iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 12 **Issue:** V **Month of publication:** May 2024

DOI: https://doi.org/10.22214/ijraset.2024.61457

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue V May 2024- Available at www.ijraset.com

Smart Waste Management and Awareness System

Vaishnavi Agre[1], Akanksha Barve[2], Sanket Gadekar[3], Aniket Gangurde[4], Dr. A. B. Pawar[5]
Department of Computer Engineering Sanjivani College of Engineering, Kopargaon, India

Abstract: ***In a time of accelerated urbanization and growing environmental awareness, efficient municipal waste management has emerged as a critical issue for cities all over the world. The idea of Smart Waste Management and Awareness Systems (SWMAS) is examined in this research study as a comprehensive strategy to maximize waste collection, recycling, and sustainability initiatives in metropolitan settings. This research investigates the essential elements, difficulties, and prospects related to SWMAS implementation by a detailed analysis of the body of previous research, case studies, and expert interviews. Additionally, it suggests a thorough implementation plan that places a strong emphasis on community awareness, technology integration, and stakeholder participation for implementing SWMAS in actual urban settings. The objective of this article is to offer significant insights and suggestions on smart waste management by examining successful case studies and upcoming trends.***

I. INTRODUCTION

The amount of waste generated daily by homes and businesses is growing at an alarming rate. This is primarily due to the growing use of packaged goods, textiles, paper, food, plastics, metals, glass, and other materials. As a result, managing this garbage has become essential to daily life. The majority of developed nations have many effective methods for managing waste, but in some, particularly the developing ones, people have a negligent attitude toward keeping their environment clean. In addition, a number of other problems, like the absence of strict regulations requiring the use of biodegradable materials, appropriate environmental policies, and laws supporting sustainable development, are the root cause of the disastrous outcomes of waste management. Due to the growing amount of waste, the public trash cans that are used to collect it are overflowing, leaving the neighbourhood littered and resulting in foul-smelling streets as well as detrimental effects on the environment and public health [3].

Waste management is a critical issue that requires careful attention. We separate our waste at home so that it is easier to process and recycle. We saw garbage trucks arriving at residences on a sporadic basis, depoliticizing residential areas. As a result, a large number of citizens empty their full dustbins in public areas. Consequently, pollution of the environment rises [2]. Waste has a terrible lot of negative consequences on the environment and human health. Bacteria, insects, and flies—the same flies that swarm around edibles and release their young—breed on trash. Consequently, they raise the danger of contracting food poisoning, typhoid, gastroenteritis, salmonella, dengue fever, malaria, and other diseases. In addition to causing a variety of respiratory ailments, hazardous waste also spreads disease through stray dogs and rodents.

In addition to harming human health, the rubbish contains harmful contaminants including CO2, methane, and nitrous oxide that pollute the air and water and cause respiratory disorders. When hazardous trash, such as electronics and plastics, are disposed of in water, aquatic life is harmed, which has an indirect effect on humans. Garbage piled too high is an annoyance to the public and an eyesore. Everybody wants to travel to new, tidy cities. A foul-smelling city with litter everywhere deters tourists, which means it loses out on possibilities and financial gain [2].

India is currently the third-largest garbage generator in the world, with 377 million people living in metropolitan areas producing 62 million tons of waste per day as the country's affluence soars. The fact that local authorities dispose of over 45 million tons, or three million trucks' worth, of untreated rubbish in an unsanitary manner every day is more of a problem than the quantity of waste produced.

It is important to address this issue and find the right solutions. Some of these include strict legislation against individuals who throw trash in the air, against businesses that do not use biodegradable materials, increasing the use of recycled materials, decreasing the use of non-biodegradable materials, and reusing existing items. All of these measures can help reduce waste to some degree. The idea put out goes hand in hand with this usage of technology to dispose of waste properly and lessen its hazardous impacts [5].

These days, the world is enthralled with the internet. Nobody survives without a phone, laptop, tablet, or internet connection. People tend to gravitate toward free Wi-Fi because they believe that in today's society, one cannot advance without connectivity. However, occasionally, heavy plans or connectivity problems prevent us from accessing the internet.

©IJRASET: All Rights are Reserved

The problem of waste would be resolved if there was free Wi-Fi available for throwing trash in the trash can. Having access to the internet and free service would also encourage people to go bonkers and serve as an incentive for keeping the neighbourhood clean [4].

II. LITERATURE SURVEY

Alam and Dey (2019) introduced an IoT-based solid waste management system tailored for smart cities, emphasizingtechnological innovation and exploration. Additionally, the Central Pollution Control Board in its 2016 annual report (Reference [2]) highlighted the importance of robust waste management strategies at the governmental level.

Gharaibeh et al. (2017) delved into the concept ofsmart waste management using IoT, contributing insights from the 2017 IEEE Jordan Conference on Applied Electrical Engineering and Computing Technologies (AEECT). Kanchan and Sharma (2020) extended this discourse with their study on IoT-based waste management for smart cities, further emphasizing the role of technology in optimizing waste processes.

A comprehensive review by Kumar et al. (2017) explored various technological options for waste-to-energy, shedding light on effective approaches to managing municipal solid waste. Meanwhile, the Ministry of Environment, Forest, and Climate Change in India provided a regulatory framework through the Solid Waste Management Rules of 2016 (Reference [6]).

Rana and Goyal (2019) contributed to the literature bydiscussing the challenges and solutions associated with implementing IoT in solid waste management, as published in the International Journal of Computer Applications. Finally, Sharma et al. (2020) addressed the impact of the COVID-19 pandemic on solid waste management, presenting challenges, opportunities, and innovations in the post-pandemic era in theirpublication in Resources, Conservation, and Recycling.

III. FLAWS IN THE EXISTING SYSTEM

The following are the primary issues with the current solid waste management and collection system:

1) Increased processing complexity.
2) Many interconnected controlling units; greater implementation costs [3].

IV. PROPOSED SYSTEM

By fusing data analytics, smart technology, and public involvement programs, the suggested system offers a novel approach to waste management. Smart garbage Bins, which are outfitted with various sensors to enable real-time monitoring and control of garbage disposal procedures, form the central component of the system. These sensors comprise a temperature and gas sensor to monitor the environment inside the bins, a proximity sensor to open the lid automatically, and an ultrasonic sensor to determine the level of waste. The bins' advanced sensor network maximizes garbage collection efficiency and fosters environmental sustainability by allowing the bins to recognize and react on their own to variations in waste levels and internal conditions [4].

A dedicated Gateway device facilitates connection between the central processing unit and the Smart Waste Bins. For the purpose of gathering data from various bins and sending it to a microcontroller for processing in real time, this Gateway acts as a centralized hub. The microcontroller that is included inside the Gateway carries out crucial functions such event triggering, anomaly detection, and data aggregation. This guarantees effective waste management procedures by facilitating prompt decision-making and action.

The technology makes use of cloud-based infrastructure to handle and analyze the vast amount of data gathered from the Smart Waste Bins. The processed sensor data is uploaded to the cloud using the Blynk platform as a local server, where it is instantly saved, examined, and visualized. Stakeholders can access waste management metrics using this cloud-based method from any internet-enabled device, allowing for remote monitoring and decision-making.

Stakeholders have access to an intuitive dashboard that offers a comprehensive picture of waste management KPIs using the Blynk platform. The dashboard's customized warnings, interactive visualizations, and tools for analyzing historical data enable users to make well-informed decisions and maximize waste management tactics. The system includes a website for awareness that aims to inform and involve the community about best practices in trash management in addition to the dashboard. The website is available in multiple languages and provides users with educational materials, interactive guides, and a chatbot for support and questions. In addition to increasing user engagement, live customer help also promotes increased community participation and collaboration in waste management initiatives [7].

The suggested system is made to be easily integrated into the current waste management infrastructure and to be deployed in a variety of scalable metropolitan settings.

©IJRASET: All Rights are Reserved

Through adherence to standards-based protocols and open- source technology, the system guarantees compatibility and interoperability with third-party applications and future enhancements [4].

Advantages of proposed system over the existing:

1) Low implementation cost
2) Simple module
3) Easy functionality

V. SYSTEM ARCHITECTURE

The system is composed of following components:

1) *The dustbin:* A standard dustbin constructed of metal or plastic that is strong enough to support all the components that are installed in it, including the load sensing plate at a mediocre level, the mechanical shredder mounted on the top side, and the IOT components.
2) Sensors: The ultrasonic sensor, proximity sensor, temperature sensor, and gas sensor will make up the majority of the sensing unit's four sensors. The trashcan's inner side has an ultrasonic sensor that measures the amount of rubbish being deposited within. When motion is detected, an infrared sensor attached to the lid will open and close the dustbin automatically. The temperature and gas concentration inside the bin are detected by temperature and gas sensors.
3) *Proximity Sensor:* Used for automatically open and close the lead of smart binwhenever somebody waves in front of bin.



Fig 1. Proximity Sensor

4) *Ultrasonic Sensor:* Used to detect the level of garbage inside the bin. Whenever thebin gets full does not open the lid of bin.

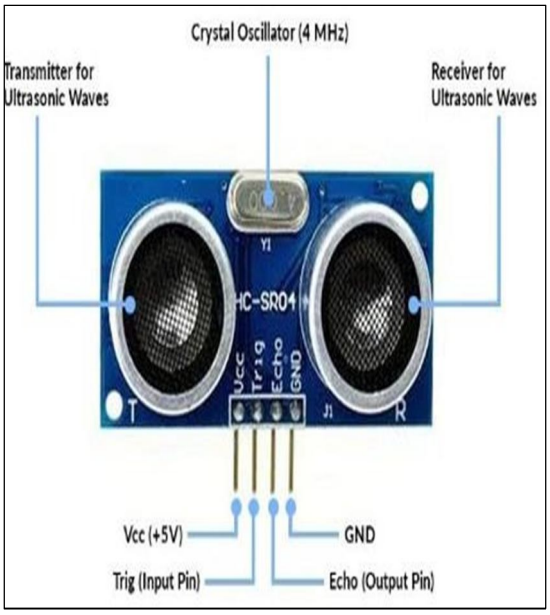


Fig 2. Ultrasonic Sensor

5) *Temperature and humidity sensor:* Used to detect the temperature and humidity inside the bin. When bins are not cleaned on the time temperature and humidity inside the bin automatically increases which is detected by temperature and humidity sensor.

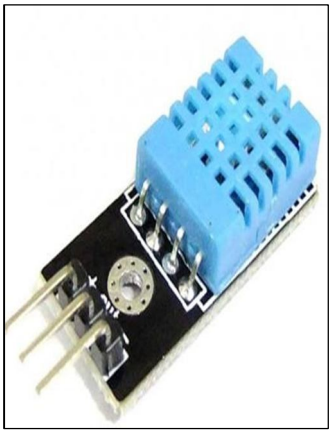


Fig3. DHT-11

6) *Gas Sensor:* Used to detect the harmful gases released from the waste A smart garbage bin that incorporates a gas sensor offers an extra degree of safety and environmental monitoring. When dangerous gases like carbon monoxide or methane are detected within the bin, these sensors notify all parties involved about possible environmental or safety risks. The sensor reduces health risks to local inhabitants and waste management staff by measuring gas concentrations in real-time. It also makes it possible to take preventative action in the event of gas leaks or accumulation, guaranteeing more secure and long-lasting waste management procedures.



Fig 4. Gas Sensor

7) *Wi-Fi module:* It comprises of the router, which gives the user access to the internet so they may throw their trash in the trash can. The integration of a Wi-Fi module significantly enhances the functionality of a smart rubbish bin integrated into it, since this makes wireless internet connectivity possible. Through the facilitation of communication between the smart bin and other platforms or devices, this connectivity enhances the smart bin's overall effectiveness and utility. For instance, the Wi-Fi module enables the smart bin to transmit real-time data, such as fill levels, temperature readings, and environmental factors, to a central gateway device or a cloud-based platform.

8) *Microcontroller:* The embedded system's processing unit at the bins will be an Arduino. Information will be sent and sensors will be controlled with this. A smart garbage can's microcontroller, which provides real-time data processing and control, is its brains. It takes inputs from various sensors inside the bin, such as ambient and fill level sensors, and applies pre-programmed algorithms to make judgments or start operations. For example, the microcontroller may use sensor data to determine when the bin needs to be emptied or when environmental circumstances require action when a fire hazard or gas leak is identified.

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |

VI. METHODOLOGY

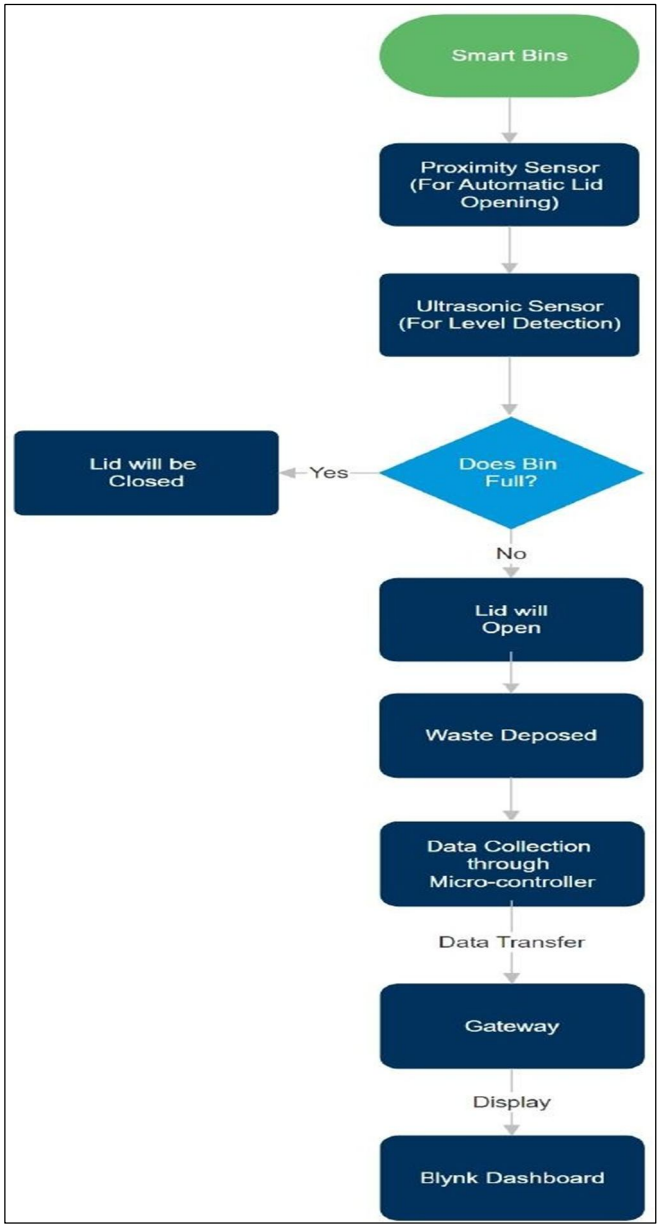


Fig 5. Flow Chart of System

VII. ADVANTAGES

In addition to its many benefits, the suggested approach is persuasive enough to be put into practice on every street in a developing country. The benefits are found in how well and easily it functions. Not only will this make our streets nicer, but it will also lay the groundwork for a more functional system.

1) Effective and efficient functioning.
2) Sanitized Environments.
3) Better health conditions surroundings free of stench and pollution.

VIII. FUTURE WORKS

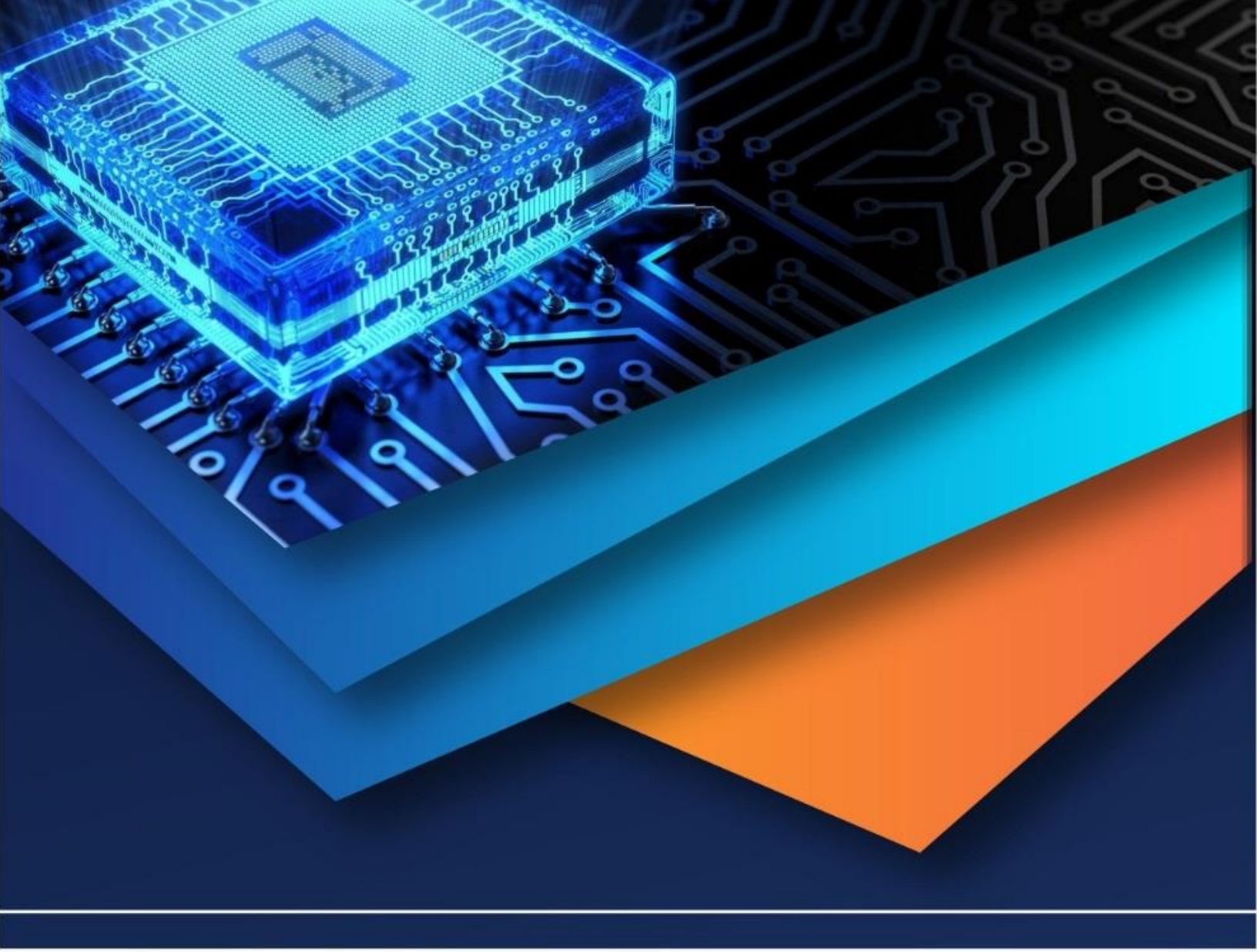
The problems associated with trash segregation can be resolved by integrating the moisture sensor with the other sensors and creating compartments for the separation of dry and wet waste.

IX. CONCLUSION

This paper attempts to provide a practical solution towards managing the waste by collaborating with the use of IOT, i.e., providing free internet facilities for a specific time once the trash is dumped into the bin. Improper disposal and maintenance of domestic waste create issues in public health and environment pollution. The suggested strategy would undoubtedly aid in resolving any significant waste-related problems and maintaining a clean environment.

REFERENCES

[1] Alam, M., Dey, A. (2019). IoT-Based Solid Waste Management System for Smart Cities. International Journal of Innovative Technology and Exploring Engineering, 8(10), 3024-3027.
[2] Central Pollution Control Board. (2016). Annual reporton solid waste management. Government of India.
[3] Gharaibeh, K., Salahuddin, M. A., Hussini, S. J., Khreishah, A. (2017). Smart Waste Management using Internet of Things (IoT). 2017 IEEE Jordan Conference on Applied Electrical Engineering and Computing Technologies (AEECT), 1-6.
[4] Kanchan, D., Sharma, P. (2020). IoT Based Waste Management for Smart Cities. International Research Journal of Engineering and Technology, 7(3), 1349-1353.
[5] Kumar, A., Samadder, S. R., Chakraborty, S. K. (2017). A review on technological options of waste to energy for effective management of municipal solid waste. Waste management, 69, 407-422.
[6] Ministry of Environment, Forest and Climate Change. (2016). Solid Waste Management Rules, 2016. Government of India.
[7] Rana, R., Goyal, R. (2019). Internet of Things for Solid Waste Management: Chal- lenges and Solution. International Journal of Computer Applications, 182(36), 0975- 8887.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)