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# An IoT Based Smart Dustbin System

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**Abstract:** *All human being are throws waste in dustbin or some other different places. The waste are plastics, degradable and non-degradable. All people are trying to put the waste in dustbin or garbage bin only. In cities, there are many public places where we see that dustbin or garbage bin are placed but there are overflowing. This create unhygienic condition in the surrounding. And it also create some serious diseases. At a same time, an odor extends throughout the city, and degrading the environment. Recycling bin is really a waste management processing, but they are limited space in a garbage bin, it does not require extra waste. Waste disposal is an efficient method of eliminating garbage disposed in commercial settings such as businesses, classrooms, colleges, shopping centers, and other public areas. We have to design the project, where the dustbin is fulled or not and the waste level of the trash bin is measured. The NodeMCU and the ultrasonic sensor is a hardware component for measuring the garbage bin. The software component is an IFTTT Webhook, and it is used to receiving a notification.The main concept of this project is when more than 70 percent of the garbage bin is filled, the IFTTT Webhook sends the notification and we receive the email.*

**Keywords:** NODEMCU, IFTTT webhooks, Ultrasonic Sensor, Dustbin, jumper Wires.

## I. INTRODUCTION

One of a famous technology in this world is an Internet of Things (IOT). Network connecting objects is referred as IOT. The feature of this technology is to communicate and exchange the data among themselves. IOT are activate with the devices like sensor, motor and some UNO board. Trash bin is used for storage the waste management in the world. In regular activities, a normal dustbin utilised for throwing the waste and dustbin is filled to empty the waste inside a dustbin. This is the basic use of a normal dustbin where no components are used, no coding is performed, and everything is done by hand manually. If the dustbin is full, people start throwing the waste around the dustbin, it cause smell and various diseases. To avoid this kind of roblem, we used for IOT and some technology to keep the dustbin or garbage bin and environment very clean.

## II. LITERATURE REVIEW / DISCUSSION

The development of IoT-based waste management systems has been the subject of extensive research aimed at addressing urban waste challenges. Navghane, Killedar, and Rohokale (2016) introduced an "IoT-Based Garbage and Waste Collection Bin,"[1] emphasizing the use of sensor technology to automate waste collection processes. Their system used ultrasonic sensors to detect waste levels, allowing for optimized waste collection routes and reduced manual checking. Building on this concept, Khan (2021)[2] further explored the potential of smart waste management in his study titled "Smart Garbage Monitoring System Using IoT." Published in SSRN Electronic, his research highlighted the role of IoT in enhancing real-time waste monitoring, making collection more efficient by alerting collectors only when bins are full.Similarly, Sohag (2020) [3]in "Smart Garbage Management System for a Sustainable Urban Life: An IoT-Based Application" examined the impact of IoT-enabled systems on urban sustainability. His work, published in ScienceDirect, presented an IoT framework for smart cities, discussing how IoT could reduce waste overflow, decrease collection frequency, and promote cleaner urban environments. The application of Arduino in waste management is another promising development explored by Sharma and Singh (2018)[4] in "Smart Dustbin Using Arduino IDE." They demonstrated a simple yet effective smart bin prototype that detects trash levels using ultrasonic

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sensors, which could be controlled and monitored through the Arduino IDE.On a broader scale, Guerrero, Maas, and Hogland (2013)[5] discussed the "Solid Waste Management Challenges for Cities in Developing Countries" in the Journal of Waste Management. Their research underscored the obstacles faced by these cities, such as inadequate infrastructure and limited resources, which make waste management particularly challenging. The authors suggested that IoT-based systems like smart bins could offer a viable solution to these challenges, especially in cities with constrained waste management budgets.

## III. METHODOLOGY

An IoT-based smart dustbin system is motivated by the need for more efficient waste management and environmental sustainability. Traditional waste disposal methods often lead to overflowing bins and inefficient collection routes, resulting in increased litter and operational costs. By utilizing real-time monitoring, smart dustbins can track waste levels, enabling timely pickups and reducing overflow. This not only enhances public health and hygiene but also encourages proper recycling and waste segregation among citizens. Furthermore, the data collected can provide valuable insights into waste generation patterns, helping municipalities make informed decisions. Integrating smart dustbins into the broader framework of smart city initiatives promotes cleaner, more sustainable urban environments, ultimately fostering a sense of responsibility within the community. Key motivations behind this project are: 1. Waste Management Efficiency 2. Environmental Impact 3. Resource OPtimization 4. Public Health And Hygiene 5. Smart City EngagementEvaluating the feasibility of an IoT-based smart dustbin system involves a comprehensive analysis of several key factors. Technically, it's essential to assess the availability of necessary IoT devices, sensors, and communication networks to facilitate real-time monitoring and integration with existing waste management systems. Economically, a cost analysis should estimate initial investment and ongoing operational expenses while evaluating potential savings from optimized collection routes and improved efficiency. Operational feasibility focuses on the need for staff training and community acceptance of the system, including any associated mobile applications. Additionally, legal and regulatory compliance must be considered to ensure alignment with local waste management regulations and data privacy standards. Finally, the project's environmental feasibility should be assessed in terms of its potential to enhance waste management practices and promote recycling.

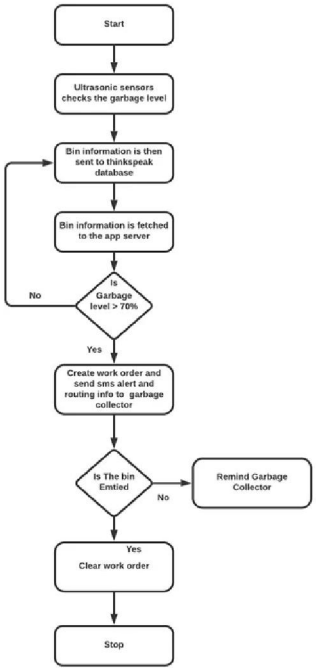


Fig 1 – Flow Chart of Smart Dustbin System

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## IV. RESULTS AND ANALYSIS

A "smart dustbin system" is a trash bin equipped with sensors and technology that help manage waste in a smarter way. The system can detect when the bin is full, track usage patterns, and even send alerts when it needs to be emptied. Here's a basic explanation of its results and analysis:

**Results:**

1. Efficient Waste Collection: Since the bin can alert when it's full, waste collectors don't have to check it constantly, saving time and reducing unnecessary trips.
2. Improved Hygiene: The bin can automatically close when not in use, keeping odors contained and reducing the risk of pests.
3. Reduced Costs: By optimizing collection schedules, the system can help reduce fuel costs for waste collection and other operational expenses.
4. Environmentally Friendly: Fewer collection trips mean reduced fuel consumption and lower emissions, helping the environment.

**Analysis:**

- Optimized Collection: The system reduces the need for manual checking by alerting collectors only when bins are full. This helps in creating an efficient collection route, saving time and fuel.
- Data Collection: Smart dustbins can collect data on how often and how quickly they fill up. This information can be used to adjust waste collection schedules based on actual need, further increasing efficiency.
- Reduced Operational Costs: By minimizing unnecessary trips, smart dustbins help reduce labor, fuel, and vehicle maintenance costs.
- Lower Waste Management Costs: The system can lead to more strategic waste collection, reducing overflows and keeping public spaces cleaner, which can also lower maintenance costs.
- Lower Emissions: Fewer collection trips mean lower fuel use and reduced carbon emissions, making the system eco-friendly.
- Reduced Littering and Overflow: Smart bins prevent overflowing, which can reduce littering and improve the cleanliness of public areas.
- Improved Public Hygiene: By keeping waste contained and only opening when needed, smart bins reduce odor and pest problems, enhancing public cleanliness and hygiene.
- Enhanced User Experience: Some smart dustbins have touch-free features, making them more convenient and safer to use, especially in public spaces.

## V. CONCLUSION

In conclusion, the implementation of an IoT-based smart dustbin system presents a transformative opportunity to enhance waste management practices in urban environments. By leveraging advanced sensor technology and data analytics, this system can optimize collection routes, reduce operational costs, and promote recycling, ultimately leading to cleaner and more sustainable cities. The comprehensive scope of the project— including system design, public engagement, and integration with existing infrastructures—ensures that it addresses the diverse challenges of waste management effectively. Moreover, the potential for scalability allows for future expansions and enhancements, making the system adaptable to evolving urban needs. By fostering community involvement and prioritizing environmental sustainability, the smart dustbin initiative not only improves public health and hygiene but also cultivates a culture of responsibility among citizens. Overall, this innovative approach positions cities to better manage waste, reduce their ecological footprint, and move toward a more sustainable future. The project's comprehensive scope encompasses critical elements such as system design, user interface development, and community engagement, ensuring that all stakeholders are considered and involved in the process. By educating and involving citizens in responsible waste disposal and recycling practices, the system fosters a culture of sustainability and civic responsibility, empowering individuals to take an active role in their environment. Moreover, the scalability of the smart dustbin

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system allows for future enhancements and expansions, accommodating the evolving needs of growing urban populations. As cities increasingly adopt smart technologies, this initiative aligns seamlessly with broader smart city objectives, integrating waste management with other urban services for a holistic approach to urban planning.

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