

# A Review on Smart Dustbin Based on Internet of Things

Arvind Kumar Pandey, Assistant Professor

Department of Computer Science, Arka Jain University, Jamshedpur, Jharkhand, India

Email Id- arvind.p@arkajainuniversity.ac.in

**ABSTRACT:** As an Indian citizen, you must participate in the Clean India Mission. This research paper proposes a smart trashcan concept based on the Internet of Things. It's a sophisticated gadget featuring a GSM module, LCD, ultrasonic sensor, and microprocessor. It detects the presence of a person and gathers RFID data from that individual as input. The trash level of the smart dustbin is shown on a serial LCD, which is placed on the front top side of the smart dustbin. When the smart trashcan identifies the user's identification, the dustbin's door opens with the assistance of the dustbin's motor, and the door remains open until the user exits the area. Ultrasonic sensors detect the presence of anybody, and after the procedure is complete, a GSM module is installed within the smart trashcan, which sends a notice to the permitted user. A GSM model connected to a smart dustbin will send a notice to the approved room when the smart dustbin is full with trash. Authorized users may take appropriate action based on the circumstances after receiving notice.

**KEYWORDS:** Dustbin, Garbage, GSM module, IOT, RFID, Sensor.

## 1. INTRODUCTION

Any kind of trash is detrimental to the country and society; it is a universal fact. The ultimate requirement for "smart cities" is critical for every growing country. Garbage pollution has severe health consequences. By creating a smart trash system for waste management, IOT creates possibilities to construct smart cities. This research paper offers an original concept for developing a smart city. Cities have trash cans that are inspected on a regular basis by approved municipal officials. Different sorts of waste are put into dustbins, and trash of all kinds is thrown together [1]. This suggested system introduces a novel approach to trash management by providing information about dustbins and their locations across the city.

Kevin Ashton was the first to utilize IOT when it was initially launched in 1999 at an auto-ID center. This new technology promises to connect all of the objects in the environment to a wireless network and allow them to communicate with one another without the need for human intervention. Things based on the internet are still in their infancy, and no specific design exists today.

IOT Provide a trash collecting system that uses sensors placed above the dustbin to monitor the amount of rubbish. This suggested system sends an alert to authorized authorities through GSM model whenever sensors detect the amount of trash in the dustbin. A Web application is developed for the specific information [2]. Many Indian cities and villages lack the infrastructure necessary for appropriate trash disposal and collection. In addition, cities' current infrastructure does not keep up with the rate of urbanization. The Indian government has started a smart city initiative to use IT-based solutions to make the city cleaner. Three issues are addressed by the suggested approach.

1. Public access to garbage disposal sites is extensive.
2. It takes less time and saves money on gasoline.
3. Ingenious garbage can Provide a mechanism for trash data collecting and arrange the disposal procedure appropriately.

This guaranteed a healthy environment as well as support for the Clean India Movement.

This system is primarily focused on open source microcontrollers, GSM communication, sensors, motors, and drives, serial communication, serial peripheral interface, and a variety of other topics. Arduino UNO, GSM modules, Ultrasonic Sensor, LCD, Motor, RFID, and a Solar Panel make up the smart trashcan [3]. Ultrasonic sensors provide digital input to the microcontroller in the form of square waves. Smart dustbins are identified using RFID technology. GSM modules are used to connect with authorized users wirelessly, allowing them to provide commands to the microcontroller. An ultrasonic sensor sends PWM pulses to the motor, allowing

the door to open and close. Arduino sends AT instructions to the GSM module that is linked to Arduino to deliver notifications.

The suggested system's primary goal is to minimize human effort and resources while enhancing the concept of a smart city. Garbage pouring over from smart dustbins into city streets is a common sight in cities, and this issue needs urgent action. Smart dustbins assist city dwellers in reducing pollution, which may lead to severe health issues [4]. When the rubbish bin overflows, numerous animals such as cows, dogs, rats, and other creatures come inside or around the dustbin, creating an unpleasant sight. Many birds also attempt to remove rubbish from the trash can. This suggested method avoids all of these scenarios by sending the notice to the cleaning truck rather than the authorized authority office.

## 2. LITERATURE REVIEW

Many urban areas are growing throughout the globe, and as these regions develop, the population of the urban area grows as well. When a result, as population density rises, the likelihood of a hazardous environment rises due to an increase in trash and waste products. The problem with today's growing society, particularly in India, is that most individuals have no sense of responsibility, and many people in society dump trash about. To address all of these issues, the suggested system was created, with the primary goal of maintaining a healthy environment and keeping the society clean.

The conventional technique of trash collection, or the usage of a dustbin in everyday life, is the first option. Every individual puts trash in the dustbin, and when the dustbin is full, they empty the garbage and reuse the dustbin. This is the most basic use of a conventional trashcan, in which no electronics are utilized, no coding is done, and everything is done by hand. The second option is to utilize a trashcan with various colors of dustbins, such as green and blue dustbins that are stored together, or a dustbin that only accepts recyclable garbage. There are no electrical devices in this trash, no coding is done, and everything is manual, meaning everything is done by hand. Only the dustbins are divided into several kinds, indicating which trash should be put in which bin.

## 3. DISCUSSION

The suggested approach for this smart trash can is to utilize a GSM module, which is more advantageous than the other two options. Arduino UNO, Ultrasonic sensor, and Servo Motor are the electronics components utilized in this suggested approach [5]. In only a few years, the number of electronic devices linked to the Internet has increased dramatically. All of these internet-connected electrical gadgets are part of the IoT system, which allows them to exchange data. The Internet of Things (IoT) is made up of electrical devices, sensors, and software that enables them to communicate with one another. Using an existing system to build the suggested smart dustbin system is advantageous. The drawbacks of the current method include the need for an authorized person to check the dustbins on a regular basis to see whether they are full or empty, resulting in a significant expense [6]. If the trash is not removed on time, the environment becomes unhealthy, and illness spreads throughout the ecosystem. The suggested method will assist in overcoming all of these drawbacks. On the web server, real-time data on the level of the smart dustbin's filling may be gathered [7]. It will also assist to save costs since workers will only be required to go when the bin is full. This will also aid in resource efficiency, and if the dustbins are removed at the appropriate times, the environment will stay healthy and disease-free. Cities will become cleaner, and waste-related odors will be significantly reduced[9].

With the assistance of the GSM module, the author Shubhangi Thorat, Swati Kanase, and Pooja Bhingardev suggested that trash dustbin filled information be transmitted to the authorized authority to empty the dustbin and give real-time information. The GSM module is the backbone of wireless communication networks [10]. It is a low-cost, high-performance technology that is very simple to install. When the smart dustbin is 70% full and a compressor is employed to compress the trash, GSM modules send out a signal. The primary goal of this goal is to save time, money, and fuel while also lowering hazardous gas emissions. However, it lacks the ability to open doors automatically using a servo motor and does not utilize solar panels for electricity production [11].

This fig shows the flow chart of a dustbin which sends notification when the level of garbage in the dustbin is above 70% but does not solve the problem of automatically door opening and power supply through renewable sources of energy. The proposed system has a number of advanced features, including:

- *Automatically Opens:*

This Smart Dustbin will open automatically when someone approaches it to dispose of trash, and it will shut automatically after the garbage has been disposed of. The Smart Trashcan's door is equipped with an

Ultrasonic sensor that detects the distance between the dustbin and any item or person approaching it [12]. When a person enters the range of an ultrasonic sensor, the sensor detects the person approaching the dustbin and automatically opens the door with the assistance of a motor connected to the Smart Dustbin, allowing the person to discard waste without exerting any further effort to open the dustbin door. If ultrasonic sensors detect no impediments in its range or in front of it, the person will walk away from the Smart Dust-bin after dumping the waste, signaling the motor to shut the Smart Dust-bin[13]. Like previous dustbins, the smart trashcan will be a box that collects rubbish and opens automatically.

- *Indicator of Level:*

The smart dustbin comes with a level indicator, which displays the amount of waste in the Smart Dustbin. The trashcan is connected to a GSM module system, and the amounts of waste are shown on the screen of an LCD linked to a smart dustbin. When the trash level hits 80%, the system will send a message to the user's registered mobile phone, allowing them to access the data. The GSM module system can send and receive notifications, and the Smart Dust-bin will send a text message to the registered user when the dustbin is full and it has to be emptied [14]. The authorized authority is notified about the status of the Smart Dust-bin by the notification, which allows them to make appropriate decisions about whether or not the dustbin is full and take the appropriate and desired action. When the dustbin is full of garbage, the Smart Dust-bin will not open, even if someone approaches it.

- *Application for the Web:*

The Smart Dust-bin will be comprised of a web server application that will monitor the contents of the Smart Dust-bin on a regular basis, including trash levels, when it was last emptied, and also save the complete history of when it was full and emptied before. It will keep track of the last time the trash was cleaned. This web application may be shared by referencing it. Anyone, from anywhere and at any time, may learn about the condition of the Smart Dust-bin.

- *Panels of Solar:*

All electrical components connected to the smart trashcan need power, which is provided by a solar panel and a rechargeable battery placed on top of the smart dustbin. The flow chart depicts the suggested system's operation, which follows the steps and detects the amount of waste in the Smart Dustbin. The Smart Dustbin will be equipped with a GSM module that will show trash levels on an LCD panel. When the trash level hits 80%, the message "DUSTBIN FULL" is automatically delivered to the registered mobile phone number. The Arduino Unit is an open source electrical platform that reads the sensor's input light and sends the data to GSM for wireless communication.

An ultrasonic sensor is an electrical device that uses ultrasonic sound waves to detect the distance between an item or person and the equipment to which the sensor is connected. It features a transducer that aids in the transmission and reception of ultrasonic pulses depending on the closeness of the item. It is capable of detecting both things and waste stuff. GSM (Global System for Mobile Communications) is an international standard for wireless telephones. The Global System for Wireless Communications (GSWC) is a communication system. A solar panel is an electrical device that converts renewable energy into electricity. The renewable energy is converted from solar energy to electrical energy.

This suggested smart dustbin system solves a slew of issues.

1. To open the Smart Trashcan door using a servo motor and sensors attached to the dustbins, as well as to give information on the amount of waste in the dustbin.
2. A notice that the dustbin is empty, full, or empty with trash may be delivered to the user's smartphone.
3. Create a web application to upload the information from the filled trash cans.
4. It also informs the authorized authority that the trashcan is full and that the dustbin needs to be emptied.
5. To send a notice to the registered user's phone when the trash bin is full.

#### 4. CONCLUSION

For real-time monitoring and management of the waste in the trash, an embedded smart dustbin with an alarm system has been developed. By sending notifications to the authorized authorities at regular intervals, this sophisticated technology prevents the dustbins from being cleaned irregularly. It further improves the system by adding features such as automatically opening and closing a smart dustbin door when a person approaches an ultrasonic sensor, which will detect the person approaching the dustbin and open the door automatically

with the help of a motor attached to the Smart Dust-bin, allowing the person to throw waste without having to apply any force. If ultrasonic sensors detect no impediments in its range or in front of it, the person will walk away from the Smart Dust-bin after dumping the waste, signaling the motor to shut the Smart Dust-bin. The smart dustbin, like other dustbins, will be a box that collects rubbish and has an automated opening. It will also alert you when the garbage level in the smart trashcan reaches 80 percent capacity. A solar panel is also connected to the supplied power source, making this smart trashcan even more sophisticated.

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