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# Automatic Waste Segregation System

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**Abstract**

The Automatic Waste Segregation System is an innovative solution aimed at addressing the pressing issue of waste management in urban areas, where improper disposal poses significant health and environmental risks. Globally, an estimated 2.01 billion tons of municipal solid waste is generated each year, with a substantial portion remaining untreated, leading to severe health and environmental consequences. This automated system utilizes a combination of IR sensors, moisture sensors, and metal detectors to classify waste into three categories: wet, dry, and metallic. Upon detection, the system employs servo motors to efficiently direct the waste into designated bins, thereby streamlining the segregation process. The integration of an LCD display provides real-time feedback about the system's operations, enhancing user interaction and monitoring. By minimizing human intervention and maximizing efficiency, this system not only facilitates better waste management but also promotes environmental sustainability by encouraging recycling and reducing landfill contamination. The implementation of this technology at local levels can significantly alleviate the burden on municipal authorities and contribute to a cleaner, healthier urban environment.

**Keywords:** Automatic waste segregation, smart waste management, IR sensor, moisture sensor, metal detector, servo motor, waste classification, wet waste, dry waste, metallic waste, LCD display, real-time monitoring, urban waste solutions, solid waste management, environmental sustainability, recycling automation, smart bin system, municipal solid waste, clean technology, sensor-based sorting

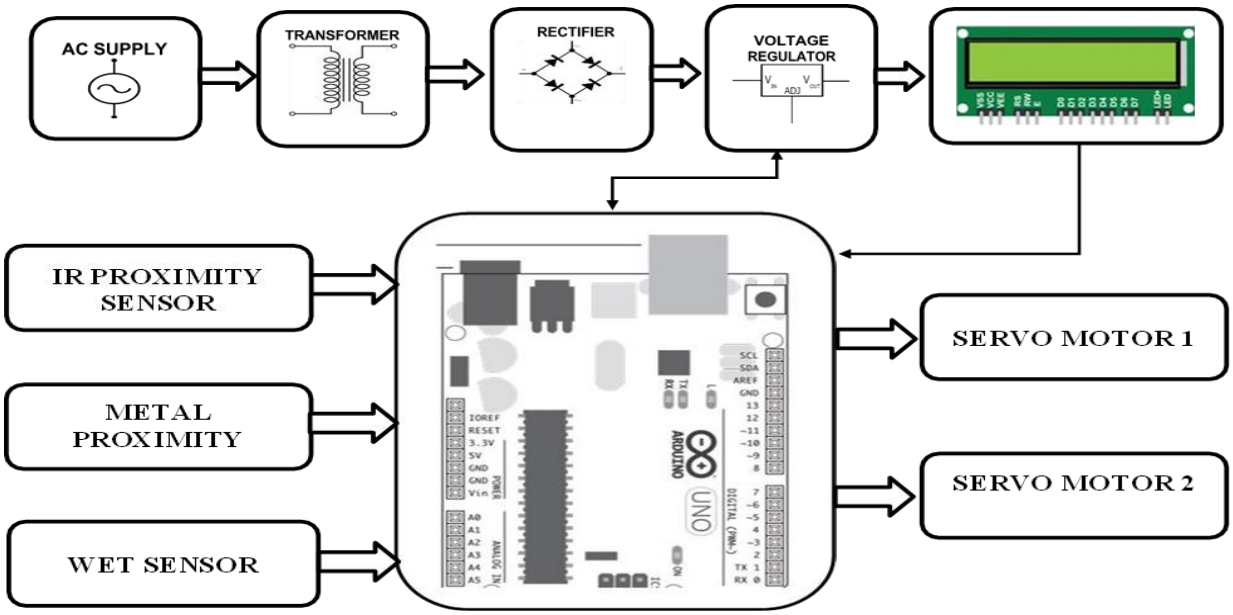
## INTRODUCTION

Waste management is a critical issue faced globally due to the increasing population, urbanization, and industrialization. Improper waste disposal and lack of effective segregation methods contribute to various environmental and health problems, including the spread of diseases, contamination of soil and water, and emission of harmful gases. Managing this waste efficiently, especially in metropolitan areas, is essential to prevent these risks. Segregating waste at the source into different categories—such as wet, dry, and metallic—plays a key role in recycling and reducing landfill usage. When mixed waste is dumped in landfills, it leads to the release of harmful greenhouse gases and causes environmental degradation. Separating waste allows recyclable materials to be reused, wet waste to be composted or converted into biogas, and metallic waste to be recycled, thus reducing the pressure on natural resources. In India, like in many other countries, the problem of waste management is compounded by a lack of efficient segregation at the household and community levels. Rag pickers and waste workers, who manually sort waste, face health risks due to direct contact with untreated waste. Automated waste

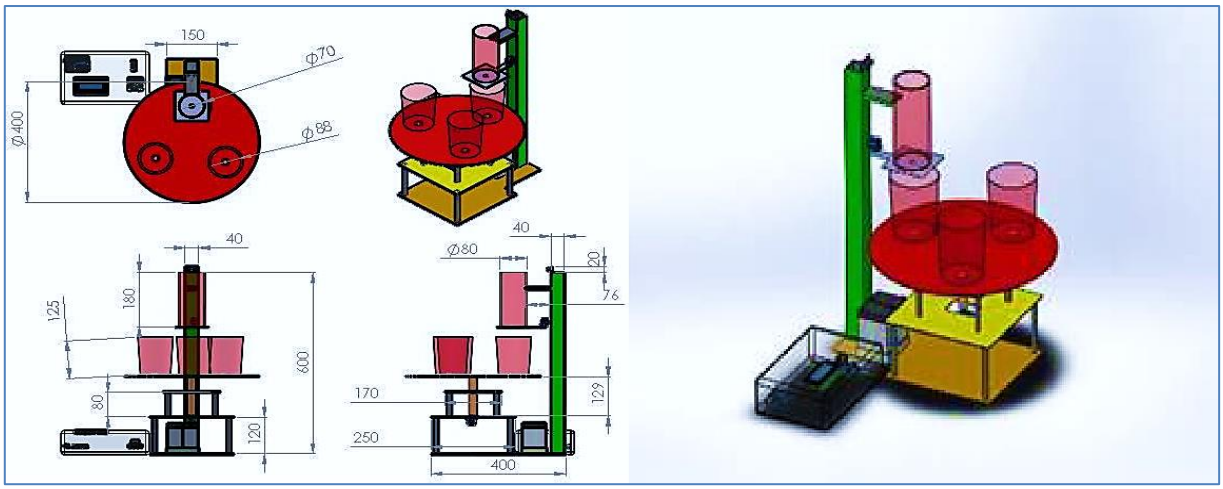
segregation systems can significantly improve this process by reducing the need for manual intervention and making the system more hygienic and efficient. This project aims to develop an Automatic Waste Segregation System that automatically sorts waste into wet, dry, and metallic categories using sensors and a microcontroller- based mechanism. The system uses IR sensors, moisture sensors, and metal detectors to classify the waste, and servo motors to direct the waste into appropriate bins. This automation can be implemented at various levels, such as residential societies, educational institutions, or commercial spaces, and contributes towards a more efficient and sustainable waste management process.

## OBJECTIVE

- Automate waste segregation.
- Improve waste management.
- Promote environmental sustainability.
- Reduce health hazards.
- Create cost effective solution.




**BLOCK DIAGRAM**



## WORKING

The Automatic Waste Segregation System operates through a series of steps to efficiently categorize waste into three distinct types: wet, dry, and metallic. The process begins when waste is placed into the designated entry compartment, where an infrared (IR) sensor detects its presence. Once waste is detected, the metal detector activates to identify if the waste is metallic. If a metallic object is present, a servo motor is triggered to divert the waste into the metallic bin. For non-metallic waste, the system moves to the next step, where another IR sensor checks for moisture content to differentiate between wet and dry waste. A moisture sensor measures the dielectric constant of the waste, helping the system determine if it is wet or dry based on the level of moisture detected. Once the waste type is identified, the system employs a rotating table equipped with three separate bins for metallic, wet, and dry waste. The table rotates to the appropriate position based on the type of waste detected, allowing the waste to drop into the correct bin. After the collection of waste, the table resets to its initial position, ready for the next batch of waste. Throughout this process, the system can provide real-time feedback on the status of the bins, helping monitor their filling levels. By automating waste segregation at the source, the project not only streamlines the recycling process but also enhances environmental sustainability by reducing the amount of mixed waste sent to landfills.

## COMPONENTS REQUIRED

| SL NO | COMPONENTS | QUANTITY |
|---|---|---|
| 1 | Arduino Uno | 1 |
| 2 | Liquid Crystal Display | 1 |
| 3 | Voltage Regulators | 2 |
| 4 | SMPS | 1 |
| 5 | IR sensor | 1 |
| 6 | Metal Detector | 1 |
| 7 | Moisture sensor | 1 |
| 8 | Servo motors | 2 |

## CONCLUSION

In conclusion, the Automatic Waste Segregation System is a groundbreaking solution that addresses the critical challenges of waste management by automating the segregation process at the source. By utilizing advanced sensors and servo motors, the system efficiently categorizes waste into wet, dry, and metallic types, significantly reducing human intervention and associated health risks. This project not only promotes environmental sustainability by enhancing recycling and composting but also mitigates landfill usage and greenhouse gas emissions. Its cost-effective and scalable design makes it adaptable for various settings, from residential complexes to public spaces, contributing to cleaner and healthier environments. The implementation of such innovative technology fosters responsible waste management practices, aligns with global sustainability goals, and paves the way for smarter urban living.

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