PROJECT REPORT

ON

SMART WASTE MANAGEMENT SYSTEM

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ABSTRACT

Solid waste management is one of the biggest problems to the humongously populated urban areas in our country. It is becoming worse day by day to live a sustainable and happy life in urban areas because of the contamination of environment. Problems like waste overflow in the surrounding areas leads to dreadful diseases. For both the developed and developing countries, waste management has become a challenge. The Increasing population and growth of industrialization and urbanization made the job of solid waste management more tough. But improving technologies have brought innovative ideas to tackle this hazardous issue. The use of software systems and programming skills in the smart way to manage the waste can reduce the issue and improvises the work. This project SMART WASTE MANAGEMENT SYSTEM is an IoT based integrated system which consists an identification system, display system, and a communication system. This project gives more efficient results than other traditional methods because it utilizes minimum manpower, prevents overflow of garbage, time efficient, and it is completely an automated waste management system.

LIST OF FIGURES

CHAPTER - 1

INTRODUCTION

1.1 OVERVIEW

“Cleanliness is next to Godliness” this saying is heard since our childhood. If we keep our surroundings clean, we can live peacefully and sustainably. But during the phase of rapid urbanization and huge population increase the waste collection has become a great threat. The overflow of waste in surroundings is causing many dreadful diseases. To mitigate this problem, we need to have a perfect and efficient solution. The type of solid waste is also changing with the increasing use of plastic along with the amount of waste. Municipality commission governing the urban local bodies are facing problem to segregate the waste and manage it effectively to prevent the serious issues of solid waste management. A major and critical issue of Solid Waste Management is treating of the garbage dumping yards of the cities- which are mostly open and near to residential places.

Fig 1.1 Waste overflow in the city

1.2 CAPPING- AN INEFFECTIVE SOLUTION

Majority of the urban areas have opted capping as a solution i.e, covering the land with the waste. Perhaps, this is an ineffective solution as it produces methane and leachate to form for decades within the cosmetically covered heap. The disastrous effects of building on and around a “closed landfill” were so clearly demonstrated at Malad in Mumbai, where trapped landfill gases seeped sideways through the soil into the basement of the adjoining complex, wreaking havoc on every other electronic equipment and causing ill health for residents nearby.

Fig 1.2 Capping of waste in the city

1.3 PURPOSE OF WASTE MANAGEMENT SYSTEM

- By 2030, nearly two third of the population migrates to urban areas. So developing smart ways to minimize the issue and develop sustainable solution to this problem becomes the need of the hour.
- Effective solid waste management is important for a city. As it consumes approximately 50% of the budget just to clean only a small area of the city.

- 60% of the waste is not collected properly, which is leading to the diseases in the surrounding living areas.
- The worker has to go physically for checking the levels of waste in the truck. This leads to waste of time and fuel.
- Waste management reduces harm to human health and the environment by reducing the volume and hazardous character of residential and industrial waste.

Fig 1.3 Waste collection

Article 51 A (g) of the Constitution of India ensures it as a fundamental duty of every citizen of India to protect and improve the natural environment and surroundings.

1.4 FEATURES OF SMART WASTE MANAGEMENT SYSTEM

- The information of the level of waste in the dustbin is given by the sensor-based application that sends the message immediately to the mobile app.
- Both the forms of solid or liquid waste is identified by it.
- According to the level and area of the dustbin the truck chooses the shortest path which will save their time.
- It promotes “DIGITAL INDIA”.

- This system is effortless. Any damage in the parts can be easily replaced and modified within less time.

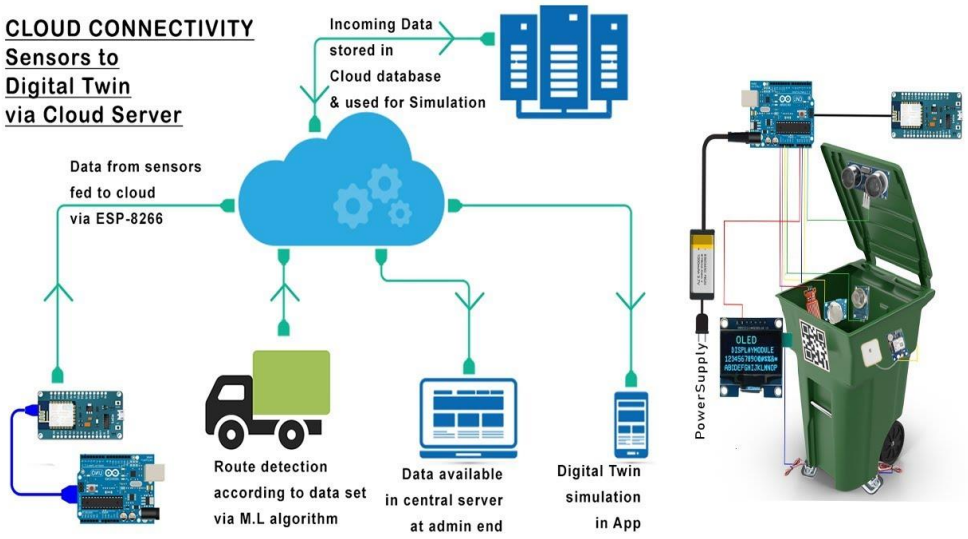

Fig 1.4 Smart waste management system

CHAPTER - 2

LITERATURE SURVEY

2.1 EXISTING PROBLEM

Source: Minhaz Uddin Sohag, Amit Kumer Podder (2020) "Smart garbage management system for a sustainable urban life: An IoT based application", ***Elsevier, 2020.***

The paper taken for literature survey presumes the problems of waste disposal in a densely populated country like Bangladesh. Drastic increase in population and urbanization in the capital city of Bangladesh, Dhaka resulted in huge amounts of waste overflow in the streets. However, this problem was overlooked by the local Government. A place like Dhaka city, where the density of population is high, needs an effective waste management system. An appropriate approach which can manage waste in such a way that it does not pollute the environment and ensure the safety of public health is required. The solid waste management in Bangladesh is not people-friendly. Dustbins do not have lids on them and mostly they are placed on the busy roads where people go to offices, schools, colleges etc. Garbage overflow is most frequently seen every day. Thus, many dreadful diseases were infected to the people.

2.2 PROPOSED SOLUTION

Based on the above issues, this paper proposed an effective and efficient garbage management system. The proposed system utilizes sensors for identification and measuring garbage level. Continuous data regarding garbage levels are available for personnel through the display of the garbage bin. This smart garbage bin provides an automated lid to personnel. The garbage bin also sends a message to the corresponding

authority to collect waste when the bin is 100% filled up. Arduino Uno synchronizes the whole automated system. A real prototype of the proposed smart waste management system in a small-scale bin is designed and found satisfactory results.

Therefore, in brief, the contributions of the paper are,

(i) It provides a very simple waste management system that is eco-friendly. It also can bring a great change in people's perspective towards messy urban life.

(ii) The proposed system is very much easy to handle than the traditional waste management system. It will also help to secure a worthy urban life.

(iii) The system also provides an automated lid that prevents any kind of physical contact with a garbage bin. With IoT based application, it helps to avoid the overflow and spreading of waste.

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THEORETICAL ANALYSIS

3.1 BLOCK DIAGRAM

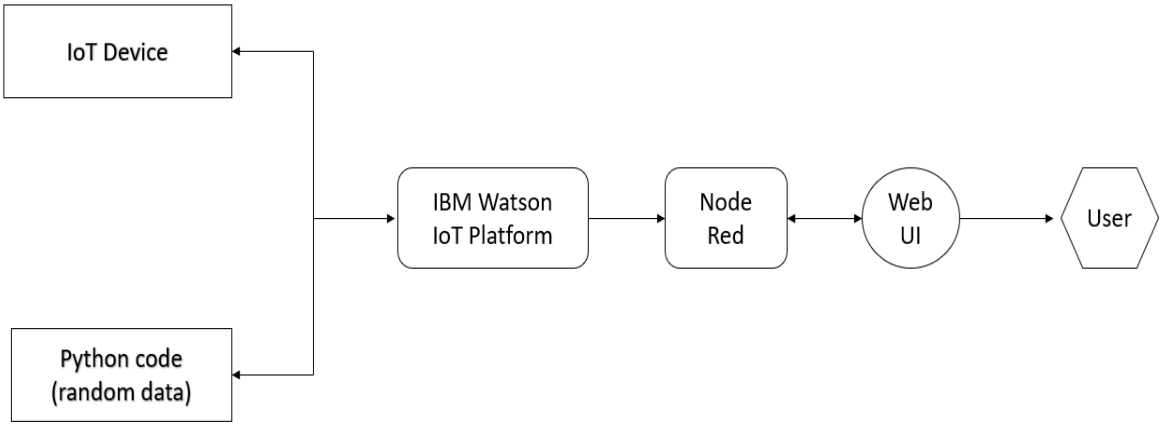


Fig 3.1 Block diagram showing the process

3.2 SOFTWARE DESIGNING

For the purpose of software design, the following procedure is followed:

In the setup environment

i. Install python idle
ii. Create IBM Account

iii. Go to services and create IoT Platform

iv. Create device credentials

v. Create Node-red application

vi. Install the required nodes

vii. Create account in MIT app inventor to build the mobile app

viii. Install Fast2SMS

CHAPTER - 4

EXPERIMENTAL INVESTIGATIONS

Step 1: In the IoT platform, create the device credentials

Device ID: 24680

Device Type: projectiot

Organization ID: r6dhnj

Step 2: Create Node-red flow to get Debug Output

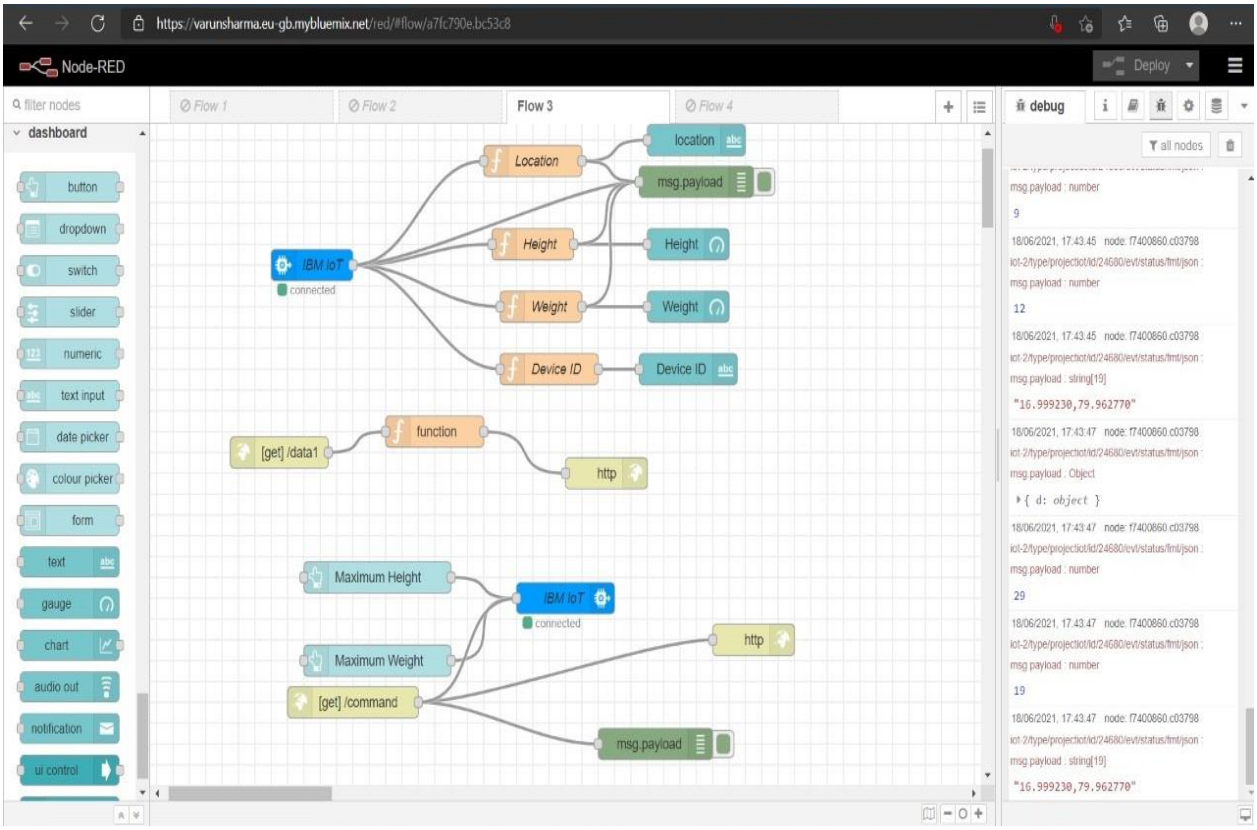


Fig 4.1 figure showing Node-RED flow creation

In the above figure, IBM IoT is the input node. It takes the information given from external simulator or from a code. Location, Height, weight, device ID are called function nodes. Dashboard nodes are used to represent the UI output in desired way. Configure the nodes to display the data. Connect these nodes to debug node. Debug node displays the values of location, height, weight, and device Id.

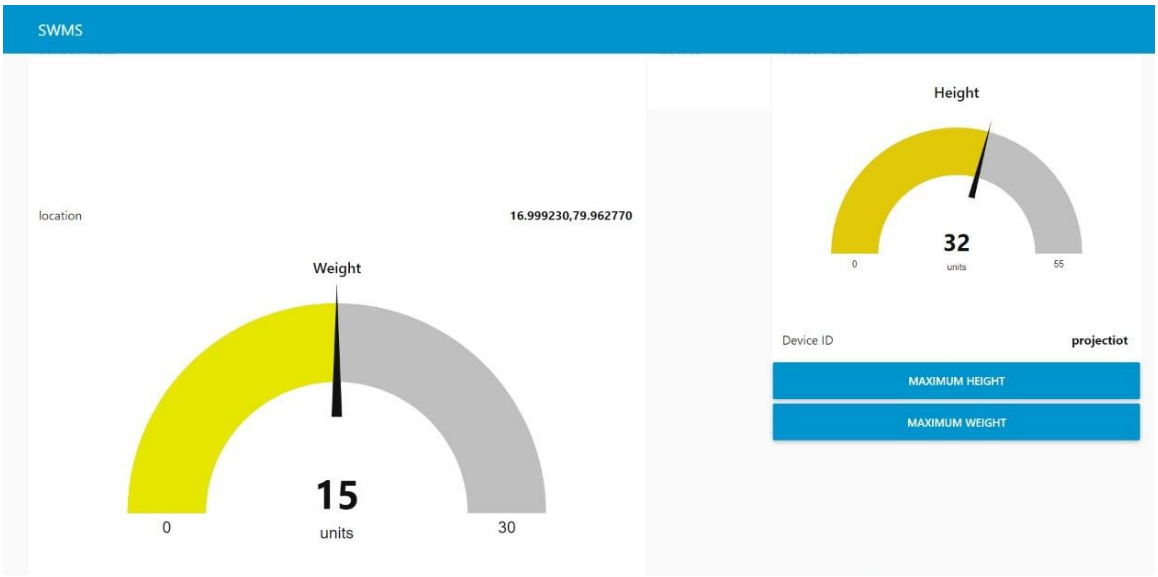


Fig 4.2 UI output screenshot

[get]/data 1 is the http in node. It is further connected to http response node. We can create a URL here. We use this URL, in design of mobile application.

Maximum height and maximum weight are the button nodes. These are connected IBM IoT output node to get the information. [get]/command is the http in node which is connected to http response node to create the URL. We also use this URL in design of mobile application.

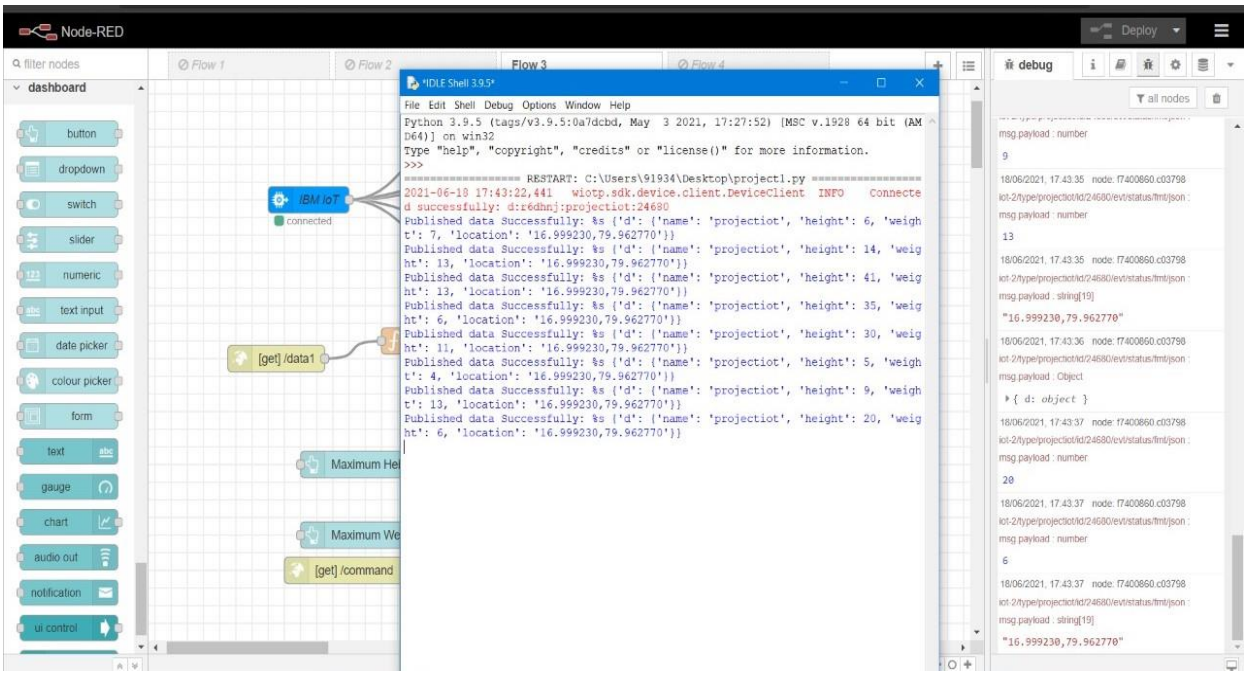


Fig 4.3 figure showing the outputs displayed in debug window

Step 3: Select new project in MIT app inventor

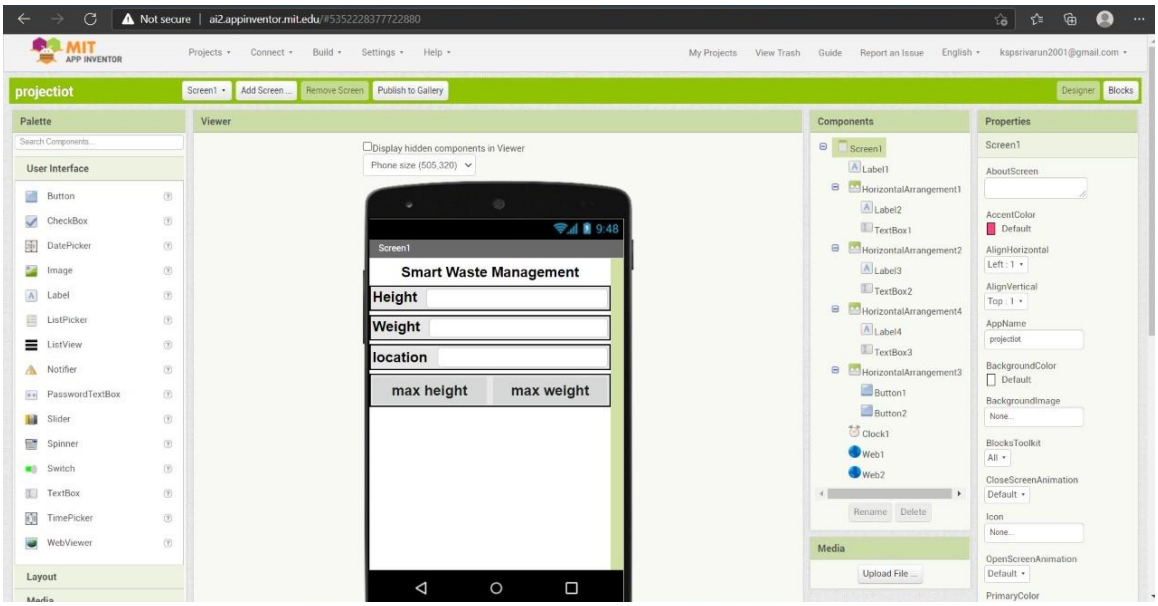


Fig 4.4 figure showing MIT app – front-end part

Height, weight and location are labels, corresponding textboxes are provided to display the values. Max height and max weight are buttons, each one is represented in separate textbox. This part represents the front-end part.

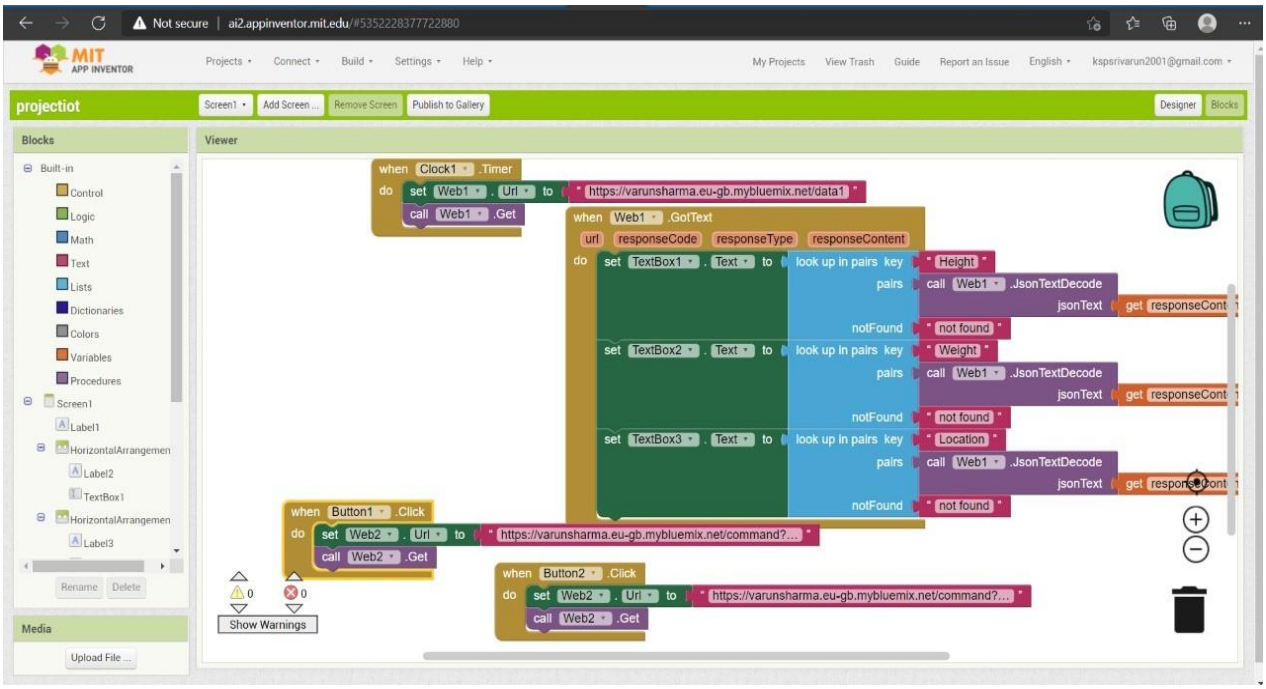


Fig 4.5 figure showing MIT app window back-end part

The above figure represents the back-end part. Here the corresponding URLs are given in the blocks and the data is represented in the separate text boxes provided.

Step 4: Displaying the output:

Install MIT AI 2 companion app in the mobile. Scan the QR code displayed on the AI companion window. Values of height, weight and location are displayed here. SMS is sent to our mobile.

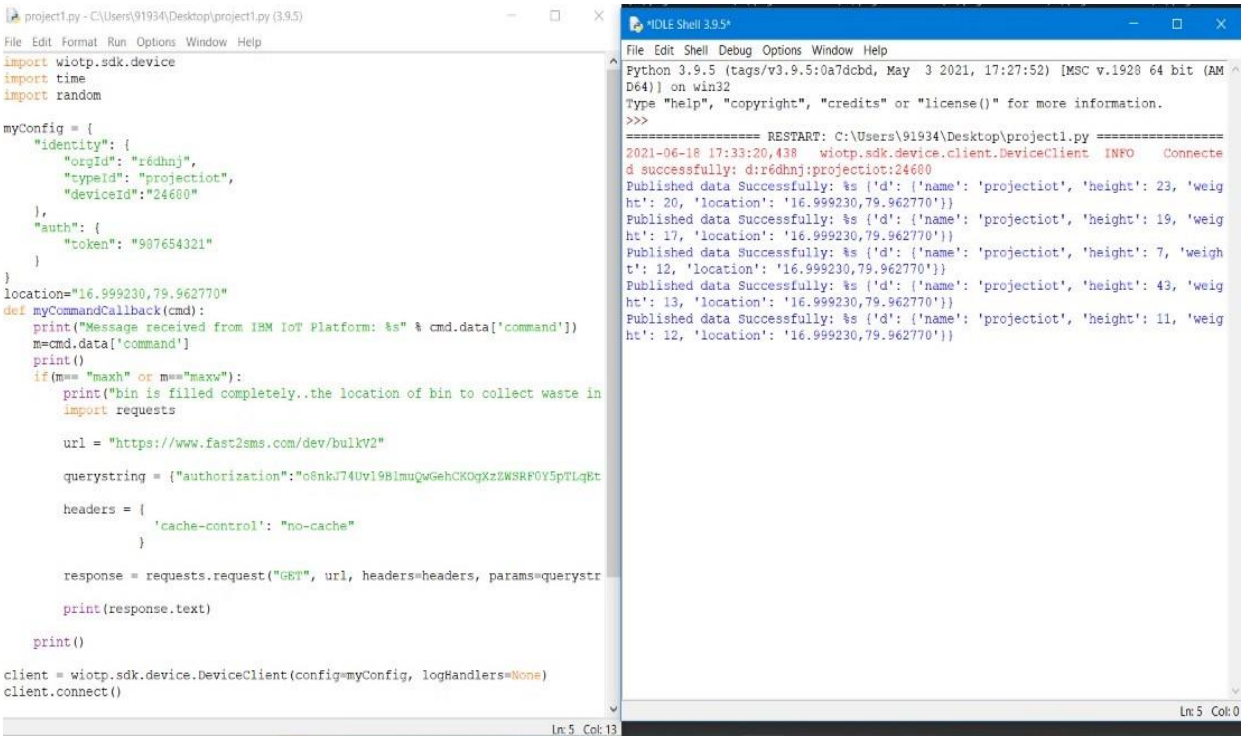
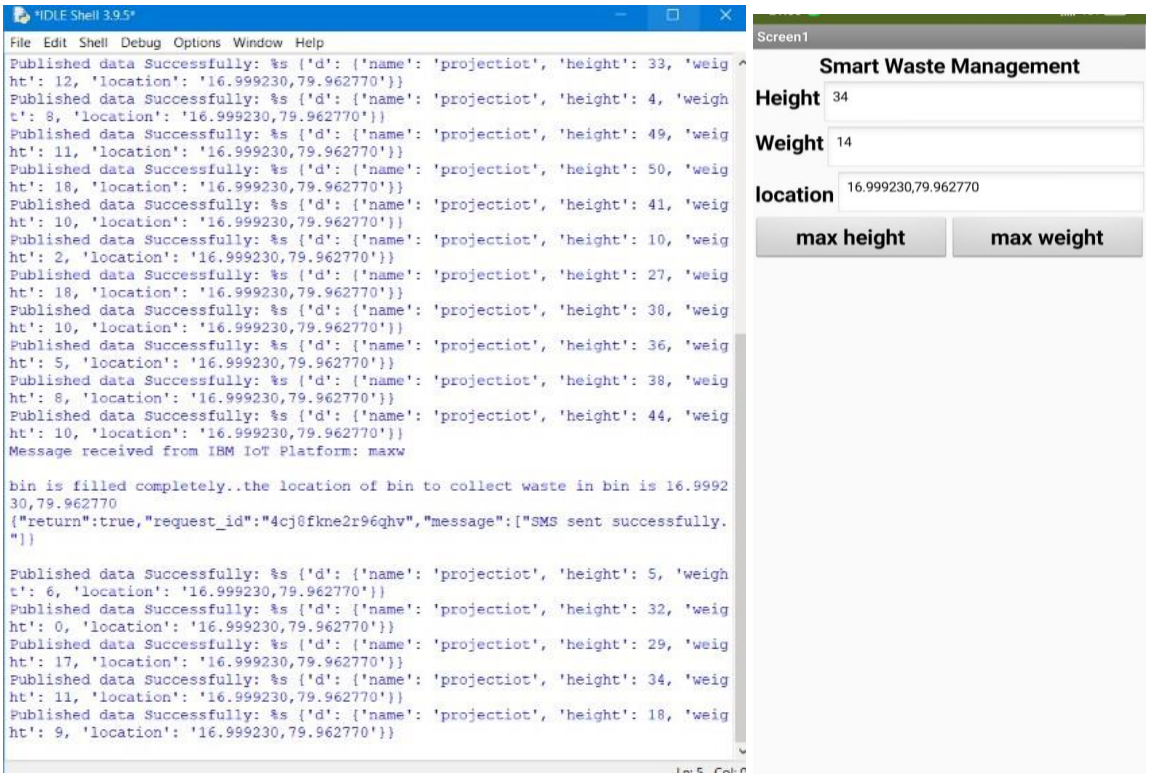


Fig 4.6 figure showing python code



By clicking the max height and max weight, we can get a message alert to our mobile to clear waste in dustbin in a specific location.

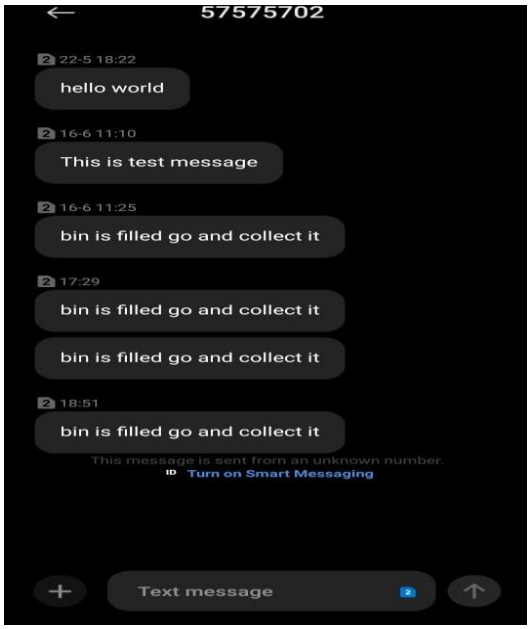


Fig 4.7 figure showing SMS alert

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FLOW CHART

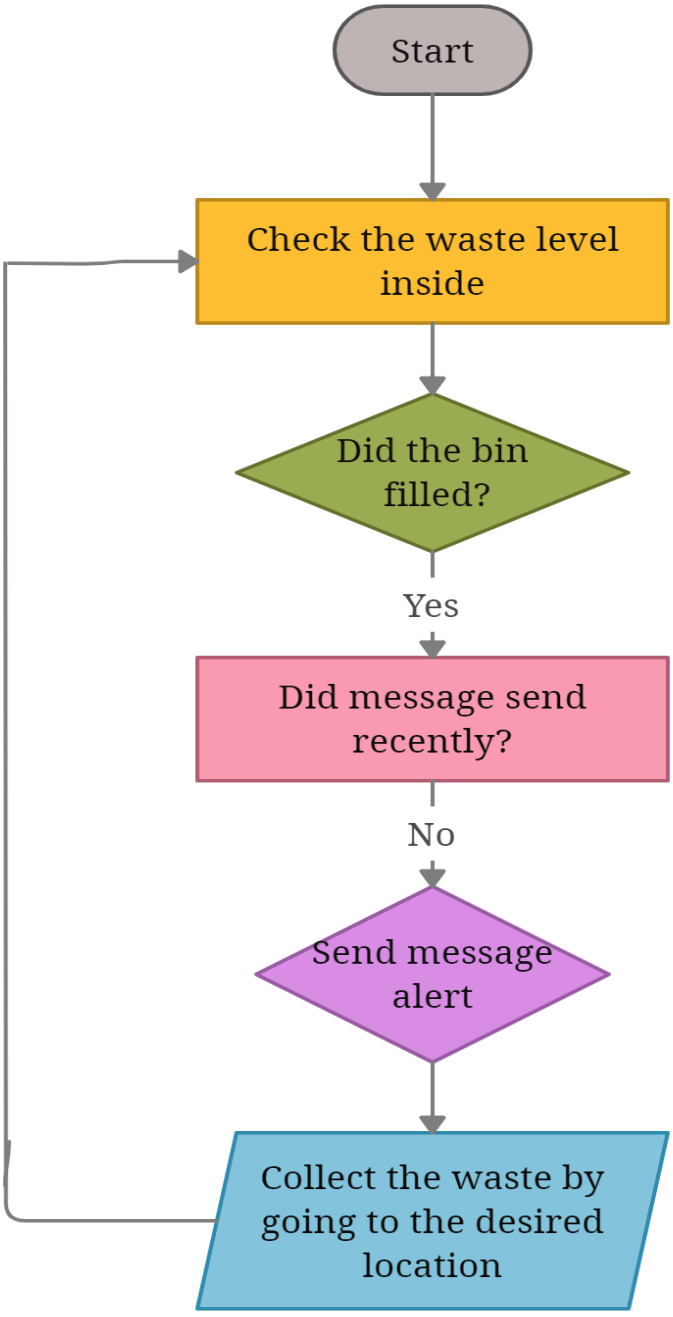

Fig 5.1 Flow chart showing the procedure

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RESULT

This software application is a one stop solution to the smart waste management system. We get message whenever the dustbin is filled. Thus, we can minimize the problems of waste overflow. This prevents the surrounding people from dreadful diseases. We can mitigate the problems of waste overflow to a greater extent by using this smart waste management technique. By further developments in the technique, we can utilize this in district waste management system by the municipal corporations.

CHAPTER-7

ADVANTAGES AND DISADVANTAGES

7.1 ADVANTAGES OF SMART WASTE MANAGEMENT SYSTEM

- Waste collection takes less time and consumption of fuel is less as the trucks reach only to the filled dustbins.
- Reduction in noise, traffic flow and air pollution as a result of less trucks on the roads.
- The smart operating system enables two-way communication between the dustbin deployed in the city and service operator. Therefore, the focus is only on collection of route-based fill level of the containers.
- It provides real time information on the filling and overflow level. Thus this information helps know when and where to collect the waste.
- By this approach both the workers and citizens would be benefitted from an optimized system which results in cost efficiency and, minimize urban pollution.
- Application of this type of technology to the city transforms it into a "SMART CITY".
- It keeps the surroundings sustainable to live.
- Manpower is reduced which is required to handle the waste collection.

7.2 DISADVANTAGES OF SMART WASTE MANAGEMENT SYSTEM

- This technique requires skilled labours who know to operate the devices. Training has to be given in advance.
- Maintenance cost is high.
- Highly Expensive as the initial equipment charges for smart dustbins is more.
- Unemployment increases as the number of trucks are decreased; it also decreases the number of drivers.

CHAPTER - 8

APPLICATIONS OF SMART WASTE MANAGEMENT SYSTEM

- This method can be used by municipal corporations for the easy collection of waste in an efficient manner.
- By using suitable technology like GPS and TRANSPORT SOFTWARE SYSTEMS we can show the shortest distance to reach the destination.
- It promotes and shares a hand in Smart City Program and Digital India Campaign.

CHAPTER - 9

CONCLUSION

Rapid escalation of population and increasing industrialization, mass urbanization is leading to complete chaos. Thus, increasing the waste disposal in the environment, eventually it is becoming difficult to stay among the humongously populated urban regions. Conventional methods of waste management cannot handle the large-scale waste. It is high time to apply technology-based solutions to handle the increasing waste. The project done gives an idea of automated waste management system. By using this method, the collection of garbage becomes easy. It also reduces air pollution, noise pollution, traffic problems and improves time management, prevents from many dreadful diseases. This project acuminates for a people friendly environment and smart living.

FUTURE SCOPE

Further improvement of this project is:

- To monitor different types of wastes in dustbins; that is there should be at least two dustbins one for dry waste and one for wet waste.
- We need to ensure that the wet waste is removed from the bins very regularly for at least once in two or three days though the bin is filled completely or not. Because wet waste releases pungent smell causing breathing issues and dreadful diseases.
- The server's information can be given to the municipal corporations for the maintenance of dustbins instead of phone number.

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APPENDIX

A) SOURCE CODE

```
import wiotp.sdk.device
import time
import random


myConfig = {
    "identity": {
        "orgId": "r6dhnj",
        "typeId": "projectiot",
        "deviceId":"24680"
    },
    "auth": {
        "token": "987654321"
    }
}
location="16.999230,79.962770"
def myCommandCallback(cmd):
    print("Message received from IBM IoT Platform: %s" % cmd.data['command'])
    m=cmd.data['command']
    print()
    if(m== "maxh" or m=="maxw"):
```

```
        print("bin is filled completely..the location of bin to collect waste in bin is",location)

        import requests


        url = "https://www.fast2sms.com/dev/bulkV2"


        querystring = {"authorization":"o8nkJ74Uvl9B1muQwGehCKOgXzZWSRF0Y5pTLqEtxdiMPyH2VfmFh92jrnykNYZe4RAftO6c3vuaoXwI","message":"bin is filled go and collect it","language":"english","route":"q","numbers":"9347844644"}


        headers = {

              'cache-control': "no-cache"

            }


        response = requests.request("GET", url, headers=headers, params=querystring)


        print(response.text)


    print()


client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)

client.connect()


while True:
```

```
    height=random.randint(0,50)

    weight=random.randint(0,20)

    myData={'d':{'name':'projectiot','height':height, 'weight':weight,"location":location}}

    client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0, onPublish=None)

    print("Published data Successfully: %s", myData)

    client.commandCallback = myCommandCallback

    time.sleep(2)

client.disconnect()
```

B) UI OUTPUT SCREENSHOT

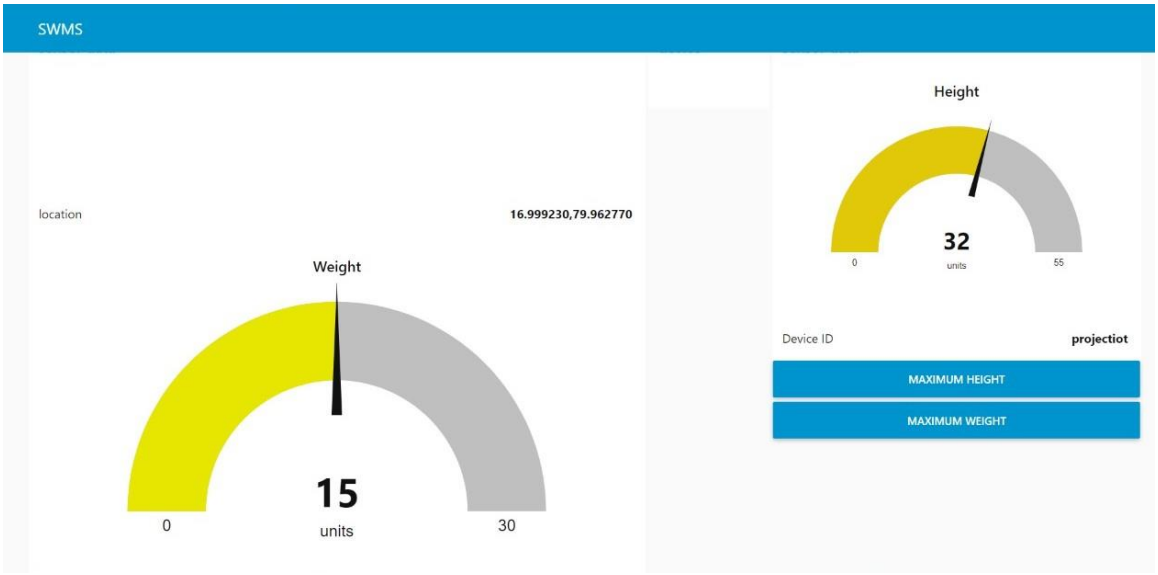

Fig b: UI Output screenshot