

## IOT BASED GARBAGE COLLECTOR

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### ABSTRACT

These days, one of the serious problems that rural and urban areas are facing is garbage disposal. In some areas, the garbage is not even being collected by the municipal corporation vans, which affects sanitation. To resolve these problems we come up with the idea of "Garbage Collector", which is a totally programmed device for doing several tasks simultaneously. It is programmed to identify the type of garbage which is collected in different sections of the collector. It is being connected with all the smart bins through wireless, which will send an alert whenever it is about to be full. Those bins have some sensors to sense the percentage of garbage being filled. This paper discusses the proposed system using the concept of Internet of Things (IoT).

### I. INTRODUCTION

As of now, it is seen that in many rural and urban areas, all the garbage are exposed to the air. Through this exposure many infectious diseases spread all over the place affecting both people and domestic animals. Garbage collectors of the municipal corporation are not able to identify the harmful garbage; they just collect the garbage and dump it in the open air or in places close

to the water bodies. The practice leads to the contamination of both air and water. In many areas, the garbage collector collects the garbage only twice a week, due to which, the garbage starts decaying there itself and posing health risks to citizens. This problem of garbage-disposal is increasing day by day and making our city garbage city [8]. The rest of the paper is organized as follows. In section II, related work is discussed. Section III presents the proposed system of garbage collector, and Section IV discusses conclusion and future work.

### II. RELATED WORK

A survey by the Energy and Resources Institute (TERI) has found that almost 90% of people felt that improper waste management in India posed a moderate to severe health risk [14]. On the issue of

Waste management, close to 50% of the people did not have provisions to collect waste from their houses. This was highest for respondents from low income localities (56%) than high and middle income localities (44% and 45% respectively).

According to the survey of Biodiversity Conservation India(Pvt) Ltd. (BCIL), a majority of the respondents had no clue as to where the waste generated in their homes were being dumped. Only 23 percent of the respondents said they segregated waste before disposing it. While 27 per cent admitted that they would

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complain to the authorities if they found waste being dumped on streets illegally.



Fig. 1.1 Waste generated in India and World

Waste that is being generated in our country is shown in Fig. 1.1. The statistics of top five cities with maximum generation of waste is shown in Fig. 1.2.

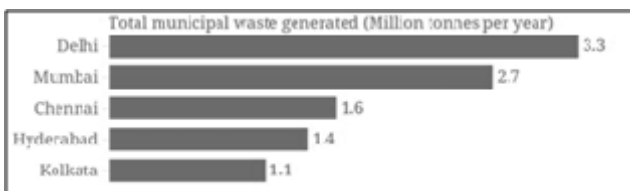


Fig.1.2 Highest municipal waste in top five cities in India

There are many infectious diseases and accidents caused while waste is -handled [10].

### Chronic diseases

Incineration operators are at risk of chronic respiratory diseases, including cancers resulting from exposure to dust and hazardous compounds.

### Infections

Skin and blood infections resulting from direct contact with waste, and from infected wounds. Eye and respiratory infections resulting from exposure to toxic

dust, especially during landfill operations. Many diseases are caused, from bite of animals feeding on the waste. Intestinal infections are transmitted by flies feeding on the waste.

### Accidents

Bone and muscle disorders are caused from the handling of heavy containers. Infecting wounds are caused from contact with sharp objects. Poisoning and chemical burns resulting from contact with small amounts of hazardous chemical waste mixed with general waste. Burns and other injuries resulting from occupational accidents at waste disposal sites or from methane gas explosion at landfill sites. Overflowing of the normal bins causes many health problems.

### Some of them are:

It causes typhoid fever, food poisoning, enteric fever, gastroenteritis and other major illnesses. Besides flies, animals that thrive on the garbage in and around the containers include rats, foxes and stray dogs.

One of the outcomes of overflowing garbage is air pollution, which causes various respiratory diseases and other adverse health effects, as contaminants enter the human body through lungs. The toxic substances in air contaminated by waste include carbon dioxide, nitrous oxide and methane.

It affects all ecosystems existing in the water, including fish and animals that drink the polluted water. Hazardous household waste items [13] such as batteries, computer equipment and leftover paints can be particularly dangerous for surface waters.

To overcome this health hazards and issues which are affecting the whole ecosystem [9], there are smart bins which are used to collect the garbage.

Maher Arebey, M.A.Hannan and Hasan Basri in [11], have proposed integrated system combined with an integrated system of Radio Frequency Identification (RFID), Global Position System (GPS), General Packet Radio Service (GPRS), Geographic Information System (GIS) and web camera.

The built-in RFID reader in collection trucks would automatically retrieve all sorts of customer information and bin information from RFID tag, mounted on each bin.

GPS would give the location information of the collection truck. All information of the center server can be updated automatically through GPRS communication system. The performance of the implemented system has been analyzed, and it is believed that the proposed system is much better than the existing system in terms of high speed data transmission, precision, real time and reliability.

According to S.Vinoth Kumar, T.Senthil Kumaran, A.Krishna Kumar and Mahantesh Mathapati [1], IOT based smart waste clean management system checks the waste level over the dustbins by using Sensor systems. Once the bin is full immediately this system alerts the authorities concerned through GSM/GPRS. For this system they use Microcontroller as an interface between the sensor system and GSM/GPRS system. To monitor and integrate, an android application is developed for the desired information, which is related to the various levels of waste in different locations.

### III. PROPOSED SYSTEM

In this paper, a garbage monitoring system comprising smart garbage collector and smart bins is proposed.

#### A. Smart Bin



Fig. 1.3 Smart bins

Smart bins for collecting wastes of different categories are shown in Fig. 1.3. There are different categories of waste such as solid waste, wet waste and bio-chemical waste, each of which should be dumped in different bins. If wrong categories of garbage are dumped in the bins, then an alarm is raised to alert people of the mistake. Smart bins comprise sensors and GPS module.

Ultrasonic Sensor: This sensor shown in Fig.1.4 is based on the frequency range. Whenever any object comes in its range it will change the frequency raising an alarm. In smart bins [5] this sensor is installed [4] to identify the level of waste being filled. Whenever it is about to fill, it will send the location of that bin through the GPS module to the garbage collector.

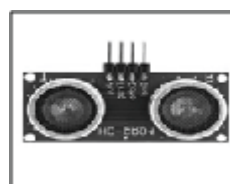
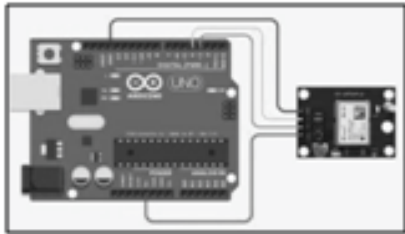


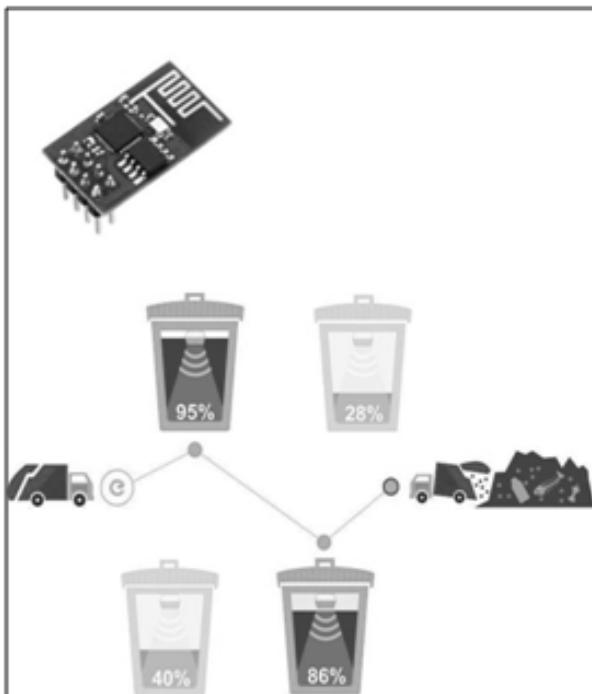
Fig. 1.4 Ultrasonic Sensor [6]

GPS module: Global Positioning System module is mainly used for tracking the Location, Time, Date, Longitude, Latitude, speed, no. of satellites used, altitude and many other things and get it across to the server. Here we can use GPS module [2] Arduino NEO-6m for transmitting the location to the server.



**Fig. 1.5 GPS**

Wi-fi Module: ESP8266 is a wi-fi module used to give the microcontroller [12] permission to access our wi-fi network. It is used to monitor the sensors [3] and data log into the internet server or Cloud.



**Fig.1.6 Alert system**

Server is used to store all the details of the garbage collecting agent, garbage collector and the smart bins

location. All the agents have an android application which has all the details of the bins and their location, and whenever the bins are full [7], an alarm will alert the agent about it as shown in Fig. 1.6.

Dijkstra Algorithm is used for finding the shortest path between the full bins and the agent who is responsible to collect the waste.

Garbage Collector: It is a fully air tight container for collecting the waste. It has also ultrasonic sensor for level measurement. Whenever the container is about to be full it will trigger an alarm and notify the agent and then agent will notify the nearby garbage collector agent through the android application to collect the waste in that area as shown in Fig.1.7



**Fig.1.7 Garbage Collector**

#### IV. CONCLUSION

In this paper, different technologies are discussed which, if they are implemented, will turn a garbage city into a garden city. Sensors are used to identify the level of measurement, Wi-fi module to send the data log into the server and GPS module for tracking the location, time, date and many other things. The use of these smart technologies will help us to prevent the spread of infectious diseases and keep the ecosystem clean.

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