GUJARAT TECHNOLOGICAL UNIVERSITY

Chandkheda, Ahmedabad

Affiliated

B. H. Gardi College of Engineering & Technology

A

Project Report

On

Smart Garbage Collection

Under subject of

DESIGN ENGINEERING –1A

B. E. , Semester – VI

COMPUTER SCIENCE AND ENGINEERING

Submitted by:

Group:

Sr.	Name of student	Enrollment No.
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3.	Chundavadara Vanita	190043131517
4.	Odedra Asha	190043131527

Prof. Monika Shah

Faculty Guide

Prof. Hemal H. Rajyaguru

Head of the Department

Academic year

(2020-2021)

CERTIFICATE

This is to certify that the project entitled "**Smart Garbage Collection "** has been carried out **Ichchhuda Daxa** Enrollment No **190043131507** under my guidance in fulfillment of the degree of Bachelor of Engineering in COMPUTER SCIENCE & ENGINEERING of Gujarat Technological University, Ahmedabad during the academic year 2020-21.

Faculty In-Charge **Internal Examiner** **External Examiner**

DEPARTMENT OF COMPUTER ENGINEERING

B.H. GARDI COLLEGE OF ENGINEERING AND TECHNOLOGY, RAJKOT

Date: _____

CERTIFICATE

This is to certify that the project entitled ""**Smart Garbage Collection** " has been carried out **Malam Karishma** Enrollment No **190043131508** under my guidance in fulfillment of the degree of Bachelor of Engineering in COMPUTER SCIENCE & ENGINEERING of Gujarat Technological University, Ahmedabad during the academic year 2020-21.

Faculty In-Charge **Internal Examiner** **External Examiner**

DEPARTMENT OF COMPUTER ENGINEERING

B.H. GARDI COLLEGE OF ENGINEERING AND TECHNOLOGY, RAJKOT

Date: _____

CERTIFICATE

This is to certify that the project entitled "**Smart Garbage Collection"** has been carried out **Chundavadara Vanita** Enrollment No **190043131517** under my guidance in fulfillment of the degree of Bachelor of Engineering in COMPUTER SCIENCE & ENGINEERING of Gujarat Technological University, Ahmedabad during the academic year 2020-21.

Faculty In-Charge **Internal Examiner** **External Examiner**

DEPARTMENT OF COMPUTER ENGINEERING

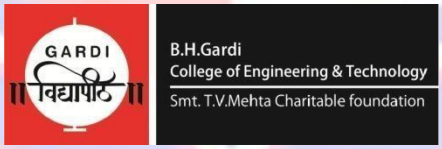
B.H. GARDI COLLEGE OF ENGINEERING AND TECHNOLOGY, RAJKOT

Date: _____

CERTIFICATE

This is to certify that the project entitled "**Smart Garbage Collection"** has been carried out **Odedra Asha** Enrollment No **190043131527 under** my guidance in fulfillment of the degree of Bachelor of Engineering in COMPUTER SCIENCE & ENGINEERING of Gujarat Technological University, Ahmedabad during the academic year 2020-21.

Faculty In-Charge **Internal Examiner** **External Examiner**



DEPARTMENT OF COMPUTER ENGINEERING

B.H. GARDI COLLEGE OF ENGINEERING AND TECHNOLOGY, RAJKOT

Date: _____

ACKNOWLEDGEMENT

I sincerely thank my college department for the academic advancement in has finally provided us opportunity for project work. My special thanks to Monika Shah for their constant help, thoughtful suggestions and deep interest have enabled me to complete this task.

I am pleased to represent this project report on the project named. **SMART GARBAGE COLLECTION** developed at B.H.Gardi College of engineering as computer department based on Gujarat Technological University.

ABSTRACT

A Smart Garbage Collection segregates waste by itself as degradable wastes and non-degradable wastes with the help of sensors and motors. Rapid changes in technology, low initial cost and planned obsolescence have resulted in a fast growing surplus of wastes all around the globe. People dump wastes on roadsides, which is not picked up regularly by the people responsible. It's proposed to separate the wastes into categories like degradable and non-degradable will take place in an effectively closed manner. The entire process of waste input, level and segregation is monitored and controlled by the reconfiguration IO using sensors, thereby reducing the open decomposition of organic wastes. The main of the project is to segregate waste to wet and dry.

INDEX

Chapter No: 1

INTRODUCTION

1.1 Existing system

1.2 Introduction of Domain

1.3 Objective

1.1 Existing system

In earlier system, there is no proper segregation of waste.usually people throw waste anywhere. all this waste are different, some waste can recycle, some waste can be used for making fertilizer and biogas. And Segregation of this mix waste is become difficult. So we decided to to make Segregation plant which segregate waste in dry and wet.

1.2 Introduction of Domain

Our project work on the principle of detection and segregation of waste. In our project we are using IR sensor, ultrasonic sensor, moisture sensor, buzzer and servo motor. Moisture sensor is connected with cardboard where waste is first put.whenever waste is detected by IR sensor , then it will detect that wet is dry or wet. Whenever there is no waste put on the card board, the waste detectioncode will not execute. The waste segregation code execute only when IR sensor detects an object. After detecting object, the segregation is done by dumping dry waste into dry dustbin and wet waste into waste dustbin using servo motor. Two ultrasonic sensor is used here for checking the dustbin level. If any of the dustbin will full, the buzzer will b high. This is how our project will work.

Keywords-
Sensors
Ardiuno
Motors
ny of the dustbin will full, the buzzer will b high. This is how our project will work.
Connecting wires
Dustbin

1.3 Objective

- To detect Waste.
- Segregation of waste into dry and wet.

Chapter No: 2

OBSERVATION

2.1 AEIOU Canvas

2.2 Mind Mapping Canvas

2.3 Empathy Mapping Canvas

2.1 AEIOU Canvas

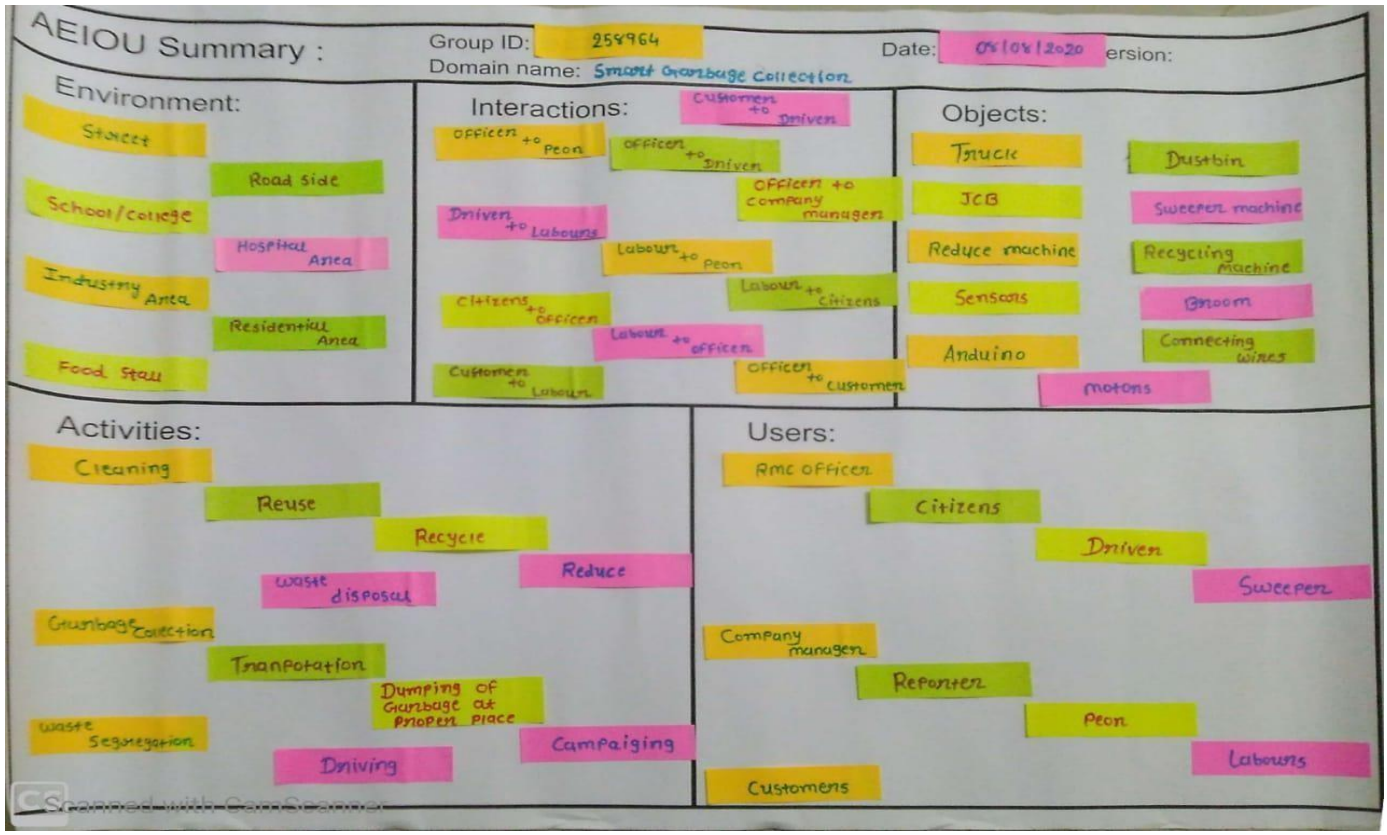
- **Environment:**
    1. Street
    2. Road side
    3. Schools/college
    4. Hospital Area
    5. Industry Area
    6. Residential Area
    7. Food Stall

- **Interaction:**
    1. Officer to peon
    2. Officer to driver
    3. Officer to company manger
    4. Driver to labour
    5. Labour to peon
    6. Labour to citizen
    7. Citizen to officer
    8. Labour to officer
    9. Customer to Labour
    10. Officer to customer
    11. Customer to driver

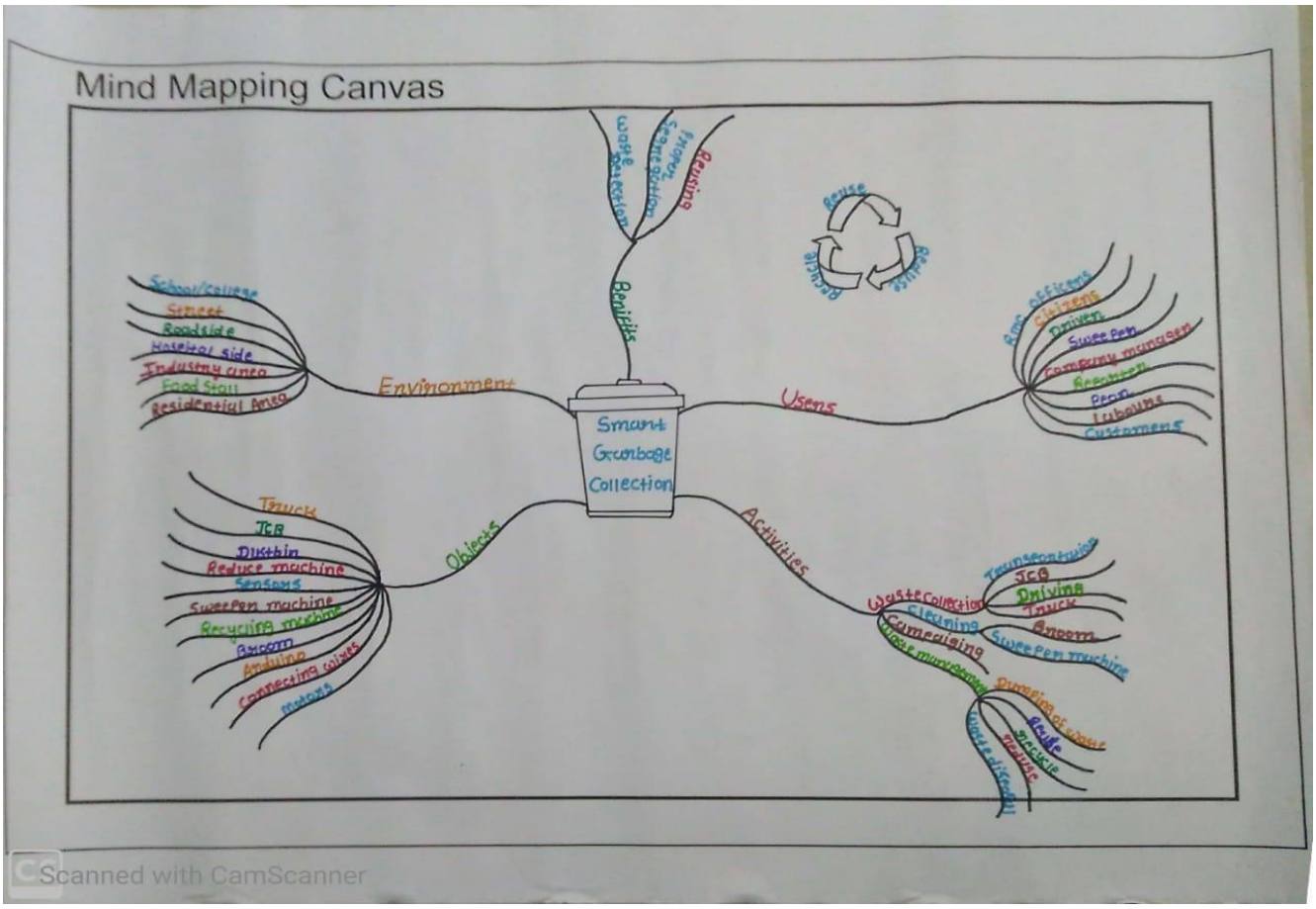
- **Objects:**
    1. Truck
    2. JCB
    3. Reduce machine
    4. Sensors
    5. Aurino
    6. Motors
    7. Dustbin
    8. Sweeper machine
    9. Recycle machine
    10. Broom
    11. Connecting wire

- **Activities:**
    1. Cleaning
    2. Reuse
    3. Recycle
    4. Reduce
    5. West disposal
    6. Garbage collection
    7. Transportation
    8. Dumping of garbage of proper place
    9. Campaigning
    10. Driving
    11. Waste segregation

- **Users:**
    1. RMC officer
    2. Citzens
    3. Driver
    4. Sweeper
    5. Company manager
    6. Reporter
    7. Customer
    8. Peon
    9. Labour


AEIOU Summary :
Group ID: 258964
Domain name: Smart Garbage Collection
Date: 05/08/2020
ersion:
Environment:
Street
Road side
School/college
Hospital Area
Industry Area
Residential Area
Food Stall
Interactions:
Customers to Driver
Officers to Peon
Officers to Driver
Officers to company managers
Driver to Labours
Labour to Peon
Labour to citizens
Citizens to Officers
Labour to officers
Customers to Labour
Officers to customers
Objects:
Truck
Dustbin
JCB
Sweeper machine
Reduce machine
Recycling Machine
Sensors
Broom
Arduino
Connecting wires
motors
Activities:
Cleaning
Reuse
Recycle
Reduce
waste disposal
Garbage collection
Tranportation
Dumping of Garbage at proper place
waste Segregation
Campaigning
Driving
Users:
RMC officers
Citizens
Driver
Sweeper
Company managers
Reporter
Peon
Labours
Customers
Scanned with CamScanner

2.2 Mind Mapping:

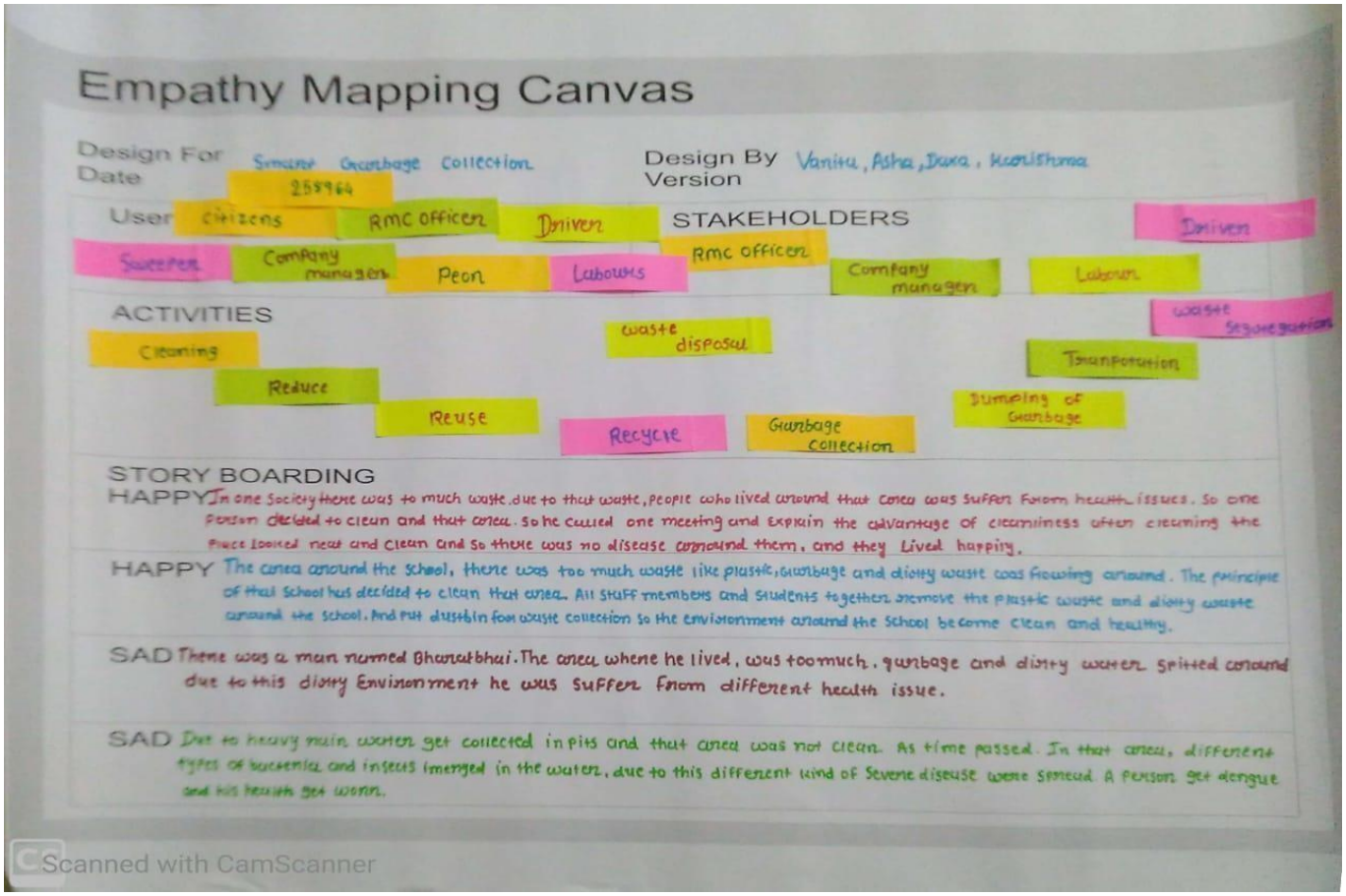


2.3 Empathy Mapping Canvas

- **Users:**
  1. Citizen
  2. RMC officer
  3. Driver
  4. Sweeper
  5. Company Manager
  6. Peon
  7. Labour

- **Stackholders:**
  1. RMC officer
  2. Company Manager
  3. Driver
  4. Labour

- **Activities:**
  1. Cleaning
  2. Reuse
  3. Recycle
  4. Reduce
  5. West disposal
  6. Garbage collection
  7. Transportation
  8. Dumping of garbage of proper place
  9. Driving
  10. Waste segregation


Empathy Mapping Canvas
Design For Smart Garbage Collection
Date 258964
Design By Vanitu, Asha, Dixa, Krishna
Version
User
Citizens
RMC officer
Driver
STAKEHOLDERS
Driver
Sweeper
Company managers
Peon
Labours
RMC officer
Company manager
Labour
ACTIVITIES
Cleaning
Reduce
Reuse
Recycle
waste disposal
Garbage collection
Dumping of Garbage
Transportation
waste segregation
STORY BOARDING
HAPPY In one Society there was to much waste due to that waste, people who lived around that area was suffer from health issues. So one person decided to clean and that area. So he called one meeting and explain the advantage of cleanliness often cleaning the place looked neat and clean and so there was no disease compound them, and they Lived happily.
HAPPY The area around the school, there was too much waste like plastic, Garbage and dirty waste was flowing around. The principle of that School has decided to clean that area. All staff members and students together remove the plastic waste and dirty waste around the school. And put dustbin for waste collection so the environment around the School become clean and healthy.
SAD There was a man named Bharatbhai. The area where he lived, was toomuch. garbage and dirty water spitted around due to this dirty Environment he was suffer from different health issue.
SAD Due to heavy rain water get collected in pits and that area was not clean. As time passed. In that area, different types of bacteria, and insects emerged in the water, due to this different kind of Severe disease were spread. A person get dengue and his health get worn.
Scanned with CamScanner

Chapter No: 3

IDEATION

3.1 Ideation canvas

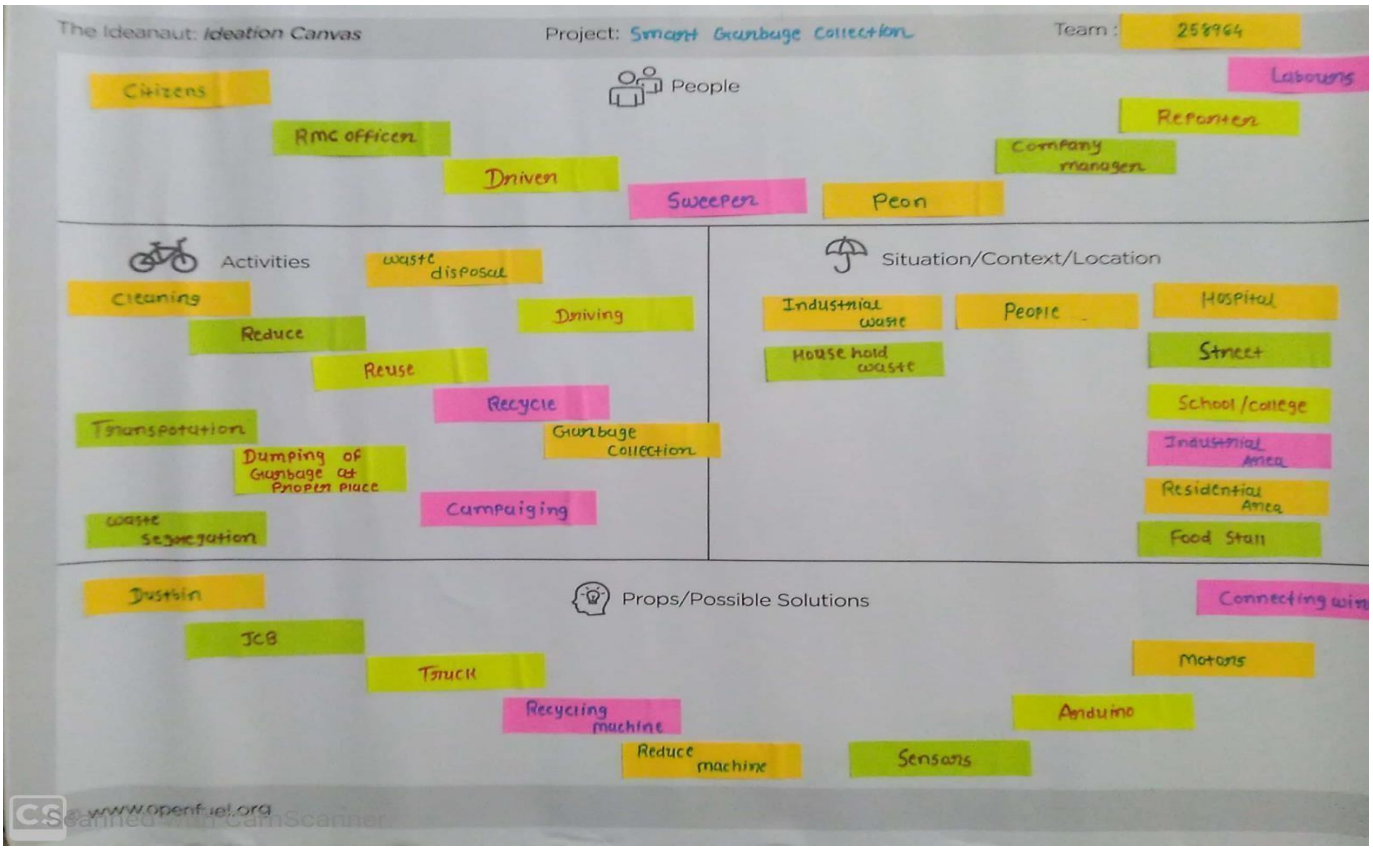
3.1 Ideation canvas

- **People**
  1. Citizen
  2. RMC officer
  3. Driver
  4. Sweeper
  5. Peon
  6. Company manager
  7. Reporter
  8. Labour

- **Activities:**
  1. Cleaning
  2. Reuse
  3. Recycle
  4. Reduce
  5. West disposal
  6. Garbage collection
  7. Transportation
  8. Dumping of garbage of proper place
  9. Campaigning
  10. Driving
  11. Waste segregation

- **Location/Context/situation:**
  1. Industrial waste
  2. People
  3. Hospital
  4. Street
  5. School/College
  6. Industrial area
  7. Hose hold waste
  8. Residential area
  9. Food stall

- **Props/Tools/Objects/Equipment:**
  1. Dustbin
  2. JCB
  3. Truck
  4. Recycling Machine
  5. Reduce Machine
  6. Sensors
  7. Ardunio
  8. Motors
  9. Connecting wires



Chapter No: 4

PRODUCT DEVELOPMENT

4.1 Product Development Canvas

4.1 Product Development Canvas

- **Purpose:**
  1. Proper segregation
  2. Waste detection
  3. Reusing

- **People:**
  1. Citizen
  2. Driver
  3. Sweeper
  4. Company manager
  5. Reporter
  6. Peon
  7. Labour
  8. Customer

- **Product Experience**
  1. Waste detection
  2. Better performance
  3. Easy to segregate waste

- **Product Functions:**
  1. It Segregate waste into matalic any and wet waste
  2. Automatic detection of waste through sensors

- **Product Features:**
  1. Smart segregation plant

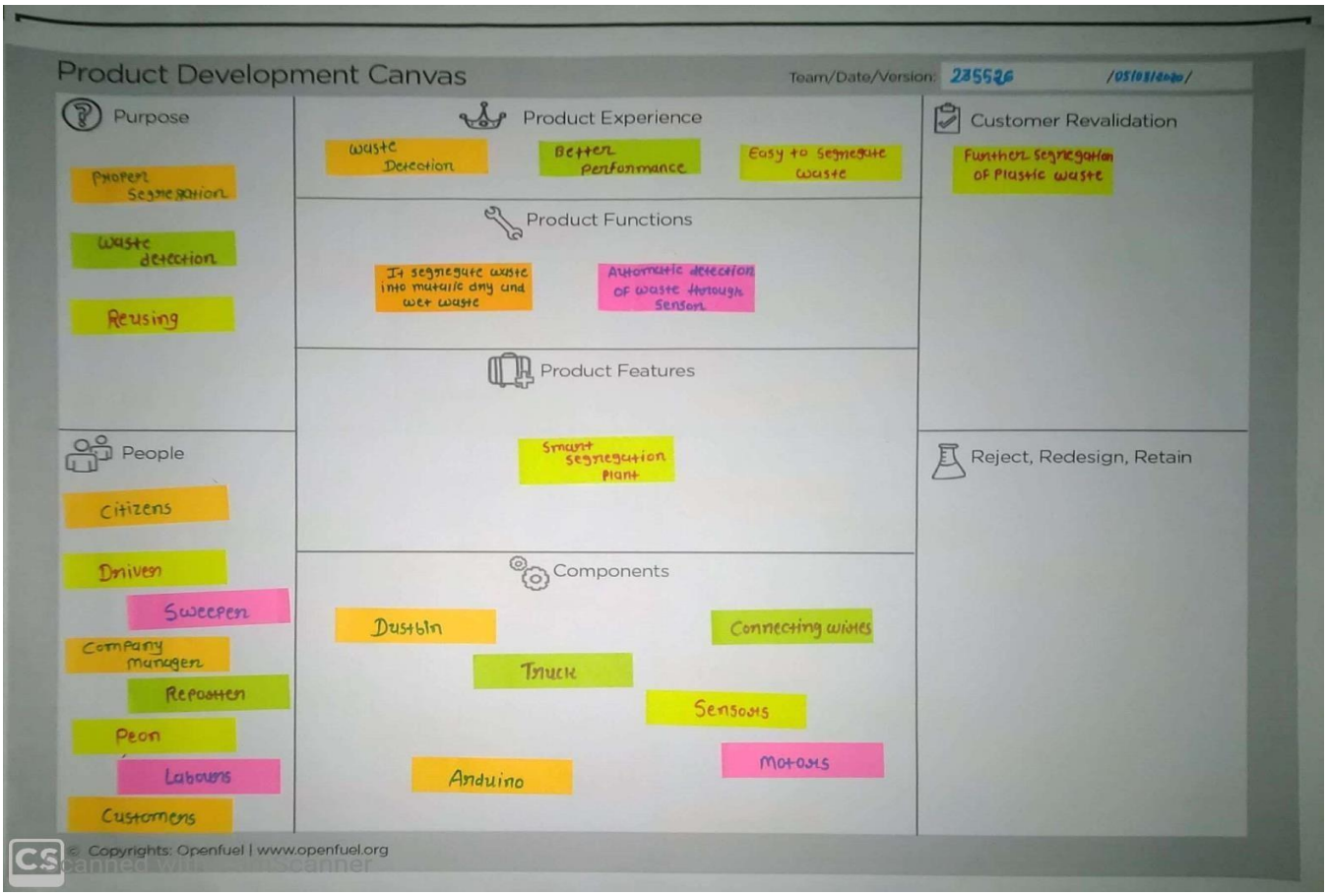
- **Redesign/Reject:**

- **Components:**
  1. Sensor
  2. Dutbin
  3. Connecting Wires

4.Truck
5.Arduino
6.Motors

- **Customer Revalidation:**

1. Further segregation of plastic waste

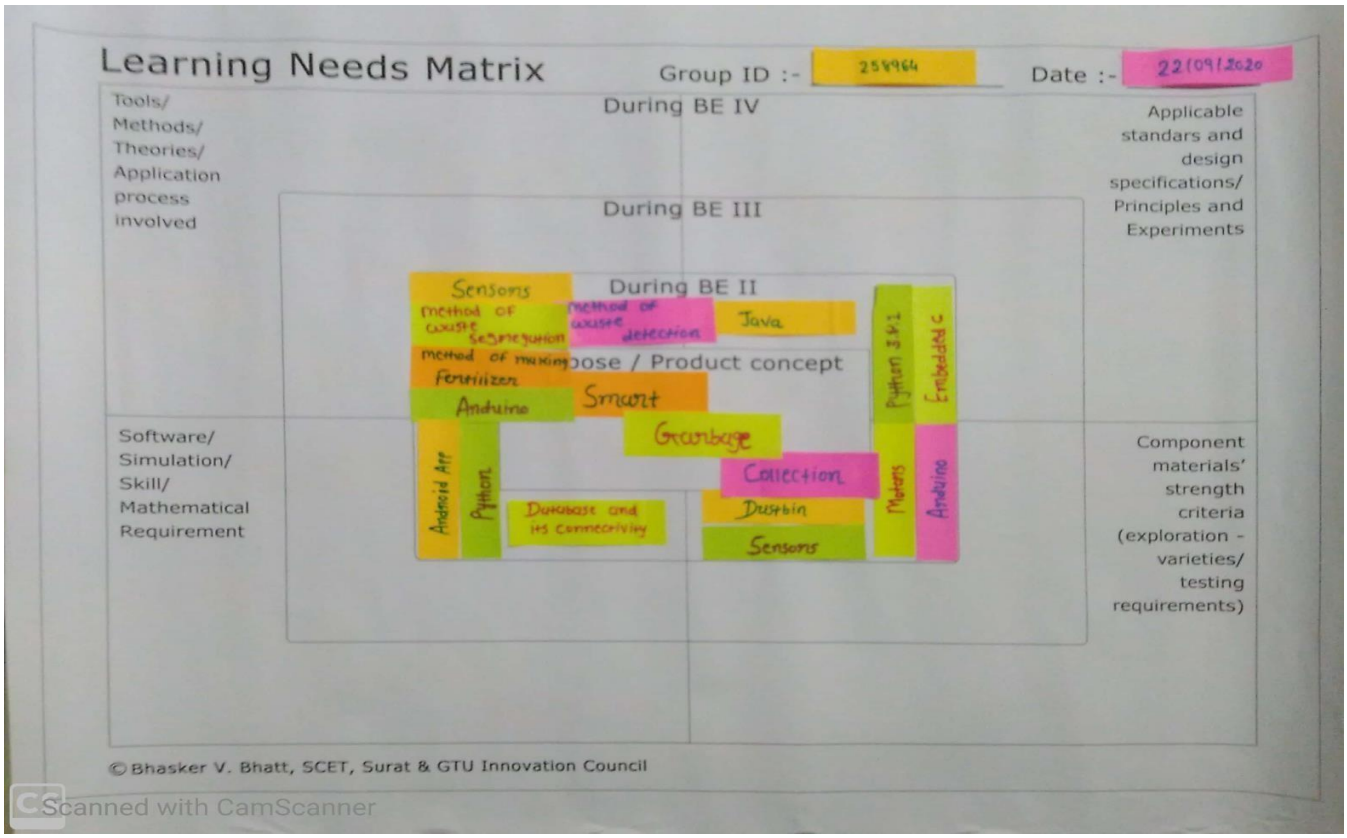


Chapter No: 5

Learning Needs Matrix

5.1 LNM

5.1 LNM


Learning Needs Matrix
Group ID :- 258964
Date :- 22/09/2020
Tools/ Methods/ Theories/ Application process involved
During BE IV
Applicable standars and design specifications/ Principles and Experiments
During BE III
During BE II
Sensors
Java
Python 3.9.1
Embedded C
Fertilizer
Arduino
Smart
Garbage
Collection
Android App
Python
Database and its connectivity
Dustbin
Sensors
Motors
Arduino
Software/ Simulation/ Skill/ Mathematical Requirement
Component materials' strength criteria (exploration - varieties/ testing requirements)
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Chapter No: 6

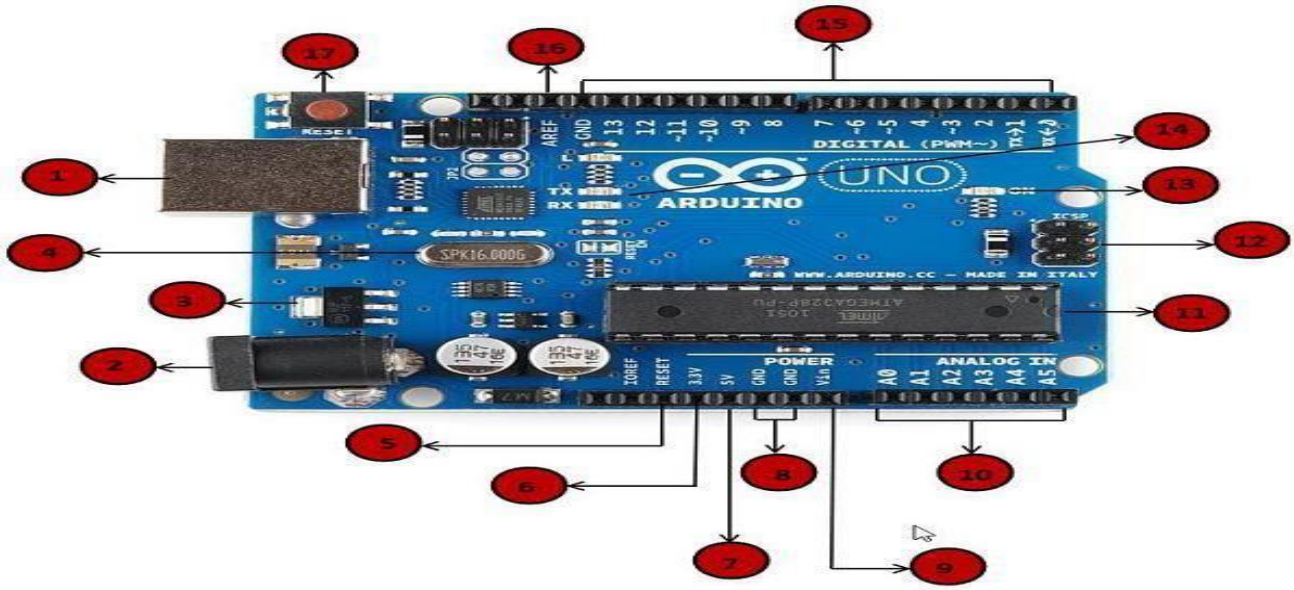
Components Used

6.1 Arduino
6.2 IR Sensor
6.3 Moisture Sensor
6.4 Ultrasonic Sensor
6.5 BUZZER
6.6 LED
6.7 Servo Motor

6.1 Arduino

What is an Arduino?

Arduino is an open-source prototyping platform in electronics based on easy-to-use hardware and software. Subtly speaking, Arduino is a microcontroller based prototyping board which can be used in developing digital devices that can read inputs like finger on a button, touch on a screen, light on a sensor etc. and turning it in to output like switching on an LED, rotating a motor, playing songs through a speaker etc.



1. Power USB

Arduino board can be powered by using the USB cable from your computer. All you need to do is connect the USB cable to the USB connection (1).

2. Power (Barrel Jack)

Arduino boards can be powered directly from the AC mains power supply by connecting it to the Barrel Jack (2).

3. Voltage Regulator

The function of the voltage regulator is to control the voltage given to the Arduino board and stabilize the DC voltages used by the processor and other elements.

4. Crystal Oscillator

The crystal oscillator helps Arduino in dealing with time issues. How does Arduino calculate time? The answer is, by using the crystal oscillator. The number printed on top of the Arduino crystal is 16.000H9H. It tells us that the frequency is 16,000,000 Hertz or 16 MHz.

5. Arduino Reset

You can reset your Arduino board, i.e., start your program from the beginning. You can reset the UNO board in two ways. First, by using the reset button (17) on the board. Second, you can connect an external reset button to the Arduino pin labelled RESET (5).

Pins (3.3, 5, GND, Vin)

6. **3.3V −** Supply 3.3 output volt

7. **5V** − Supply 5 output volt

Most of the components used with Arduino board works fine with 3.3 volt and 5 volt.

8. **GND (Ground)** − There are several GND pins on the Arduino, any of which can be used to ground your circuit.

9 . Vin − This pin also can be used to power the Arduino board from an external power source, like AC mains power supply.

10. Analog pins

The Arduino UNO board has six analog input pins A0 through A5. These pins can read the signal from an analog sensor like the humidity sensor or temperature sensor and convert it into a digital value that can be read by the microprocessor.

11. Main microcontroller

Each Arduino board has its own microcontroller (11). You can assume it as the brain of your board. The main IC (integrated circuit) on the Arduino is slightly different from board to board. The microcontrollers are usually of the ATMEL Company. You must know what IC your board has before loading up a new program from the Arduino IDE. This information is available on the top of the IC. For more details about the IC construction and functions, you can refer to the data sheet.

12. ICSP pin

Mostly, ICSP (12) is an AVR, a tiny programming header for the Arduino consisting of MOSI, MISO, SCK, RESET, VCC, and GND. It is often referred to as an SPI (Serial Peripheral Interface), which could be considered as an "expansion" of the output. Actually, you are slaving the output device to the master of the SPI bus.

13. Power LED indicator

This LED should light up when you plug your Arduino into a power source to indicate that your board is powered up correctly. If this light does not turn on, then there is something wrong with the connection.

14 . TX and RX LEDs

On your board, you will find two labels: TX (transmit) and RX (receive). They appear in two places on the Arduino UNO board. First, at the digital pins 0 and 1, to indicate the pins responsible for serial communication. Second, the TX and RX led (13). The TX led flashes with different speed while sending the serial data. The speed of flashing depends on the baud rate used by the board. RX flashes during the receiving process.

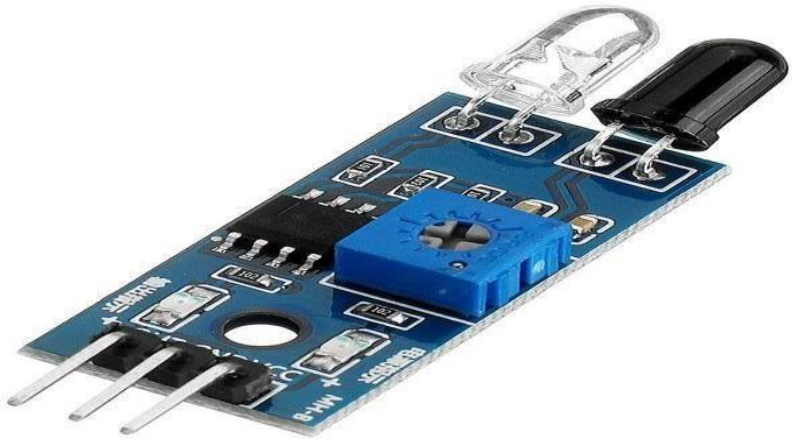
15. Digital I/O

The Arduino UNO board has 14 digital I/O pins (15) (of which 6 provide PWM (Pulse Width Modulation) output. These pins can be configured to work as input digital pins to read logic values (0 or 1) or as digital output pins to drive different modules like LEDs, relays, etc. The pins labeled "~" can be used to generate PWM.

16 . AREF

AREF stands for Analog Reference. It is sometimes, used to set an external reference voltage (between 0 and 5 Volts) as the upper limit for the analog input pins.

6.2 IR Sensor



What is IR Sensor?

IR sensor is an electronic device, that emits the light in order to sense some object of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. Usually, in the infrared spectrum, all the objects radiate some form of thermal radiation. These types of radiations are invisible to our eyes, but infrared sensor can detect these radiations.

1. **Active Infrared Sensor**

Active infrared sensors consist of two elements: infrared source and infrared detector. Infrared sources include the LED or infrared laser diode. Infrared detectors include photodiodes or phototransistors.

The energy emitted by the infrared source is reflected by an object and falls on the infrared

detector.

2. Passive Infrared Sensor

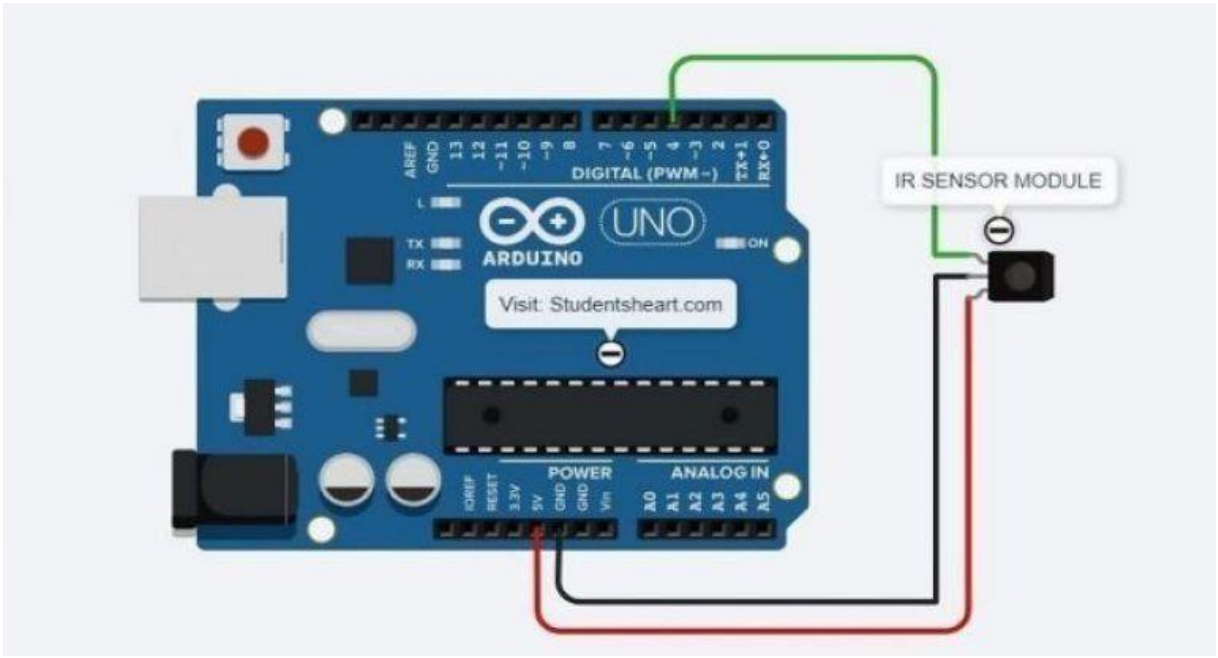
Passive infrared sensors are basically Infrared detectors. Passive infrared sensors do not use any infrared source and detector they are two types: quantum and thermal.

IR Sensor working principle

IR Sensor is consist of two circuits, IR transmitter, and IR receiver. In the transmitter section, IR LED is used and in the Reciever section, a photodiode is used. IR LED transmit Infrared light to an object and then that IR light is bounced back and IR receiver, receives that light and convert it to the electric voltage accordingly.

Interfacing IR sensor with arduino

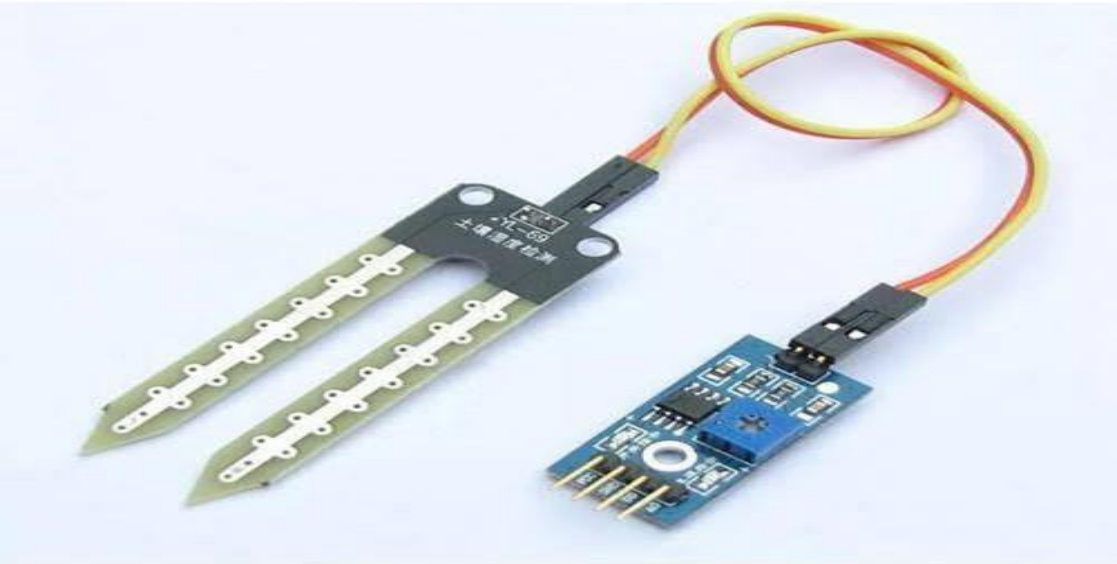
- connect VCC of a module(IR) with Arduino 5vpin
- connect the ground of module with Arduino's Ground
- connect OUT pin of a module with a 4th digital pin of Arduino.



6.3 Moisture Sensor

Soil moisture sensors are designed to estimate soil volumetric water content based on the dielectric constant (soil bulk permittivity) of the soil. The dielectric constant can be thought of as the soil's ability to transmit electricity.

The dielectric constant of soil increases as the water content of the soil increases. This response is due to the fact that the dielectric constant of water is much larger than the other soil components, including air. Thus, measurement of the dielectric constant gives a predictable estimation of water content.



6.4 Ultrasonic Sensors

Use of ultrasonic Sensor:

An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and convert 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 component:The transmitter(which emits the sound using Piezoelectrical crystals. And the receiver(which

encounters the sound after it has travetravelled to and from the target) .Ultrasonic sensors are used as level sensors to detect , monitor, and regulate liquid levels in closed containers(such as vats in chemical factories).

Working of ultrasonic sensor

High level signal is sensent to 10 Microseconds using trigger.

The module sends 40 KHZ signals automatically and then detect whether the pulse is received or not through echo.

If the signal is received, then it is through the high level.the time of high duration is the timegap between sending and receiving the signal is calculated

Ultrasonic sensor distance measurement formula

Distance=(Time× sound speed in air(340 M/S)) /2

Here we have devided the product of speed and time by 2 Because the time is the total time it took to reach the obstacle and return back. Thus the time to reach obstacles is just half the total time taken.

6.5 BUZZER

A buzzer is a small yet efficient component to add sound features to our project/system. It is very small and compact 2-pin structure hence can be easily used on breadboard, Perf Board and even on PCBs which makes this a widely used component in most electronic applications.There are two types are buzzers that are commonly available. The one shown here is a simple buzzer which when powered will make a Continuous Beeeeeeppp.... sound, the other type is called a readymade buzzer which will look bulkier than this and will produce a Beep. Beep. Beep. Sound due to the internal oscillating circuit present inside it. But, the one shown here is most widely used because it can be customised with help of other circuits to fit easily in our application. This buzzer can be used by simply powering it using a DC power supply ranging from 4V to 9V. A simple 9V battery can also be used, but it is recommended to use a regulated +5V or +6V DC supply. The buzzer is normally associated with a switching circuit to turn ON or turn OFF the buzzer at required time and require
interval.

6.6 LED

A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The color of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gap of the semiconductor.White light is obtained by using multiple semiconductors or a layer of light-emitting phosphor on the semiconductor device.

6.7 Servo Motor

What is a Servo Motor?

A servo motor is an electrical device which can push or rotate an object with great precision. If you want to rotate and object at some specific angles or distance, then you use servo motor. It is just made up of simple motor which run through servo mechanism. If motor is used is DC powered then it is called DC servo motor, and if it is AC powered motor then it is called AC servo motor. We can get a very high torque servo motor in a small and light weight packages. Doe to these features they are being used in many applications like toy car, RC helicoptersand planes, Robotics, Machine etc.

Chapter No: 7

IMPLEMENTTION

7.1 IMPLEMENTTION

7.1 Implementation

```
#define ir1 4       //ir sensor
int buzzer=10;
int TRIGPIN=3;
int ECHOPIN=2;

int TRIGPIN2=9;
int ECHOPIN2=8;

int sensor_pin = A0;
int output_value ;
int LED =13;

long duration,cm,inches;
long duration2=0,cm2,inches2;
int   object=0;
//Servo myservo;

void setup() {
  // put your setup code here, to run once:

   Serial.begin(9600);
   pinMode(ir1,INPUT);
   pinMode(buzzer,OUTPUT);

   pinMode(TRIGPIN,OUTPUT);
   pinMode(ECHOPIN,INPUT);

   pinMode(TRIGPIN2,OUTPUT);
   pinMode(ECHOPIN2,INPUT);
   pinMode(LED,OUTPUT);
    delay(2000);
    //myservo.attach(6);

}

void loop() {
  // put your main code here, to run repeatedly:


  object=digitalRead(ir1);
  digitalWrite(TRIGPIN,LOW);
  delayMicroseconds(5);
  digitalWrite(TRIGPIN,HIGH);
  delayMicroseconds(5);
  digitalWrite(TRIGPIN,LOW);
  delayMicroseconds(5);

    pinMode(ECHOPIN,INPUT);
    duration = pulseIn(ECHOPIN,HIGH);
    cm = (duration/2)/29.1;
```

```
  inches = (duration/2)/74;

  Serial.print(inches);
  Serial.print("in, ");
  Serial.print(cm);
  Serial.print("CM");
  Serial.println();
  delay(1000);


 digitalWrite(TRIGPIN2,LOW);
 delayMicroseconds(5);
 digitalWrite(TRIGPIN2,HIGH);
 delayMicroseconds(5);
 digitalWrite(TRIGPIN2,LOW);
 delayMicroseconds(5);


  pinMode(ECHOPIN2,INPUT);
  duration2 = pulseIn(ECHOPIN2,HIGH);
  cm2 = (duration2/2)/29.1;
  inches2 = (duration2/ 2)/74;

  Serial.print(inches2);
  Serial.print("in2, ");
  Serial.print(cm2);
  Serial.print("CM2");
  Serial.println();
  delay(1000);

   if(cm<=10)
  {
    digitalWrite(buzzer,HIGH);
    Serial.println("Wet Dustbin Full");


  }
  else if(cm2<=10)
  {
    digitalWrite(buzzer,HIGH);
    Serial.println("Dry Dustbin Full");
  }

  else
  {
    digitalWrite(buzzer,LOW);
    Serial.println("Dry Dustbin Empty");
  }


digitalWrite(LED,LOW);

if(object==LOW)
{
  output_value = analogRead(sensor_pin);
```

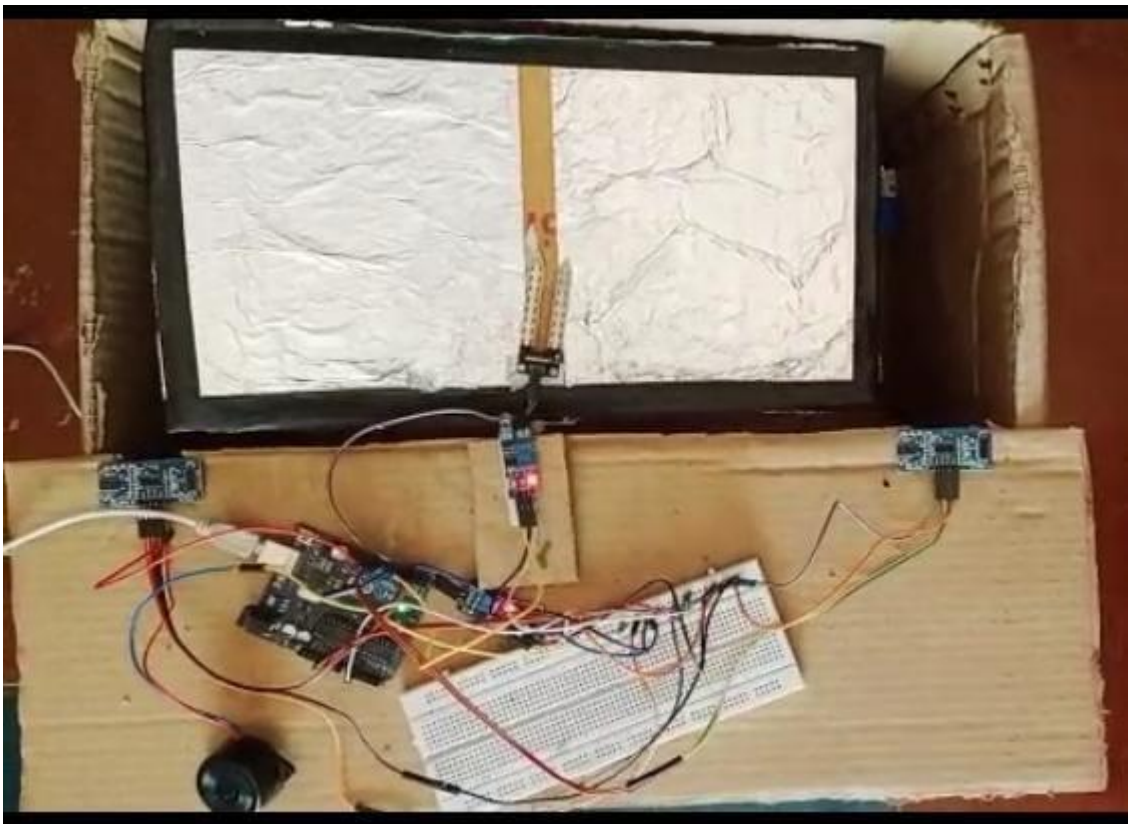
```
  output_value = map(output_value,550,0,0,100);
  Serial.print("Moisute  :");
  Serial.print(output_value);
  Serial.println("%");
  if (output_value > -70)
  {
     //myservo.write(45);
     //delay(5000);
     //myservo.write(87);
     //delay(2000);
    Serial.println("Wet");
    digitalWrite(LED,LOW);
    delay(2000);
  }
  else
  {
    //myservo.write(135);
    //delay(5000);
    //myservo.write(87);
    //delay(2000);
    Serial.println("dry");
    digitalWrite(LED,HIGH);
    delay(2000);
  }

  delay(2000);
 }
}
```

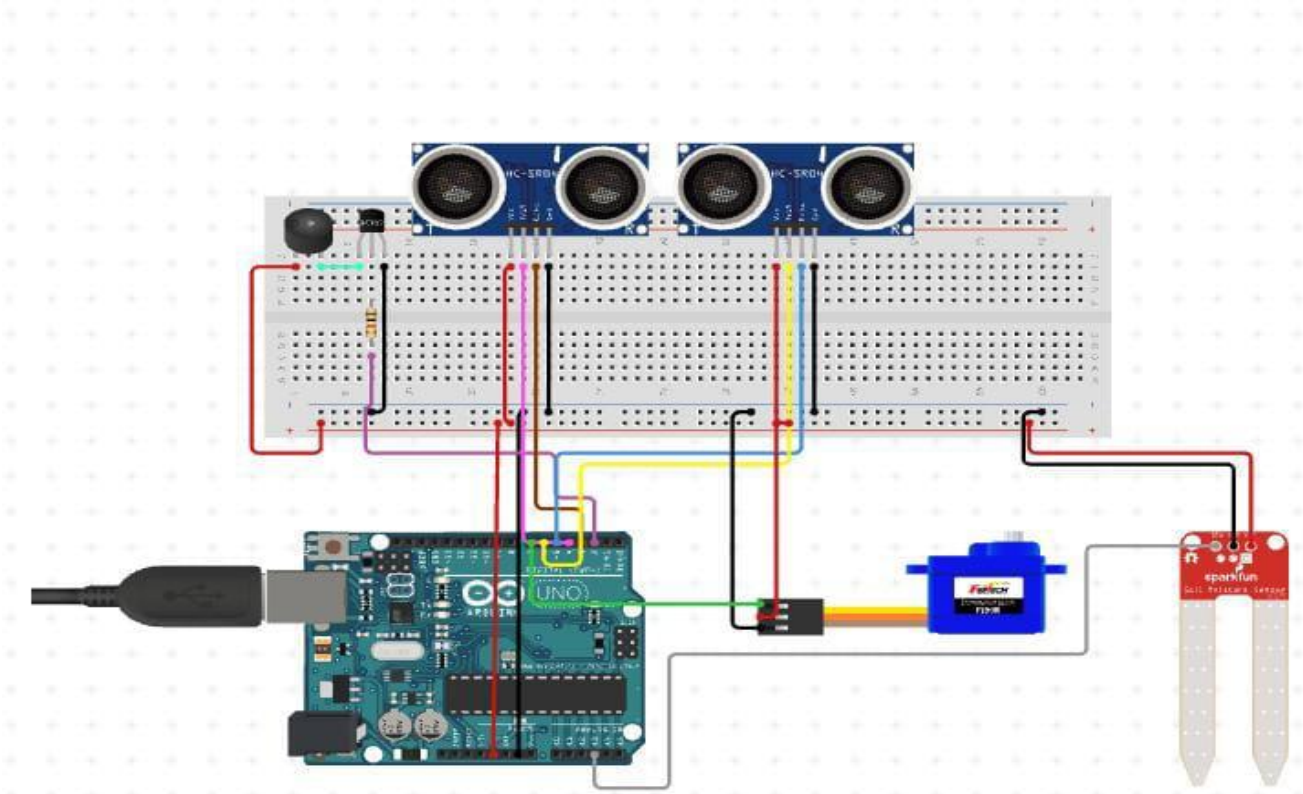
Chapter No: 8

prototype

8.1 Prototype

8.1 Prototype





Chapter No: 9

Conclusion And References

9.1 Conclusion

In this , we have presented a Smart segregation plant to segregate waste into wet waste and dry waste.

9.2 References

YouTube.com