

# Smart Bin using Speech Recognition

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**Abstract:** Our project “SMART BIN USING SPEECH RECOGNITION” is a public dustbin designed with keeping simplicity and efficiency in mind. It is designed for smart cities and will be a roadside- style dustbin. It will avoid the condition of overflowing of garbage from the bin that causes bad smell and spread of diseases too. To make the dustbin touch free it will use speech recognition for all its functionalities like open and shut of bin lid. Emergency services will be available to call in case of any accident near the roads. The dustbin is designed in such a way that cleaning authorities do not interact with the electronics part of the dustbin. If the bin is full then it will automatically get locked and will notify cleaning authorities by sending messages. All calculations are performed on a designated server which also monitors the status of the dustbin and provides the garbage collection mechanism. In another aspect of the present disclosure, a system for keeping surroundings clean is disclosed.

**Keywords** - Swachh Bharat Abhiyan, Smart cities mission, Speech Recognition, Waste management, Internet of things (IoT), Dustbin.

## I. INTRODUCTION

The present disclosure generally relates to the environment. More specifically, the present disclosure relates to a smart dustbin which can assist in maintaining hygiene to the environment. Cities around the world are facing great challenges due to increasing urbanization, and one of the major challenges is the rising amount of generated waste and littering due to high demand for food products and other essentials. Littering of garbage on roads is very common now-a-days. Public waste bins are filling up faster than ever and inevitably many of the bins end up overflowing before collected, causing not only cluttered streets and bad odors but also negative health and environmental impacts.

When garbage overflows, flies, bacteria, and other pests can start to swarm around your home. Garbage flies, which love to breed on piled-up trash, can carry bacteria on their bodies. If these flies get into your home, they can contaminate your fresh food and pose a health risk to your family. Overflowing garbage is also unsightly to look at and decreases your curb appeal. Plus, your neighbors are not going to enjoy looking at your trash overflowing nearby. Litter is any kind of trash thrown away in small amounts, especially in places where it doesn't belong. With time, it heaps up. The practice is unlawful because it costs municipalities millions of dollars annually in cleanup costs. It also portrays a bad picture of the

area. The most frequently littered items include fast food packaging, cigarette butts, used drink bottles, chewing gum wrappers, broken electrical equipment parts, toys, broken glass, food scraps, or green waste.

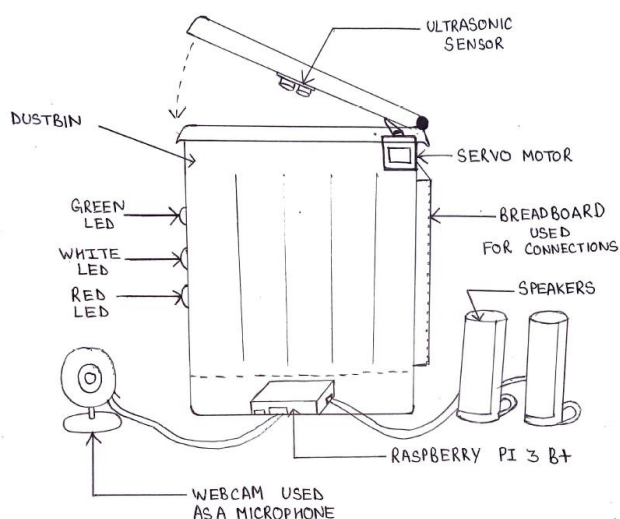
Even practices such as leaving items overflowing beside a dustbin, deliberate throwing of items from vehicles, and abandoning items or wrappers by the roadside qualify as littering. Littering is a dangerous activity and should not be taken lightly because it impacts the environment in multiple ways.

Overflowing waste bins are an ideal breeding ground for bacteria and insects. The flies that visit the garbage are also the same flies that roam around your lunch buffet and drop their offspring on your plate. By doing so, they increase the risk of you contracting salmonella, which causes typhoid fever, food poisoning, enteric fever, gastroenteritis, and other major illnesses. Besides flies, other animals that thrive from the garbage in and around the containers include rats, foxes and stray dogs. Moreover, street animals also eat polythene bags. It causes various respiratory diseases. The toxic substances in air contaminated by waste include carbon dioxide, nitrous oxide and methane. In everyday life we identify the polluted air especially through bad odors. It even causes high rates of cancer, allergies, and birth defects. Besides causing all sorts of health and environmental issues, overflowing garbage is a public nuisance and an eyesore.

Everyone wants to live and visit places that are fresh, clean, and healthy. A smelly city with poor sanitation and trash all over the place does not attract people or tourists, let alone investments. Cities keep losing money, and they also miss out on the revenue and job opportunities coming from proper waste control.

The amount of waste we collectively produce is unbelievable. The US alone produces 250 million tons of waste a year. And honestly, we don't need numbers to see that the problem of overflowing trash cans exists at a colossal level. We are all aware of the overflowing garbage bins, the stench, and the clutter we come across in the streets. And these are not just unpleasant sights, but they also pose serious threats.

Laziness and carelessness have bred a culture of habitual littering. Typically, people have become too lazy and unwilling to throw away trash appropriately.



**Fig 1: Prototype of Smart Bin**

## II. RESEARCH METHODOLOGY

The normal bins available in the market come in many variations. Some do not have a lid whereas some have manual opening lid. These can be suitable for homes but in public places they cause a bad smell due to the overflowing of garbage as people do not use it wisely. Moreover, these are not touch free, therefore hygiene is not maintained.

The existing smart bins work on ultrasonic sensors for open and shut mechanism. The sensor is placed in the front part of the bin which causes the opening of the lid whenever anything comes in its range. With growing development various experiments and research have been carried out in recent years releasing the relevant significant papers.

[1] Muhammad Muzammul proposed “Intelligent System for Garbage collection”. The proposed system is consisted by the ultrasonic sensor to measure the waste level, and an Arduino Mega which Control the system operations. The main aim of this project is to reduce human resources and efforts along with the enhancement of a smart city vision. Furthermore, it is expected to contribute to improving the efficiency of solid waste disposal management.

[2] Yanjun Hu proposed “Analysis and Validation of Ultrasonic Probes in Liquid Level Monitoring Systems”. Selecting and designing the optimum ultrasonic probe is vital for ultrasonic measurements and experiments. The amplitude of the emitted ultrasonic wave excitation signal as well as the diameter and the natural frequency of the probe seriously affect the validity of the probe results. In this paper, we analyze the significance of the key parameters of the ultrasonic probe theoretically. Further, an external fixed- point liquid level monitoring system was assembled according to the principle of ultrasonic reflection and transmission. On this experimental platform, we study the key parameters of the ultrasonic probe that affect the system evaluation through a simulation and experiment and select the optimal sensor parameters for this experiment. The evaluations show that under the experimental conditions where the tested container is made of aluminum alloy and its wall thickness is 3 mm, the best results are obtained when the diameter of the ultrasonic sensor is 15 mm, the amplitude of the emitted excitation signal is  $\pm 15$  V, and the frequency is 1 MHz. The results' average deviation is less than  $\pm 0.22$  V. The evaluations are consistent with the simulation results. This research can effectively monitor the liquid in the closed, ultra-thin-walled container, and can realize non-contact measurement. It provides an effective basis for the parameter's selection and design of the ultrasonic probe in the ultrasonic-based experiments and tests.

[3] Soni Choubey proposed “A Study of Ultrasonic Sensors in Garbage Monitoring”. Owing to a paradigm shift toward Internet of Things (IoT), research into IoT services has been conducted in a wide range of fields. As a major application field of IoT, waste management has become one such issue. The absence of efficient waste management has caused serious environmental problems and cost issues. Therefore, in this paper, an IoTbased smart garbage system (SGS) is proposed to reduce the amount of food waste. 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 analyze the information for service provisioning. Furthermore, the SGS includes various IoT techniques 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 experiment showed that the average amount of food waste could be reduced by 33%.

[4] Ms. Puja k. Dhotre proposed “A Review on Smart Garbage Monitoring System Using Internet of Things (IOTs)”. Garbage Monitoring System helps to eradicate or minimize the garbage disposal problem and helps to manage unwanted material left over from City, College, home, Society, colonies, public area etc. This paper provides survey on various smart garbage monitoring existing ideas in the recent years, using IoT (Internet of Things). IoT is developing day by day effective methods, that transparently and seamlessly many different and heterogeneous end systems.

[5] Paleti Surya Teja proposed “Development of IoT based Garbage Management System using NodeMCU”. In this paper, a smart system is developed for collecting the garbage without letting it overflow. This system collects the sensor data and delivers it to the cloud server using a gateway. An effective system with low cost and low power consumption can be achieved by using NodeMCU as a gateway. An ultrasonic sensor is used to observe the waste level inside the bin and the other ultrasonic is used for detecting the motion whether anybody is approaching the bin to dump the waste. A servo motor is used to automate the opening of bin. A weight sensor is being used in order to evaluate the heaviness of the bin along with its levels. Using a load cell also acts as an alternative to the failure of ultrasonic sensor. These sensor values are continuously uploaded to the cloud server (Thingspeak) for analysis and also for further reference. If the garbage level of bins reaches a certain threshold value an alert mail can be sent to the concerned authority through an application. These levels and location of the filled dustbins can be seen in a mobile application given to the municipal authority, so that they can optimize their routes for collecting waste.

[6] T Tawami proposed “Design of Smart Trash Bin”. In this paper, the effect of high-tech bins on people's interest in disposing trash. The method used in this study is a quantitative descriptive method and literature study to analyses community perceptions of smart trash bin. The results of this study state that the mind-set of the community in disposing trash increased after the

existence of smart trash bin project. These results were obtained because the community became more interested in disposing trash in the presence of unique designs and diverse functions of these high-tech bins. This study concluded that smart trash bin can increase people's interest in disposing garbage in its place.

[7] Jun-Ho Huh proposed “Trash Bin Model Design”. The trash disposal system, using standard trash bags, has been adopted by the government of the Republic of Korea (ROK) for more than two decades. This has caused a sanitary problem, as well as some secondary pollution. It is possible to solve this problem by deploying more manpower, but considering the manpower and maintenance costs that impose a heavy burden on the local governments who are experiencing tight financial situations, it would not be feasible. Thus, an Internet of Things (IoT)-based Smart Trash Separation Bin model that can reduce the cost of trash separation work has been proposed in this paper. The three efficient designs that respectively use a sensor, image processing, or spectroscopy technology are presented. These IoT-based designs can bring significant merit to reducing the manpower costs, as well as the administrative cost involved.

[8] Dushyant Singh proposed “IoT Bin”. To the rapid growth of industries and people in urban areas, the generation of garbage is increasing very rapidly by these everyday millions of garbage is generated. To resolve this problem, we created an intelligence model which can monitor and control waste through the sensors and gives the information in detailed reports which are connected to the internet. Initially all the sensors from different locations are connected through the Internet and in every location, sensors will measure and calculate the garbage levels and information will be sent to the server. At Server further information will Process and sent it to the Authorities to take prescribed action. By This approach we can get information of bin locating in different locations and by using an android app also we can get data of bins.

### III. RESULTS AND DISCUSSION

As it completely works on speech recognition, so on giving command the lid opens and after 5 seconds it automatically shuts with the help of servo motor. It will contain an ultrasonic sensor to measure the depth of the garbage. The lid automatically locks when the bin is full and stays locked until it gets emptied by cleaning authorities. Moreover, the location of nearest bin will be displayed. When the bin gets full, it will notify the cleaning authorities to clean the trash.

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The three LEDs red, green and white will denote the state of the bin. Red LED denotes that the bin is empty, green denotes that bin is full and white denotes that the bin is listening. Breadboard is used for making connections. The whole controlling will be done by the Raspberry Pi module. The waste will be collected in detachable polythene bags instead of containers which will be convenient for disposal. As this dustbin will be situated near the roads and highways, etc so, in case of any emergency near the bin it will call to police, ambulance or fire brigade on the command from user. There is a client-server model which will help in checking the state of the bin and to give an efficient way for cleaning the bins by providing a least fuel consuming path.

Some pictures of working Smart Bin:



**Fig 2:** Initially it is waiting for command and speaking "I'M READY LISTENING!!"



**Fig 3:** When anyone give command "HP OPEN" via



microphone, then it will automatically open for 5 seconds.

**Fig 4:** After 5 seconds it automatically shut down and waiting for other command and again is in listening state.

#### Commands for testing the Smart Bin:

- HP OPEN - To open the Smart Bin.
- HP TELL ME ADDRESS - To know address.
- HP SET ADDRESS - To set address.
- HP CALL FIRE BRIGADE - To call Fire Brigade.
- HP CALL POLICE - To call Police.
- HP CALL AMBULANCE - To call Ambulance.
- HP DESCRIBE YOURSELF - To know the features of Smart Bin.
- HP CLEAN TRASH - To clean Trash from it.
- HP CLOSE – To close the lid of the bin after cleaning.

Further recommendations to this innovation are as follows:

- We can add Solar Panel as the power source.
- We can also use GSM Module to automate phone calls.
- Object detection for hazardous material.
- Face capture of person doing mischievous activities.
- Instead of using Raspberry Pi, we will use ESP8266 module which would be cost effective and then we will connect all the dustbins to the server.

#### IV. CONCLUSIONS

To conclude, this project originally leans towards the promotion of "SWACH BHARAT ABHIYAN" and contribution to smart cities mission. With this project we can avoid the littering of garbage and we will get a clean,

pollution free and healthy environment to live. There will be no spread of foul smells and diseases. Moreover, animals will not eat polyethene bags which will save their lives. With this we will achieve touch free, communicable, digital smart bin with garbage management system.

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