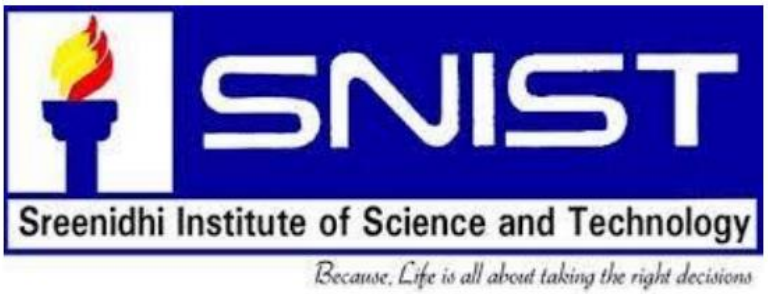
PROJECT REPORT

ON

ARDUNIO BASED WASTE SEGREGATION

BY

TEAM-9



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ABSTRACT

Segregation at the source is the key in solid waste management, especially when we have limited economical resources. Waste management faces numerous difficulties because of its enormous, quickly developing populace in a densely populated nation in the developing nations. The primary target of the research work is waste separation and management process. A portion of the trash individuals produce is biodegradable, some are recyclable, and some are not one or the other. Waste segregation includes isolating wastes as per how it's dealt with or handled. Isolation of waste through at unloading locales burns-through additional time and labor. This work suggests a Arduino Based Waste Segregator (ABWS) which is a modest, simple to utilize answer for an isolation framework at family units. We our team utilizes moisture sensor and induce proximity sensor to distinguish waste and separate them with ultrasonic sensors for ceaseless checking. This system can be used in industries, house hold and in waste monitoring system of municipality. The (ABWS) system has been developed using ARDUINO MEGA. As the integrated circuits and microcontroller become more and more accessible and the technology is a fact of today with the improved availability of sensor devices.

INTRODUCTION

- Definition of Waste Segregation:

We divide solid waste into three categories Wet, Dry and hazardous waste. According to solid waste management rule, 2016 it is responsibility of generators to segregate waste into these three categories. Lack of awareness, loosely implementation of laws and various other reasons are obstacles in achieving appropriate results. After segregation we can choose Reduce, Reuse and Recycle for appropriate solid wastes. Solid waste management should be sustainable ecologically as well as economically. In a developing country like India, it's very important to have a cast effective solid management plan. We have to deal with poverty, population growth and high urbanization rate combines with ineffective and underfunded solid waste management technique. Waste segregation is the separating and sorting of waste to facilitate recycling and, when sorted, waste is more easily recycled thereby saving you money and time.

- Need for dry and wet waste separation:

This segregation is essential because it makes the task of recycling dry non-biodegradable waste easier. It also simplifies the conversion of wet waste like leftover food, used tea leaves, etc. to compost.

If the segregation of the waste is not done properly, then the biodegradable and non-biodegradable waste cannot be recycled. As a result, the waste is dumped somewhere else i.e. sea or land. If the waste is dumped in the sea, the whole water gets polluted, as a result The aquatic animals living in the water will be affected more.

We also read about the articles in the newspapers from few years that the whales living in the water gets dying due to the pollution. Else the waste is dumped on the land and then also humans and birds get affected. Due to the waste pollution.

Hazardous health problems will arise and infections will be spreading, birds will be dying due to the pollution. To reduce this pollution, we need to separate the dry waste and wet waste and use them again by Recycling.

METHODLOGY

PROPOSED SYSTEM :

The automated waste segregates the wet, dry and metal waste.so it has three bins for each type of waste we use the two sensor they are moisture sensor and inductive proximity sensor to detect the wet and metal waste respectively. As the waste is placed on the flatform IR sensor detects that the waste is present so if the waste is wet then the moisture sensor will detect and servo motor 2 will rotates 0 degrees and servo motor 1 rotates 90 degrees. And the waste will be thrown in the respective bin i.e., wet bin. If the waste is any metal then the inductive proximity sensor will detect and the servo motor 2 will rotates 180 degrees and the servo motor 1 will rotates to 90 degrees. And the waste will be thrown to the metal bin .If the waste is either wet nor metal then the waste is considered as dry waste and servomotor 2 will rotates to 360 degrees and the servo motor 1 rotates to 90degrees .And the waste will be thrown to the dry bin.

Thus, the waste is been segregated. So, as the waste is being segregated the thrown to their respective bins then the bins may fill after sometime. So, we place the ultrasonic sensors in each to detect the level of the bins. If Any of the bin is filled then the LCD displays that the respective bin is filled so we clear the bin and place it again in its place.

COMPONENTS USED:

1. Arduino mega 2560
2. Ultrasonic sensor-3No
3. Moisture sensor
4. Inductive proximity sensor
5. IR sensor
6. LCD
7. Servo motor-2No
8. Breadboard
9. Jumper wire
10. Power supply-5v to 9v
11. USB port

ARDUINO MEGA 2560:

Fig.1 Arduino mega

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

ULTRASONIC SENSOR:

Fig.2 Ultra sonic sensor

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity.

High-frequency sound waves reflect from boundaries to produce distinct echo patterns.

MOISTURE SENSOR:

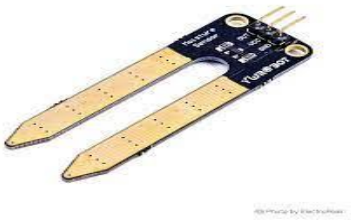


Fig.3 Moisture sensor

As the name indicates, this sensor is used to measure the moisture content in a given material. These sensors use the volumetric water content indirectly by making use of some other properties like electrical resistance, dielectric constant. In general cases, the sensor generates a voltage proportional to the dielectric permittivity and therefore measures the moisture content of a material.

INDUCTIVE PROXIMITY SENSOR:

Fig.4 Metal sensor

An Inductive Proximity Sensor is a non-contact electronic proximity sensor used for the detection of metals. Sensing range of this sensor completely depends upon the metal being detected. Their working principle is based on a coil and an oscillator that generates an electromagnetic field in the surrounding of the sensing range. Presence of any metallic substance in the sensing range causes dampening of oscillation amplitude.
Rise and fall of amplitudes are detected by a threshold circuit that causes a corresponding change in the output of the sensor. If a metal contains some percentage of ferrous, the sensing range is longer, while non-ferrous metals like copper reduce the sensing range by 60 percent. There are two possible outputs of this sensor, hence it is also called inductive proximity switch. Common applications of inductive sensors include metal detectors, traffic lights, etc. and a plethora of industrial automated processes.

IR SENSOR:

Fig.5 IR sensor

IR sensor is one of the most commonly used sensors in the field of electronics; it has a large number of applications at the domestic as well as at the industrial level. IR module is a sensor module that consists of both IR transmitter and a receiver. Operating voltage of this module is 5 volts and the obstacle detection range is 5 cm that can be increased by 15 cms. An IR sensor can detect the heat of an object as well any motion in the surrounding. Here this is used to detect the trash in the inlet. The functioning of an IR module is pretty straightforward. As the module contains both transmitter and receiver. When powered, IR transmitter starts to transmit continuous IR waves, if an obstacle is placed in the path of the waves, they get reflected back from the obstacle and are received by the receiver.

LIQUID CRYSTAL DISPLAY:

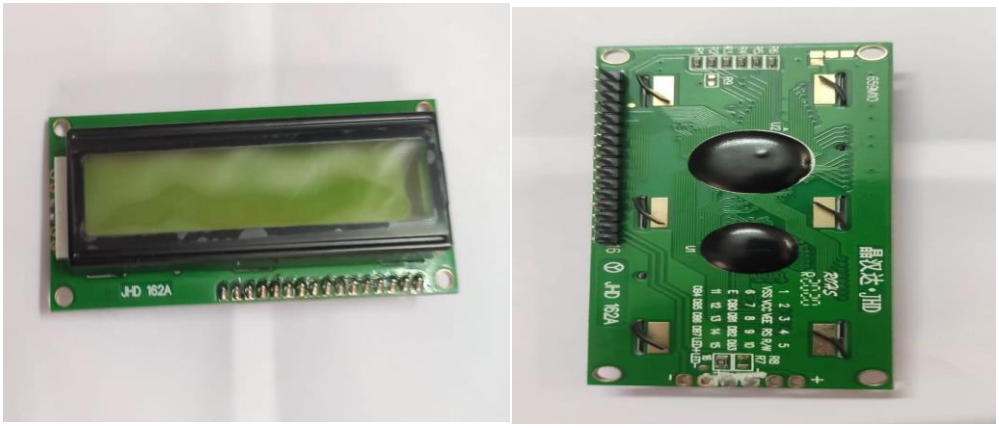


Fig.6 Liquid crystal display

This is a flat panel display that uses properties of liquid crystals. LCD displays do not emit light directly, instead, they use a backlight to develop images in single color. LCD displays are used in a wide range of applications like television panel, computer monitors and instrument panels as well. Here the LCD Displays the status the result of the trash detected.

SERVO MOTOR:

Fig.7 Servo motor

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration.[1] It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.
Servomotors are not a specific class of motor, although the term *servomotor* is often used to refer to a motor suitable for use in a closed-loop control system.

BREADBOARD:

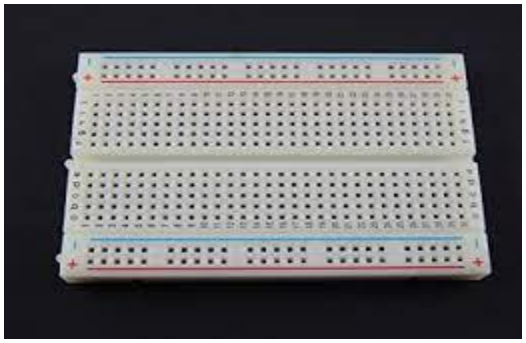


Fig .8 bread board

A breadboard is used **to build and test circuits quickly before finalizing any circuit design**. The breadboard has many holes into which circuit components like ICs and resistors can be inserted.

JUMPER WIRE:

Fig .9 Jumper wires

Jumper wires are simply **wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering**. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed.

POWER SUPPLY:

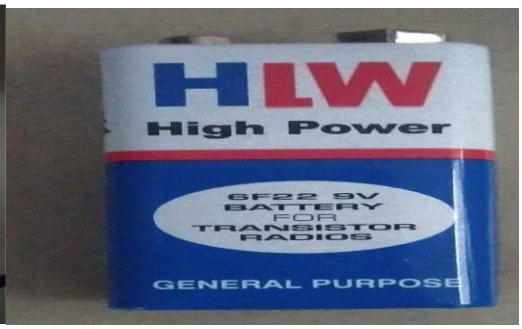


Fig.10 12Volt adapter Fig.11 HLW battery

The power adapter of 12V – 2A and HLW High Power Battery of 9 V are used to power this Project.

USB PORT:

Fig.12 USB port

A USB port is a standard cable connection interface for personal computers and consumer electronics devices. USB stands for Universal Serial Bus, an industry standard for short-distance digital data communications. USB ports allow USB devices to be connected to each other with and transfer digital data over USB cables.

WORKING

As shown in flow chart when the system starts it firstly checks for waste that is done through the IR sensor. If there is any waste present on the flatform then the remaining(moisture sensor and inductive proximity sensor) will detects the which type the waste is present on the flatform, if there is no waste on the flatform then the IR sensor will detect any object. So, if the waste is placed on the flatform is wet then the moisture will detect it and the system throws the waste into the wet bin.

If the waste is metal waste, then the inductive proximity sensor will detect it and throws it into the metal bin. If the waste is neither wet nor metal then it is thrown into the dry bin.

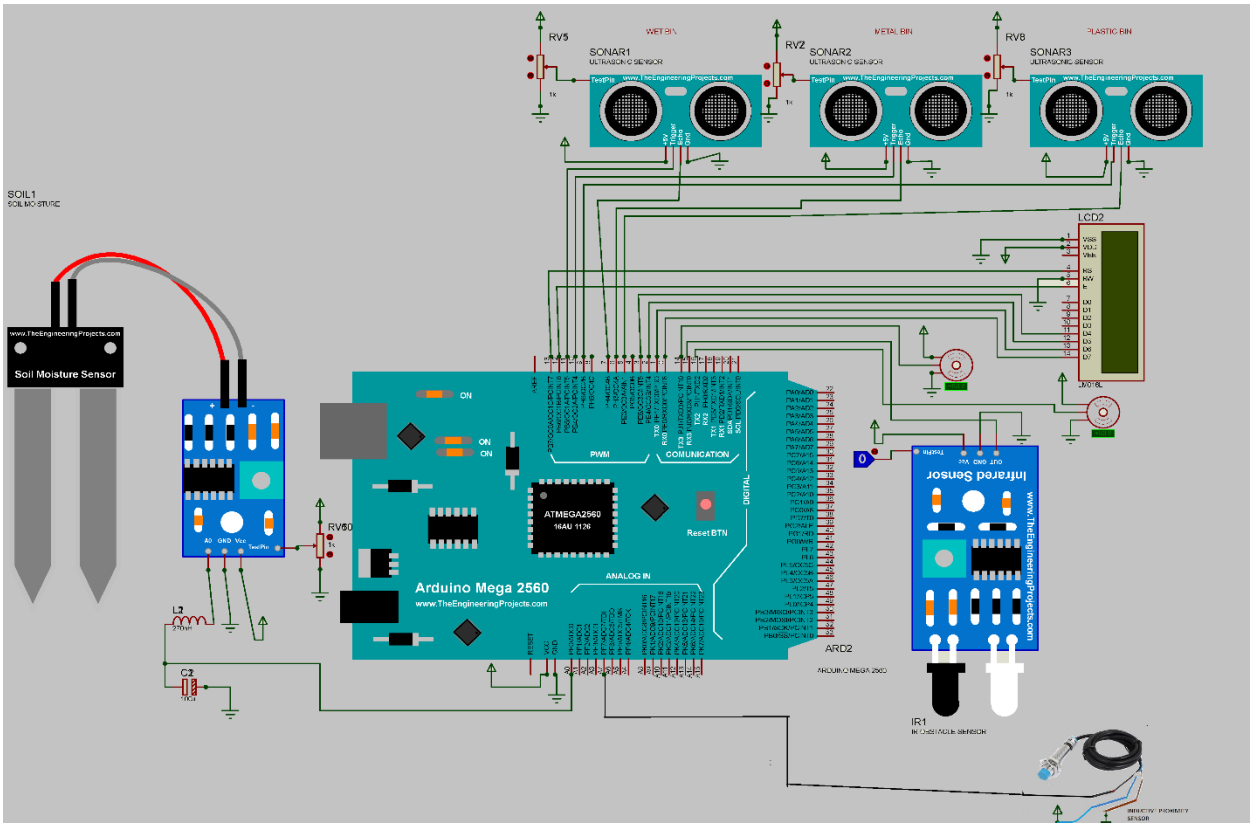
So as the waste is placed on the flatform it is detected through the different sensors and then it is been thrown to their respective bins. As the waste is thrown in their respective bins at some time the bins may filled so now whether the bins filled or not, we use the ultrasonic sensor which detects the level of the waste in the bin .As the bin files the ultrasonic will detects and LCD will display that the respective bin is filled so we can clear the bin and place again for the use.

So, through this system we are able to segregate the waste and also clean the filled bin on time so that the waste is not thrown outside of the bin.

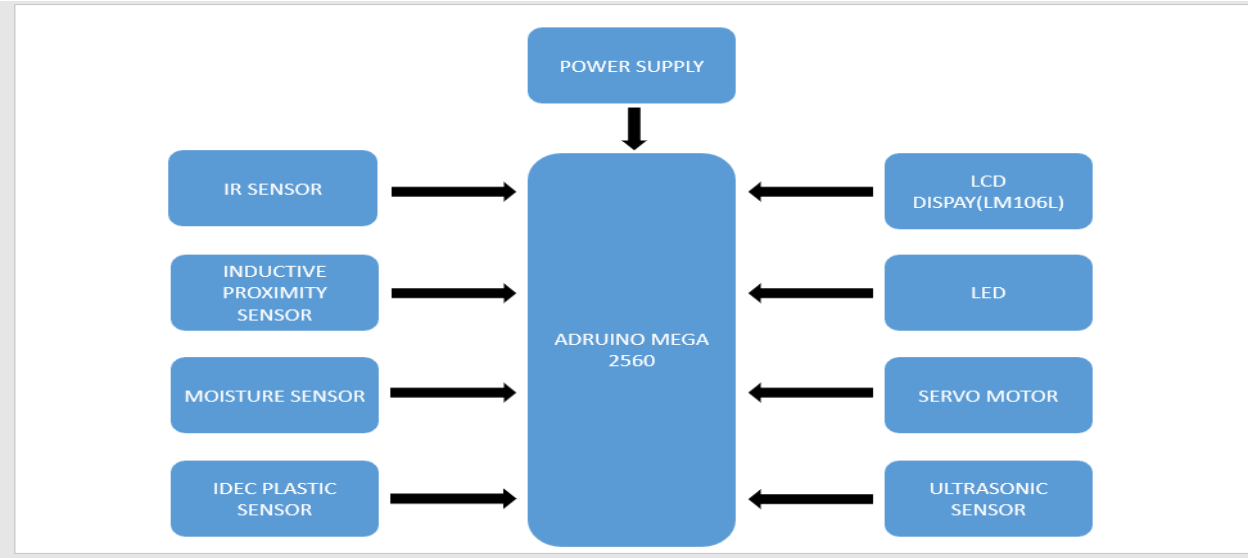
IR SENSOR	INDUCTIVE PROXIMITY SENSOR	MOISTURE SENSOR	OUTPUT
0	0	0	NO WASTE
1	1	X	MEATAL WASTE
1	X	1	WET WASTE
1	0	0	OTHER WASTE

X= No detection

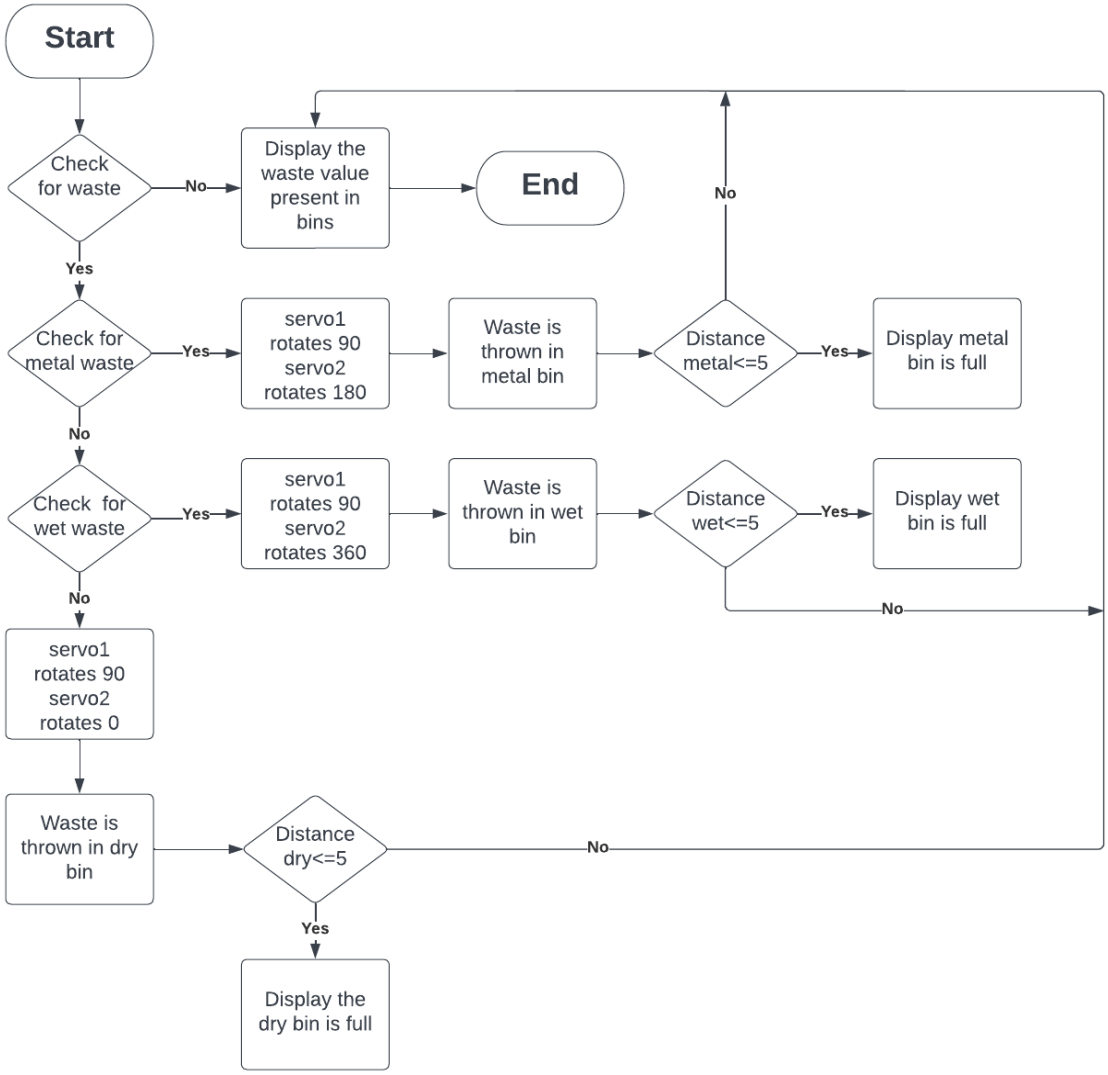
CIRCUIT DIAGRAM



BLOCK DIAGRAM



FLOW CHART



CODE

```
#include <Servo.h>

#include <LiquidCrystal.h>
```

```
const int rs = 13, en = 22, d4 = 23, d5 = 24, d6 = 25, d7 = 26; // Setting up LCD
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);
int moistValue = 0; // Setting Values
int irValue = 0; int metalValue = 0;
int servopin1 = 0; int servopin2 = 0;
int distanceDry; long durationDry;
int distanceWet; long durationWet;
int distanceMetal; long durationMetal;
int distance; int duration;
// Indicate pins for Components
int servoPin1 = 4;  // Servo
int servoPin2 = 5;
int trig1Pin = 12; // Dry Garbage Utrasonic Sensor
int echo1Pin = 9;
int trig2Pin = 11; // Wet Garbage Utrasonic Sensor
int echo2Pin = 8;
int trig3Pin = 10; //metal Garbage Utrasonic Sensor
int echo3Pin = 7; //--------------------------------------------------------------------// Initiate Servo
Servo servo1; Servo servo2; //--------------------------------------------------------------------
void setup()
{
  pinMode(3, INPUT);//ir sensor
  pinMode(A1, INPUT);//moisture
  pinMode(2, INPUT);//inductive  //--------------------For Dry Garbage Ultrasonic Sensor-----------
  pinMode(trig1Pin, OUTPUT);
```

```
pinMode(echo1Pin, INPUT);   //--------------------For Wet Garbage Ultrasonic Sensor----------
pinMode(trig2Pin, OUTPUT);
pinMode(echo2Pin, INPUT);  //--------------------For metal Garbage Ultrasonic Sensor-----------
pinMode(trig3Pin, OUTPUT);
pinMode(echo3Pin, INPUT);  //-------------------------------------------------------------------
servo1.attach(servoPin1); // Attaching the Servo
servo2.attach(servoPin2);  //-----------------------------LCD Starting----------------------------
lcd.begin(16, 2);     // LCD setup
lcd.setCursor(0, 0);
lcd.print("Welcome to");
lcd.setCursor(0, 1);
lcd.print("our Project");
delay(2000);
lcd.clear();
lcd.print("Waste");
lcd.setCursor(0, 1);
lcd.print("Segregation");
delay(2000);
lcd.clear();  //-------------------------------LCD Credits-------------------------------
lcd.print("By:");
lcd.setCursor(0, 1);
lcd.print("team 9");
delay(2000);
lcd.clear();
Serial.begin(9600);
```

```
}//---------------------------------------------// This is for indicating if the dustbin is full or not
void ultrasensor(int trigPin, int echoPin)
{
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  duration = pulseIn(echoPin, HIGH);  //Checks the Duration
  distance = (duration * 0.034 / 2);  //Calculates the distance
}void loop()
{
  irValue = digitalRead(3);
  metalValue = digitalRead(2);
  moistValue = analogRead(A1);
 servo1.write(0);  //Ultrasonic Sensor Part
  ultrasensor(trig1Pin, echo1Pin);
  distanceDry = distance;
  ultrasensor(trig2Pin, echo2Pin);
  distanceWet = distance;
  ultrasensor(trig3Pin, echo3Pin);
  distanceMetal = distance;
  lcd.print("DRY   WET  METAL");
  lcd.setCursor(0, 1);
  lcd.print(distanceDry);  lcd.setCursor(6, 1);
```

```
lcd.print(distanceWet);
lcd.setCursor(13, 1);
lcd.print(distanceMetal);
delay(1000);
lcd.clear();
lcd.setCursor(0, 1);
lcd.clear(); //------------------------Dustbin Full or NOT Part-------------------------
if (distanceDry <= 5 && distanceWet <= 5 && distanceMetal <= 5)
{
  lcd.print("Three Bins are ");
  lcd.setCursor(0, 1);
  lcd.print(" Full");
  delay(2000);
  lcd.clear();
  delay(450);
}else if (distanceDry <= 5 && distanceWet <= 5)
{ lcd.print("1&2 Bins is Full");
  delay(2000);
  lcd.clear();
  delay(450);
} else if (distanceWet <= 5 && distanceMetal <= 5)
{
  lcd.print("2&3 Bins is Full");
  delay(2000);
  lcd.clear();  delay(450);
```

```
}  else if (distanceDry <= 5 && distanceMetal <= 5)
{  lcd.print("1&3 Bins is Full");
  delay(2000);
  lcd.clear();
  delay(450);
}else if (distanceDry <= 5)
{  lcd.print("Dry Bin is Full");
  delay(2000);
  lcd.clear();
  delay(450);
} else if (distanceWet <= 5)
{  lcd.print("Wet Bin is Full");
  delay(2000);
  lcd.clear();
  delay(450);
} else if (distanceMetal <= 5)
{  lcd.print("Metal Bin is Full");
  delay(2000);
  lcd.clear();
  delay(450);
}else if(irValue == LOW)
{ Serial.println(metalValue);
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Metal = ");
```

```
  lcd.print(metalValue);
  delay(1000);
  Serial.println(moistValue);
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Moisture = ");
  lcd.print(moistValue);
  delay(1000);
  lcd.clear();
 if(metalValue == HIGH)
{  lcd.setCursor(0, 0);
 lcd.print("Its metalGarbage");
 servo2.write(120);
 delay(1000);
 servo1.write(90);
 delay(1000);
 servo1.write(0);
 delay(1000);
 servo2.write(0);
 delay(1000);
 lcd.clear();
} else if(moistValue < 1000)
{ lcd.setCursor(0, 0);
    lcd.print("Its wet Garbage");
    servo2.write(180);  delay(1000);
```

```
 servo1.write(90);
 delay(1000);
 servo1.write(0);
 delay(1000);
 servo2.write(0);
 delay(1000);
lcd.clear();
 }else
{
 lcd.setCursor(0, 0);
 lcd.print("Its dry Garbage");
  servo2.write(0);
 delay(1000);
 servo1.write(90);
 delay(1000);
 servo1.write(0);
 delay(1000);
 servo2.write(0);
 delay(1000);
lcd.clear();
}
  }
}
```

APLLICATIONS

It can be used in industries, schools, colleges, malls etc., so it can used in public places where there is a lot of waste is produced .

It can also be used at homes for segregating the wet waste like vegetables, fruits etc., which make easy to clean.

CONCLUSION

The Arduino based waste segregation system, sorts waste into four different categories namely, plastic, dry, wet and metal waste. Plastic waste refers to plastic items like water bottles, dry waste to dry items like paper, clothes etc., wet waste refers to organic waste, and metal waste refers to metals. Separating our waste is essential as the amount of waste being generated today causes immense problem. Here, we have tested the household wastes which are generated in every home today and we have come up with the following result. When the waste is exposed to our Arduino based waste segregator system, we would be able to monitor the solid waste collection process and management of the overall collection process. The technologies which are used in the proposed system are good enough to ensure the practical and perfect for waste collection process monitoring and management for green environment.