IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

## IN COMPUTER & COMMUNICATION ENGINEERING

Volume 11, Issue 4, April 2023

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.379

9940 572 462 | 6381 907 438 | ijircce@gmail.com | www.ijircce.com

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 4, April 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1104268 |

# MAAP: THE SEGREGATOR

[1] Shashank M Gowda, [2] P N Anvitha, [3] Abhishek Poojary, [4] Prajwal Shetty, [5] Mouna C B

[1]Assistant Professor, Department of ECE, YIT, Moodbidri, Karnataka, India

[2 3 4 5] Student, 8th Semester, Department of ECE, YIT, Moodbidri, Karnataka, India

**ABSTRACT --** Waste management has become a critical issue in recent times due to the increasing amount of waste being generated by human activities. Poor waste management practices, such as improper waste segregation, can lead to negative environmental and health impacts. It is therefore imperative that we adopt more responsible and sustainable waste management practices, with proper waste segregation being a crucial element. The MAAP- The Segregator offers an innovative solution to waste segregation, particularly for plastic, wet, and metal waste. This technology has the potential to positively impact the recycling industry by improving the quality and quantity of recyclable materials. Correct waste segregation can contribute to a decrease in the volume of waste that is sent to landfills, leading to a reduction in the negative environmental and health impacts associated with landfills.

**KEYWORDS***:* waste management, waste segregation, waste, landfills

## I. INTRODUCTION

According to the Global Waste Management Market report, the world produces 2.02 billion tons of waste, a significant concern in urban and rural areas globally. It is important to realize that waste can be valuable if it is properly segregated. To manage waste effectively, it must be handled, separated, transported, and disposed of in a way that minimizes risks to public health and the environment. Waste management is a critical aspect of sustainable development in many countries, as urbanization, economic growth, and industrialization have led to a rapid increase in the amount and variety of solid waste being generated. Effective waste management is crucial for reducing the negative impact of waste on the environment, as well as conserving natural resources and minimizing pollution. Proper waste segregation is a key component of effective waste management, as it allows for the recovery and recycling of valuable materials. With the growing population and urbanization, waste management has become a critical issue, and it requires the collaboration and efforts of governments, businesses, and individuals to find sustainable solutions. Adopting innovative technologies and practices, such as waste-to-energy, composting, and recycling, can play a vital role in reducing waste sent to landfills and promoting a circular economy. Waste segregation plays a critical role in facilitating this process by separating different types of waste materials into distinct categories for easier disposal or recycling. In recent years, waste segregation has become increasingly popular as more individuals and organizations have recognized the importance of sustainable waste management practices. With the rise of environmental consciousness and the growing awareness of the impact of waste on the environment, waste segregation has emerged as a critical tool in addressing the challenges of waste management. In this article, we will explore the concept of waste segregation, the benefits of using waste desegregation, and the different types of segregation available in the market today. What is waste segregation? Waste segregation is the process of separating waste materials into different categories based on their properties and characteristics. Waste segregation aims to facilitate the recovery and recycling of valuable resources while minimizing the environmental impact of waste disposal. Waste materials are segregated into various categories based on their composition, such as organic waste, plastics, metals, glass, paper, and hazardous waste. Each category of waste requires different treatment methods to dispose of it safely and sustainably. For example, organic waste such as food waste, yard waste, and paper can be composted to produce organic fertilizer, while plastics and metals can be recycled to produce new products. Hazardous waste, such as batteries, fluorescent bulbs, and electronic devices, requires specialized disposal methods to prevent contamination of the environment.

## II. LITERATURE REVIEW

[1] Padmakshi Venkateshwara Rao, Pathan Mohammed Abdul Azeez "IoT based waste management for smart cities" International conference on computer communication and information (ICCCI), Coimbatore, India, Jan22-24,2020.
**Description:** The system includes a network of sensors and devices that can monitor the waste levels in different containers and communicate that information to a central control system. This information can then be used to optimize

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waste collection routes and schedules, reducing the cost and environmental impact of waste management.

[2] Nikolaos Baras, Dimitris Ziouzios "A cloud-based smart recycling bin for in-house waste classification" in the 2nd International Conference on Electrical, Communication and Computer Engineering, Istanbul Turkey June 12-13 2020.
**Description:** The authors also discuss the potential for using machine learning algorithms to analyze the data collected by the system and provide more advanced waste management insights. The system uses sensors and cameras to classify waste items as recyclable or non-recyclable and then stores this information in the cloud. The authors also discuss the potential for using machine learning algorithms to improve the accuracy of waste classification and provide insights into recycling behavior. The system can also generate reports and statistics on recycling rates and provide feedback to users to encourage more sustainable waste disposal practices.

[3] Shashank Shetty, Sanket Salvi "SAF-Sutra: A prototype of Remote Smart Waste Segregation and Garbage Level Monitoring System" International Conference Communication and Signal Processing, India, July 28- 30,2020.
**Description:** The system includes a network of sensors and cameras that can identify different types of waste and measure the levels of waste in different containers. The authors propose using this information to optimize waste collection routes and schedules and reduce the time and cost of waste management. The system also includes a mobile app that allows users to receive alerts when containers are full and provides information on nearby waste disposal locations.

## III. PROBLEM STATEMENT

The issue of waste disposal has become a significant problem worldwide in recent times. While large-scale industrial waste segregation facilities exist, it is better to segregate waste at the source itself. An innovative application has been developed to help manage and segregate waste more efficiently. Dustbins have been placed throughout the city and equipped with a cost-effective tracking system that assists in monitoring the garbage bins. When a bin reaches its maximum capacity, an SMS text is sent to the municipal corporation to notify them. This allows the authorities to take immediate action to empty the bin, ensuring that the waste is appropriately managed. The technology has the potential to revolutionize waste management, promoting a cleaner and more sustainable environment. It can also reduce the risks of health hazards associated with improper waste disposal. The application is user-friendly and can be easily integrated into any waste management system. With proper implementation, this innovative technology can help to create a cleaner, safer, and more sustainable world for everyone.

## IV. METHODOLOGY

The proposed waste management system uses three replaceable bins for plastic, metal, and wet waste. The dry-wet sensor in the system is set with a threshold value of moisture and senses the moisture content of the waste. This sensor helps in moving the waste into its respective bins through the relay which rotates the servo motor in both clockwise and anticlockwise directions. To keep track of the garbage level in the bins, IR sensors are used, which send a message to the municipality when the bin is full. All the data sensed by the Arduino UNO using the sensors is transmitted to the cloud via node MCU. The program for this system would be coded in embedded C. Messages will be displayed to the users on the LCD. Overall, this waste management system is designed to be efficient, easy to use, and environmentally friendly.

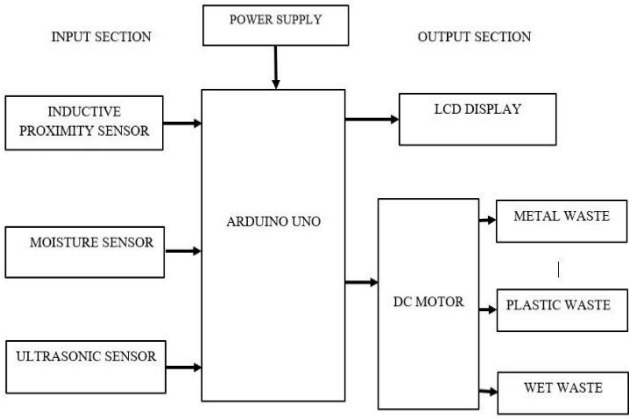


Fig.1 Block Diagram of MAAP: The Segregator

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This waste management system not only helps in sorting the waste but also ensures that the waste is disposed of properly. Using separate bins for different types of waste reduces the burden on landfills and promotes recycling. The dry-wet sensor in the system ensures that wet waste is not mixed with dry waste, which can cause odors and attract pests. The IR sensors help in monitoring the waste level in the bins and enable timely disposal, preventing overflow and littering. Cloud-based data transmission allows for real-time monitoring and analysis, facilitating better waste management practices. Overall, this waste management system is a step towards creating a cleaner and greener environment.

## V. FUNCTIONAL PARTITIONING

The project comprises two components: Hardware and Software. The Arduino UNO was utilized in this project, and as a result, the Arduino IDE was used. The hardware components employed in the project are listed below.

**1. Arduino Uno**

The ATmega328 microcontroller is integrated into the Arduino UNO board, which serves as a versatile platform for developing and implementing projects that require microcontroller functionality. The board features 14 digital input/output pins, with 6 of them being analog input pins. Additionally, it has a power jack, a USB connector, a reset button, an ICSP header, and other necessary components that enable its operation and utilization in a project.

**2. Infrared sensor**

An infrared sensor emits to sense the surroundings. It is used to detect the amount of waste in each dustbin. Thus, it helps in preventing the overflow of bins.

**3. Inductive proximity sensor**

The inductive proximity sensor is capable of detecting metallic objects located near its active side. It functions based on the principle of electrical inductance, whereby a fluctuating current in the sensor generates an electromotive force (EMF) in the target object. This results in the detection of the object by the sensor.

**5. Moisture sensor**

A resistive moisture sensor operates by leveraging the correlation between electrical resistance and the water content of the material being measured. These sensors typically feature two exposed probes that are directly inserted into a soil sample to take readings. Moisture sensors, on the other hand, are devices that can measure or estimate the amount of water present in a material or substance, such as waste. These sensors can be stationary, placed at predetermined locations and depths in the field, or portable, such as handheld probes.

**6. Servo motors**

The Micro Servo Motor is a small, lightweight servo motor that delivers high-output power. With the ability to rotate approximately 180 degrees, 90 degrees in either direction, this servo motor operates similarly to standard-sized motors, but in a smaller form factor. This servo motor can be controlled using any servo code, hardware, or library, making it an excellent choice for beginners who want to create motion without having to build a motor controller with feedback and a gearbox.

**7. Capacitive sensor:**

The concept of Capacitive sensing relies on the phenomenon of capacitive coupling. The non-contact device that can detect or sense the presence or absence of any object virtually irrespective of its material is known as a capacitive proximity sensor. They use the alteration of capacitance based on the change in the electrical field and the electrical property of capacitance everywhere around the active face of the sensor.

## VI. ADVANTAGES

- The MAAP segregator project reduces the environmental impact of waste disposal by segregating waste, allowing for plastic waste to be recycled, and organic waste to be composted, reducing greenhouse gas emissions.
- The project recovers valuable resources from waste that would otherwise be lost, such as plastic and metal

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waste, which can be used as raw materials in manufacturing processes.

- The MAAP segregator project is cost-effective in the long run by reducing waste disposal costs and generating revenue from the sale of recycled materials.
- Proper waste segregation can improve health and safety by reducing the risk of exposure to hazardous waste.
- The project involves the community in waste management, encouraging sustainable behavior.
- By reducing the amount of waste that needs to be processed, the MAAP segregator project can reduce the burden on waste management systems.
- The MAAP segregator project promotes sustainability by reducing waste and generating raw materials that can be used in various industries, contributing to a more circular economy.

## VII. APPLICATIONS

- MAAP can be implemented in households which can reduce the core cause of garbage creation.
- This can also be implemented in public places such as railways, metro stations, bus stands malls, etc.
- This can be taken on a large scale and used in manufacturing units.
- This segregated waste can be used as raw materials for many industries such as cement and other sustainability-related products.

## VIII. CONCLUSION

The waste management system helps to keep our surroundings clean, green, and free from the garbage. By sorting waste at the primary stage, it reduces the burden on manual labor, making waste collection and segregation more efficient. The automated segregation process also reduces the health issues and work stress of workers who manually segregate the wastes. This system plays a significant role in reducing environmental pollution by ensuring that waste is disposed of properly, reducing the harmful effects on the environment. The use of separate bins for different types of waste promotes recycling and reduces the amount of waste that goes to landfills. The waste management system can also save costs associated with waste management by reducing the frequency of waste collection and increasing the efficiency of segregation. The system can be easily monitored and controlled through remote access to the cloud-based data. This allows for better management and planning of waste collection and segregation. In addition to the benefits of reducing pollution and promoting recycling, this system can also generate revenue by selling the sorted waste to recycling industries. The use of embedded C programming ensures that the system operates accurately and can be easily customized for specific waste management needs. This waste management system can also help to create awareness and educate the public about the importance of proper waste disposal and recycling practices. It promotes a sense of responsibility towards the environment and encourages individuals to take action toward a sustainable future. The system can be easily scaled up or down depending on the size and needs of the community, making it a flexible and adaptable solution for waste management. Overall, this system is eco-friendly and contributes to a cleaner, healthier, and more beautiful environment for everyone to enjoy.

## REFERENCES

[1] Padmakshi Venkateshwara Rao, Pathan Mohammed Abdul Azeez “IoT-based waste management for smart cities” International conference on computer communication and information (ICCCI), Coimbatore, India, Jan22-24,2020.
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Impact Factor: 8.379

doi cross ref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

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