

# **SMART DUSTBIN FOR SMART CITIES**

## **ABSTRACT**

The govt. of India has recently launched a smart city project and for these smart cities to be smarter it is necessary that the garbage collection system has to be smarter and in addition to that the people need easy accessibility to the garbage disposing points and garbage collection process has to be efficient in terms of time and fuel cost.

# **INTRODUCTION**

Most of the urban cities and town in India are not well designed to facilitate the proper garbage disposing and collection mechanism. Also the cities are expanding rapidly putting the pressure on existing infrastructure which is not expanding at the same pace that of urbanization .As the govt. of India has launched smart city project to utilize the IT enabled solution so there is an implicit need to make the city cleaner. Our proposed system provide an IT based solution to garbage collection providing greater accessibility, planning appropriately for disposing process and at the same time enabling collection of garbage generation data. Our proposed system solves three related problems:-

- 1) Greater access to the garbage disposing points (public dustbin)
- 2) Efficient in terms of time and fuel cost.
- 3) Provide data collection facility on how much a city generates garbage and accordingly plan disposing process.

## **EXISTING SYSTEM**

A waste-bin system can be adapted into general waste-bin and it consists of the sensing units, a Bluetooth and GSM module for data transmission, and a mobile application and web-based monitoring for interfacing and communication with the waste department for waste management.

The smart bin composed of sensor node mounted on it for the data collection and transmission. The sensors are divided into two paths. One path is mounted with the bin cover and the other is in the bottom of the bin. The first path is level sensor to monitor the level of waste bin. The other path is smart load cell sensor to calculate the weight of waste.

## **PROPOSED SYSTEM**

- Real time waste management system to check the fill level of dustbin whether the dustbin are full or not.
- It will inform the status of each and every dustbin so that concerned authority can send the garbage collection vehicle.
- The level of waste in the dustbin is detected with the help of ultrasonic sensor.
- Force sensor is used to measure the weight of the dustbin.
- When the measured value of sensors exceeds a certain threshold value then red led becomes ON.
- Android device will detect, in which area dustbin is located and status of that.

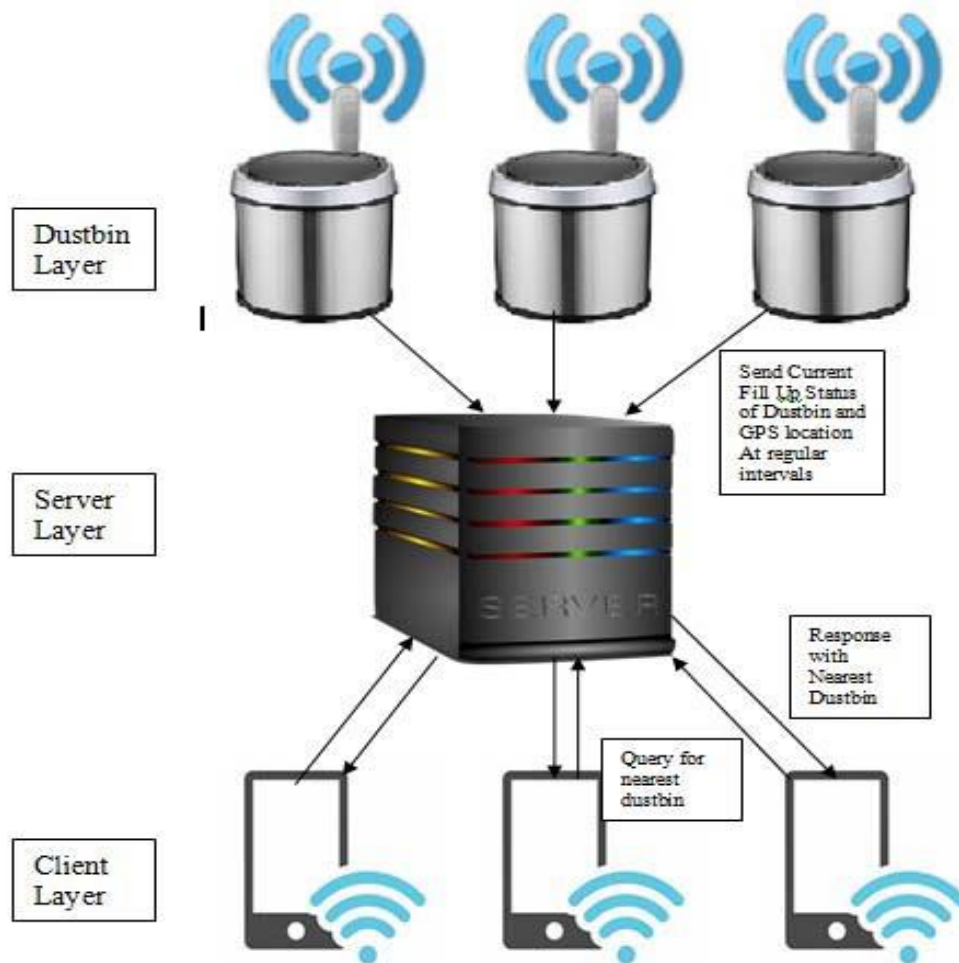


Fig. Concept of Smart Dustbin System

# SYSTEM ARCHITECTURE

This proposed system has been divided into three layers:

1. Dustbin layer
2. Server layer
3. Client layer



### **1) Dustbin Layer: -**

This layer consists of internet and Wi-Fi enabled dustbins. Every dustbin contains a sensor which senses the fill up status of dustbin and sends the data to the server. It also sends its current GPS location to the server at regular intervals.

### **2) Server layer:**

Server collects the fill up status and location of dustbins. It processes the client's query and responds with nearest dustbin location and with direction to access dustbin.

### **3) Client layer: -**

Clients request for the nearest location of the IT enabled dustbin to the server using Mobile App designed for this purpose.



## WORKING PRINCIPLE OF A SMART DUSTBIN

X is current fill up status, T is time duration between generation of wave and wave received by receiver and C is the speed of light. And we will calculate the value of X using formula given below

$$X=L-(CT)/2$$

And similarly percentage of fill up is calculated using formula given below

$$P=(X/L)*100$$

Where P is the % fill up Here we are assuming the wave path is almost vertical.

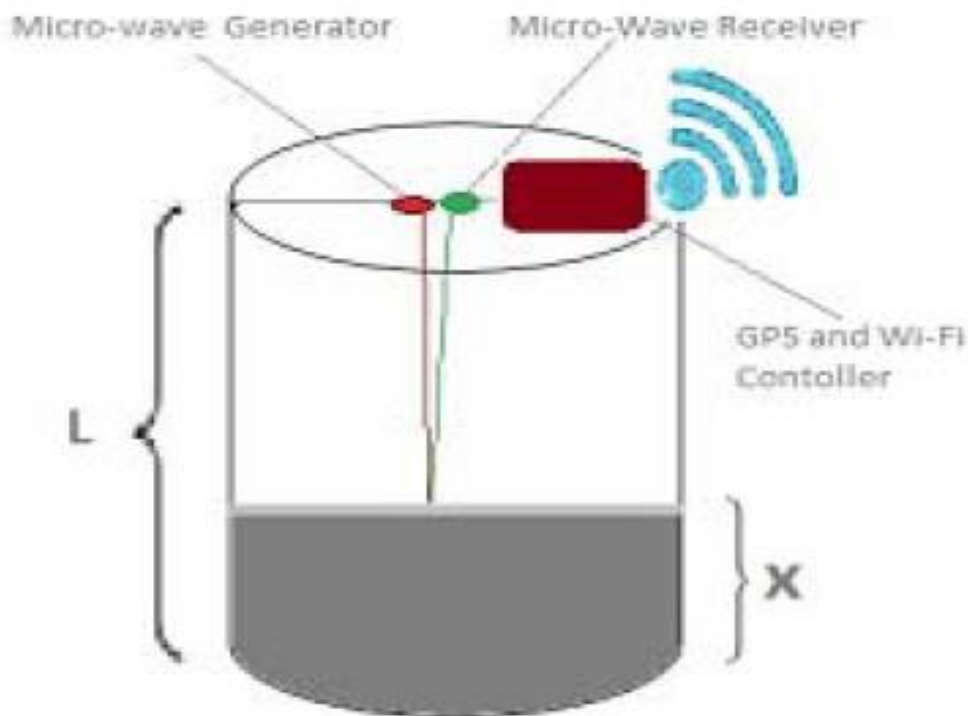
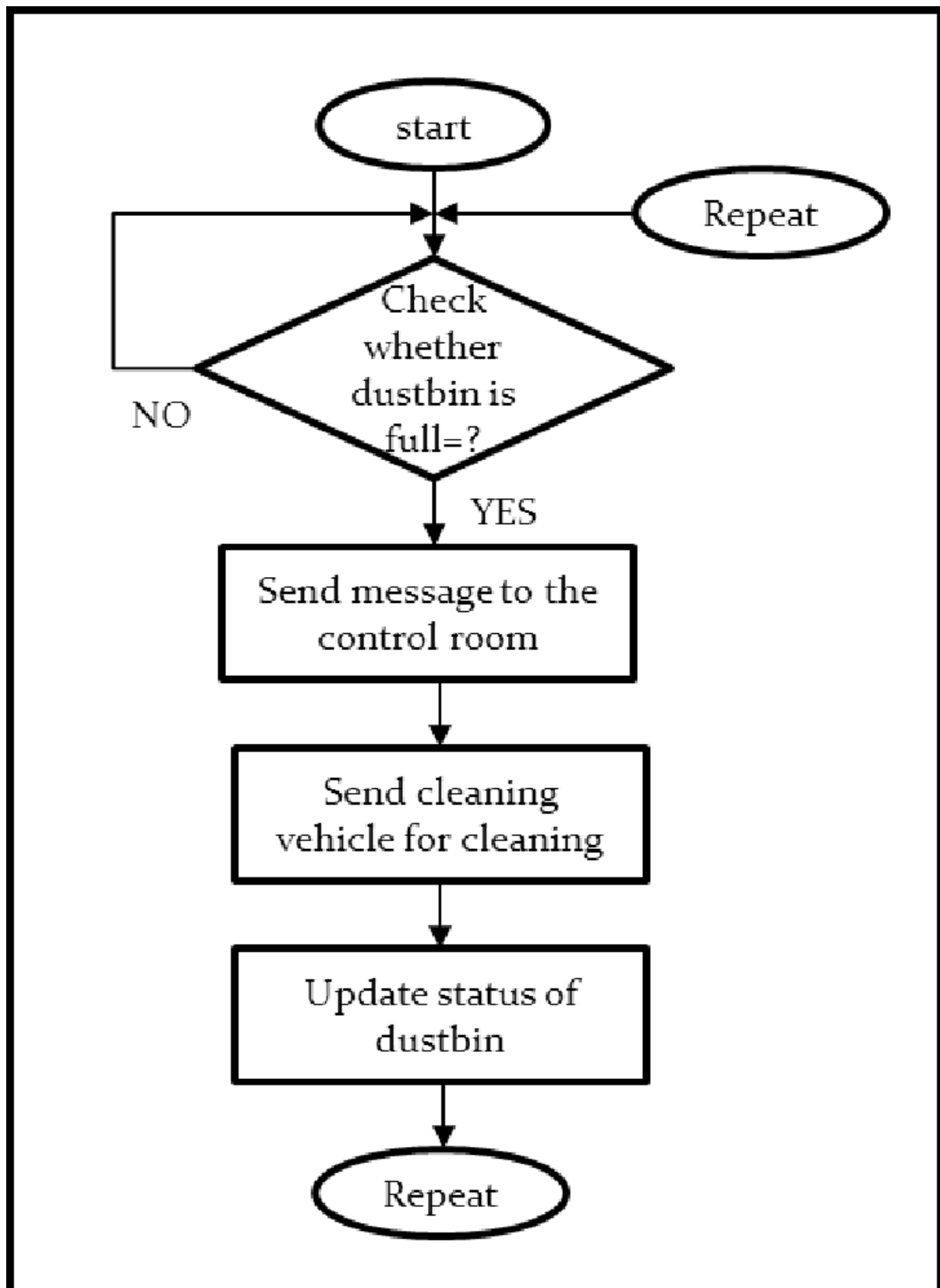


Fig.2 shows the Working principle of dustbin

## Flow chat of Woking Principle



The PIR sensor will observe a person nearby dustbin. If motion is detected the lid of dustbin is opened, the servo motor activates and as GSM connected it will send an alert message to user if dustbin is filled.

Dustbin placed in public place, people throw garbage in dustbin, place the ultrasonic sensor in top of the garbage bin. If dustbin reach in 75% then arduino send message through GSM module. When dustbin level is reach threshold level buzzer will give alert sound for don't again put waste in dustbin. This all process updated in IOT GECKO platform for monitoring garbage bin.

# **IMPLEMENTATION**

We can use following three scheduling Algorithm.

- 1) Fixed Scheduling
- 2) Priority Scheduling
- 3) Average Threshold Scheduling
- 4) Full Dustbin Capacity Utilization Scheduling

## **1) Fixed Scheduling: -**

In this scheduling collection process carried out after fixed interval for example collect after every three days. Here we can use the Traveling salesman problem algorithm for route planning.

With fixed priority preemptive scheduling, the scheduler ensures that at any given time, the processor executes the highest priority task of all those tasks that are currently ready to execute. Fixed scheduling is a scheduling system commonly used in real-time systems. With fixed scheduling, the scheduler ensures that at any given time, the garbage collection van follows its schedule. In this type of scheduling no matter how much the dustbin is full after a fixed interval van comes and collect the garbage.

## **2) Priority Scheduling: -**

In this scheduling the dustbins are collected according to the decreasing current fill up status. Here based on Priority that means the fill up status of the dustbin is checked and accordingly garbage gets collected. This can be used for routine check of bins for saving resources. In this scheduling according to the status of the dustbins, their priority is decided and collection of garbage is carried out accordingly. In this method, the scheduler chooses the tasks to work as per the priority, which is different from other types of scheduling, for example, a simple round robin.

### **3) Average Threshold Scheduling: -**

In this scheduling we first find out the average of all fill up status of all dustbins. Then if average is greater than some threshold like 70% then schedule the collection process and within that scheduling collect according to the Priority scheduling or Traveling salesman problem.

This type of scheduling has its own advantages and disadvantages. According to the average threshold value set by the authority, if the dustbin capacity reaches this value, only then the van will collect the garbage from it. There are some drawbacks in this scheduling, as if one of the dustbin in the area reaches to its full capacity while the average of all the dustbins in the area has not reached the threshold value, the dustbin will remain unattended. To overcome that drawback we can add one algorithm as while calculating average we will only consider the dustbins which are above 70 percent filled.

### **4) Full Dustbin Capacity Utilization Scheduling: -**

In this scheduling we will carry the collection process only when all the dustbins are completely filled up. Here we can again use the traveling salesman problem algorithm for route planning.

This type of scheduling is most efficient in terms of cost because garbage is collected only when all the dustbins are filled. Until all the dustbins in the area are filled to its full capacity, the garbage collection van will not come. Some dustbins which are filled to its full capacity will remain unattended. Thus, it refers to the relationship between actual output produced and potential output that could be produced with installed equipment, if capacity was fully used.



Fig. Collection Process

## **APPLICATION**

- Empowered Swach Bharat Mission
- e-Governance based on Digital India
- Reduce environmental pollution
- Real time based cleaning of our cities
- It makes our system transparent between municipal corporation, workers and public

## **ADVANTAGES**

1. Our system provides greater accessibility to the dustbin.
2. In our system if dustbin is relocated to another location it will automatically registered with the server with the new GPS location.
3. It will save fuel and time using appropriate route planning.
4. It will generate less pollution as we are saving fuel here which is mostly diesel and petrol.
5. We can plan and design the collection process as here we can estimate the current garbage disposing levels on monthly basis using the data provided by IT enabled dustbin.



## **DISADVANTAGES**

1. The process is not always cost-effective
2. The resultant product has a short life
3. The site are often dangerous
4. The practices are not done uniformly

## **FUTURE SCOPE**

- This project is made for demo concern, it can be taken to product level.
- It can be made durable, by making it compact and cost effective.
- Two bins can be placed to collect wet and dry waste separately.
- Wet waste can be decomposed and used for making biogas.

## **CONCLUSION**

The system help the local municipal administration in waste management system.ie,monitoring of domestic wastage clearance at proper time to avoid damage to the public health.A web server is also been set up through which the municipal authorities also get information about the bins in their area.It uses sensors for sensing information of bins and sending to workstation,which is situated at municipal office for finding shortest path.

One of the utility of our system is that the Govt. can use the garbage generations statistics for policy and program design. If the system is implemented properly it will really make the cities cleaner and greener and makes the smart city a reality.

## **REFERENCE**

- [www.seminarsonly.com](http://www.seminarsonly.com)
- [WWW.google.com](http://WWW.google.com)
- <https://www.slideshare.net>