

‘3 LAYERED SMART DUSTBIN’ A NEW CONCEPT OF WASTE MANAGEMENT IN SMART CITY.

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Abstract: The rapid urbanisation and population increase have caused the waste management issue to expand greatly. The paucity of rubbish bins and peoples lazy conduct, waste items being thrown out anyplace and harming our environment. The main problem with waste management is that public trash cans frequently overflow well before the next cleaning cycle starts. It spreads illnesses by bringing unpleasant smells and unsightliness into the surrounding area. By installing these smart dustbins, the area's cleanliness and hygiene are preserved. The primary goal of the project is to create a smart trash can with three layers. The application facilitates the display of the dustbin's precise location, availability status, and distance from the user. The dustbin can be used by users again after being cleaned by the waste collection agent and ultrasonic sensors that are attached to an Arduino UNO to monitor the amount of garbage in the dustbin and transmit an alert message to the municipal office server. This process will be carried out once more.

Keywords- Arduino UNO, Ultrasonic Sensors, Monitoring, Detection and Indication.

I. INTRODUCTION

The country is expanding rapidly, yet waste management is not well understood by the general people. Garbage that has been overfilled and poured out is a typical occurrence in public areas. In the end, this resulted in pollution. Due to the enormous number of bugs and mosquito breeding on it, this also increases the number of diseases. The present study can observe that there is an excess of trash in the bin due to an inefficient and disorganised technique of disposing of garbage. Garbage management has become a global issue due to fast population increase, disarray in local administration, low public awareness, and inadequate finance. The shortage of dustbins and people's lazy habits have led to a massive surge in waste disposal. As is well known, there are several kinds of waste, such as moist waste and non-biodegradable waste, and sorting them into separate dustbins requires laborious work. To manage household waste using an Arduino Uno-based smart garbage monitoring system, particularly in urban areas that are congested. This system will keep track of the amount of trash in the bin and notify the appropriate authorities when the bin is almost full.



Fig. Improper Waste Management in Nagpur City

II. SMART CITY

Proper sanitation, electricity and water supplies, solid waste management, public transportation, reasonably priced housing, connectivity among people, digitization, and many other necessities that make life easier are all present in Smart City in contrast to the everyday struggles author face. Owing to all of these issues, finding solutions for daily issues through the notion of smart cities is a good way to improve government services, quality, and public welfare. The idea of "smart cities," which refers to digital technology and attempts to boost productivity in the nation's sophisticated economy, must be the government's main priority. The fundamental goal of smart cities, or cities that support them, is to use "smart solutions" and offer basic infrastructure, a clean and sustainable environment, and a respectable standard of living for their residents.

III. INTERNET OF THINGS

The term "Internet of Things" describes a system of physically connected objects and devices that are equipped with sensors, software, and other technologies. This enables them to collect and share data with other systems and devices over the internet. These gadgets, which can be anything from commonplace domestic objects to sophisticated industrial gear, can all communicate and share data in order to facilitate intelligent applications and boost productivity across a range of industries. These gadgets use sensors to gather data from their environment, which they then send online to other gadgets or cloud-based services. IoT technology is revolutionising a number of industries quickly, increasing productivity, and opening up new avenues for creative problem-solving.

VI. ULTRASONIC SENSOR

An ultrasonic sensor is a gadget that measures distance or identifies things using ultrasonic sound waves. The principle of sending and receiving ultrasonic waves underlies its operation. Ultrasonic sensors are widely utilised for non-contact distance measuring and object detection in robotics, industrial automation, and other applications. They are well-liked since they don't require direct contact with things to estimate distances accurately.

V. SOLID WASTE MANAGEMENT

It refers to finishing the solid waste collection, treatment, and disposal procedure. One of the fundamental issues impeding the development of smart cities is waste management. The waste has a direct negative impact on both human and animal health by contributing to pollution. Although the government has launched numerous trash management initiatives, waste management is not being properly utilised. Waste containers are frequently left unmonitored and uncontrolled, making it difficult to maintain a clean and healthy atmosphere. Thus, the author created real-time smart garbage cans for this project.

VI. LITERATURE REVIEW

A smart trashcan system has been developed, and community socialisation has been carried out as part of the numerous solid waste challenges and research projects undertaken in recent years. The majority of which concentrated on the manual collection, distribution, and recycling of waste. People have been adopting technology to efficiently collect and manage waste in recent years. The researchers encountered several challenges, including the need to separate dry and wet trash. Certain researchers have discovered strategies to keep waste from coming into contact with smart bins.

As stated in [2] This essay has suggested that creating a fully green product supply network can be greatly aided by smart cities. There are several benefits to an intelligent approach to environmental sustainability. It is possible to use smart technologies to advance environmental causes.

The potential contribution of digital technologies towards facilitating the shift towards ecologically sustainable practises in various sectors of the economy. It looks into the potential for green initiatives in the creation of smart cities as enablers of sustainable behaviour at the supply chain and individual levels.

In [5] Paper Due to a surge in waste, author frequently notice garbage cans overflowing at several public locations in cities. It produces an unclean atmosphere and an unpleasant smell. His idea is to create an IoT-driven waste management solution for intelligent urban areas. Several trash cans will be placed across the city and on our campus as part of the proposed system. These trash cans will be equipped with inexpensive embedded devices. This assists in monitoring the amount of trash in a certain bin and uses a location tracking module to establish the bin's actual location.

VII. PROPOSEL SYSTEM

Ultrasonic Sensor: This device gauges the amount of trash gathered in a dustbin. This technological gadget uses ultrasonic waves to determine an object's distance and then converts the sound waves' reflection into an electrical signal. The transmitter and receiver are the two primary components of ultrasonic sensors. The sensor calculates how long it takes for the transmitter to release sound and make touch with the receiver. In other words, this sensor is utilised to detect if the dustbin is full or not.

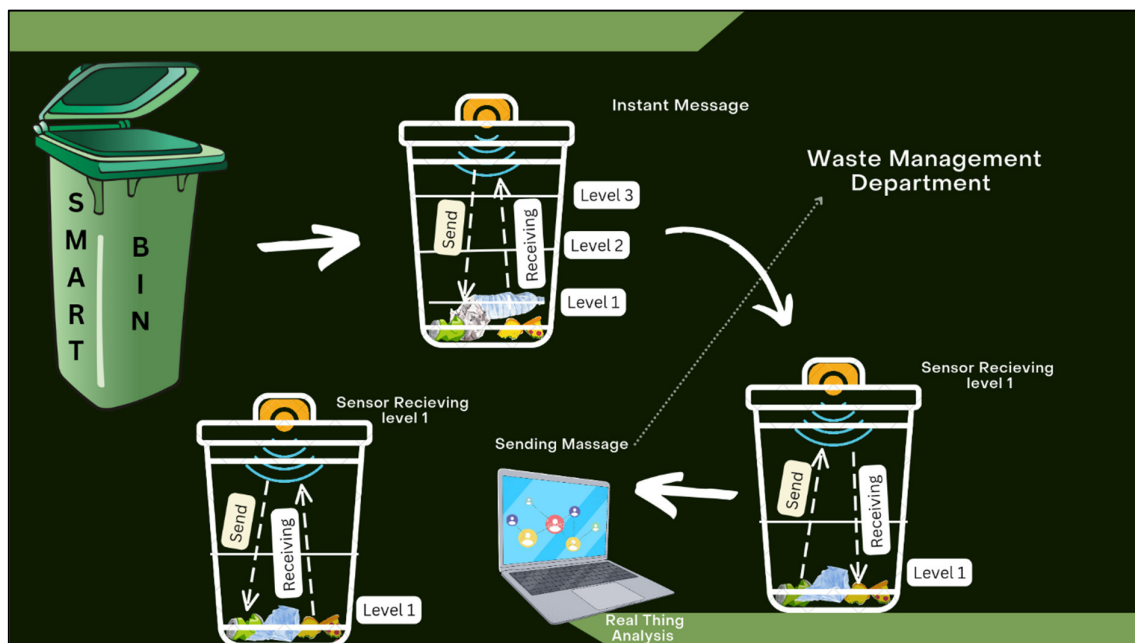


Fig. Virtual Model of Dustbin

Arduino Uno R3: One type of microcontroller board is the Arduino Uno R3. Its foundation is the ATmega328. Everything required to sustain the microcontroller is contained in it. To begin, all the author have to do is plug it in using a USB cable to a computer, or power it using a battery or an AC/DC adapter.

Wi-Fi Model ESP8266: The Arduino Uno R3 microcontroller can access a Wi-Fi network thanks to the ESP8366 WI-FI module.

Author are able to send and receive alert messages with this. The amount of waste produced annually can even be ascertained using the data gathered. All Wi-Fi networking functions can be hosted by the ESP8266 from a different application processor.

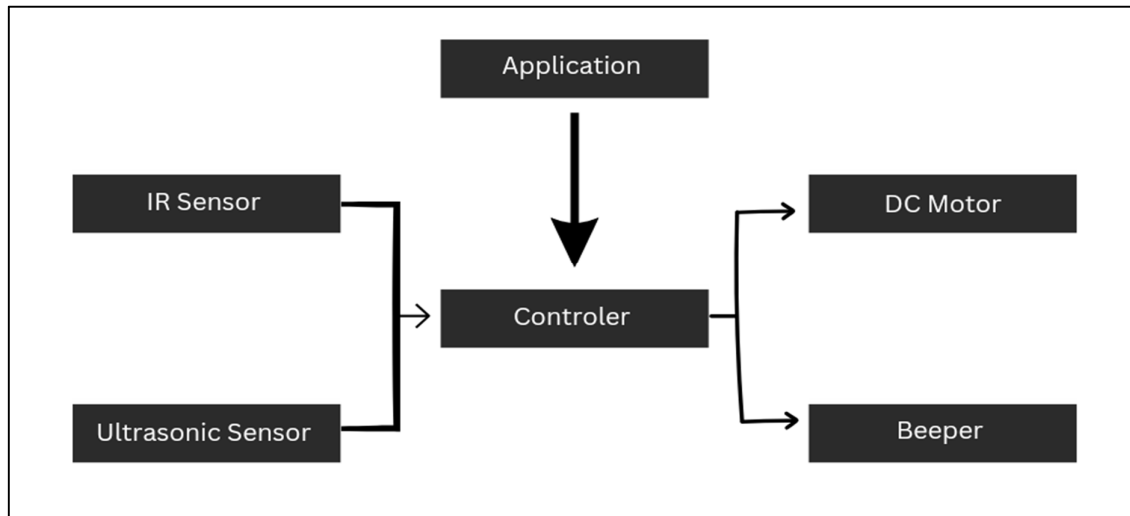


Fig. Block Diagram: Architectural Design

VIII. IMPLEMENTATION

In this paper the author suggested an Internet of Things-enabled waste management system for smart cities, wherein each trash can is equipped with ultrasonic sensors to detect the amount of waste within, as well as a GPS module to track its exact location in real time. The Global System for Mobile (GSM) and an ultrasonic sensor make up the suggested solid waste management system. Proteus has an installed programme that allows the ultrasonic sensor to measure the distance between the trash and the lid. As trash is deposited into the trash can, ultrasonic sensors detect the level and alert the user when the dustbin has filled to the fullest extent possible. It gives the GSM model instructions to change the bin's state by sending a notification in the form of a message to the admin department employee.

By using sensors to measure the distance between the top of the smart bin and the waste, user can find the waste level. The Ultrasonic Ranging Module is necessary to maximise battery usage and extend the life of the devices. Energy usage is significantly impacted by wireless technologies, sensing and data transfer rates. Data might be gathered and forwarded twice or three times in a single day. Data that is transmitted will be gathered on the cloud, enabling us to access it via the internet from any location. The continuously sensed data from garbage bins are store in cloud server and can be further used by both Waste management authority and as well as garbage collection truck drivers. The system leads to the unloading of the waste making the wall process time efficient and hygienic.

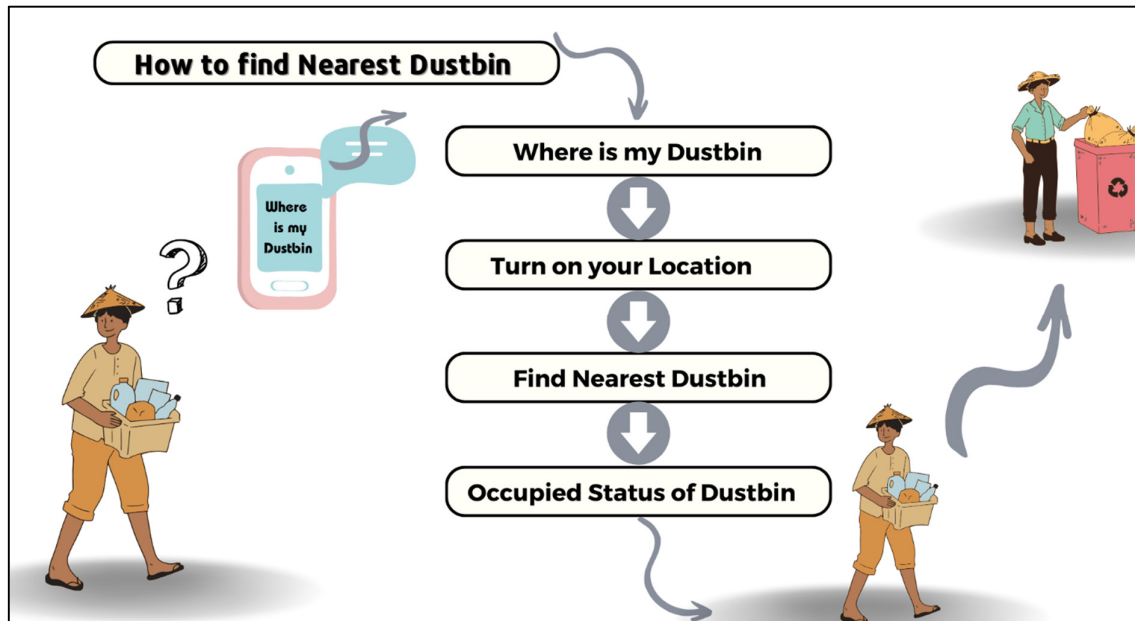
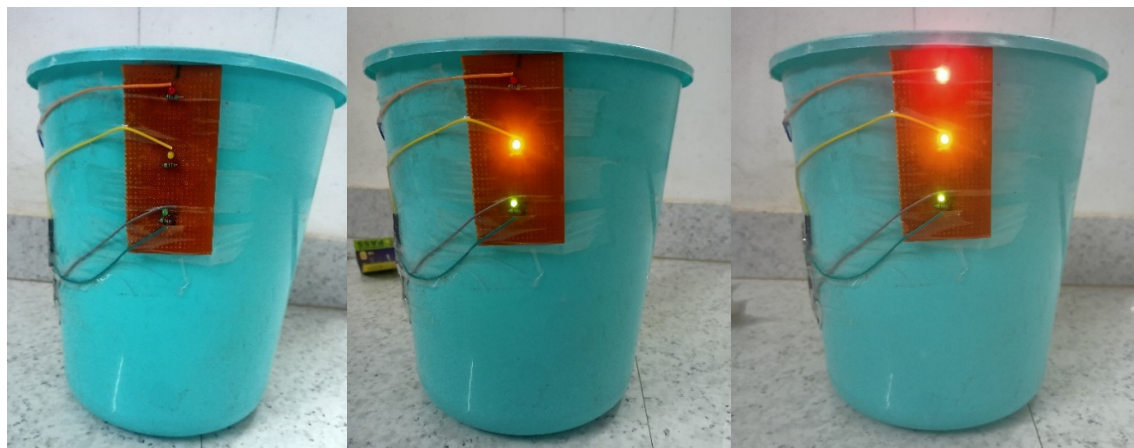


Fig. Process to find out Dustbins

IX. RESULT AND CONCLUSION

Model of Dustbin

The below pictures of dustbins show their availability status of the dustbins. The blowing lights indicate the filling level of dustbins.



Empty Dustbin

Half Filled Dustbin

Fully Occupied Dustbin

Fig. Status of Dustbins

Expected Result:

After the Smart Dustbins will be ready with completion of work for smart dustbin. The following test features will be performed.

Sr. No	Test Features	Expected Action	Test Result
1.	First Level	Glow green light. It shows dustbin is empty.	Successfully
2.	Second Level	Glow orange and green light. It shows the dustbin is half filled and half empty.	Successfully
3.	Third Level	Glow all the light. It shows the dustbin is fully occupied.	Successfully

CONCLUSION

The suggested features of the waste management system, which is based on the Internet of Things idea, include time management and intelligent management of all garbage cans located around the city. In this present study the author creating an android-based application that will provide real-time waste bin information. The Internet of Things will help with the operation of smart dustbins, level-to-level garbage detection, waste monitoring, and real-time information management.

According to the test findings, the first level is indicated by a glowing green light, the second level by an orange light, and the dustbin will be fully occupied and a notification will be sent to the municipal corporation office by a red light. After closely inspecting the site, they will dispatch a waste collector to collect the trash and empty the dustbin there. For the same case, that procedure will be repeated. This vocabulary aids in the development of a smart campus environment going forward.

Future Scope

Following are the future scopes:

- Proposed the automatic waste collection system.
- Propose the smoke sensing system with the help of this dustbin sense the surrounding burnt.
- Smoke and inform to the municipal corporation.
- Proposed automatic segregation of organic and inorganic waste.
- Smart management system web portal to connect all the cities and street with GUI model

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