REWARD BASED INTELLIGENT GARBAGE AND MANAGEMENT SYSTEM

A Project Report

submitted by

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DECLARATION

We undersigned hereby declare that the project report **REWARD BASED INTELLIGENT GARBAGE AND MANAGEMENT SYSTEM**, submitted for partial fulfilment of the requirements for the award of degree of Bachelor of Technology of the Dr. APJ Abdul Kalam Technical University, Lucknow is a bonafide work done by us under supervision of (Dr Dharmendra Dixit and Mr Prashant Pandey). This submission represents my ideas in my own words and where ideas or words of others have been included, we have adequately and accurately cited and referenced the original sources. We also declare that We have adhered to ethics of academic honesty and integrity and have not misrepresented or fabricated any data or idea or fact or source in my submission. We understand that any violation of the above will be a cause for disciplinary action by the institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained. This report has not been previously formed the basis for the award of any degree, diploma or similar title of any other University.

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CERTIFICATE

This is to certify that the Report entitled "**REWARD BASED INTELLIGENT GARBAGE AND MANAGEMENT SYSTEM**" submitted by "Abhishek Nigam, Vinay Prajapati, Anjali Gautam, Arhan Shekhar, Ratnesh Chaudhary" to the Dr. APJ Abdul Kalam Technical University, Lucknow in partial fulfilment of the requirements for the award of the Degree of Bachelor of Technology in Electronics Engineering is a bonafide record of the project work carried out by him/her under my/our guidance and supervision. This report in any form has not been submitted to any other university or Institute for any purpose.

Dharmendra Dixit

Signature   Signature

Dr. Dharmendra Dixit   Mr. Prashant Pandey

Signature of Head of Department with seal

Abstract

Clean and healthy environment is the need of the hour where overflowing garbage bins have been a cause of concern for the residents of the developing countries. With increase in population, the cleanliness with respect to garbage management is degrading tremendously. Open and overflowing containers prove to be a breeding ground for germs. Traditionally municipal corporations operate on weekly routes to pick up trash only on some of the designated days of the week, regardless of whether the containers are full or not. As a result of rapid growth of technology, life of mankind has got automated. One of the major contributors to this automation is Internet of Things, also known as IoT. This idea is based on the mutual working of IoT and cloud server. Sensors installed under the lid of the trash cans compute the distance between the lid of the can and the garbage level. Using this data when the trash level reaches 70% of the total capacity, a message from the trash can, will be sent to the servers notifying them that the trash can is full. Then the municipal corporations can send vehicles only to those areas where the trash can is full, thereby saving time as well as fuel due to optimized route for garbage collection instead of visiting all the blocks to check each trash can individually. There is no need to install new trash cans for this purpose, instead this technology can be implemented into the already existing trash cans to bring down the capital investment. Thus, a smart and cost effective equipment like this would be beneficial in the long run.

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INTRODUCTION

Dustbin is the storage container used for disposing waste by each and every person in the world. The main thing they look in their surroundings for disposing waste is the Dustbin. Smart Dustbin is just a normal bin where everyone can dispose of waste but integration of some hardware components is done for more efficient use of it. Smart Dustbin is integrated with some hardware components such as Arduino, ESP8266, Servo Motor, Ultrasonic sensors, RF-Id, inductive proximity sensor. In RBIGS we get rewards for every limited disposal in a day by verifying with RF-ID and its tag, ultrasonic sensor counts the number of disposals also alert when the dustbin is 70% filled. The alert notification is sent by ESP8266. The rewarded data is collected on portal of RBIGS, the user can simply check via login and also redeem it.

LITERATURE REVIEW

Traditional Method

First is the traditional method or the normal use of Dustbin in our daily life. each and every person in the world disposes the waste in the dustbin and if the dustbin becomes full, he empties the waste inside the bin and again uses the same Dustbin. This is the basic use of a normal dustbin where no components are used, no coding is done and where everything is manual i.e. everything is done by hand No Batteries, no electronic components such as Arduino, ESP8266 are used.

The advantages of using this method of disposal is the waste will be disposed of in the bin and emptying the bin is easy as there are no electronic components used

The various disadvantages are If the maintenance of the bin is not proper then the bin gets a stinky smell. If the bin is not emptied immediately after it gets full then various flies, mosquitoes and other insects will be around it which leads to a cause of various diseases. If the bin does not have a lid then the waste is over flowed out of the causing damage to the environment.

Fig. Traditional dustbin [6.1]

The various disadvantages are If the maintenance of the bin is not proper then the bin gets a stinky smell. If the bin is not emptied immediately after it gets full then various flies, mosquitoes and other insects will be around it which leads to a cause of various diseases. If the bin does not have a lid then the waste is over flowed out of the causing damage to the environment. [3.1]

Second Method

The second method is the use of dustbin with different segregations like green and blue bins which are placed together or the dustbin where only recyclable waste should be disposed. This method also has the same advantages and disadvantages as mentioned above because this method also does not use any hardware components or any electronic items like the above method. Only the bins are segregated in many types indicating which waste should be disposed in a particular bin. [3.2]

Fig. Different types of bins for different waste materials [6.2]

Third Method

The third method is the Smart Dustbin which uses electronic components like Arduino, Servo Motor, Ultrasonic Sensor and GSM module. In this the code for opening the dustbins lid and sending notifications to a mobile by using GSM module is interfaced in Arduino and the GSM module. This smart dustbin is an effective and efficient one when compared with the above dustbins. This smart dustbin works in the following manner:

The ultrasonic sensor is present at the front side of the dustbin and this sensor is linked to the lid of the dustbin and the ultrasonic sensor to Arduino. The ultrasonic sensor detects human hand and waste when the hand and the waste are placed in front of that sensor and the lid of

that dustbin opens and the waste is put into it. There is another ultrasonic sensor present inside the dustbin where the height of the waste inside the dustbin is measured and this distance is sent as the notification using GSM module to a mobile phone indicating that the dustbin is full or not.

The advantages in this method are as follows: The waste is stored in a dustbin. Various electronic components are used in this making this dustbin as Smart Dustbin. This dustbin automatically opens the lid of the dustbin upon detection of the human hand and waist without being able to touch the dustbin which is very hygienic. This dustbin also sends notifications to the mobile which tells us whether the dustbin is full or not. Considering the advantages and being more efficient than the above two methods this dustbin also has some disadvantages.

The disadvantages in this method are as follows: The mobile should have a good signal of a carrier to receive notifications very fast, if the mobile is not reachable or a good signal is not available then notifications sent will not be received and the dustbin will not be cleaned or emptied. Multiple users share the same bandwidth; with enough users the transmission can encounter interference. The radiation is considered to be more harmful than Wi-Fi's radiation. [3.3]

Fig. Physical appearance of the Smart Bin [6.3]

The garbage system what we have today is a system which provides job for more than millions of people around the world. This prevailing system which has evolved much from road side garbage dumping system, where people used to dump their garbage on the road side which also creates a buzz among the society due to difference of opinions and the ill effects of it, to a little civilised roadside garbage bin dumping system in which people are advised to put their garbage only in the garbage bin kept at the side of a road. The largest cost in waste management is the physical garbage collection from residential and commercial customers, says Brian Sheridan, Ph.D., Director of Odour Monitoring Ireland, a provider of analytic and process engineering services. Also, in this system the garbage collection is done on a periodic basis. A garbage truck comes on particular days in a week and collects the garbage in the area and goes to the landfill. In some cases, the garbage from a bin is not collected if the truck is already full with collection from the previous garbage bins. Like this after having some experiences with the current prevailing system we now are able to site out some of the defects underlying within it. Some of them are;

a) We cannot control the amount of garbage that people put into the garbage bin, even though the garbage can is full, people keep on putting their garbage in it thus leaving the can to overflow.

b) In the current system the garbage collection vehicle is often a big truck and it goes to all the garbage bins in the area for pickup even though they are not filled just to complete their duty. The garbage pickup is a routine in certain areas where they come only once in a week. If there is an event or a function held in that area, the garbage bins are more likely to get filled within a day. As the garbage collection vehicle comes once in a week, the garbage bin at that place would keep on overflowing with garbage leading to stinking smell and unhealthy environment.

c) The garbage pick trucks have to go on a complete tour to all the garbage bins even though they are not full thus, wasting time and fuel.

d) With current garbage bin system people are reluctant to put the waste in in the bin and they land up leaving it on the road which leads to same practice for everyone.

Quantitative Analysis of Spatial Pattern of Dustbins and its Pollution in Dhaka City -- A GIS Based Approach

The authors in [3.4] have made a quantitative analysis between existing dustbins and their serving population. The study first analyses the spatial distribution of dustbins in some areas of Dhaka city using average nearest neighbour functions of GIS. Remarkably, the spatial circulation of the current dustbins has appeared to be dominatingly in clustered pattern. Next, an optimal number of additional dustbins were calculated. It is shown that the number of existing dustbins is insufficient in the study area. The extent of pollution caused by the existing dustbins was calculated using spatial analyst functions of GIS. It is found that all the dustbins are burnt with wastes and causing pollution to the environment. The results thus obtained would help to understand the present situation of the waste management of Research Article Volume 6 Issue No. 6 International Journal of Engineering Science and Computing, June 2016 7114 http://ijesc.org/ Dhaka city and to optimally place the required number of dustbins to prevent further pollution to environment.

IoT BASED WASTE COLLECTION MONITORING SYSTEM USING SMART PHONES

The authors in [3.5] have equipped the smart bins with ultrasonic sensors which measure the level of dustbin being filled up. The container is divided into three levels of garbage being collected in it. Every time the garbage crosses a level the sensors receives the data of the filled level. This data is further sent to the garbage analyser as instant message using GSM module. Placing three ultrasonic sensors at three different levels of the container may be a disadvantage as the cost of the dustbin increases due to the sensors and also the sensors can be damaged due to the rough action by the users. An IoT-based smart garbage system (SGS) is proposed to reduce the amount of food waste.

IoT-Based Smart Garbage System for Efficient Food Waste Management

The authors in [3.6]. In an SGS, battery-based smart garbage bins (SGBs) exchange information with each other using wireless mesh networks, and a router and server collect and analyse the information for service provisioning. Furthermore, the SGS includes various IoT skills considering user convenience and increases the battery lifetime through two types of energy-efficient operations of the SGBs: stand-alone operation and cooperation based operation. The proposed SGS had been functioned as a pilot project in Gangnam district, Seoul, Republic of Korea, for a one-year period. The test demonstrated that the normal measure of food waste could be decreased by 33%.

Project Details

Proposed System

Thanks to the development of microcontrollers and microcomputers with an operating system, it is now possible to design integrated systems with their own intelligence (edge-computing) or cloud-based systems over Internet, delegating the computational load to connected machines and reducing the cost. In this perspective, a smart system capable of monitoring the waste disposal process could represent the ideal solution to address the aforementioned problem. In the field of waste management, several solutions are proposed in the literature, most of these are based on the use of RFID technology and Cloud-computing [4.a – 4.f]

The proposed method for this smart dustbin is use of Wi-Fi module which is more beneficial than using GSM module.

The hardware components used in this method are Arduino UNO, ESP8266, Ultrasonic sensor, Servo Motor, RF-ID, inductive sensor.

The one thing which makes our project different from the above three is that we have made a REWARD based smart dustbin in which people will be tempted so that they do not dispose of garbage out. It will be fully automatic without human interface. Whoever needs to dump the garbage will have one RF-ID using which he can earn rewards points according to their weight.

The advantages of our project are as follows

In our project we used RF-ID which differentiate every person with a unique Id so that everyone can collect points by disposing of waste and also they can see their reward point on a web portal and redeem it as a discount coupon.

They can't be able to redeem their reward point until they reached up to

some minimum reward points.

Used Components

Arduino UNO

It is a microcontroller board which has fourteen digital input/output pins, six analog inputs, USB connection, power jack, 16MHz quartz crystal, ICSP header, and a reset button. The components such as Servo Motor and Ultrasonic Sensor are connected to this board and the first part code is dumped into this board. After the dumping of the code, the sensors start working according to the code written. When the sensors do not work as expected then the reset button should be pressed so that the code and the microcontroller restart and the sensors start working. This UNO board and 1.0 version of Arduino IDE are the reference versions of Arduino. UNO means one in Italian which denotes the version of the device. It is programmed in Arduino Programming language (APL) similar to C/C++.It is the winner of "World Best Interaction Award 2012" sponsored by Google

Fig. Microcontroller Arduino UNO [7.1]

ESP8266 Wi-Fi Module

ESP8266 is an open source IoT platform. This is used for making things work using Wi-Fi. This board includes firmware which runs on ESP8266 Wi-Fi SoC Express Systems and the hardware is based on ESP-12 module. The second ultrasonic sensor is connected to this board and the second part code is dumped into this board. Before dumping the code, in the Arduino IDE the correct board should be selected. This uses many open-source projects such as lua-cjson and SPIFFS. This is used to sending the real time data to the web portal.
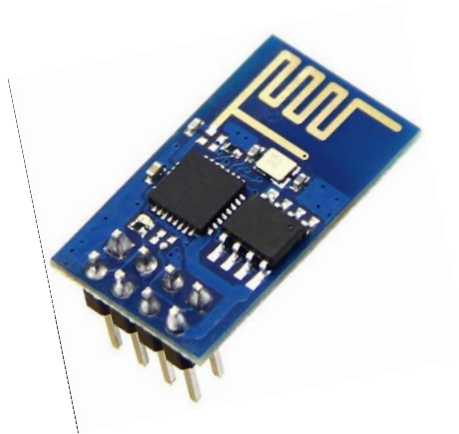
Fig. ESP8266 board [7.2]

ESP8266 Pin Configuration

Pin Number	Pin Name	Alternate Name	Normally used for	Alternate purpose
1	**Ground**	-	Connected to the ground of the circuit	-
2	**TX**	GPIO – 1	Connected to Rx pin of programmer/C to upload program	Can act as a General-purpose Input/output pin when not used as TX
3	**GPIO-2**	-	General purpose Input/output pin	-
4	**CH_EN**	-	Chip Enable – Active high	-
5	**GPIO - 0**	Flash	General purpose Input/output pin	Takes module into serial programming when held low during start up
6	**Reset**	-	Resets the module	-
7	**RX**	GPIO - 3	General purpose Input/output pin	Can act as a General-purpose Input/output pin when not used as RX
8	**Vcc**	-	Connect to +3.3V only	

ESP8266-01 Features

- Low cost, compact and powerful Wi-Fi Module
- Power Supply: +3.3V only
- Current Consumption: 100mA

- I/O Voltage: 3.6V (max)
- I/O source current: 12mA (max)
- Built-in low power 32-bit MCU @ 80MHz
- 512kB Flash Memory
- Can be used as Station or Access Point or both combined
- Supports Deep sleep (<10uA)
- Supports serial communication hence compatible with many development platforms like Arduino
- Can be programmed using Arduino IDE or AT-commands or Lua Script

Ultrasonic Sensor

HC-SR04 Ultrasonic (US) sensor is a 4-pin module, whose pin names are Vcc, Trigger, Echo and Ground respectively. This sensor is a very popular sensor used in many applications were measuring distance or sensing objects are required. The module has two eyes like projects in the front which forms the Ultrasonic transmitter and Receiver. The sensor works with the simple high school formula that

Distance = Speed × Time

The Ultrasonic transmitter transmits an ultrasonic wave, this wave travels in air and when it gets objected by any material it gets reflected back toward the sensor this reflected wave. [5.3]

Fig. Ultrasonic sensor [7.3]

An inductive proximity sensor is a non-contact electronic proximity sensor. It is used for positioning and detection of metal objects. The sensing range of an inductive switch is dependent on the type of metal being detected, the sensor consists of an induction loop or detector coil.

Ultrasonic Sensor is an instrument which measures the distance to the waste using ultrasonic sound waves. It has a transducer that helps to send and receive ultrasonic pulses based on the object's proximity. It detects the objects and the waste materials. In RBIGS ultra sonic measure the distance that how dustbin is filled and if the dustbin is 70% full then it goes high and send the notification by serial connection of Arduino uno and ESP8266 on the employee mobile which have Blynk app.

Another use of Ultrasonic sensor in RBIGS is that it goes high when any waste drop from outside by the verified user so that score point on the portal may increase.

Inductive proximity sensor

Fig. Inductive Proximity Sensor Module [7.4]

An inductive proximity sensor is a non-contact electronic proximity sensor. It is used for positioning and detection of metal objects. The sensing range of an inductive switch is dependent on the type of metal being detected. The sensor consists of an induction loop or detector coil.

SERVO MOTOR SG90

Fig. servo motor [7.5]

Servo Motor helps in segregation of the type of waste material. The Arduino is programmed in such a way that after detecting the waste using an ultrasonic sensor moved automatically and this is done using this servo motor. In RBIGS we segregate two type of waste material. The metallic part waste is through at one side with the movement according to the servo motor and inductive part is on another side respectively.
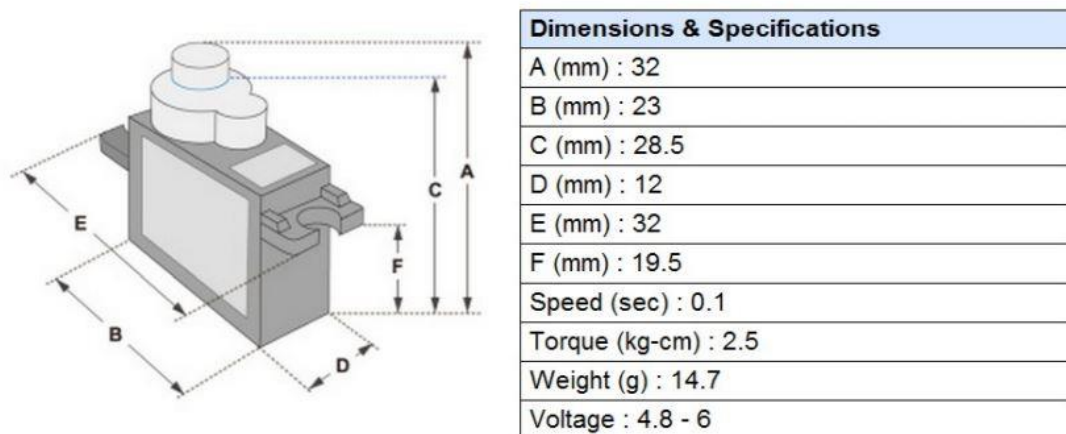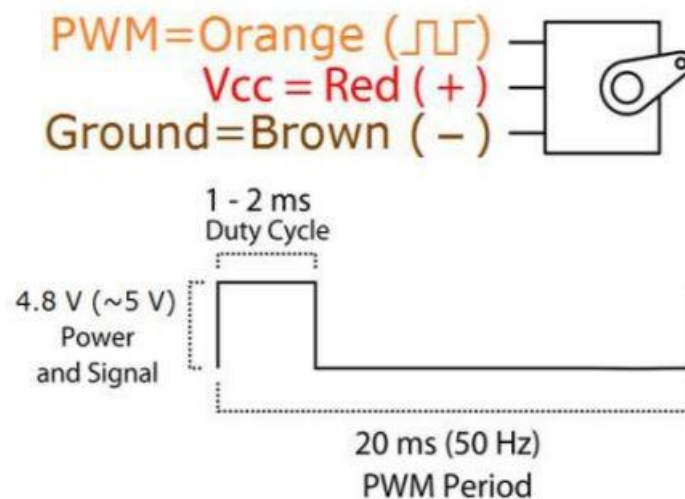

Dimensions & Specifications
A (mm) : 32
B (mm) : 23
C (mm) : 28.5
D (mm) : 12
E (mm) : 32
F (mm) : 19.5
Speed (sec) : 0.1
Torque (kg-cm) : 2.5
Weight (g) : 14.7
Voltage : 4.8 - 6

Fig. Structure of Servo Motor [7.6]

Fig. Pins of Servo Motor [7.7]

RF-ID Reader and Tags

Radio Frequency Identification (RFID) is a technology that enables wireless short- and medium- range tracking and identification of objects. Radio Frequency Identification (RFID)

is the wireless non-contact use of radio frequency waves to transfer data Tagging items with RFID tags allows users to automatically and uniquely identify.

Fig. RF-ID Reader and Tags [7.8]

PIR Motion Sensor

PIR sensors allow us to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason, they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors.

PIRs are basically made of a pyroelectric sensor (https://adafru.it/aKh) (which you can see below as the round metal can with a rectangular crystal in the center), which can detect levels of infrared radiation. Everything emits some low-level radiation, and the hotter something is, the more radiation is emitted. The sensor in a motion detector is actually split in two halves. The reason for that is that we are looking to detect motion (change) not average IR levels. The

two halves are wired up so that they cancel each other out. If one half sees more or less IR radiation than the other, the output will swing high or low.

Fig. PIR Motion Sensor [7.9]

I2C 1602 Serial LCD Module

Features:

The I2C 1602 LCD module is a 2 line by 16-character display interfaced to an I2C daughter board. The I2C interface only requires 2 data connections, +5 VDC and GND to operate.

Specifications:

I2C Address Range	0x20 to 0x27 (Default=0x27, addressable)
Operating Voltage	5 Vdc
Backlight	White
Contrast	Adjustable by potentiometer on I2c interface
Size	80mm x 36mm x 20 mm
Viewable area	66mm x 16mm

Power:

The device is powered by a single 5Vdc connection
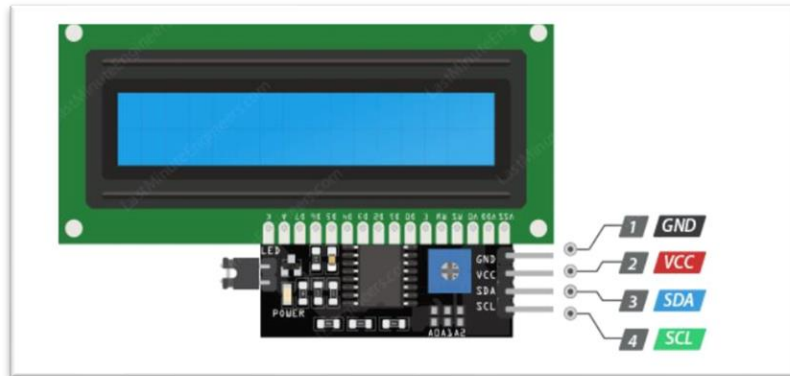
Fig. I2C 1602 Serial LCD Module [7.10]

GND is a ground pin and should be connected to the ground of Arduino.

VCC supplies power to the module and the LCD. Connect it to the 5V output of the Arduino or a separate power supply.

SDA is a Serial Data pin. This line is used for both transmit and receive. Connect to the SDA pin on the Arduino.

SCL is a Serial Clock pin. This is a timing signal supplied by the Bus Master device. Connect to the SCL pin on the Arduino.

Cloud Server

The Cloud server has been developed using Node.js, Node.js provides an effective way to set up, configure, and run web-based applications. The entire server is deployed on the Cloud server provider Heroku and its main modules are:

• Database. Mongo dB has been chosen as Database Management System (DBMS). The choice to use a non-relational database as NoSQL, instead of relational database, has been made because NoSQL requires much less structure than SQL, each stored object is pretty much self-contained and independent. Thus, objects can be easily stored on multiple servers without having to be linked. database schema consists of several Models and relationships. The Many-to-Many relationship between Reader and Garbage bin entities generates the main entity Reading that stores data coming from RFID reader, such as garbage bin ID and points.

• Business Logic Module. It has multiple roles. Firstly, it processes all data coming from both database and API module and provides a bidirectional communication between these blocks. In fact, this layer formats API response resulting from the query to the database. Moreover, it manages Authentication and Authorization processes, thanks to the implementation of JSON Web Token (JWT) and roles.

• API module. It provides public interfaces through which it is possible to retrieve data. In particular, this module handles the HTTP protocol through REST paradigm, allowing GET / PUT / POST / DELETE methods.

Proposed server is given below:

The user can login by itself and check there score anytime and if they wanted to redeem it they do it simply. User have their user email and password to login on the portal

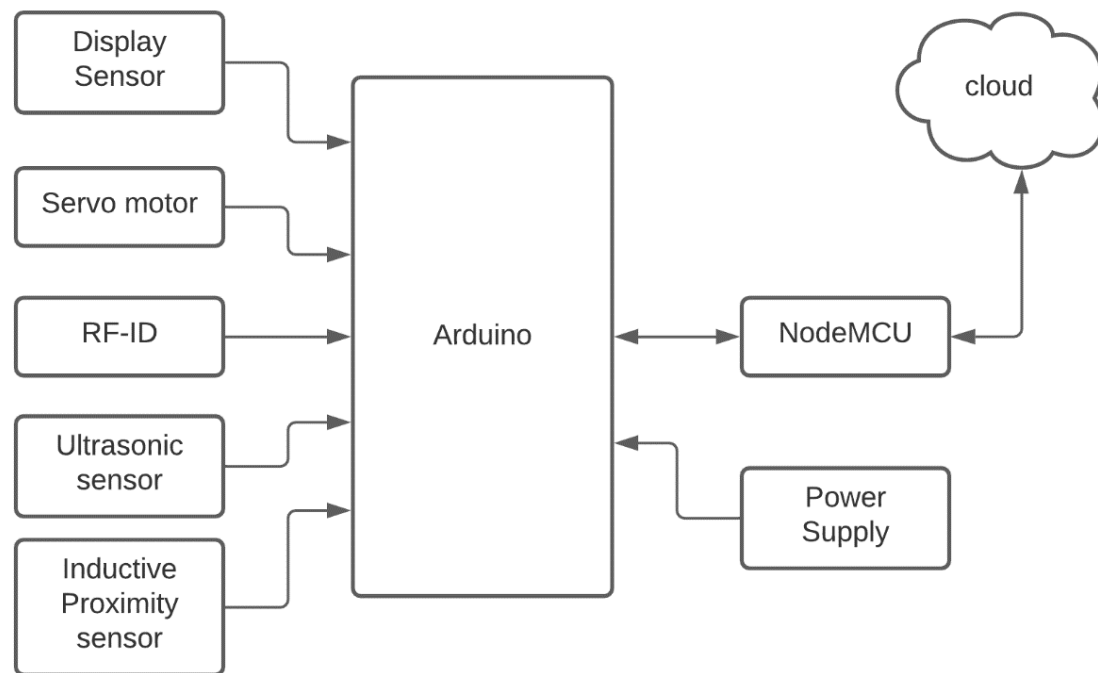Portal stores the real time which it received by the dustbin through ESP8266.

BLOCK DIAGRAM

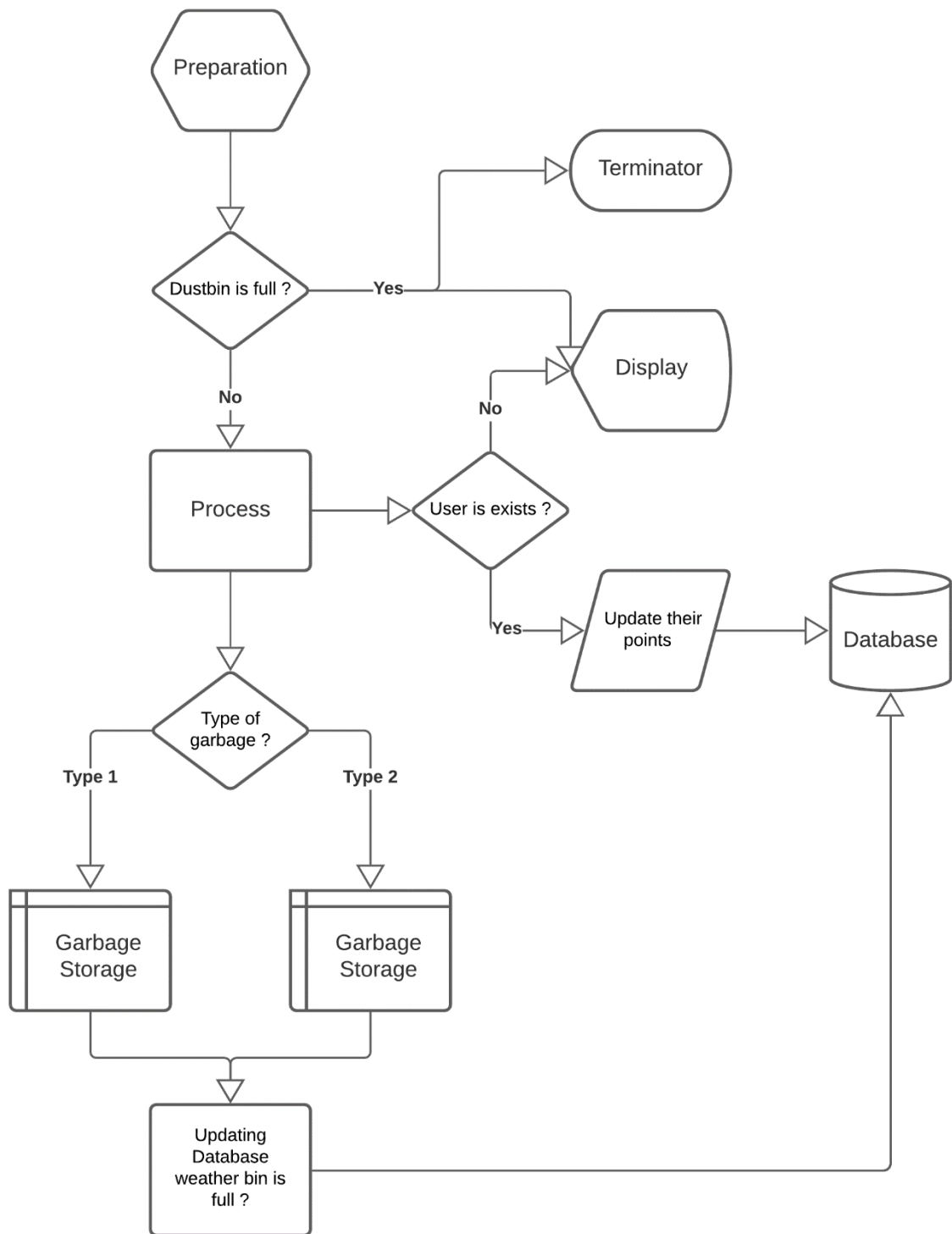

Fig. Block diagram [8.1]

FLOW CHART

Fig. Flow Chart [8.2]

SIMULATION

Hardware requirements

- Arduino Uno
- Ultrasonic sensor (HCSR04)
- RF-ID reader & Tags
- Servo motor
- Resistors
- Inductive Proximity sensor. We used (infrared for simulation)
- 16x2 Lcd display

Software
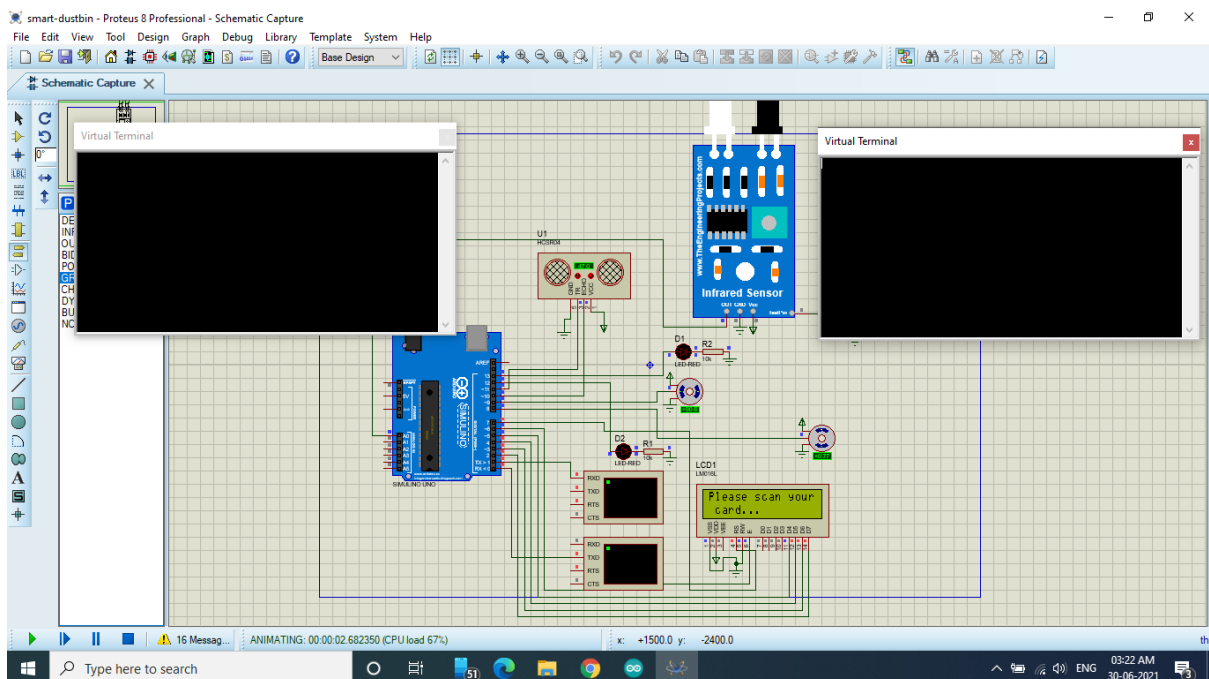
- Arduino IDE
- Proteus 8.10 Professional

Circuit diagram

Fig. Circuit diagram of Project [8.3.1]

WORKING

The waste is first placed in front of the inductive proximity sensor. The sensor detects the type waste whether it is metallic waste or non-metallic waste and servo matter through it accordingly to their respective sections

User have its own unique RF-ID through which they can register and verify itself. After the verification the registered user can get increment in its score by disposing any waste, the score is not increase until the ESP8266 doesn't receive high signal from ultrasonic sensor, ultrasonic sensor gets high when the waste material is drop to dustbin. After all these processes the score point of user automatically increases.

NOTE: the one user will get increment in score only five times in a day if the user tries for 6th attempt, they will not get any increment in their score.

Code

We have made function for every sensor and after that we call accordingly to our requirement here below all sensors code is

Ultrasonic Sensor

This piece of code is responsible to handle our Ultrasonic Sensor

```
// defines variables for ultraSonic

#define echoPin 2

#define trigPin 3

long duration;

int distance;

//  pins for ultraSonic

  pinMode(trigPin, OUTPUT);

  pinMode(echoPin, INPUT);


int ultraSonic(){

 // Clears the trigPin condition

 digitalWrite(trigPin, LOW);

 delayMicroseconds(2);

 // Sets the trigPin HIGH (ACTIVE) for 10 microseconds

 digitalWrite(trigPin, HIGH);

 delayMicroseconds(10);

 digitalWrite(trigPin, LOW);

 // Reads the echoPin, returns the sound wave travel time in microseconds

 duration = pulseIn(echoPin, HIGH);
```

```
// Calculating the distance

distance = duration * 0.034 / 2; // Speed of sound wave divided by 2 (go and back)

// Displays the distance on the Serial Monitor

Serial.print("Distance: ");

Serial.print(distance);

Serial.println(" cm");

return distance;

}
```

PIR Sensor

This piece of code is responsible to handle our PIR Sensor

```
//defines variables for PIR

int sensor=4;

int sensor_value;


boolean pirSensor(){

 while(true){

  sensor_value = digitalRead(sensor);

  if(sensor_value == 1){

    return true;

  }

 }

}
```

Servo Motor

This piece of code is responsible to handle our servo motor

Here we made two functions for rotating servo motor in clockwise and counter clockwise direction

```
//defines variables for Servo motor

#include <Servo.h>

int pos5 = 0;

int pos8 = 0;

Servo servo_5;

Servo servo_8;


//  pins for Servo motor

  servo_5.attach(5, 500, 2500);

  servo_8.attach(8, 500, 2500);


void clockWiseServo(Servo &theServo, int servoPostion, int fromAngle, int toAngle){

 for (servoPostion = fromAngle; servoPostion <= toAngle; servoPostion += 1) {

   theServo.write(servoPostion);

   delay(15);

 }

}


void antiClockWiseServo(Servo &theServo, int servoPostion, int fromAngle, int toAngle){

 for (servoPostion = fromAngle; servoPostion >=toAngle; servoPostion -= 1) {

   theServo.write(servoPostion);
```

```
    delay(15);

  }

}
```

RFID

This piece of code is responsible to handle our RFID Reader & tags

```
//defines variables for RFID

#include <SPI.h>

#include <MFRC522.h>

#define SS_PIN 10

#define RST_PIN 9

MFRC522 mfrc522(SS_PIN, RST_PIN);


//  initilization for Rfid

  SPI.begin();     // Initiate  SPI bus

  mfrc522.PCD_Init();   // Initiate MFRC522

boolean RfidReader(){

  // Look for new cards

  while(true){

  Serial.print("UID tag :");

  String content= "";

  byte letter;

  for (byte i = 0; i < mfrc522.uid.size; i++)

  {
```

```
    Serial.print(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : " ");

    Serial.print(mfrc522.uid.uidByte[i], HEX);

    content.concat(String(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : " "));

    content.concat(String(mfrc522.uid.uidByte[i], HEX));

  }

  Serial.println();

  Serial.print("Message : ");

  content.toUpperCase();


  Serial.println(content.length());


  if (content.substring(1) == "AA 55 E5 81") //change here the UID of the card/cards that you
want to give access

  {

   Serial.println("Authorized access");

   Serial.println();

   return true;

  }


 else{

   Serial.println(" Access denied");

   return false;

  }


  }
```

```
}
```

ESP 8266-01

This piece of code is responsible to handle our ESP 8266-01

Use this code we make rest api call to our server

```
//defines variables for ESP8266-01

#include "ESP8266.h"

const char *SSID     = "Universe";

const char *PASSWORD = "vinay0000";

SoftwareSerial mySerial(6, 7);

ESP8266 wifi(mySerial);


//  Initialization for Wi-Fi

  Serial.println("Connecting Wifi");

  if (!wifi.init(SSID, PASSWORD))

  {

    Serial.println("Wifi Init failed. Check configuration.");

    while (true) ; // loop eternally

  }

void apiCall(){

  Serial.println("Sending Request to Add point");

  wifi.httpGet();

}
```

```cpp
int ESP8266::httpGet()
{
 char* request =        "GET  /points/123456-10  HTTP/1.1\r\nHost: smart-dustbin-
backend.herokuapp.com\r\nConnection: close\r\n\r\n";



 if (createTCP("smart-dustbin-backend.herokuapp.com", 80))
 {
  Serial.println(F("create tcp - OK"));
 }
 else
 {
  Serial.println(F("create tcp - ERROR"));
  return "";
 }


 if (!sendSingle(request))
 {
  Serial.print(F("not sent"));
  //return "";
 }


 int len = recvSingle(m_responseBuffer, MAX_BUFFER_SIZE);
 Serial.println((char*)m_responseBuffer);
```

```cpp
  return len;

}

bool ESP8266::createTCP(String addr, uint32_t port)

{

  return sATCIPSTARTSingle("TCP", addr, port);

}

bool ESP8266::sATCIPSTARTSingle(String type, String addr, uint32_t port)

{

  String data;

  rx_empty();

  m_puart->print("AT+CIPSTART=\"");

  m_puart->print(type);

  m_puart->print("\",\"");

  m_puart->print(addr);

  m_puart->print("\",");

  m_puart->println(port);


  data = recvString("OK", "ERROR", "ALREADY CONNECT", 500);

  if (data.indexOf("OK") != -1 || data.indexOf("ALREADY CONNECT") != -1) {

    return true;

  }

  return false;

}
```

```cpp
String ESP8266::recvString(String target, uint32_t timeout)
{
  String data;

  char a;

  unsigned long start = millis();

  while (millis() - start < timeout) {

    while (m_puart->available() > 0) {

      a = m_puart->read();

      if (a == '\0') continue;

      data += a;

    }

    if (data.indexOf(target) != -1) {

      break;

    }

  }

  return data;

}
```

Inductive Proximity Sensor

This piece of code is responsible to handle our Inductive Proximity Sensor

```cpp
//defines variables for Inductive Proximity Sensor

float a;

// initilization for Inductive Proximity Sensor

  pinMode(A0,INPUT);
```

```
boolean InductiveProximitySensor(){

 while(true){

  a = analogRead(A0);

 if(a > 0){

  return false;

 }

 else if(a <= 0){

   return true;

 }

 delay(500);

 }

}
```

16X2 LCD Display

This piece of code is responsible to handle our LCD Display

```
//defines variables and importing library for LCD

#include <Wire.h>

#include <LiquidCrystal_I2C.h>

LiquidCrystal_I2C lcd(0x27,20,4);


// initilization for LCD

 lcd.init();

 lcd.init();

 lcd.backlight();
```

```
  displayText("Welcome to RBIGMS");

  Serial.println("Welcome to RBIGMS");


void displayText(String text){

 if(text.length() <= 0){

  return;

 }

 lcd.clear();

 String countText1 = "";

 String countText2 = "";

 for(int i=0; i<text.length(); i++){

  if(countText1.length() < 16){

   countText1 += text.charAt(i);

  }

  else if(i >= 15 && countText2.length() <= 16){

   countText2 += text.charAt(i);

  }

 }

 lcd.print(countText1);

 lcd.setCursor(0, 1);

 lcd.print(countText2);

 delay(1000);


 String remainingText = text.substring(32, text.length());
```

```
  Serial.println(remainingText);

 displayText(remainingText);

}
```

Here void loop code where all function will be called

```
void loop() {


 int isDustbinFull = ultraSonic();

 Serial.println(isDustbinFull);

 if(isDustbinFull <= 10){

  Serial.println("Dustbin is Full");

  displayText("Dustbin is Full");

  exit(0);

 }

 delay(1000);

 boolean isTrue = pirSensor();


 if(isTrue){

  clockWiseServo(servo_5, pos5, 0, 180);

  delay(1000);

  displayText("Do you have RFID ?");

  Serial.println("Do you have RFID ?");

  int IsAuthorized = RfidReader();

  delay(2000);
```

```
int isMetal = InductiveProximitySensor();

if(true){

  displayText("metal object is detected !");

  Serial.println("metal object is detected !");

  clockWiseServo(servo_8, pos8, 0, 90);

  delay(3000);

  if(IsAuthorized == 1){

    // adding points to usr account

    apiCall();

  }

}

else if(isMetal == 0){

  displayText("non - metal object is detected !");

  Serial.println("non -metal object is detected !");

  clockWiseServo(servo_8, pos8, 0, 90);

  delay(3000);

  if(IsAuthorized == 1){

    // adding points to usr account

    apiCall();

  }

}

antiClockWiseServo(servo_8, pos8, 90, 0);

displayText("Point added in your acount");
```

```
  Serial.println("Point added in your account");

  delay(3000);

  displayText("Thanks for using RBIGMS");

  Serial.println("Thanks for using RBIGMS");

  antiClockWiseServo(servo_5, pos5, 180, 0);

 }

}
```
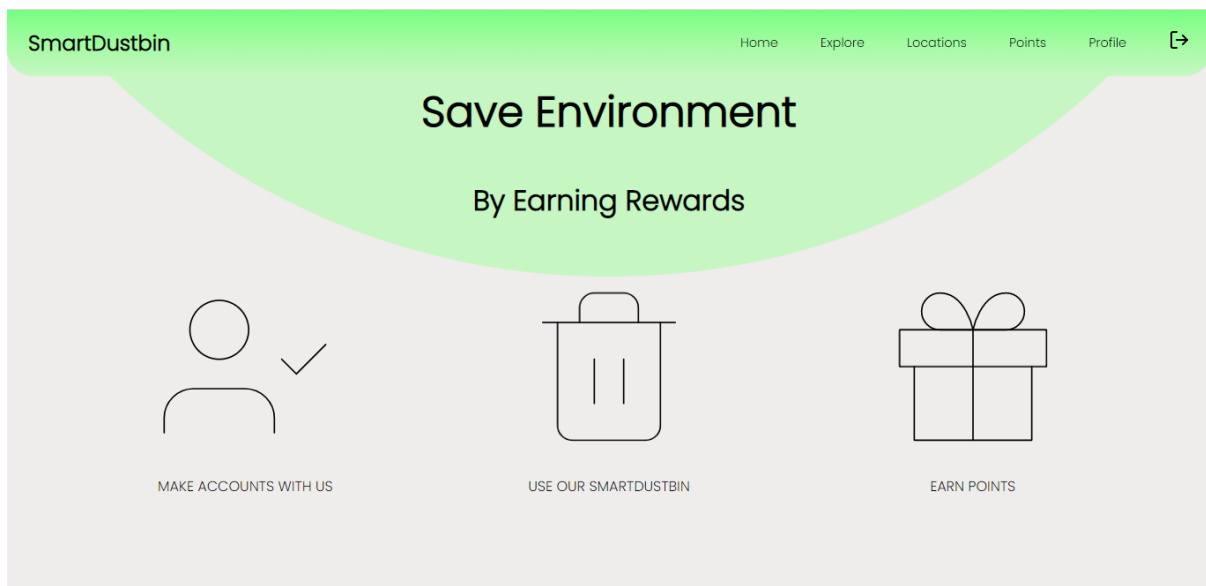
RESULTS

Fig. Home page of portal [9.1]

Fig. Explore page of portal [9.2]

Where any one can see top users earned point using smart dustbin this is not public page

Fig. Login page of portal [9.3]

From here user will login to see them earn points

Fig. Point page of portal [9.4]

After login he will able to see point page which is protected it is not public here user can redeem their points

Fig. Profile page of portal [9.5]

Here use can update their profile such as their name, email, mobile number and RF-ID number

Code of all above frontend and backend is update soon!

CONCLUSION

Urbanisation is growing at a rapid pace, as more people are willing to live in cities. Hence it is essential for a clean and hygienic environment. Although public services and waste management companies have been around for a long time, they have seen only limited innovation with operational efficiency- until the last few years. Our proposed reward based intelligent garbage-based system when implemented on a larger scale and in the long run can get high satisfying outputs. By implementing this system of garbage disposal and collection we can reduce the pollution cost by the stinking garbage that we come across along the road, paving way for a clean environment also not only the world is made clean but also the people are rewarded for their help. This proposal for the management of wastes is efficient and time saving process than the currently employing method in which concerned municipal employee has to look for the filled waste bins manually across different spot in an area/street for checking regularly whether the waste bin is filled or not, which is complex time-consuming process. This automation of waste also reduces the human effort and consequently the cost of the whole process [6]. This system can be implemented at any place with ease and within reasonable amount of time. Our work is small but an efficient step for building of a dream city with a clean and a very healthy environment. With encouragement from the government we believe that our proposed system when implemented will provide high returns and yields.

FUTURE SCOPE:

- This project is made for demo concern, it can be taken to product level.

- Cloud Platform and Raspberry Pi can be used for Data Storage and Data Analysis.

- Daily Produce of waste can be monitored.

- Currently this dustbin would be made for locally used but after some modification

- We can also implement it for globally usable.

ADVANTAGES

- People motivated to put their garbage only in the garbage bin.
- By this way we attain two innovative functions they are, operational efficiency and waste reduction.
- We can eliminate waste overflow.
- Time and fuel can be saved due to optimised Route for garbage collection.
- The monitoring of the waste level in the garbage can could be done remotely with a simple browser or an installed software effectively.
- As the garbage levels will be monitored by a remotely, the required sized vehicle can be assigned for garbage collection thus making it cost effective.
- New garbage bins not required the existing garbage bins can be modified thus again making it cost effective.
- The reward system will encourage people for their active participation.

REFERENCES

[1] https://www.instructables.com/Smart-Garbage-Monitoring-System-Using-Internet-of-/

[2]. http://bit.ly/abstractofdustbin

[3.1]. https://en.wikipedia.org/wiki/Waste_container

[3.2]. https://4waste.com.au/rubbish-removal/5-types-waste-know/

[3.3]. http://bit.ly/electronicshubsmartdustbin

[3.4] Alexey Medvedev, Petr Fedchenkov, ArkadyZaslavsky, Theodoros, Anagnostopoulos Sergey Khoruzhnikov,‖Waste Management as an IoT-Enabled Service in Smart Cities‖.

[3.5] Meghana K C, Dr. K R Nataraj,‖ IOT Based Intelligent Bin for Smart Cities‖.

[3.6] KasliwalManasi H., SuryawanshiSmitkumar B, A Novel Approach to Garbage Management Using Internet of Things for Smart Cities‖.

[4.a]. Yann Glouche, Paul Couderc. "A Smart Waste Management with Self Describing objects." Leister, Wolfgang and Jeung, Hoyoung and Koskelainen, Petri. The Second International Conference on Smart Systems, Devices and Technologies (SMART'13), Jun 2013, Rome, Italy. 2013

[4.b] M. H. A. Wahab, A. A. Kadir, M. R. Tomari and M. H. Jabbar, "Smart Recycle Bin: A Conceptual Approach of Smart Waste Management with Integrated Web Based System," 2014 International Conference on IT Convergence and Security (ICITCS), Beijing, 2014, pp. 1-4.

[4.c]. Chowdhury, B.; Chowdhury, M.U. "RFID-based real-time smart waste management system." In Proceedings of the 2007 Australasian Telecommunication Networks and Applications Conference, Christchurch, New Zealand, 2–5 December 2007; pp. 175–180. [

[4.d]. Catania, V.; Ventura, D. "An Approach for Monitoring and Smart Planning of Urban Solid Waste Management Using Smart-M3 Platform". In Proceedings of the 15th Conference

of Open Innovations Association FRUCT, St. Petersburg, Russia, 21–25 April 2014; pp. 24–31

[4.e]. M. Al-Jabi, M. Diab, "IoT-enabled citizen attractive waste management system," Proceedings of 2nd International Conference on the Applications of Information Technology in Developing Renewable Energy Processes and Systems, IT-DREPS 2017, 2018-January, pp. 1-5, 2018.

[4.f]. E. Al-Masri, I. Diabate, R. Jain, M.H. Lam, S. Reddy Nathala, "Recycle.io: An IoT-Enabled Framework for Urban Waste Management," Proc. of 2018 IEEE International Conference on Big Data, Big Data 2018, pp. 5285-5287, 2019

[6] Adil Bashir, Shoaib Amin Banday Ab. Rouf Khan, Mohammad Shafi: IJRITCC, Concept, Design and Implementation of Automatic Waste Management System, Volume 1, Issue 7, July 2013

[5.1] https://www.theengineeringprojects.com/2018/06/introduction-to-arduino-uno.html

[5.2]. http://bit.ly/ESP8266intro

[5.3]. http://bit.ly/fierceelectronicsultrasonicsensor

[5.3]. https://components101.com/sensors/ultrasonic-sensor-working-pinout-datasheet

[3.1]. https://engineeringprojectshub.com/serial-communication-between-ESP8266-and-arduino/

[5.4] http://bit.ly/ezrobotservomotor

[5.5]. https://www.theengineeringprojects.com/2018/10/introduction-to-arduino-ide.html

[5.6]. https://www.electronicsforu.com/videos-slideshows/introduction-proximity-sensor

 [5.7]. http://bit.ly/rfidwarehouseanywhere