# SMART WASTE MANAGEMENT SYSTEM

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## 1 Abstract

In order to address the issue of overflowing trash cans and dustbins in Indian public spaces, this research paper suggests a smart garbage management system utilizing LabVIEW. In order to minimize the frequency of waste collection visits, the system attempts to keep dry and wet rubbish separate and offer real-time information on the status of garbage bins. In highly populated places, waste management—which includes sorting, transportation, processing, recycling, and disposal—is essential. Given the volume of trash produced in India, the article emphasizes the urgent need for efficient waste management. Indian cities' inadequate infrastructure for transportation and waste collection makes it difficult to manage waste and encourages the spread of illness. The suggested solution seeks to enhance trash management and stop waste overflow.

**Keywords— waste overflow, LabVIEW, real-time monitoring, waste separation, waste collection, waste disposal, waste recycling.**

## 2 Introduction

For better life outcomes in India, the environment needs to be clean and hygienic. In the current situation, it frequently occurs that the dustbins or garbage cans located in public spaces in cities are overflowing as a result of the daily growth in waste. These overflowing trash cans can produce an unpleasant odour and lead to an unclean atmosphere. Because of this, germs and viruses that can cause various diseases thrive quickly. In order

o apply distinct processes—composting, recycling, and ncinerationi-to different types of garbage, the proposed ystem will assist keep dry and wet garbage separate and nform users to the status of garbage bins. By alerting people when garbage is full then number of trips of the vehicle who are collecting waste garbage should get reduced.

r ubbish management involves sorting, moving, processing, recycling, or eradicating waste, as well as monitoring rubbish items. The management of waste is a highly important issue ht at has grown in importance as a result of the dense population. Municipal Corporation has created a productive trategy for managing rubbish to lessen its impact. The amount of waste produced per person in India ranges from 200g to 500g. According to numerous organizations, each Indian produces 1.3 to 1.5 pounds of garbage. In 2001 alone, 47 million tons of trash were reportedly produced. The amount has gone up to 95 million tons in the last two years. In comparison o other countries, Indian cities perform poorly when it comes o rubbish collection. As a result, the Indian government is having trouble managing the rubbish. Due of population growth, disposal problems have gotten more difficult. The accumulation of waste in all areas and places of the city is the result of inadequate garbage collection and poor transportation infrastructure. Municipal trash management is becoming critically important as a result of these inaccessible facilities. In addition, improper rubbish management causes life forms to contract fatal diseases. Therefore, "Smart Management of Garbage Using LabVIew" has been suggested to prevent waste overflow.

## 3 Literature Review

[1] presented an Internet of Things (IoT) smart dustbin that was developed on an Arduino Uno board platform linked to an ultrasonic sensor and a GSM modem. The sensor was placed at the top of the bin. A threshold of 10 centimeters was set. When the trash level hits the threshold, the sensor triggers the GSM modem, notifying the relevant authority until the bin is emptied. Ultimately, it was found that several issues, such as affordability, upkeep, and durability, were taken into consideration during the design process of these smart bins. Furthermore, it contributed to the establishment of a sanitary and hygienic atmosphere as a component of the smart city development process. The researchers [2] recommend the following approach to waste management. A central system that displayed the amount of trash in the bin at any one time was connected to a microcontroller-based system that used infrared wireless technologies.

to the wastebasket. Using Wi-Fi, a mobile web browser displayed To determine how much rubbish has accumulated in the trash an HTML page with the status. They just employed weight-based barrels, the ultrasonic detectors are positioned above them in sensors and a Wi-Fi module on the sender's side to broadcast and cooperation with the ultrasonic detectors. An interface was used by receive data in order to cut costs. In the end, the sensor could only the wifi modem and microcontroller. The force (230V 50 Hz ac) is estimate the amount of waste in the bin based on its weight. The received by the step-down motor, which then steps it down to 12V author proposed a method for organizing trash collection in ac and sends its matter to the therapy.
residential and commercial metropolitan areas.[3]. This system's The therapy transforms interspersing current into direct current ultrasonic sensor monitored the amount of trash in the bin and (AC to DC). The controllers acknowledge their therapeutic affair. used the GSM module to transmit the data to the control panel. A The primary goal of a regulator is to maintain a steady voltage. graphical user interface (GUI) was also developed to check the One matter is sent straight from the controller to the data related to the trash for different sites; however, this GUI was microcontroller, and another is sent through a wifi modem from the unique since it was constructed using MATLAB. There are controller. Figure No. 1 displays the Block Diagram.
currently two units in the system: the slave unit was located in the garbage, and the master unit was located in the control room. The slave unit will get the information from the sensor measuring the amount of trash, and it will subsequently be forwarded to the master unit. A decision support system was created in this project to be used in municipal trash collection. [4]. The ineffective waste collection in the city's hard-to-reach neighborhoods was handled by this system. Cameras were placed in the cities where the problems were most prevalent. The systems consisted of two components. Finding companies who collected waste, had vehicles, and could employ drivers to gather trash from all around the city and deliver it to recycling centers or landfills was the first step in the process. The next stage was to design a system that could record and oversee all communication between the various stakeholders. Different garbage cans were placed across the city, and within each was a low-cost embedded device that measured the quantity of trash inside. [5]. Because every bin has an ID, it's easier to figure out which bin needs to be emptied when it gets full. The project consists of two parts: the receiving section and the transmitter section. In order to empty the trash can, sensors in the transmitter portion measure the level of rubbish. An RF transmitter sends data to the system, which is subsequently collected by an RF receiver and forwarded to the relevant client.

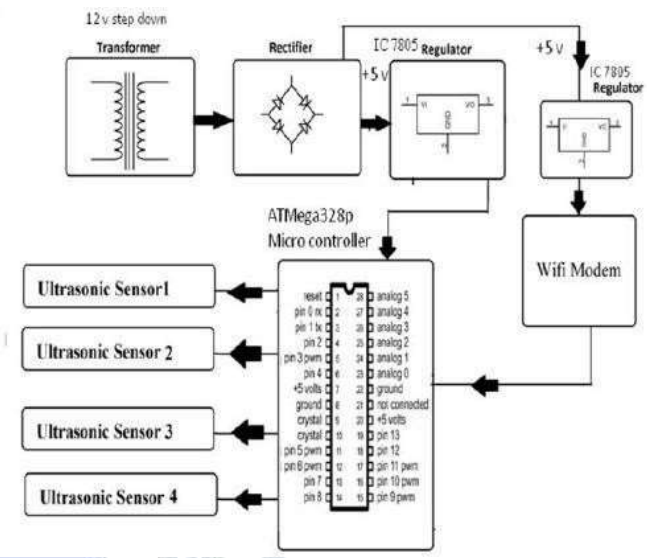


Fig No 1: Block Diagram.

## 4 Methodology

### 4.1 Block diagram of proposed system:

The Internet of Things waste monitoring system is built utilizing the IOT Gecko web development platform and an Arduino board platform, as shown in the picture.8. Compost has a Wi-Fi modem interface and is reinforced with an ultrasonic sensor. A 12V transformer, an AVR family microcontroller, LEDs, LCD displays, resistors, capacitors, and diodes are examples of hardware components. The software consists of IOT Gecko, MC Programming Language C, and the Arduino compiler.

The block diagram displays ultrasonic detectors, AVR microcontroller, wifi modem, controllers, transformers, and therapies.

### 4.2 HARDWARE USED:

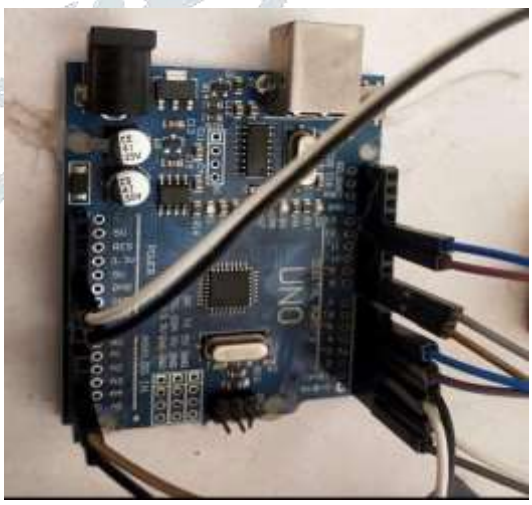


Fig No 2: Arduino Uno Board.

**4.3 Ultra Sonic Sensor:**

You can determine the detachment with great accuracy and constant measurements if you wear an ultrasonic sensor. It measures detachment from 2 cm to 400 cm, or from 1 inch to 13 feet, at a frequency of 40 KHz in the air. Should an object get in the way, it will return to the feeler. Figure No. 3 shows the Ultrasonic Sensor.

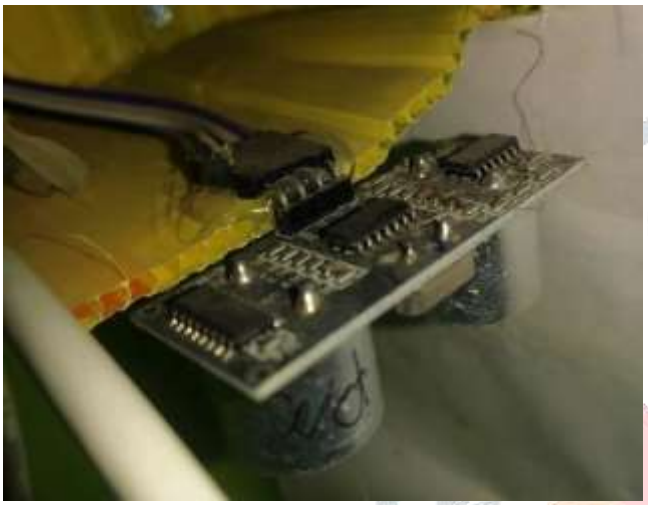

Fig No 3: Ultra Sonic Sensor.

**4.4** GSM modem:

Figure No. 4 shows a GSM modem.If the garbage can rises above the predetermined threshold level, signal number 11 alerts the waste depots. We can send rapid SMS messages to the appropriate municipal office using the GSM module interface. The GSM module is provided by the SIM card issued by the mobile service provider, which forwards SMS messages to the appropriate authorities in accordance with the program. It uses frequencies between 900 and 1800 MHz for operation.

Fig No 4: GSM Modem.

**4.5** Microcontroller:

It interprets the information provided by the sensor. To produce the result, the received data is compared to the threshold value. The 16/32-bit ARM7TDMI-S CPU powers the LPC131/32/34//38 microcontrollers, which also feature integrated outline holdup and concurrent emulation. Thus, the microcontroller has access to built-in flash memory that is 32KB, 64KB, 128KB, 256KB, and 512KB. 32-bit code can operate at the fastest clock rate when it has a 128-bit wide memory interface and only one accelerator structural architecture.

**4.6** WI-FI MODEM:

This device has sufficient computing power and storage built in to allow GPIO integration with sensors and other application-specific devices with minimal to no loading needed during runtime and little to no configuration needed beforehand. Due to the extensive on-chip integration, very little additional circuitry is possible, and even the frontend module was designed to occupy minimal PCB real estate. Without the need for extra RF components, the ESP8266 can function in any operational conditions thanks to its built-in self-calibrated radio. It also has APSD for VoIP claims and Bluetooth coexistence limitations.

Many of the almost infinite sequences available for the ESP8266 have been made possible by the tremendous community assistance. Since the ESP8266 Module cannot change the logic from 5 to 3 volts, an external logic level converter is needed. Never use a 5V development board to power a gadget directly**.**

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**4.7 System Architecture**:

An innovative device that will help keep towns clean is the IOT Garbage Monitoring system. This device monitors the garbage cans and issues alerts on the quantity of waste that is building up inside of them via a website. To that end, an array of ultrasonic sensors located above The containers' depth and the amount of trash they hold are measured and correlated using the bins. The gadget has an LCD display that can be controlled by Arduino, a buzzer, a Wi-Fi modem for data transmission, and microprocessor. A transformer powered by a 12V source powers the system.

The amount of trash that has accumulated in the bins is shown on the LCD panel.

On the other hand, a web page is designed so that the user can see the status. The website provides a visual depiction of the trash cans and highlights the collected waste in color to indicate the volume of rubbish that has been gathered.

The plan initiates the signal when waste output surpasses the usual level. Thus, this approach contributes to keeping the city clean by informing the public about the amount of trash in the bins and offering a visual representation of the bins on a website. With the integrated TCP/IP protocol stack of the self-contained SOC ESP8266 Wi-Fi Module, you may link any microcontroller to your Wi-Fi network. The ESP8266 can host a submission or assume full control of another application processor's Wi-Fi networking duties. Every ESP8266 module has an AT command standard firmware pre-programmed onto it.

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The ESP8266 module is a very cheap board with a large and growing community. The architecture of the proposed system is displayed in Fig. No. 5.

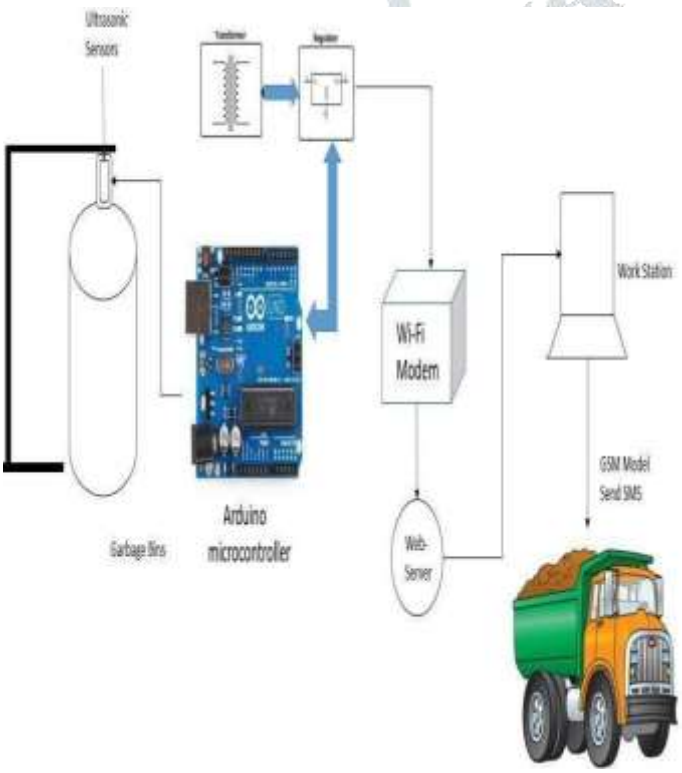


Fig No 5: System Architecture

**4.8 Flow chart:**

The flow chart is seen in Fig. No. 6. At first, the waste container is empty, and sensors are positioned above the trash cans to gauge the amount of rubbish that has accumulated there. The sensor provides no information to the person watching from the control room if it detects no trash in the bin. In all other cases, if the sensor finds garbage in the bin and the level is between 0% and 70%, it displays a graph of the level. If the level is between 70% and 100%, the buzzer will sound every 10%. It gives the people instructions to collect the waste after informing the responsible party in the control room.


Fig No 6: Flow Chart.

## 5 Result and Discussion:

The results of this investigation are displayed below. • Calculating how much rubbish is in the trash container. • The recipient will receive the data wirelessly; • Anyone, anywhere, can view the info. • Instantaneous data transmission and access. • Keeps the garbage can from filling up too much. This Internet of Things-based waste management is tremendously advantageous for smart cities in many respects. We've noticed that different trash cans are positioned differently throughout cities, and some of them are filled to the brim. countless times, yet the people who ought to be aware of this never do. Our solution is designed to solve this issue and will offer detailed information about the numerous trash cans located across the city.

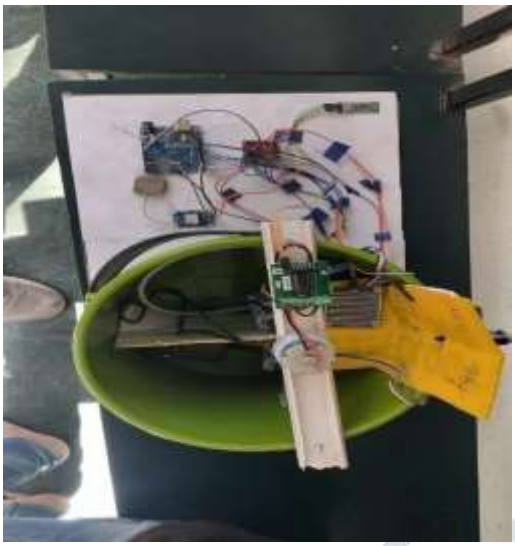

Fig No 7: Diagram

## 6 Conclusion and Future Work

1) This article shows how to build trash management using GSM, LabVIEW, and sensors. This essay proposes a way to accomplish waste management. This method helps to maintain the garbage can's cleanliness even when it is completely filled. The management system and rubbish collection infrastructure in place now are inadequate for the demands of the modern world. More garbage collection and transportation options must therefore be provided. Because this system alerts the user when the trash can is completely full, it reduces the frequency with which the garbage collection service arrives. Lastly, this method helps to protect the environment. Garbage collection becomes more efficient as a result.

2) Improving living conditions and preserving the city's level of cleanliness are the major objectives. We can keep an eye on the quantity of trash in the many trash cans located across the city by using this technique. When a particular dustbin fills up, employees can be notified so they can quickly empty it as soon as practical. The employees may always check the status of these dumpsters on their phones. When used appropriately, this strategy may prove to be very beneficial.
Individuals who wish to improve hygiene even more could use the method as a guideline.

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