SMART WASTE MANAGEMENT SYSTEM FOR METROPOLITAN CITIES

IBM NALAIYA THIRAN

PROJECT REPORT

Submitted By

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CHAPTER-1

INTRODUCTION

1.1 PROJECT OVERVIEW

Checking, assortment and removal of trash squander is considered as one of the main points of contention in the evolving modern society since its lack of maintenance will leverage negative ecological effects. A dreary technique is the traditional method used for physically controlling and gathering the waste, since it requires a critical human work and assets, which adds greater expenses.

An IoT-based trash checking system utilizing Arduino board and an open IoT stage is presented in this report. The proposed framework includes an Arduino microcontroller, ultrasonic sensor, Transformer. Information from the ultrasonic sensor is obtained by using the Arduino microcontroller.

By utilizing an ultrasonic sensor, the profundity of the trash in the compartment is resolved and the heaviness of the waste receptacle from the heap cell is also estimated. For indicating the information, the screen is utilized.

The Wi-Fi module sends to the web the information portrayed previously. Thing speak and an open IoT discussion is utilized to follow the trash framework. In this framework, the executive can adequately track and plan the waste disposal. In this research work, a model was fabricated and assessed. Thing Speak allows you to aggregate, visualize and analyze live data streams in the cloud.

1.2 PURPOSE

Smart waste management is an innovative approach to handling and collecting waste. Based on IoT (Internet of Things) technology, smart waste management provides data on waste generation patterns and behaviour. This empowers municipalities, cities, and waste collectors to optimize their waste operations, become more sustainable, and make more intelligent business decisions.

The waste sector has traditionally been a static industry. And it is only in recent years that we have started to see modernizations to the ways of working in waste management. With the birth of IoT technology and new innovations becoming commercially available, waste authorities are increasingly looking to smart solutions, as a way of addressing budget cuts and ambitious sustainability targets. Smart waste management is the future of the waste sector. Embedding a data-driven approach into the way we handle waste is the key to creating waste services that are fit for today and tomorrow.

Optimizing your resources and ingraining more sustainable processes into waste services starts with data. Data empower you to move away from assumptions and historic trends and base your waste operations on real-time needs. A smart waste management solution with sensors, a digital platform, intelligent routing, and container tracking provide all the essential elements to transition your waste practices towards greener, cleaner, and smarter pastures.

CHAPTER-2

LITERATURE SURVEY

2.1 EXISTING PROBLEM

2.1.1 IOT-Based Smart Solid Waste Management System:

A Systematic Solid waste management (SWM) is the process of collecting, handling, and disposing of no longer in use solid objects that are discarded

[1]. In today's world, typical solid waste management includes large outdoor waste bins, waste pickup trucks, and scheduled pickup routine by the related party.

[2] Explain that solid waste is categorized into three categories, Each is handled by different authorities. Table 2.1.1 shows the categories of solid waste and the related party that's responsible for handling the waste.

Table 2.1.1 Category of Solid Waste and Related Authorities

Category	Related Authorities
Municipal solid waste	Ministry of Housing and Local Government
Hazardous waste	Department of Environment
Clinical waste	Ministry of Health

2.2 REFERENCES

[1] IOT-Based Smart Solid Waste Management System A Systematic (Nor Azman Ismail, Nurul Aiman Ab Majid, Shukur Abu Hassan), June 2019

[2] IOT based smart garbage detection system link (Abhishek Dev, Maneesh Jasrotia, Muzammil Nadaf, Rushabh Shah), December 2016

[3] Waste management using IOT (Sapna Suryawanshi, Rohini Bhuse, Megha Gite , Dhanashri Hande), March 2018

[4] Smart Soild Waste Management (Mohd Helmy Abd Wahab), May 2008 (RFID)

[5] Smart Solid Waste Management System Using IOT (M.P. Sureshkumar, S.Pavithran), November 2019

2.3 PROBLEM STATEMENT DEFINITION

Today big cities around the world are facing a common problem, managing the city waste effectively without making city unclean. Today's waste management systems involve a large number of employees being appointed to attend a certain number of dumpsters this is done every day periodically.

This leads to a very inefficient and unclean system in which some dumpsters will be overflowing some dumpsters might not be even half full. This is caused by variation in population density in the city or some other random factor this makes it impossible to determine which part needs immediate attention.

Here a waste management system is introduced in which each dumpster is embedded in a monitoring system that will notify the corresponding personal if the dumpster is full. In this system, it is also possible to separate wet and dry waste into two separate containers. This system provides an effective solution to the waste management problem

CHAPTER-3

IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS

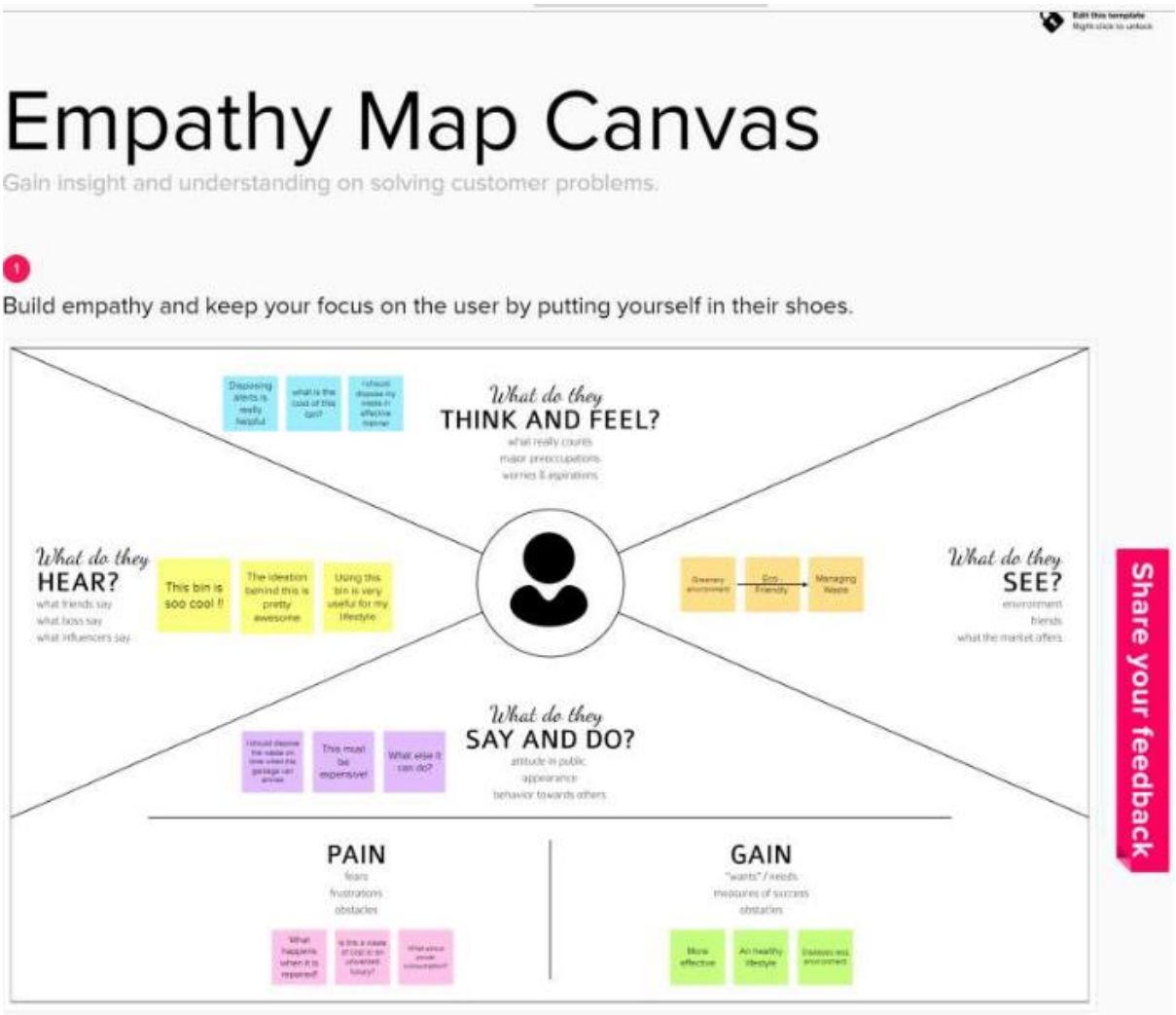


Fig 3.1 Empathy Map Canvas

3.2 IDEATION & BRAINSTORMING

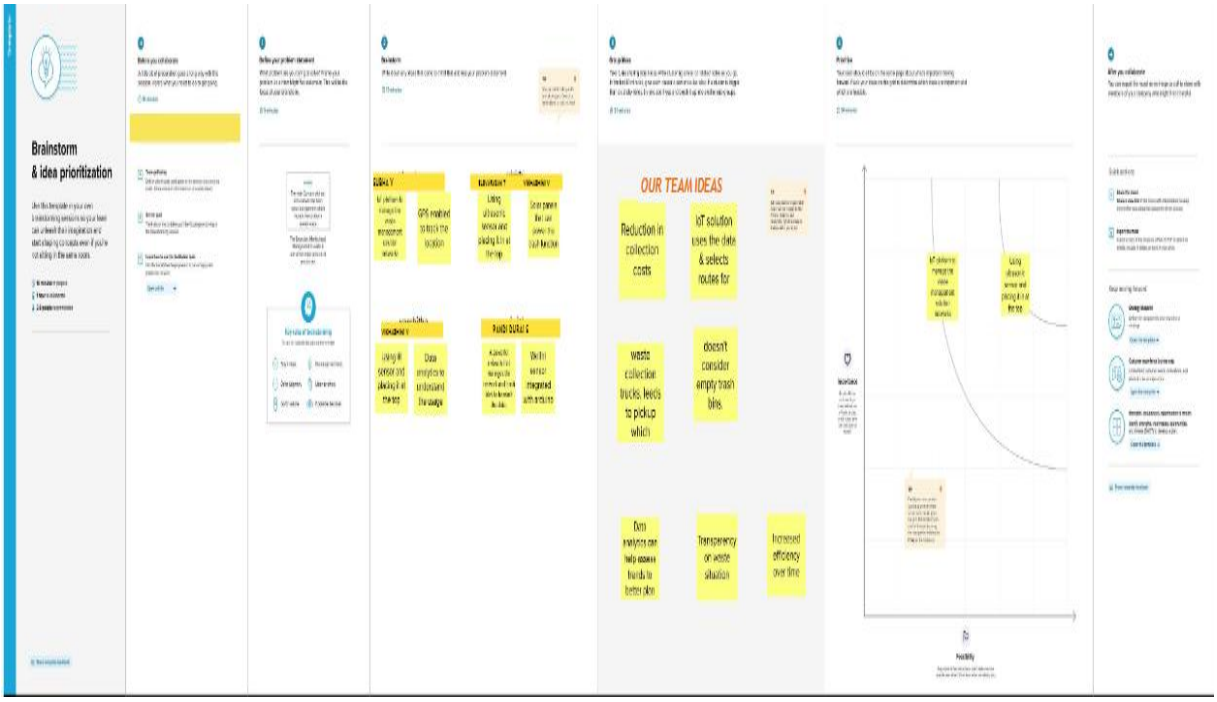


Fig 3.2 Ideation & Brainstorming

3.3 PROPOSED SOLUTION

3.3.1 EXECUTIVE SUMMARY:

Checking assortment and removal of trash squander is considered as one of the main points of contention in the evolving modern society since its lack of maintenance will leverage negative ecological effects. A dreary technique is the traditional method used for physically controlling and gathering the waste, since it requires a critical human work and assets. An IOT based trash checking system will reduce the work of human.

3.3.2 PROBLEM STATEMENT:

Develop a smart waste management system using internet of things that give the alert signal to manage the garbage bin.

3.3.3 PROPOSED SOLUTION:

- The proposed system should be able to automated the waste from the garbage bin and management of overall collection process using internet of things.
- Whenever the garbage bin is filled it send details about the bin to the authorized person.
- The received signal indicate the smart waste monitoring system is doing well.

3.3.4 NOVELTY / UNIQUENESS:

This project is established in prototype model for check our project is going to well or not. We fix a buzzer for intimating the public to clean the dust bin and also send a signal to authorized person to clean the dustbin.

3.3.5 SOCIAL IMPACTS/CUSTOMER SATISFACTION:

- Waste in different forms such as solid waste, gaseous waste and liquid waste increases due to population increase, urbanization, and industrialization and affect the globe. Waste management involves activities such as reuse, recycling and reduces waste generation and other

strategies to combat the effect of waste generation due to increasing population and industrialization.

- Monitoring is one of the key functions of waste management, as it is needed to address the issues faced by waste management, which includes waste generation, waste collection, transportation of waste, waste treatment and waste disposal processes.

3.3.6 BUSINESS MODEL:

- Solid Waste, comprising the Company's waste collection, transfer, recycling and resource recovery, and disposal services, which are operated and managed locally by the Company's various subsidiaries, which focus on distinct geographic areas.
- Corporate and Other, comprising the Company's other activities, including its recycling brokerage services, as well as various corporate functions.

3.3.7 SCALABILITY OF SOLUTION:

- Each sensor has its own independent area of responsibility the way system is designing each sensor is responsible for specific area of waste bin and there is no overlap between area of various sensor.
- The chosen ultrasonic sensor comes in multiple version of beam range and width. These model provide the basic functionalities and logic of measurement.

3.4 PROBLEM SOLUTION FIT

3.4.1 CUSTOMER SEGMENT :

Public people

Authority people

Industrialist people

3.4.2 CUSTOMER NEEDS:

User friendly device Easy to operate Free of cost Need good service

3.4.3 CUSTOMER USE:

The customer will use this technology in smart way and it will give the trigger authorised to clean the bin regularly so it will keep the area clean

3.4.4 PROBLEM ROOT CAUSE:

- The bin was not cleaned regularly
- The bin overflow will pollute the environment

3.4.5 BEHAVIOUR:

The iot bins can be monitored regularly

3.4.6 JOBS TO BE DONE:

- The authority will notify whenever the bin is filled
- The bin will be cleaned when it will partially filled

CHAPTER-4

REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS

Functional requirement Serial Number.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	➢ User needs to login ➢ Registration needs to be done by giving their mobile number and locality
FR-2	Identify bin location	Identify the location of dustbin using Google maps
FR-3	Monitoring details	➢ This process gives a brief description about the bins. ➢ Using Capacitance sensor the level of the bin can be measured
FR-4	Buzzer	➢ Buzzer should alert the public people by giving the alarm ➢ If the buzzer is alert means it will send notification to authorized persons

4.2 NON-FUNCTIONAL REQUIREMENTS

Functional requirement Serial Number.	Non-Functional Requirement	Description
NFR-1	Usability	IoT device verifies that usability is a special and important perspective to analyse user requirements, which can further improve the design quality.
NFR-2	Security	We propose a Secure Incentive based Waste monitoring system to encourage garbage segregation at the initial level.
NFR-3	Reliability	Smart waste management is also about creating better working conditions for waste collectors and drivers. Instead of driving the same collection routes and servicing empty bins, waste collectors will spend their time more efficiently, taking care of bins that need servicing.
NFR-4	Performance	The Smart Sensors use ultrasound technology to measure the fill levels. focuses on solving the previously mentioned solid waste management problems using sensors, intelligent monitoring systems, and mobile applications.
NFR-5	Availability	By developing & deploying resilient

		hardware and beautiful software we empower cities, businesses, and countries to manage waste smarter
NFR-6	Scalability	Using smart waste bins reduce the number of bins inside town , cities as we are monitoring the whole 24 hours of 7days Smart waste bins are more cost efficient and scalability

CHAPTER-5

PROJECT DESIGN

5.1 DATA FLOW DIAGRAMS

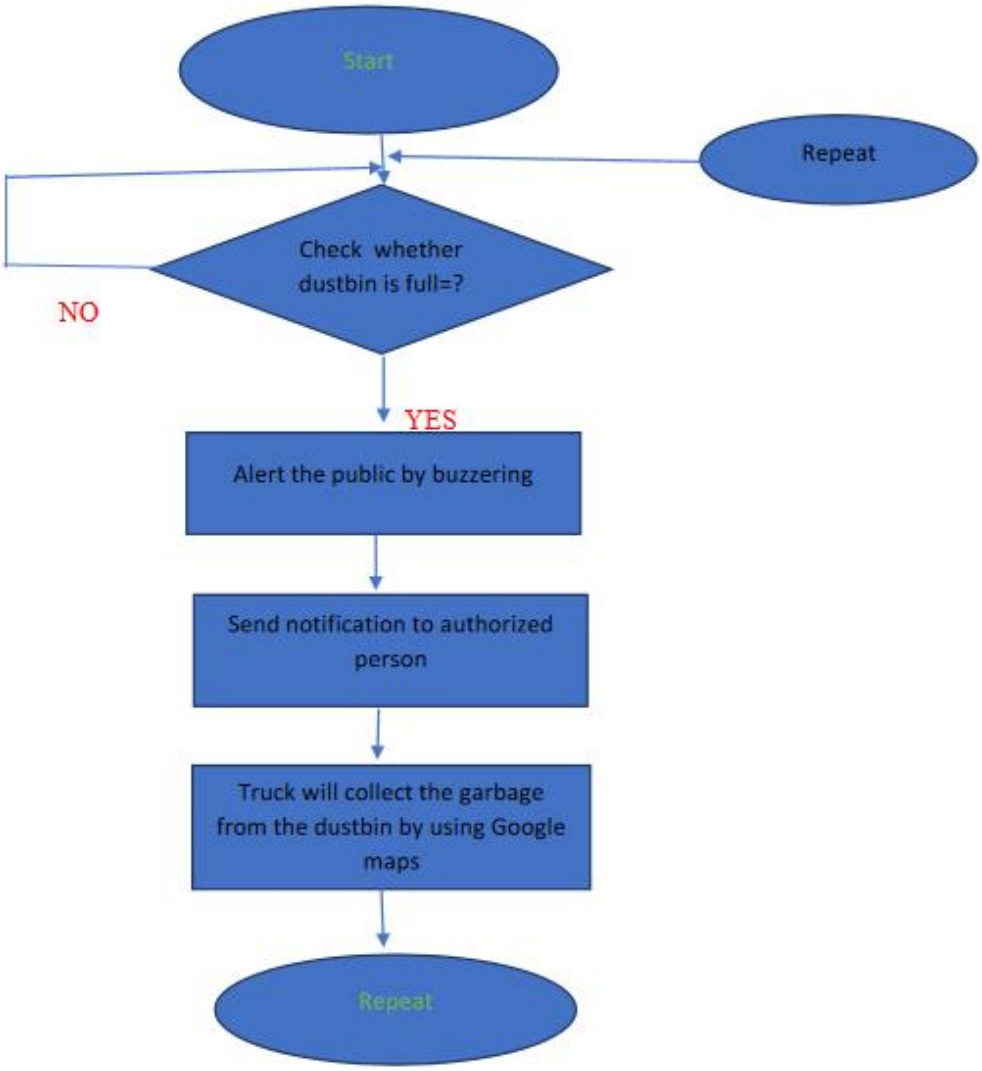


Fig 5.1 Data Flow Diagrams

5.2 SOLUTION & TECHNICAL ARCHITECTURE

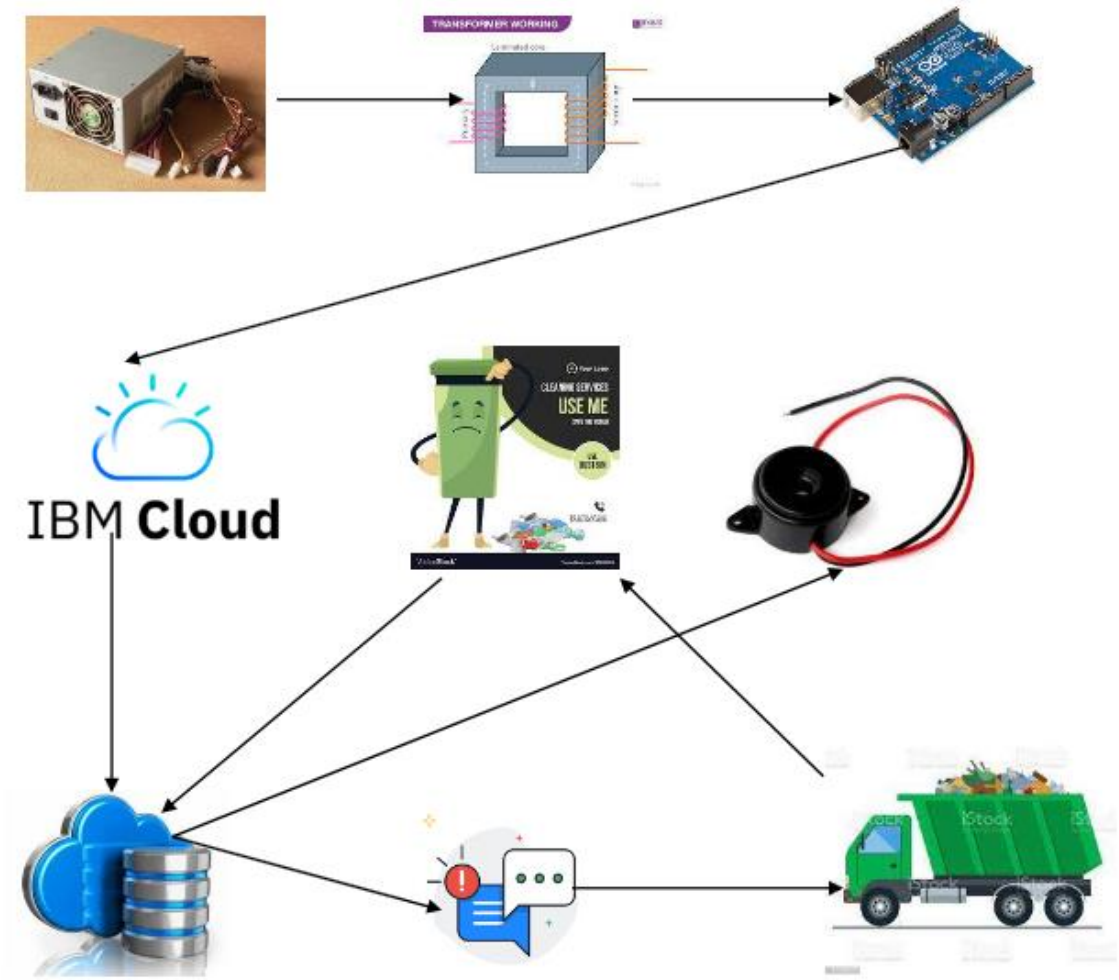


Fig 5.2 solution & technical architecture

5.3 USER STORIES

PHASES	Motivation	Information gathering	Analyzes various products	chooses the most efficient product	Payment
Actions	wants to reduce the tension about the waste management	wants to choose an efficient product to get better waste management	Available other products are Normal Dustbin	Smart dustbins are more efficient compared to normal dustbin	After the product satisfication
Touch points	The buyers feel excited	After installation the government no need to worry much about the waste management	The user amuse by thevarious typesof product available.	After getting this the government won't worry about the safety	After find the product worthy, the government get's it.
Customer Feeling					
Customer Thoughts	Customer thinks it will helpful for better status of health condition	Customer thinks it will leads long duration	Customer thinks alter solution willbe available	The product choosing will be easy and comfortable for them	They think the productwill be userfriendly
Opportunities	The customer gets the better waste management	The customer known about the process of product	The customer will be aware of other product	The customer comes to know which product is best one	The customer will enjoy the journey

Fig 5.3 user stories

CHAPTER-6

PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING & ESTIMATION

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Point	Priority	Team Members
Sprint-1	Login	USN-1	As a Admin I need to give user id and pass code for ever workers over there in municipality	10	High	Pandi durai, Elavarasn
Sprint-2	Dashboard	USN-2	Attach Google Map to track the location of the dustbin	20	Low	Elavarasn, Pandi durai
Sprint-3	Dashboard	USN-3	Data will be stored in the IBM cloud and Database for knowing of dustbin status	20	Medium	Vikashini, Subha
Sprint-4	Dashboard	USN-4	If the dustbin is fill means buzzer will alert the public and send notification to authorized person to collect the garbage	20	High	Subha, Vikashini

6.2 SPRINT DELIVERY SCHEDULE

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov2022	20	05 Nov2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov2022	20	12 Nov2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov2022	20	19 Nov2022

Velocity:

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

CHAPTER-7

CODING & SOLUTIONING

7.1 FEATURE-1

7.1.1 Inserting Google map:

Google Maps has evolved over the years from a simple virtual map to a place to explore local garbage bin, plan your detailed commute, and uncover new suggested locations.

The platform is more than a map, it is a place of discovery.

Google Maps offers numerous marketing advantages for businesses. But first, let's take a look at what recent updates and features have transformed Google Maps into such a powerful marketing tool.

Source code:

```
import gmplot
import webbrowser
import googlemaps
import gmaps
import time
from make_api_orders import get_routes_from_txt
```

7.2 FEATURE-2

7.2.1 Arduino IDE

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Source code

```
// include the library code:

#include <LiquidCrystal.h>

#include <SoftwareSerial.h>

#define USE_ARDUINO_INTERRUPTS true    // Set-up low-level interrupts for most acurate BPM math.

#define RX 2

#define TX 3
```

CHAPTER-8

TESTING

8.1 TEST CASES

Steps to execute	Test data	Expected result	Status	Executed By
As an user, We can access the information about the smart bin level and the number of bins are filled in the area	Smart bin level and weight in percentage	Garbage levels and range of Visibility displayed dynamically	Pass	Subha V Vikashini V
1.Check whether the bins are empty or full 2.Displayed as per Situation Choose the shortest route to collect the garbage	If the bin is full Indicate -"BIN IS FULL!!" Or else "BIN IS IN NORMAL LEVEL"	Displayed Instructions	Pass	Pandidurai S Elavarasan T
1.Take the location data 2. Find the shortest route for the truck to collect the garbage	Garbage bin's location data	Indication for collecting the garbage as per pinned location	Pass	Pandidurai S Elavarasan T
Take data's from all require factors and showed response in display	Displayed instructions as per the situation	Showed message for precautionary responses	Pass	Subha V Vikashini V

8.2 USER ACCEPTANCE TESTING

8.2.1 Purpose of the document

Purpose of Document The purpose of this document is to briefly explain the test coverage and open issues of the web UI which provides “Clean and green environment“ at the time of the release to User Acceptance Testing (UAT).

8.2.2 Test Case Analysis

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	12	0	0	12
Client Application	30	0	0	30
Security	2	0	0	2

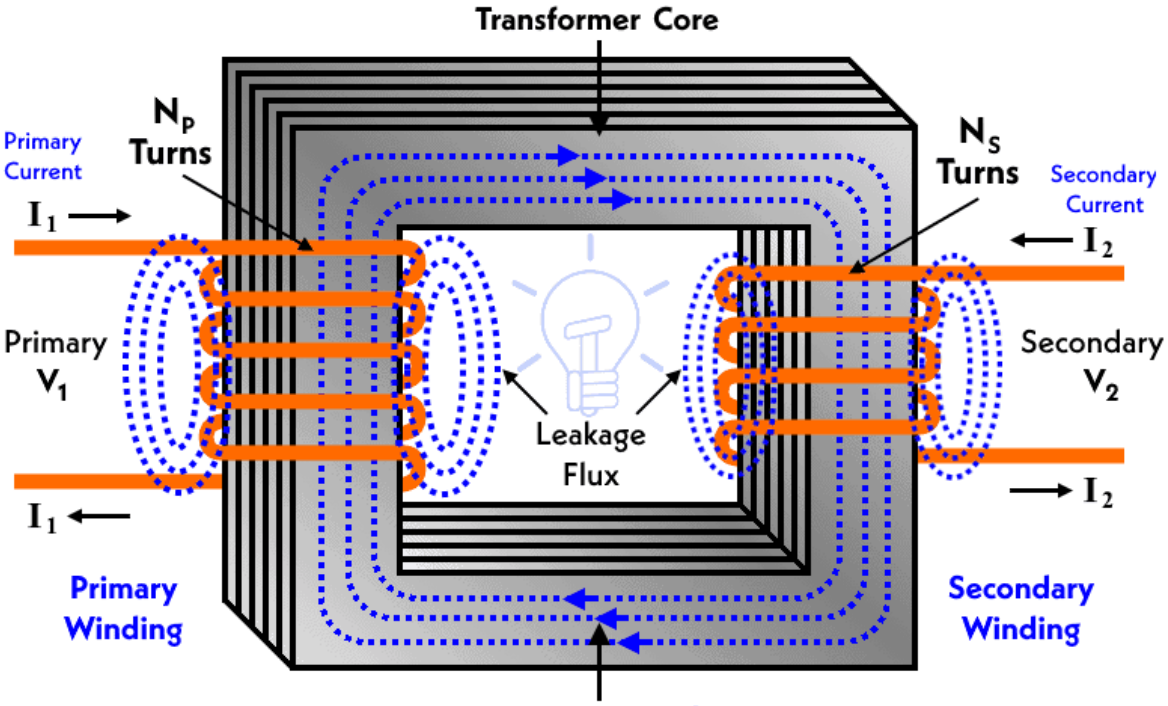
CHAPTER-9

RESULTS

9.1 PERFORMANCE METRICS

9.1.1 TRANSFORMER

Fig 9.1.1 TRANSFORMER



Transformers change voltage through electromagnetic induction; i.e., as the magnetic lines of force (flux lines) build up and collapse with the changes in current passing through the primary coil, current is induced in another coil, called the secondary. The secondary voltage is calculated by multiplying the primary voltage by the ratio of the number of turns in the secondary coil to the number of turns in the primary coil, a quantity called the turns ratio. A transformer is a device that transfers electrical energy from one circuit to another through inductively coupled wires. A changing current in the first circuit (the primary) creates a changing magnetic field; in turn, this magnetic field induces a changing voltage in the second circuit (the secondary). By

adding a load to the secondary circuit, one can make current flow in the transformer, thus transferring energy from one circuit to the other. The secondary induced voltage VS is scaled from the primary VP by a factor ideally equal to the ratio of the number of turns of wire in their respective windings:

$$\frac{V_S}{V_P} = \frac{N_S}{N_P}$$

9.1.2 POWER SUPPLY

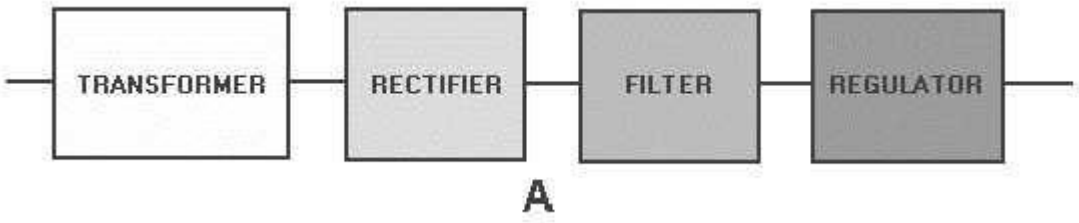


Fig 9.1.2 power supply

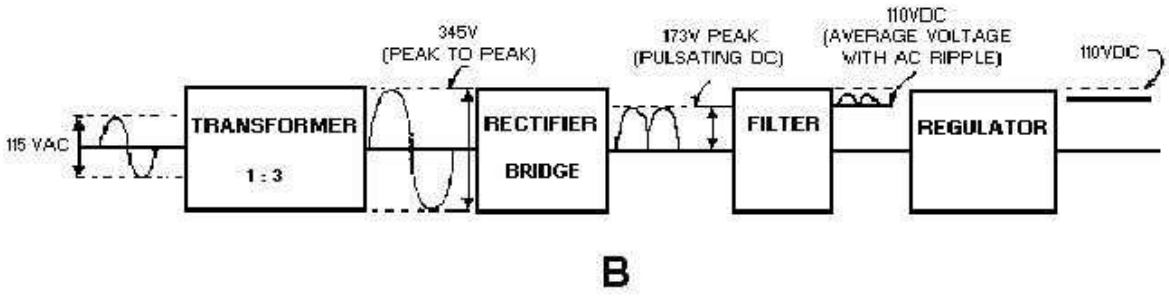


Fig 9.1.2 power controller

Fig 9.1.2 Arduino Uno

A power supply (sometimes known as a power supply unit or PSU) is a device or system that supplies electrical or other types of energy to an output load or group of loads. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.

9.1.3 RECTIFIER

A rectifier is an electrical device that converts alternating current to direct current or at least to current with only positive value, a process known as rectification. Rectifiers are used as components of power supplies and as detectors of radio signals.

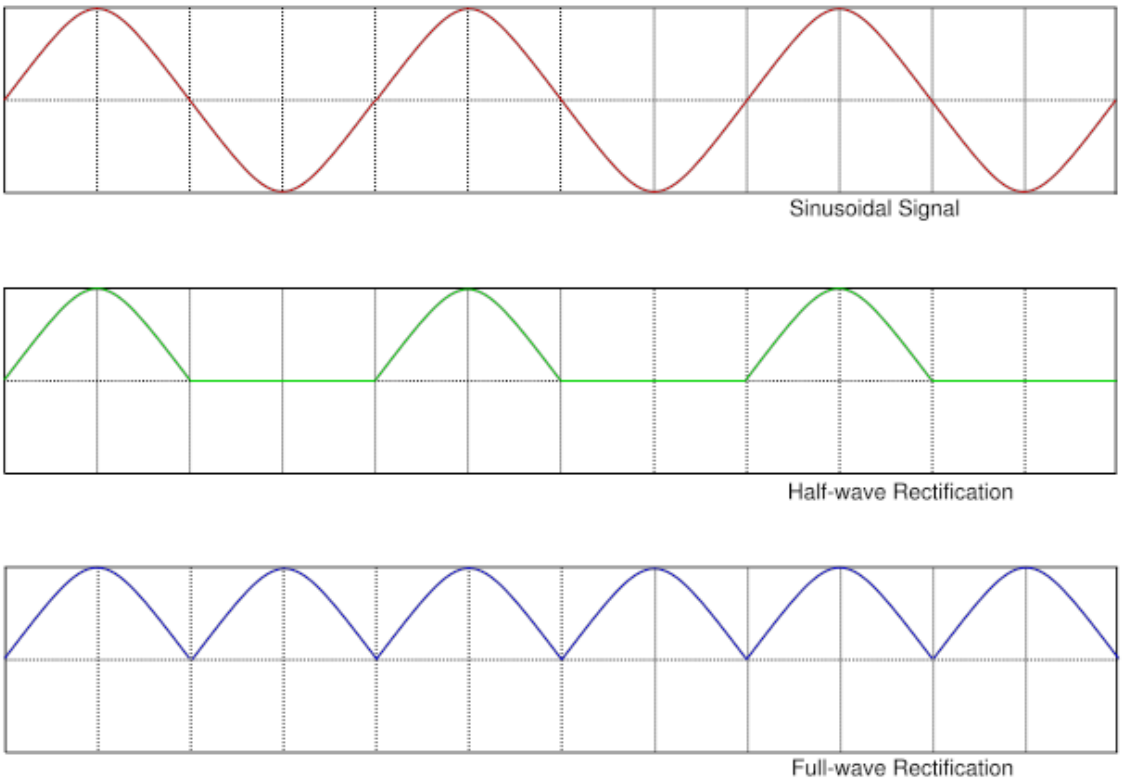


Fig 9.1.3 rectifier

9.1.4 ARDUINO

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing. Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike. Arduino was born at the Ivrea Interaction Design Institute as an easy tool for

fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments.

CHAPTER-10

ADVANTAGES

- It saves time and money by using smart waste collection bins and systems equipped with fill level sensors. As smart transport vehicles go only to the filled containers or bins. It reduces infrastructure, operating and maintenance costs by upto 30%.
- It decreases traffic flow and consecutively noise due to less air pollution as result of less waste collection vehicles on the roads. This has become possible due to two way communication between smart dustbins and service operators.
- It keeps our surroundings clean and green and free from bad odour of wastes, emphasizes on healthy environment and keep cities more beautiful.
- It further reduces manpower requirements to handle the garbage collection process.

DISADVANTAGES

- System requires more number of waste bins for separate waste collection as per population in the city. This results into high initial cost due to expensive smart dustbins compare to other methods.
- Sensor nodes used in the dustbins have limited memory size.
- It reduces man power requirements which results into increase in unemployments for unskilled people.
- The trainining has to be provided to the people involved in the smart waste management system.

CHATPER-11
CONCLUSION

Monitoring the fullness of bins through the use of sensors, it is possible to achieve a more efficient system than the current existing. Our idea of “Smart waste management system”, mainly concentrates on Monitoring the waste management, providing a smart technology for waste system, avoiding human intervention, reducing human time and effort and which results in healthy and waste ridden environment. The proposed idea can be implemented for smart cities where the residents would be busy enough with their hectic schedule and wouldn’t have enough time for managing waste. The bins can be implemented in a city if desired where there would be a large bin that can have the capacity to accumulate the waste of solid type for a single apartment. The cost could be distributed among the residents leading to cheaper service provision.

CHAPTER-12

FUTURE SCOPE

There are several future works and improvements for the proposed system,

1. Change the system of user's authentication and atomic lock of bins which would help in securing the bin from any kind of damage or theft.
2. Concept of green-points that would encourage the involvement of the residents or the end users making the idea successful and helping to achieve joined efforts for the waste management and hence fulfilling the idea of Swachch Bharath.
3. Having a case study or data analytics on the type and times the waste is collected on the type of days or season making the bin filling predictable and removing the dependency on electronic components and fixing the coordinates.
4. Improving graphical interfaces for the Server and complete Android applications has possibility of extending the system adding other use cases and applications for smart cities.
5. Moreover, the proposed solution is flexible and decoupled with respect to the determination of optimal number of bins and vehicles or to the algorithm that define the best route for vehicles.

Therefore, future works can be made in the study of models that offer the best results in terms of decision-making.

CHAPTER-13

APPENDIX

13.1 SOURCE

```
// include the library code:
#include <LiquidCrystal.h>
#include <SoftwareSerial.h>
#define USE_ARDUINO_INTERRUPTS true    // Set-up low-level interrupts
for most acurate BPM math.

#define RX 2
#define TX 3

// initialize the library by associating any needed LCD interface pin
// with the arduino pin number it is connected to
//const int rs = 13, en = 12, d4 = 11, d5 = 10, d6 = 9, d7 = 8;
//LiquidCrystal lcd(rs, en, d4, d5, d6, d7);

#include <Wire.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27, 16, 2);

String AP = "S@THYA IPHONE";       // CHANGE ME
String PASS = "sathyanarayana"; // CHANGE ME
String API = "4M78AALUC1W80V0S";   // CHANGE ME
String HOST = "api.thingspeak.com";
String PORT = "80";
String field1 = "field1";
String field2 = "field2";
String field3 = "field3";
String field4 = "field4";
int countTrueCommand;
int countTimeCommand;
boolean found = false;

const int triggerpin = 4;     //Connect the trigger pin at pin 2
const int echopin = 5;


long time;                  //Variable for storing the time traveled
int S;                      //Variable for storing the distance covered
```

```
int inch;
//int ir_sensor1 = A0;
//int ir_sensor2 = A1;
//int thermister = A2;
int buzzer = 7;
SoftwareSerial esp8266(RX, TX);
void setup()
{
  //Serial.begin(9600);
  esp8266.begin(115200);
  //lcd.begin(16, 2);
  lcd.init();
  lcd.backlight();

//  pinMode(ir_sensor1, INPUT);
//  pinMode(ir_sensor2, INPUT);
  //pinMode(panic_switch, INPUT_PULLUP);
 pinMode(buzzer, OUTPUT);
 // pinMode(led, OUTPUT);
  pinMode(triggerpin, OUTPUT);  //Setting the triggerpin as output pin
  pinMode(echopin, INPUT);

  lcd.setCursor(0, 0);
  lcd.print("SMART DUSTBIN");
  lcd.setCursor(0, 1);
  lcd.print("    SYSTEM      ");
  delay(2000);
  lcd.setCursor(0, 0);
  lcd.print("CONNECTING...   ");
  lcd.setCursor(0, 1);
  lcd.print("                ");
  sendCommand("AT", 5, "OK");
  sendCommand("AT+CWMODE=1", 5, "OK");
  sendCommand("AT+CWJAP=\"" + AP + "\",\"" + PASS + "\"", 20, "OK");
  lcd.clear();
}
 void loop()
 {
digitalWrite(triggerpin, LOW);
delayMicroseconds(2);
digitalWrite(triggerpin, HIGH); //Setting the triggerpin high for 10us to
generate a wave
delayMicroseconds(10);
```

```
digitalWrite(triggerpin, LOW);
time = pulseIn(echopin, HIGH); //Setting the echopin high to receive the wave
S= time*0.034/2;                //Calculating the distance traveled in cm
inch = time*0.0133/2;
delay(20);
lcd.setCursor(0,1);
lcd.print("LVL VALUE:");
lcd.print(inch);
//Serial.print(inch);
lcd.print(" inc");
  lcd.setCursor(0,0);             // Sets the location at start
  lcd.print("LEVEL:");
  if (inch < 2)
  {
    lcd.setCursor(7,0);             // Sets the location at start
    lcd.print("FULL ");
    digitalWrite(buzzer, HIGH);
  }
   else
   {
    lcd.setCursor(7,0);             // Sets the location at start
    lcd.print("NRML ");
    digitalWrite(buzzer,LOW);
    }

//  if (inch < 10 || level2 == 1 || level3 == 1)
//  {
//    digitalWrite(buzzer, HIGH);
//   delay(10);
//  }
//   else
//   {
//    digitalWrite(buzzer, LOW);
//    }
  //String getData = "GET /update?api_key=" + API + "&" + field1 + "=" +
String(inch) + "&" + field2 + "=" + String(level2)+ "&" + field3 + "=" +
String(level3);
    String getData = "GET /update?api_key=" + API + "&" + field1 + "=" +
String(inch);
   sendCommand("AT+CIPMUX=1", 2, "OK");
  sendCommand("AT+CIPSTART=0,\"TCP\",\"" + HOST + "\"," + PORT, 3,
"OK");
  sendCommand("AT+CIPSEND=0," + String(getData.length() + 4), 2, ">");
```

```
  esp8266.println(getData); delay(1); countTrueCommand++;
  sendCommand("AT+CIPCLOSE=0", 2, "OK");
}

void sendCommand(String command, int maxTime, char readReplay[]) {
  Serial.print(countTrueCommand);
  Serial.print(". at command => ");
  Serial.print(command);
  Serial.print(" ");
  while (countTimeCommand < (maxTime * 1))
  {
    esp8266.println(command);//at+cipsend
    if (esp8266.find(readReplay)) //ok
    {
      found = true;
      break;
    }

    countTimeCommand++;
  }

  if (found == true)
  {
    Serial.println("OYI");
    countTrueCommand++;
    countTimeCommand = 0;
  }

  if (found == false)
  {
    Serial.println("Fail");
    countTrueCommand = 0;
    countTimeCommand = 0;
  }
```

13.2 GitHub & Project Demo Link

Table 13.2 GitHub Link

Content	Link
GitHub	https://github.com/IBM-EPBL/IBM-Project-16394-1659613024