MINI PROJECT REPORT

Smart Dustbin – Garbage Management:

USING ARDUINO (IOT)

(IT IV Semester Mini project on PCS-404)

2020-2021

Submitted to:

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Guided by:

Mr. DEEPAK UNIYAL SIR

Submitted by:

Mr.Shourya Kapoor

Roll. No.: 1918914

(IT -IVrd-Sem)

Session: 2020-2021

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

GRAPHIC ERA UNVERSITY, DEHRADUN

CERTIFICATE

Certified that Mr. Shourya kapoor (Roll No.- 1918914) has developed mini project on "SMART DUSBIN GARBAGE MANAGEMENT" for the IT IVrd Semester Mini Project Lab (PCS-404) in Graphic Era University, Dehradun. The project carried out by Students is their own work as best of my knowledge.

Date:15/MAY/2021

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ACKNOWLEDGMENT

We would like to express our gratitude to The Almighty Shiva Baba, the most Beneficent and the most Merciful, for completion of project.

We wish to thank our parents for their continuing support and encouragement. We also wish to thank them for providing us with the opportunity to reach this far in our studies.

We would like to thank particularly our project Co-ordinator **MR ASHWINI KUMAR SIR** and our Project Guide **Mr.DEEPAK UNIYAL**for his patience, support and encouragement throughout the completion of this project and having faith in us.

At last, but not the least We greatly indebted to all other persons who directly or indirectly helped us during this work.

Mr. SHOURYA KAPOOR

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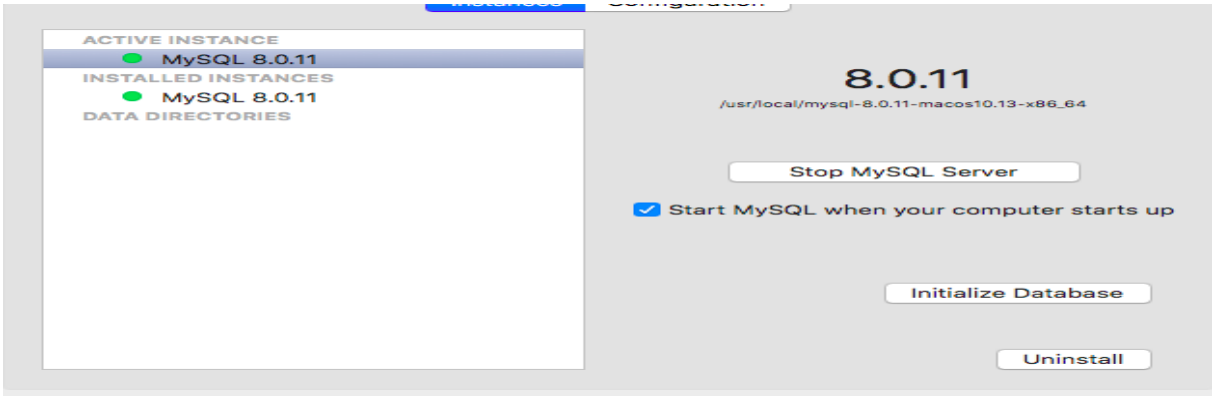
- 

- SOFTWARE SPECIFICATIONS:
    1. PAGES or Mircosoft Word 98 later
    2. Web Browser: Microsoft Internet Explorer, Mozilla, Google Chrome or later
    3. MySQL Server (back-end)
    4. Operating System: MAC OS 11 BIG SURR
    5. Arduino IDE

- HARDWARE SPECIFICATIONS:

MacBook Pro (16-inch, 2019)

Processor 2.6 GHz 6-Core Intel Core i7

Memory - 16 GB 2667 MHz DDR4

ABOUT PROJECT

We are living in an age where tasks and systems are fusing together with the power of IOT to have a more efficient system of working and to execute jobs quickly! With all the power at our finger tips this is what we have come up with.

The Internet of Things (IoT) shall be able to incorporate transparently and seamlessly a large number of different systems, while providing data for millions of people to use and capitalize. Building a general architecture for the IoT is hence a very complex task, mainly because of the extremely large variety of devices, link layer technologies, and services that may be involved in such a system.

One of the main concerns with our environment has been solid waste management which impacts the health and environment of our society. The detection, monitoring and management of wastes is one of the primary problems of the present era. The traditional way of manually monitoring the wastes in waste bins is a cumbersome process and utilizes more human effort, time and cost which can easily be avoided with our present technologies.

This is our solution, a method in which waste management is automated. This is our IoT Garbage Monitoring system, an innovative way that will help to keep the cities clean and healthy.

Follow on to see how you could make an impact to help clean your community, home or even surroundings, taking us a step closer to a better way of living :)

OVERVIEW of the Monitoring System

The idea struck us when we observed that the garbage truck use to go around the town to collect solid waste twice a day. Although this system was thorough it was very inefficient. For example let's say street A is a busy street and we see that the garbage fills up really fast whereas maybe street B even after two days the bin isn't even half full. This example is something that actually happens thus it lead us to the "Eureka" moment

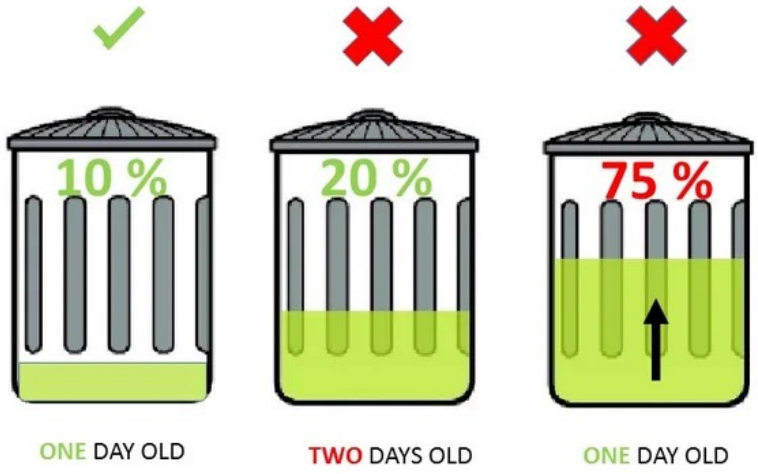
What our system does is it gives a real time indicator of the garbage level in a trashcan at any given time. Using that data we can then optimize waste collection routes and ultimately reduce fuel consumption. It allows trash collectors to plan their daily/weekly pick up schedule.

COMPONENTS IN OUR SYSTEM

The basic Model works like so...

To start with you will first have to enter the height of the dustbin. This will help us generate the percentage of trash in the trashcan. We then have two criterias which needs to be satisfied to show that the particular bin needs to be emptied :

1. The amount of trash, in other words let's say if your bin is half full you don't really need to empty it. Our thresh, or maximum amount that we permit of trash, is 75% of the bin. (You could alter the thresh according to your preference.)
2. If supposing a particular trashcan fills up 20% and then for a week doesn't change, it comes into our second criteria, time. With time even the little amount will start rotting leading to a smelly surrounding. To avoid that our tolerance level is 2 days, so if a trashcan is less than 75% but it is two days old it then will also need to be emptied.



With these criterias in mind let's understand the technical part:

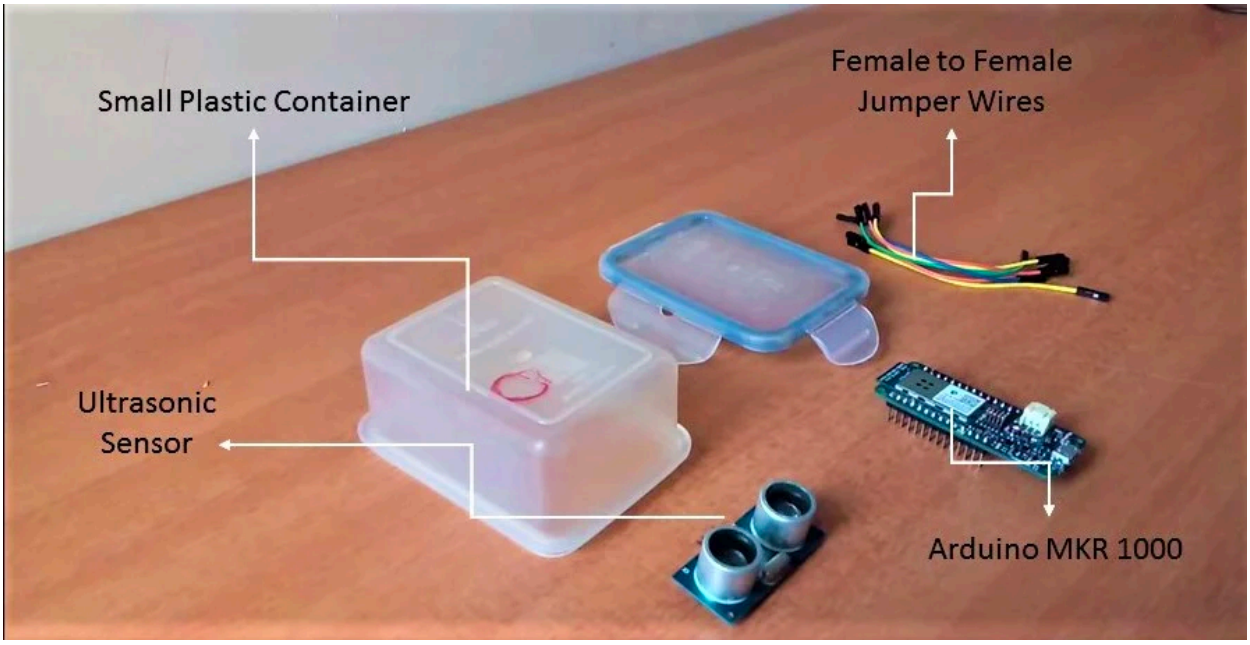
- An ultrasonic sensor (A.K.A a distance sensor) will be placed on the interior side of the lid, the one facing the solid waste. As trash increases, the distance between the ultrasonic and the trash decreases. This live data will be sent to our micro-controller.
- Our micro- controller then processes the data and through the help of WiFi sends it to an app.
- What the app does it visually represents the amount of trash in the bin with a small animation.

This process will indicate all the bins which require attention, leading the user to take the most effective route.

MATERIALS NEEDED

HARDWARE:

- 2 x AA Batteries (Gearbest) these batteries will power the Arduino board
- Plastic Container (Gearbest) I found an old plastic container in which all the components could fit. The box is important as you can easily access the components and it's waterproof.
- Battery Holder Case (Gearbest)
- Ultrasonic Sensor (Gearbest) An ultrasonic sensor measures distance. It will be attached to the lid indicating the quantity of trash. Our system's key component.
- Jumper Wires (Gearbest)
- Arduino MKR1000 (Amazon) The center piece is one of Arduino's latest micro-controller, which simplifies the task of connecting to the Internet using prebuilt libraries that can be downloaded.
- White Spray Paint Turn your regular box into a more professional product



SENSOR USED

Ultrasonic sensor: Ultrasonic sensor will be used to detect the level of garbage filled in the dustbin. The level of garbage will be depicted in terms of distance between the sensor and garbage in dustbin. This module has 4 pins- VCC (5V), Trig, Echo and GND. Trig have to be used to send out an ultrasonic high level pulse for at least 10μs and the Echo pin will then automatically detect the returning pulse. Sensor will calculate the time interval between sending the signal and receiving the echo to determine the distance. Working frequency of ultrasonic sensor is 40Hz. Max range and min range is 4m and 2cm and measuring angle is 15 degree

Humidity sensor: The temperature and humidity sensor have to be used to distinguish between dry and wet waste. For this purpose DHT11 sensor will be used. Depending upon the output temperature, dry and wet waste would be differentiated. The DHT11 is a highprecision digital humidity and temperature sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin. Sensor will only get new data from it once every 2 seconds. It will be good for 0-100% humidity

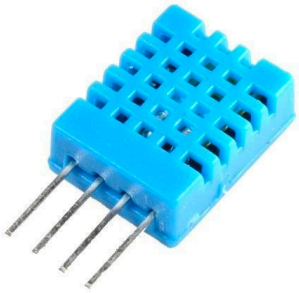
readings with 2-5% accuracy and for -40 to 80°C temperature readings ±0.5°C accuracy

Raspberry pi: The information collected by sensor will be processed by micro-controller. For this purpose raspberry pi 3 model B needs to be used. Raspberry-pi 3 is based on Broad-com BCM2837 SoC with a 1.2 GHz 64-bit quad-core ARM Cortex-A53 processor, with 512 International Journal of Advanced Engineering Research and Science (IJAERS) [Vol-4, Issue-4, Apr-2017] https://dx.doi.org/10.22161/ijaers.4.4.12 ISSN: 2349-6495(P) | 2456-1908(O) www.ijaers.com Page | 95 KB shared L2 cache. The allocated RAM will be of 1 GB. It will primarily use Raspbian, a Debian-based Linux operating system, but many other operating systems can also run on the Raspberry Pi such as RISC OS Pi,FreeBSD,NetBSD.

Serial Wi-Fi wireless transceiver module: ESP8266 is a chip which is wireless network micro-controller module. It will be a system-on-a-chip (SoC) with capabilities for 2.4 GHz Wi-Fi, general-purpose input/output etc.

PICTURES OF ALL SENSOR -

ULTRASOUND SENSOR



HUMIDITY SENSOR

RASBERRY PI

Serial Wi-Fi wireless transceiver module

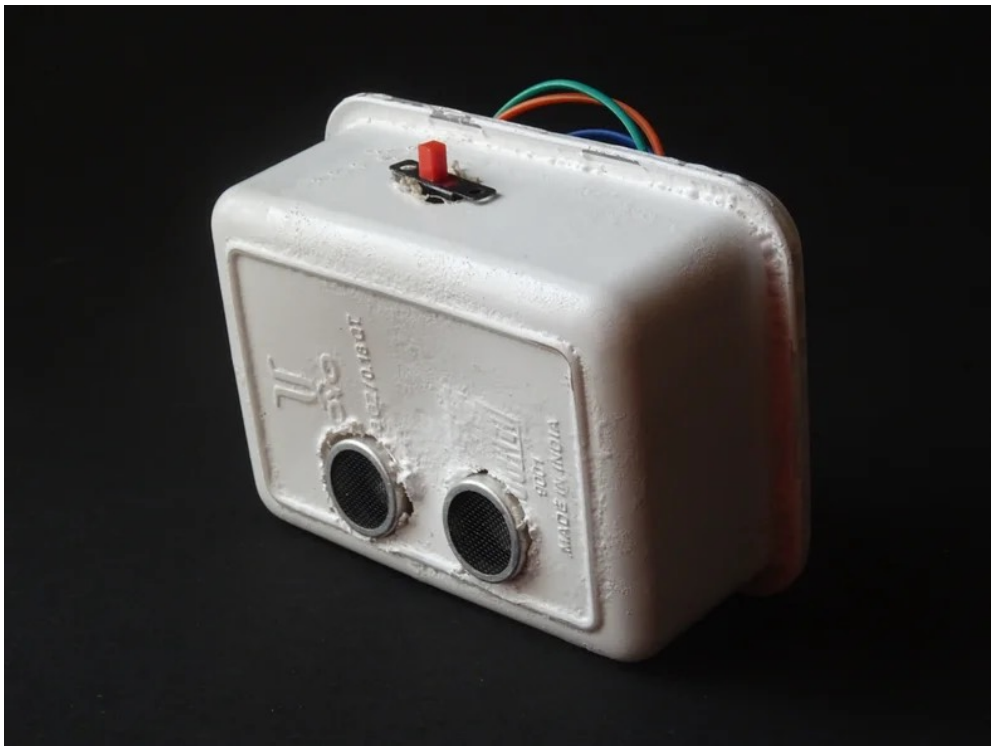
Constructing the Model

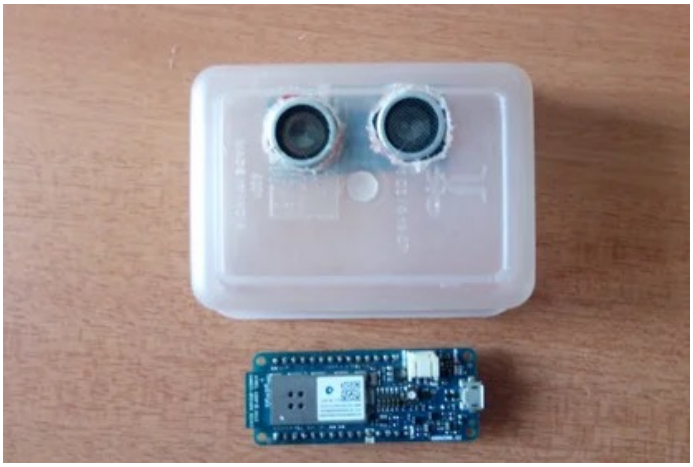
It's time to make our very own system to test our concept at home on a small scale! Look for an old small plastic container and make sure your components fit.

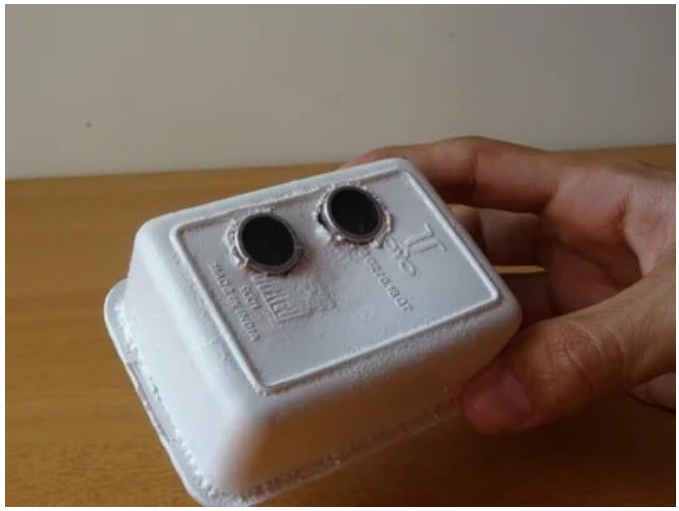
Now remove the lid and trace the two "eyes" of the ultrasonic sensor. this will be the side facing the bottom of the bin.

Take your biggest drill bit, mine was **10mm** and drill out the holes. If they still are a bit small lightly file them till the ultrasonic sensor snugly fits in, completely flush to the surface.

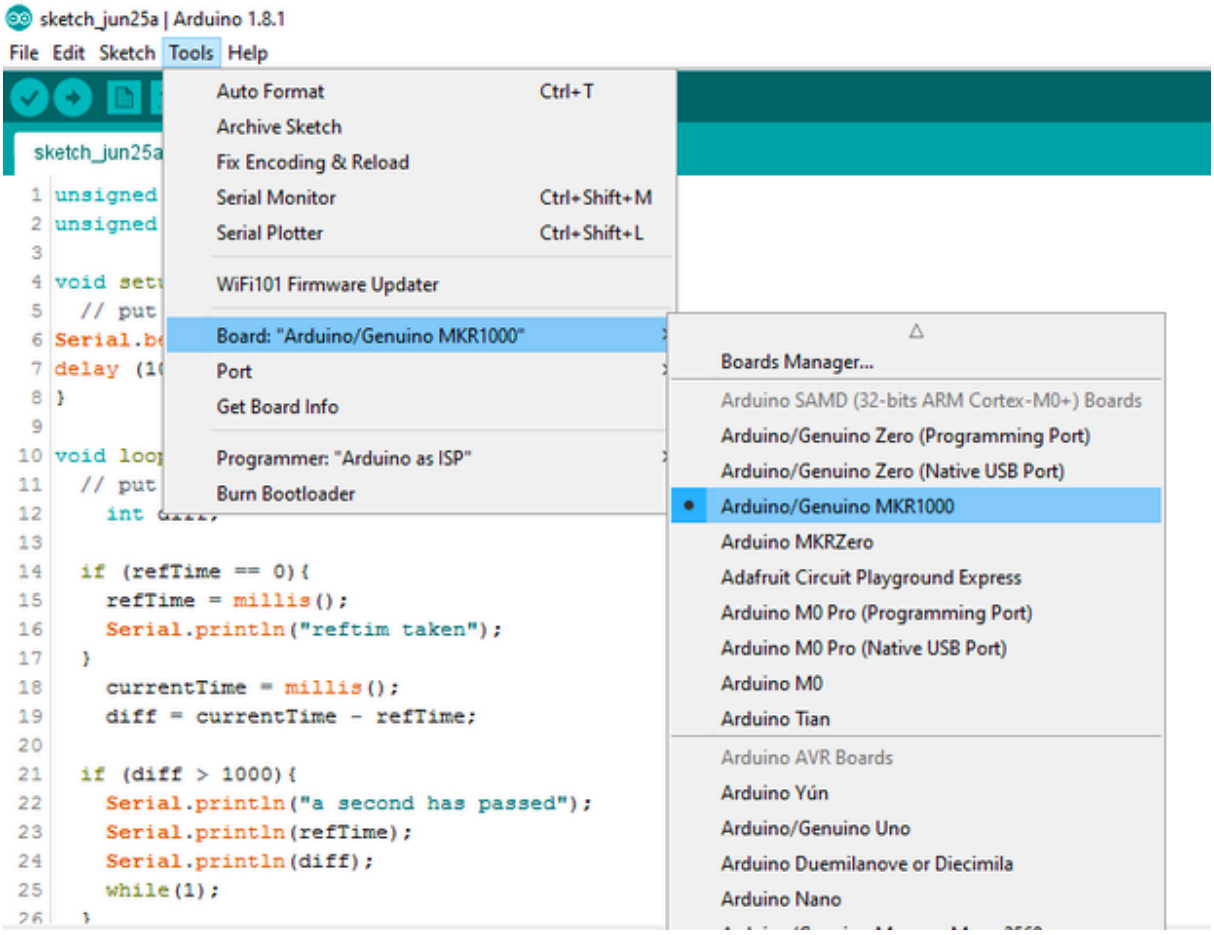
Attaching the ULTRASONIC SENSOR

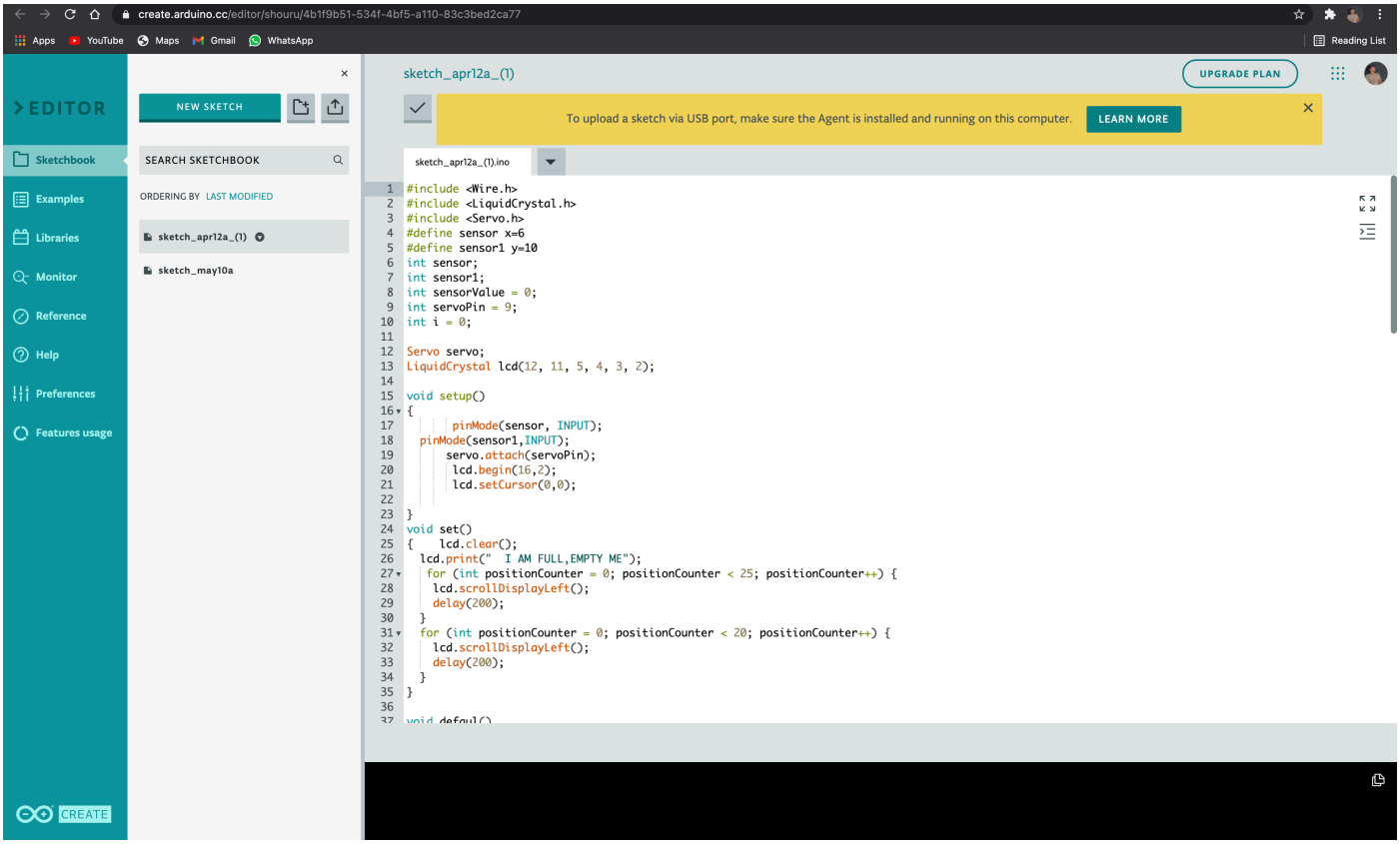




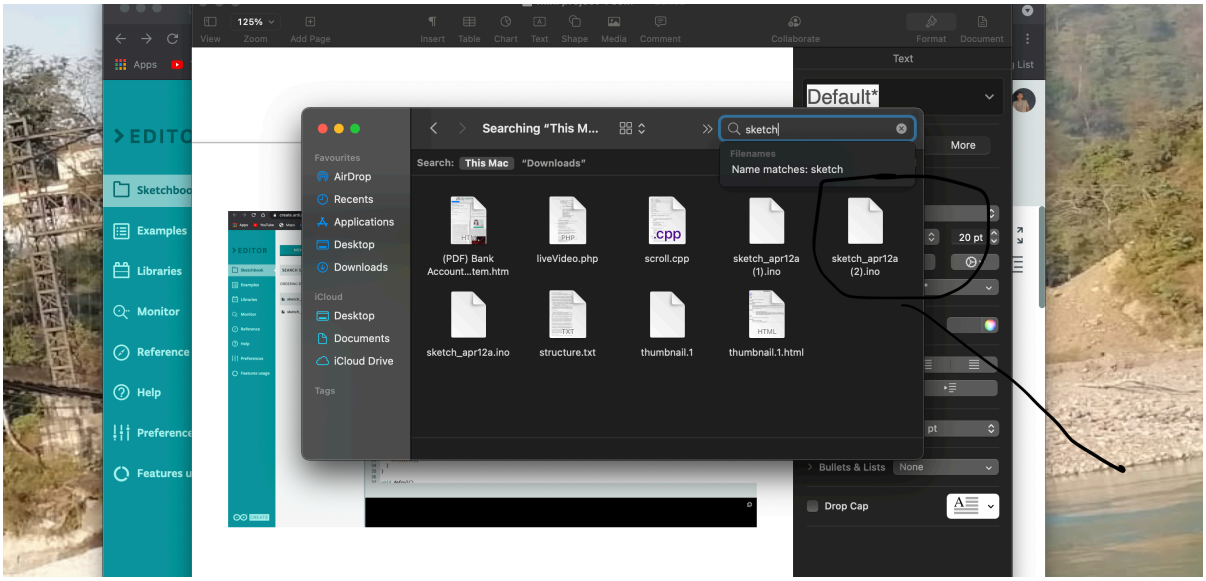


SNAPSHOT OF CODE AND PROGRAM

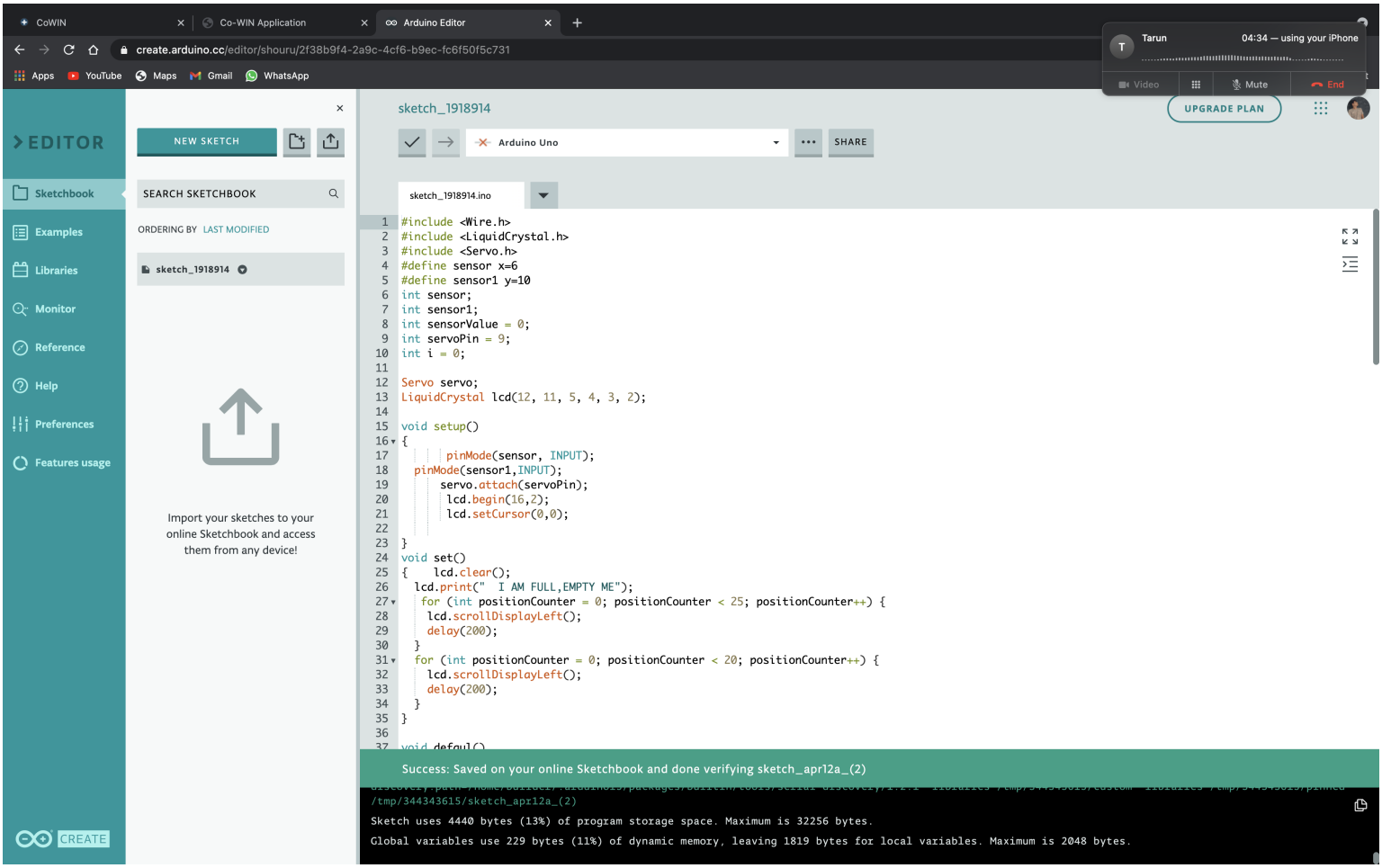




I HAVE USED ONLINE ARDUINO EDITOR FOR MY CODE I HAVE ALSO DOWNLOAD THE SKETCH WHICH IS SHOWN IN NEXT SCREENSHOT



THE OUTPUT SCREENSHOT IS HERE



CODE

```
#include <Wire.h>
#include <LiquidCrystal.h>
#include <Servo.h>
#define sensor x=6
#define sensor1 y=10
int sensor;
int sensor1;
int sensorValue = 0;
int servoPin = 9;
int i = 0;

Servo servo;
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);

void setup()
{
      pinMode(sensor, INPUT);
 pinMode(sensor1,INPUT);
     servo.attach(servoPin);
      lcd.begin(16,2);
      lcd.setCursor(0,0);

}
void set()
{    lcd.clear();
 lcd.print("  I AM FULL,EMPTY ME");
  for (int positionCounter = 0; positionCounter < 25; positionCounter++) {
   lcd.scrollDisplayLeft();
   delay(200);
 }
 for (int positionCounter = 0; positionCounter < 20; positionCounter++) {
   lcd.scrollDisplayLeft();
   delay(200);
```

```
 }
}

void defaul()
{
   lcd.clear();
 lcd.setCursor(0,0); lcd.print("FEED ME!");
}

void loop()
{
      //sensorValue = analogRead(sensor1);
      int sensorValue=digitalRead(sensor1);
      //int senread1 = digitalRead(sensor);
if(digitalRead(sensor)==HIGH)
      {
       set();

      }
      else
      {
       defaul();

      }
if(sensorValue ==LOW)
 {
    if(digitalRead(sensor)==HIGH)
      {
       set();

      }
      else
      {
       defaul();

      }
   for (int i = 0; i<=180; i++)
   {
     servo.write(i);
     delay(15);
     if(digitalRead(sensor1) == HIGH)
     {

       servo.write(i);
       delay(3000);
          if(digitalRead(sensor)==HIGH)
      {
       set();

      }
      else
```

```
      {
       defaul();

      }
     }
   }

   for (int i = 180; i>=0; i--)
   {
     servo.write(i);
     delay(15);
     if(digitalRead(sensor1) ==LOW)
     {

       servo.write(i);
       delay(3000);
          if(digitalRead(sensor)==HIGH)
      {
       set();

      }
      else
      {
       defaul();

      }

     }
   }
 }
if(digitalRead(sensor)==HIGH)
      {
       set();

      }
      else
      {
       defaul();

      }
delay(1000);
}
```

END OF THE CODE …..

CONCLUSION

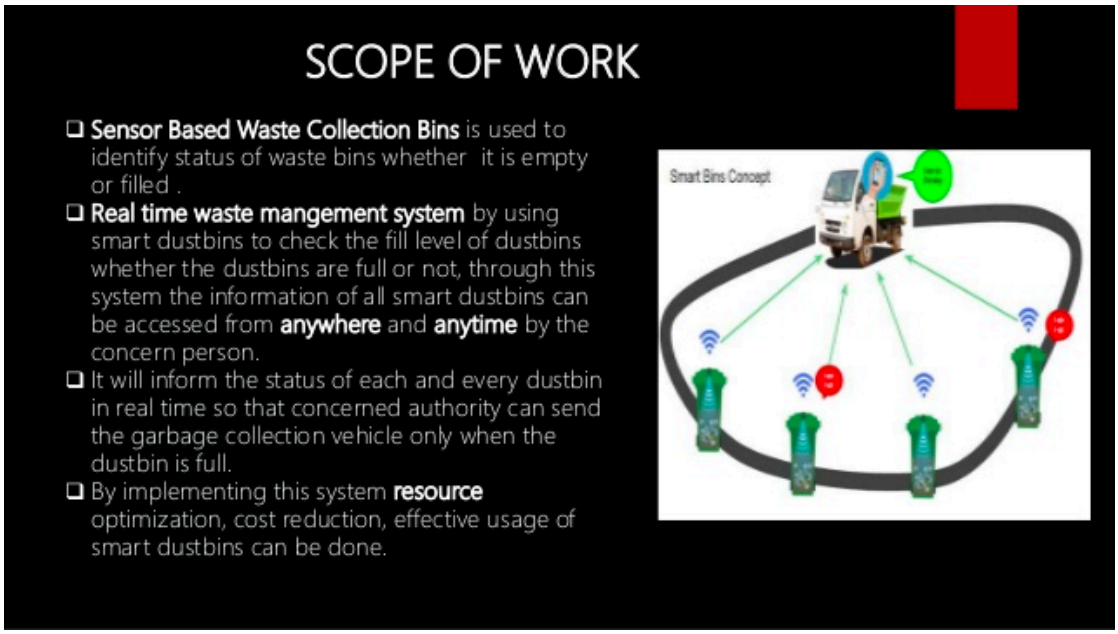
SUMMARY

This project shows how the smart waste management using IoT can be implemented. This proposed system assures the collection of garbage soon when the garbage level reaches its maximum level. The system will thus provide accurate reports, increasing the efficiency of the system. The real-time monitoring of the garbage level with the help of sensors and wireless communication will reduce the total number of trips required of GCV and thus, will reduce the total expenditure associated with the garbage collection. Thus, the dustbins will be cleared as and when filled, giving way to cleaner city, better infrastructure and increased hygiene.

IMPLEMENTATION METHODOLOGY In this scenario, garbage bins will be classified as master dustbins and slave dustbins. Master dustbins will be equipped with Raspberry Pi and slaves with IoT module. Every dustbin whether a master or a slave will have to be given a unique id. A database will be maintained containing the information about which dustbin to be placed in which area by their corresponding ids. The dustbin has UV sensor and load sensor for level detection, and humidity sensor for wet and dry garbage detection. Every dustbin, slave or master will have to communicate with Raspberry-pi 3, where Raspberry-pi 3 will act as a broker. The work of Raspberry-pi 3 will be to collect the data from sensors attached to master and slave dustbins, apply noise removal algorithm and send data to server using Wi-Fi. The message has to be sent to server by raspberry-pi 3 about levels of garbage in a bin, wet and dry waste segregation levels along with dustbin id. Server matches ids with database of dustbins, and will find levels of dustbins located in different areas of city. Different IoT protocols can be used for data transmission like MQTT or COaP.

FUTURE WORK

The authors are continuously working to upgrade the Smart dustbin so as to address a wide number of current shortcomings. The problems of foul odour and manual controlled mobility calls for the future scope which includes the odour control mechanism to get rid of foul smell of organic garbage. Also, realising the requirement of an autonomous dustbin, GPS module can be implemented for path planning combined with ultrasonic sensor for obstacle avoidance.



REFRENCES

[1] S.S.Navghane, M.S.Killedar, Dr.V.M.Rohokale, ”IoT based smart garbage and waste collection bin”, international journal of advance research in electronics and communication engineering, volume 5, Issue 5, May 2016 [2] Andrea Zanella, Nicola But, Angelo Castellani,Lorenzo Vangelista,Michele Zorzi, “Internet of Things for Smart Cities”, IEEE Internet of Things Journal (Volume: 1, Issue: 1, Feb. 2014) [3] Kanchan Mahajan, Prof J.S. Chitode, ”Waste bin monitoring system using integrated technology”, International Journal of Innovative Research in Science, Engineering and Technology

**********END OF PROJECT**********