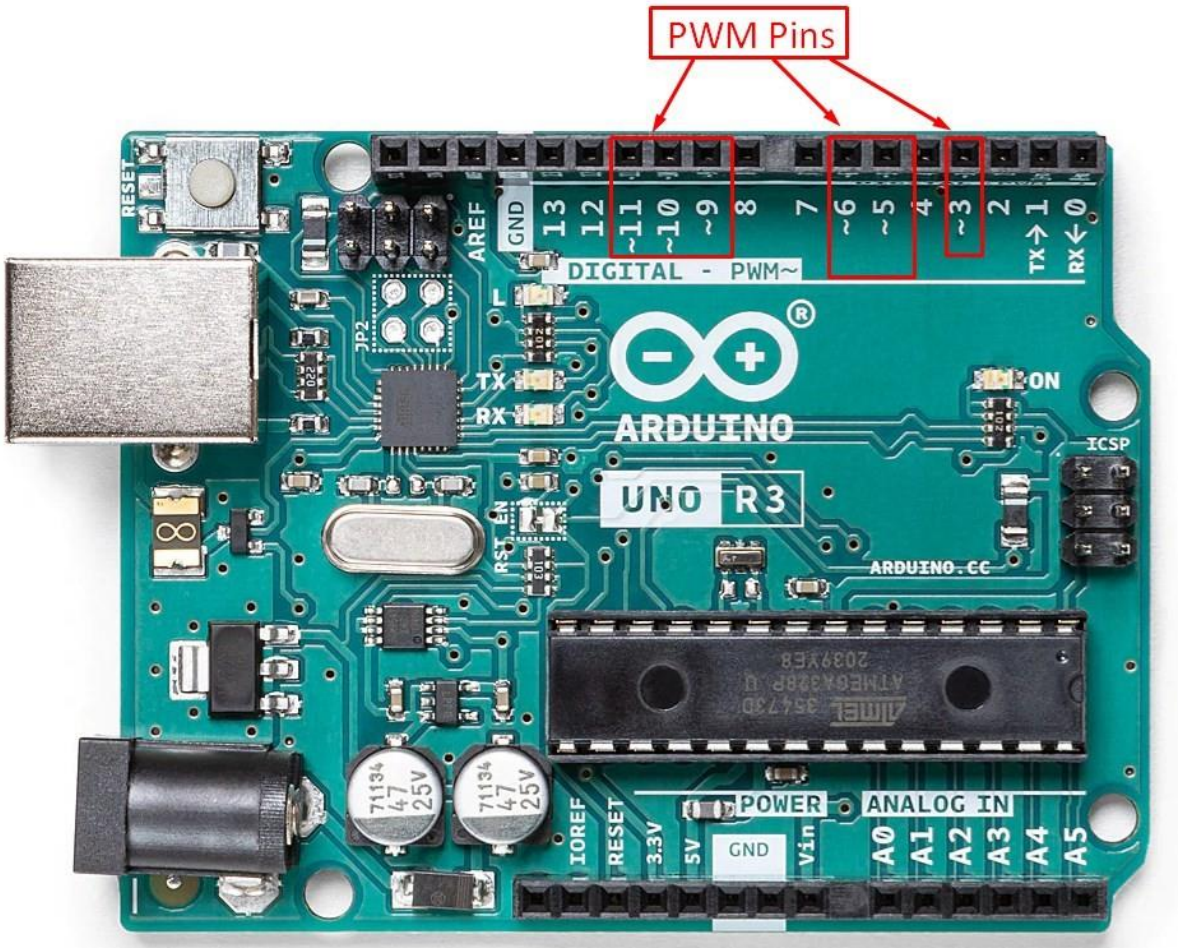
To update or change the firmware of the Arduino Uno we can use the 12 header pins given on the Arduino Uno board. The in circuit system programming (ICSP) can be done by connecting Arduino with the device using a programming cord. We have encircled using square boxes the ICSP header pins of Arduino Uno in the image given below.



2.5.5 PWM pins of Arduino

The pins that are used for making the inputs and outputs of the Arduino in the form of pulses are called the PWM pins and its duty cycle varies from 0 to 255. The pins dedicated for PWM in Arduino Uno are 11, 10, 9, 6,5, and 3. Below the image shows the PWM pins of Arduino highlighted in red.

n

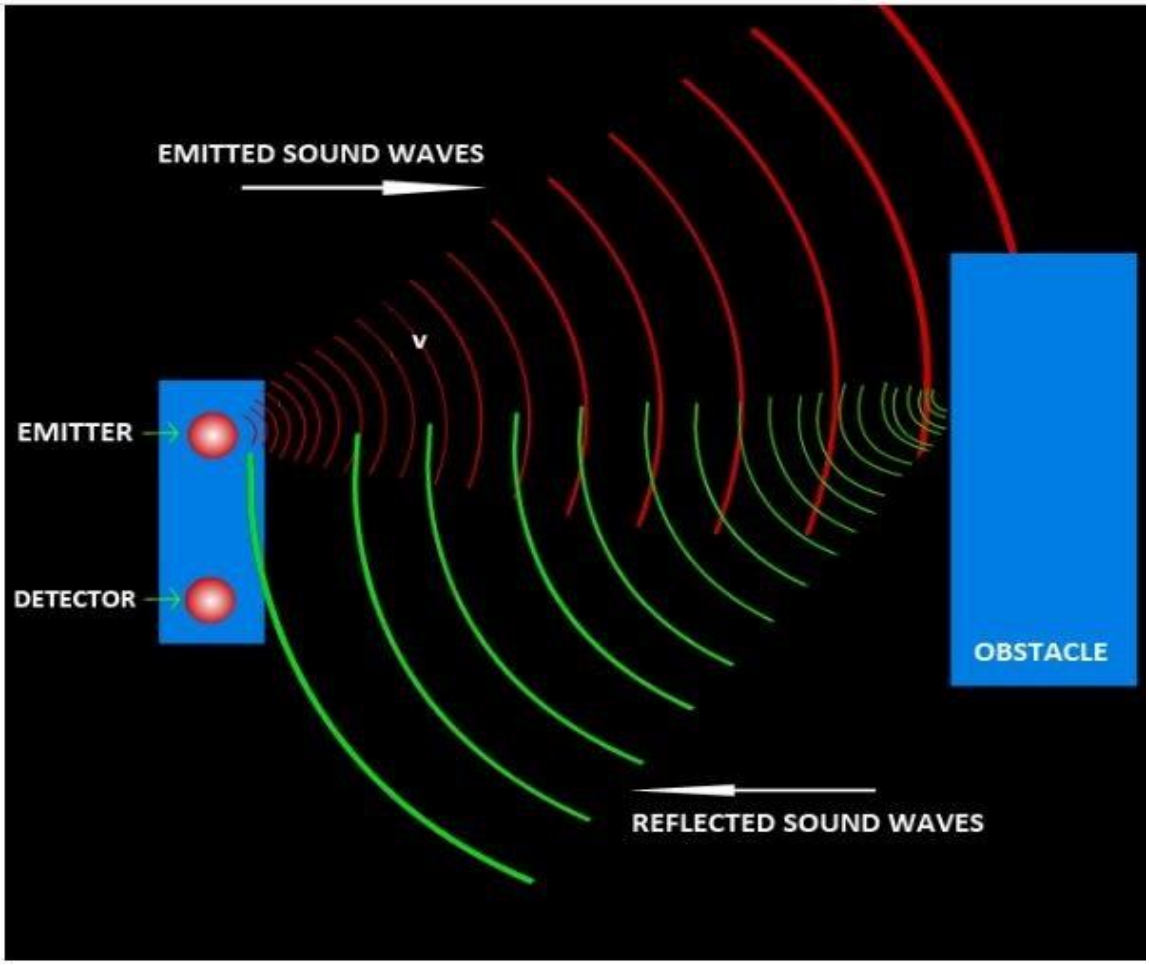

PWM Pins
DIGITAL - PWM~
ARDUINO
UNO R3
ARDUINO.CC
POWER
ANALOG IN
ON
ICSP
TX
RX
RESET
AREF
GND
IOREF
3.3V
5V
Vin
A0
A1
A2
A3
A4
A5

2.6 Ultrasonic Sensor

An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humans can hear). Ultrasonic sensors have two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target).

In order to calculate the distance between the sensor and the object, the sensor measures the time it takes between the emission of the sound by the transmitter to its contact with the receiver. The formula for this calculation is D = ½ T x C (where D is the distance, T is the time, and C is the speed of sound ~ 343 meters/second). For example, if a scientist set up an ultrasonic sensor aimed at a box and it took 0.025 seconds for the sound to bounce back, the distance between the ultrasonic sensor and the box would be:

D = 0.5 x 0.025 x 343 or about 4.2875 meters.



Ultrasonic sensors are used primarily as proximity sensors. They can be found in automobile self-parking technology and anti-collision safety systems. Ultrasonic sensors are also used in robotic obstacle detection systems, as well as manufacturing technology. In comparison to infrared (IR) sensors in proximity sensing applications, ultrasonic sensors are not as susceptible to interference of smoke, gas, and other airborne particles (though the physical components are still affected by variables such as heat).

Ultrasonic sensors are also used as level sensors to detect, monitor, and regulate liquid levels in closed containers (such as vats in chemical factories). Most notably, ultrasonic technology has enabled the medical industry to produce images of internal organs, identify tumors, and ensure the health of babies in the womb.



Pin Number	Pin Name	Description
1	Vcc	The Vcc pin powers the sensor, typically with +5V
2	Trigger	Trigger pin is an Input pin. This pin has to be kept high for 10us to initialize measurement by sending US wave.
3	Echo	Echo pin is an Output pin. This pin goes high for a period of time which will be equal to the time taken for the US wave to return back to the sensor.
4	Ground	This pin is connected to the Ground of the system.

HC-SR04 Sensor Features

- Operating voltage: +5V
- Theoretical Measuring Distance: 2cm to 450cm
- Practical Measuring Distance: 2cm to 80cm
- Accuracy: 3mm
- Measuring angle covered: <15°
- Operating Current: <15mA
- Operating Frequency: 40Hz

HC-SR04 distance sensor is commonly used with both microcontroller and microprocessor platforms like Arduino, ARM, PIC, Raspberry Pie etc. The following guide is universally since it has to be followed irrespective of the type of computational device used.

Power the Sensor using a regulated +5V through the Vcc ad Ground pins of the sensor. The current consumed by the sensor is less than 15mA and hence can be directly powered by the on board 5V pins (If available). The Trigger and the Echo pins are both I/O pins and hence they can be connected to I/O pins of the microcontroller. To start the measurement, the trigger pin has to be made high for 10uS and then turned off. This action will trigger an ultrasonic wave at frequency of 40Hz from the transmitter and the receiver will wait for the wave to return. Once the wave is returned after it getting reflected by any object the Echo pin goes high for a particular amount of time which will be equal to the time taken for the wave to return back to the sensor.

The amount of time during which the Echo pin stays high is measured by the MCU/MPU as it gives the information about the time taken for the wave to return back to the Sensor. Using this information the distance is measured as explained in the above heading.

Applications

- Used to avoid and detect obstacles with robots like biped robot, obstacle avoider robot, path finding robot etc.
- Used to measure the distance within a wide range of 2cm to 400cm
- Can be used to map the objects surrounding the sensor by rotating it
- Depth of certain places like wells, pits etc can be measured since the waves can penetrate through water

2.7 Servo Motor

Here we used the servo motor to open and close the gate.

servo motor is an electromechanical device that produces torque and velocity based on the supplied current and voltage. A servo motor works as part of a closed-loop system providing torque and velocity as commanded from a servo controller utilizing a feedback device to close

the loop

Servo motors are able to operate at a wide range of speeds—both high and low—without overheating and to maintain sufficient torque at zero speed to hold a load in place. They can also maintain a constant velocity, despite changes in the amount of torque acting on the system.

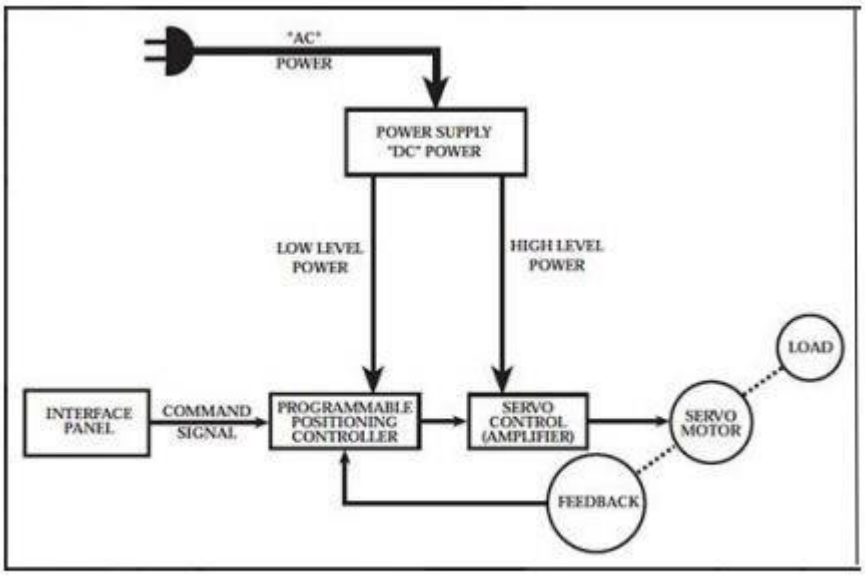


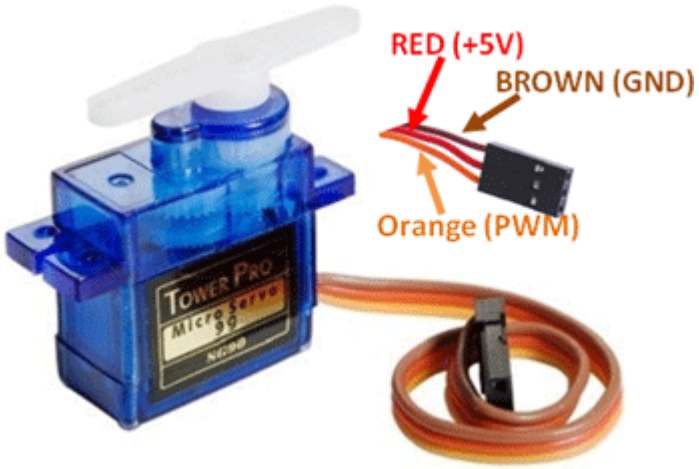
Fig: 2.2.6.1: Servo Motor Block Diagram

2.7.1 Servo Motor Wire Configuration

TowerPro SG-90 Features

Wire Number	Wire Colour	Description
1	Brown	Ground wire connected to the ground of system
2	Red	Powers the motor typically +5V is used
3	Orange	PWM signal is given in through this wire to drive the motor

- Operating Voltage is +5V typically
- Torque: 2.5kg/cm
- Operating speed is 0.1s/60°
- Gear Type: Plastic
- Rotation : 0°-180°
- Weight of motor : 9gm
- Package includes gear horns and screws

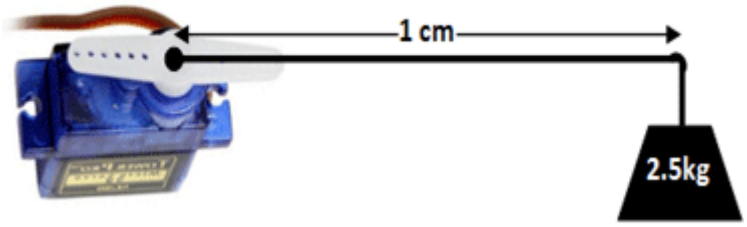


2.7.2 Selecting your Servo Motor

There are lots of servo motors available in the market and each one has its own speciality and applications. The following two paragraphs will help you identify the right type of servo motor for your project/system.

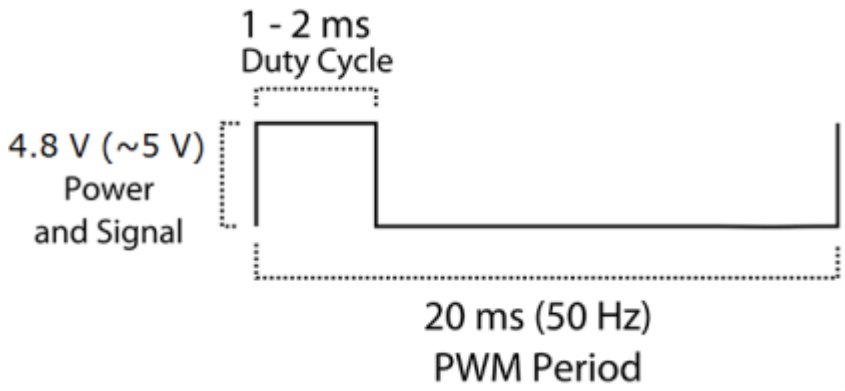
Most of the hobby Servo motors operates from 4.8V to 6.5V, the higher the voltage higher the torque we can achieve, but most commonly they are operated at +5V. Almost all hobby servo motors can rotate only from 0° to 180° due to their gear arrangement so make sure you project can live with the half circle if no, you can prefer for a 0° to 360° motor or modify the motor to make a full circle. The gears in the motors are easily subjected to wear and tear, so if your application requires stronger and long running motors you can go with metal gears or just stick with normal plastic gear.

Next comes the most important parameter, which is the torque at which the motor operates. Again there are many choices here but the commonly available one is the 2.5kg/cm torque which comes with the Towerpro SG90 Motor. This 2.5kg/cm torque means that the motor can pull a weight of 2.5kg when it is suspended at a distance of 1cm. So if you suspend the load at 0.5cm then the motor can pull a load of 5kg similarly if you suspend the load at 2cm then can pull only 1.25. Based on the load which you use in the project you can select the motor with proper torque. The below picture will illustrate the same.



2.7.3 How to use a Servo Motor

After selecting the right Servo motor for the project, comes the question how to use it. As we know there are three wires coming out of this motor. The description of the same is given on top of this page. To make this motor rotate, we have to power the motor with +5V using the Red and Brown wire and send PWM signals to the Orange colour wire. Hence we need something that could generate PWM signals to make this motor work, this something could be anything like a 555 Timer or other Microcontroller platforms like Arduino, PIC, ARM or even a microprocessor like Raspberry Pie. Now, how to control the direction of the motor? To understand that let us a look at the picture given in the datasheet.



From the picture we can understand that the PWM signal produced should have a frequency of 50Hz that is the PWM period should be 20ms. Out of which the On-Time can vary from 1ms to 2ms. So when the on-time is 1ms the motor will be in 0° and when 1.5ms the motor will be 90°, similarly when it is 2ms it will be 180°. So, by varying the on-time from 1ms to 2ms the motor can be controlled from 0° to 180°

Applications

Used as actuators in many robots like Biped Robot, Hexapod, robotic arm etc..

Commonly used for steering system in RC toys

Robots where position control is required without feedback

Less weight hence used in multi DOF robots like humanoid robots

CHAPTER III

DESING & FEBRICATION

3.1 Introduction

In this chapter fully cover with discuss design and fabrication of this project. Here we will discuss about developed block diagram and briefly describe about the circuit description and also learn about working principle. Total project flow chart is also available in this chapter.

3.2 Block Diagram

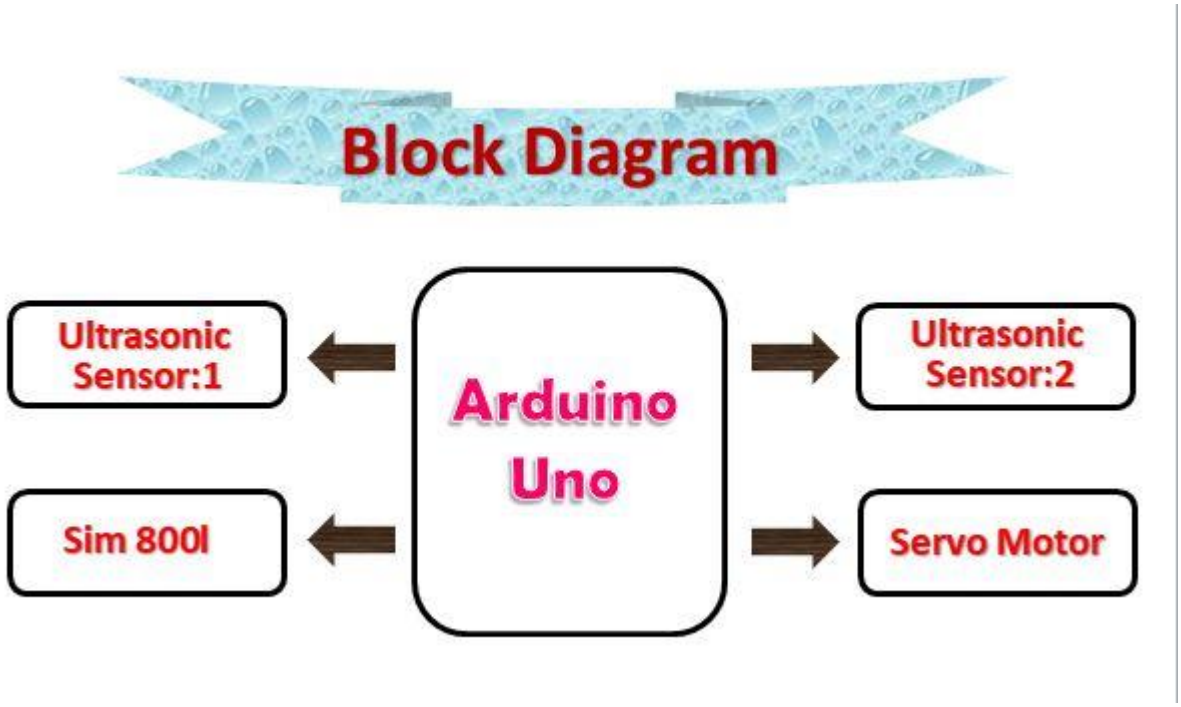


Fig: 3.2: Block diagram of project

3.3 Circuit Description

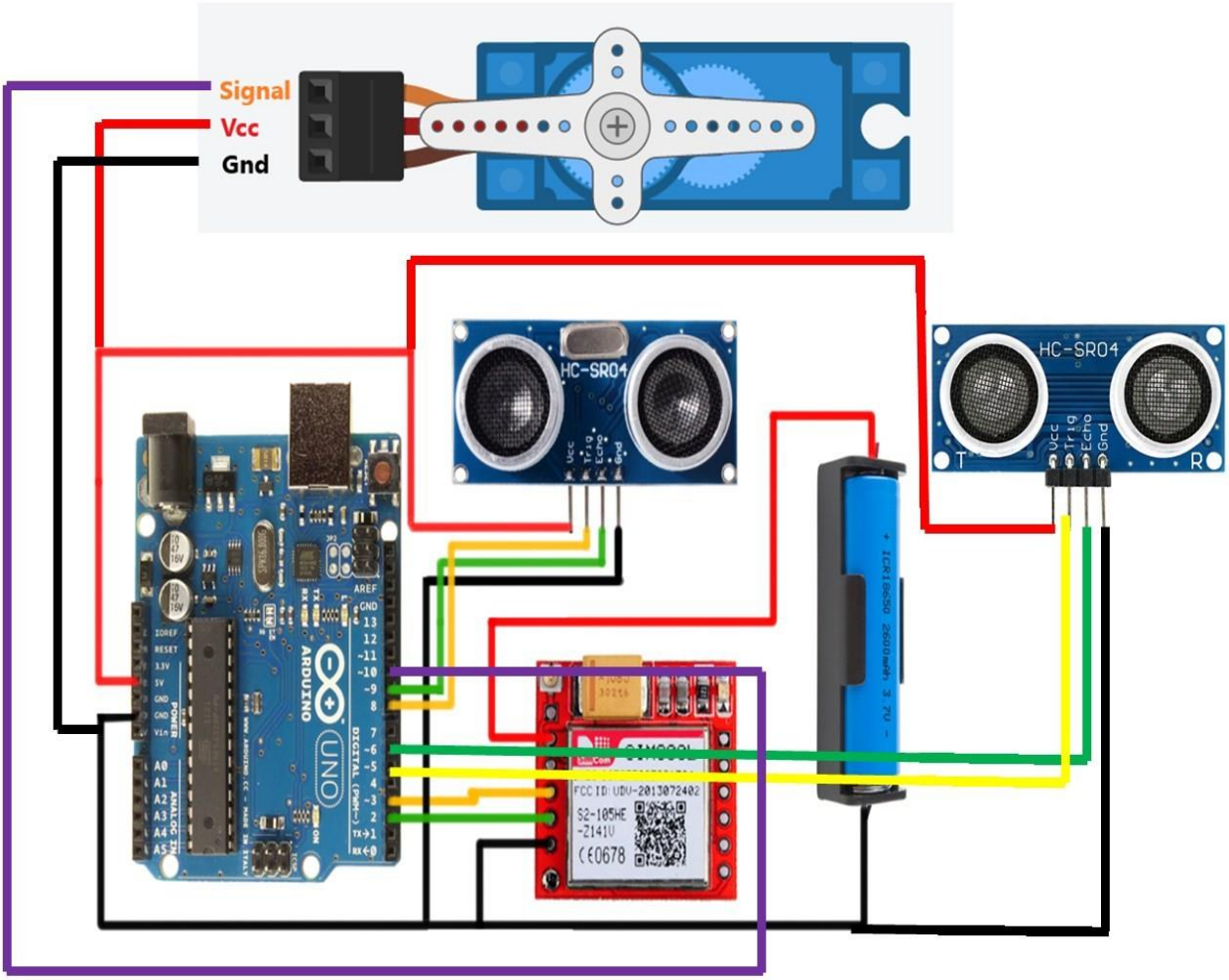


Fig: 3.3: Circuit diagram of the Project

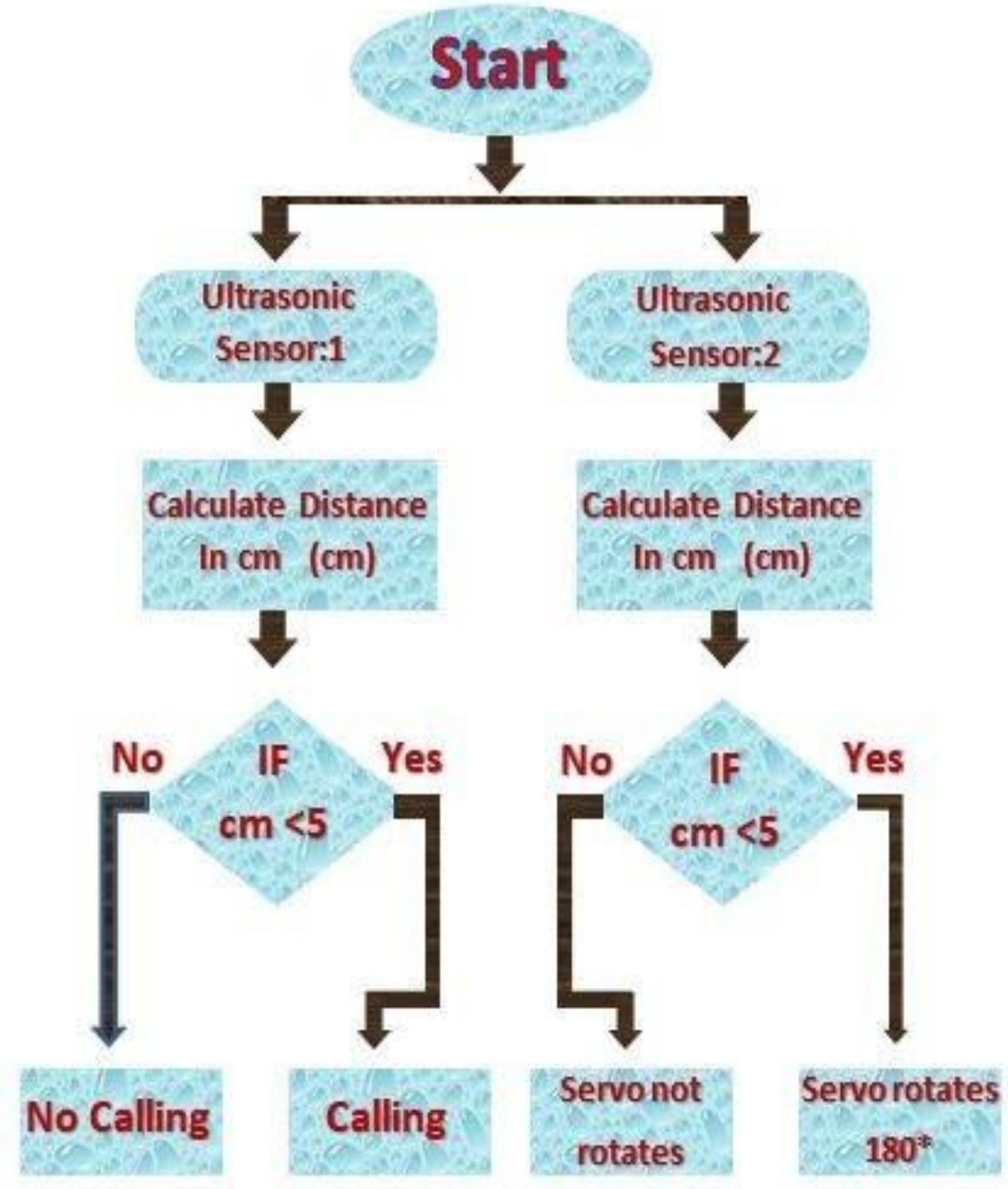
3.5 Working Principle

After wiring and attaching all the devices and setting up to the Smart Dustbin, now observe all the important setup whether they are well connected or something missed. After connection set up now next step is to submit/upload code in Arduino and supply power to the circuit. When system is powered ON, Arduino keeps monitoring for any things that come near the sensor at give range. When Ultrasonic sensor detect any object for example like hand or others, here Arduino calculates its distance and if it less than a certain predefines value than servo motor get activate first and with the support of the extended arm of the lid. Lid will open for a given time than it will automatically close

3.6 Image of the Project



3.7 Flow Chart



CHAPTER IV: RESULT & DISCUSSION

4.1 Introduction

In this chapter Simulation of full programming and connection with SIM will be explain.There is some difference between Computer data signal and mobile data signal after studay this chapter it will be clear.

4.2 Simulation of Programming

To simulate sensor at first we have to upload a code at atmega328p and code is given bellow.

PROGRAM CODE:

```
#include  <Servo.h>
#include <SoftwareSerial.h>

//Alarm reciever's phone number with country code
const String PHONE = "01580356207";

//GSM Module RX pin to Arduino 3
//GSM Module TX pin to Arduino 2
#define rxPin 2
#define txPin 3
SoftwareSerial sim800(rxPin,txPin);

//the pin that the pir sensor is atteched to
#define trigPin1 8
#define echoPin1 9
#define tPin2 5
#define ePin2 6
int t2 = 5;
int e2 = 6;
int trigpin1 = 8;
```

```
int echopin1 = 9;
Servo servoMain; // Define our Servo
int distance;
float duration;
float cm;

void setup()
{
   servoMain.attach(10); // servo on digital pin 10
    pinMode(trigpin1, OUTPUT);
    pinMode(echopin1, INPUT);
    pinMode(t2, OUTPUT);
  pinMode(e2, INPUT);

  Serial.begin(115200);          // initialize serial

  sim800.begin(9600);
  Serial.println("SIM800L software serial initialize");

  sim800.println("AT");
  delay(1000);
}

void loop()
{
  digitalWrite(t2, LOW);
  delay(2);
  digitalWrite(t2, HIGH);
  delayMicroseconds(10);
  digitalWrite(t2, LOW);
  duration = pulseIn(e2, HIGH);
  cm = (duration/58.82);
  distance = cm;

    if(distance<5)
```

```
  {
    servoMain.write(180); // Turn Servo back to center position (90 degrees)
   delay(3000);
  }
   else{
       servoMain.write(0);
       delay(50);
         }
         ////////////////////////////////////////////////
while(sim800.available()){
  Serial.println(sim800.readString());
}
////////////////////////////////////////////////
while(Serial.available()) {
sim800.println(Serial.readString());
}
////////////////////////////////////////////////
  long time_duration, distance_in_cm;
  digitalWrite(trigPin1, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin1, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin1, LOW);
  time_duration = pulseIn(echoPin1, HIGH);
  distance_in_cm = time_duration / 29 / 2;

  Serial.print(distance_in_cm);
  Serial.println(" cm");

  //Ranging Distance − 2cm – 400 cm
  //if the distance is equal or less then 10 cm
  if (distance_in_cm <= 5) {
  Serial.println("Motion detected!");
  Serial.println("calling .. ");
   sim800.println("ATD"+PHONE+";");
```

```
  delay(20000); //20 sec delay
}
```

4.3 Parts List

1. arduino uno - 1pcs
2. sim800l - 1pcs
3. ultrasonic sensor- 2 pcs
4. bread board - 1pcs
5. jumper cable - as needed
6. blue gan - 1pcs
7. blue strike- 1pcs
8. dustbin - 1pcs
9. soldaring iron- 1pcs
10. Servo motor - 1pcs
11. Battary - 2pcs

Chapter V

CONCLUSION AND RECOMMENDATION

5.1 APPLICATION

This project can be used at

- Industry
- commercial office
- Corporate office ect

5.2 ADVANTAGE

Following are the advantages of using Smart dustbin;

 A reduction in the number of waste collections needed by up to 80%, resulting in less manpower, emissions, fuel use and traffic congestion.

 A reduction in the number of waste bins needed.

 Maintain environment hygiene (i.e. no overflowing of waste and less unpleasant odor).

 It will help in bringing evolution by technology in term of cleanliness

5.3 CONCLUSION

Here we are going to make an evolution changes toward cleanliness. The combination of intelligent waste monitoring and trash compaction technologies, smart dustbins are better and shoulders above traditional garbage dustbin. It is equipped with smart devices like sensor Arduinoetc.Lid of the dustbin willautomatically open when an object comes near to the dustbin and after certain time period it will close the lid. For social it will help toward health and hygiene, for business for we try to make it affordable to many as many possible. So that normal people to rich people can take benefit from it. Believe this will bringsomething changes in term of cleanliness as well technology.So our next work will be adding one more sensor which will sense whether our dustbin is full or not. And there will be a display will be added so that user can notify that dustbin is full or not.

5.3 DISCUSSION

The project has met all the objectives as listed previously.The objective as defined earlier was to construction an smart dustbin which is fulfill.

5.4 Future work

For social it will help toward health and hygiene, for business for we try to makeit affordable to many as many possible. So that normal people to rich people can take benefit from it.Believe this will bring something changes in term of cleanliness as well technology.

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