International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 11 | Nov - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

Automatic Waste Segregation System

Mr. Rahul Khalge, Mr. Sanket Rasal, Mr. Ajay Raut, Mr. Mayuresh Shinde, &

Prof. Sachin Nikam

Department of Mechanical Engineering SRTTC Pune

Abstract - The Automatic Waste Segregation System aims to enhance waste management practices by efficiently sorting waste into three categories: wet waste, dry waste, and metallic waste. Utilizing advanced sensor technologies, this system leverages an LM393 IC moisture sensor to detect the moisture content in waste, effectively identifying wet organic materials such as food scraps. Additionally, an infrared (IR) sensor is employed to distinguish dry waste, including paper, plastics, and textiles, based on the reflective properties of the materials. To further enhance the sorting process, a metal detector is integrated to identify and segregate metallic waste, ensuring that recyclables are collected accurately. The automation of waste segregation not only reduces the manual labor involved in traditional waste sorting methods but also increases the accuracy and efficiency of the process. This system is designed to operate autonomously, with real-time monitoring and feedback mechanisms that allow for seamless integration into existing waste management infrastructures. The collected data on waste types can be utilized for further analysis, enabling municipalities and organizations to develop more effective waste disposal and recycling strategies. By implementing this Automatic Waste Segregation System, we aim to address the growing challenges of waste management, reduce landfill dependency, and promote recycling and resource recovery. This innovative approach aligns with global sustainability goals, contributing to cleaner environments and enhanced waste resource management. The project has the potential to significantly improve waste processing efficiency, reduce environmental impact, and foster community awareness regarding the importance of proper waste segregation.

***Key Words*:** Arduino Mega, IR Sensor, DC Motor, Rotary Indexer, Container, etc.

1. INTRODUCTION

This Waste Management and segregation is a much-needed process in metro cities and urban areas due to spreading of diseases. It is estimated that India produces 42.0 million tons of municipal solid waste annually at present. Waste lying littered in the surrounding, dumped on open lands, becomes a major problem for various types of disease-causing bacteria and viruses hence, segregation, transport, handling and disposal of waste must be managed properly to minimize the risks of the public and environment. When mixed dry and wet waste breaks down in lowland, it creates nasty greenhouse gases. Segregation makes it attainable to utilize and recycle the waste effectively. This waste segregator system can easily segregate waste. When waste is thrown in the pipe, IR sensor will sense the waste. Waste is divided into three categories namely Wet, Dry and Metallic. Another sensor will sense the garbage category.

2. Body of Paper

Aim & Objective of Project: Implementation of proposed work into practical experimental as follow:

1. To study existing systems of garbage segregation.
2. To utilize simplest technique for garbage separation.
3. To study automation as for segregating waste.
4. To manufacture Arduino based simple automation.
5. Reduced time required for waste separation.
6. To develop low cost machine and easily operable by any one.

Problem Definitions: In today's world common problem faced in waste collection and dumping is mainly: overflowing garbage bins and waste segregation as per its type. Nearby 62 million tons of waste is generated each day by 377 million people living in urban India of which 45 million of waste is left untreated and disposed of unhygienic ally causing severe health problems and environmental degradation. A rage of notable inflation in the municipal solid waste generation has been registered. worldwide due to overpopulation, industrialization and economic growth and overflowing landfills are impossible to reclaim because of the improper disposal of wastes on outskirts of cities causing vital environmental entanglement in terms of water pollution and global warming causing a reduction in average lifetime of the manual segregator. In India, rag pickers and conservancy staff play a crucial role in the recycling of urban solid waste and have higher jejuneness due to infections of the skin, respiratory system, gastrointestinal tract, and other allergic disorders.

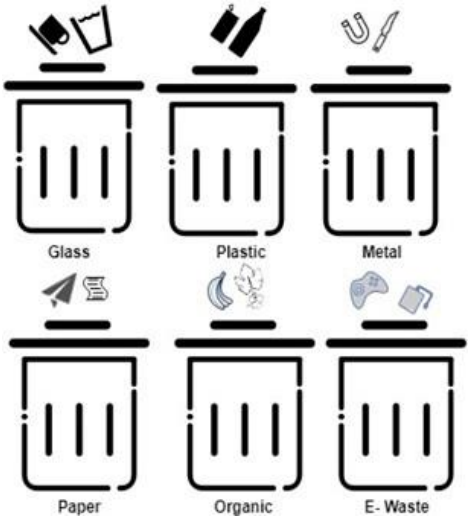

Fig 1: Waste Segregation

Methodology: The Smart bin is divided into three compartments. Each compartment has their own function, the first compartment consists of an IR sensor and a metal detector and the second compartment consists of another IR sensor and a moisture sensor for detecting dry and wet waste, the last compartment is subdivided into three bins for collection of the segre-gated waste respectively. The whole system is controlled by ARDUINO MEGA Board. Each and every component is interfaced to the arduino board.

The necessary code for controlling the sensors and the motors is coded using embedded-C language, in which the inputs and the output ports can be defined easily. In this project we have used IDE compiler to compile the code and upload it to the board using an A-B wire. To provide details of every decision we have used an Liquid Crystal Display device to display the desicions made by the arduino processor. NodeMCU is a component which can be used to connect to a wifi hotspot using the 802.11 protocol. NodeMCU when interfaced with ARDUINO MEGA can be used for providing real time updates, through updating the decisions made by the device on to the specific server, from where the status of the device can be monitored.

The automated process of segregation starts with the detec-tion of garbage in the first compartment, where an IR sensor and a metal detector [4] are placed. The IR sensor is used for the detecting the presence of garbage in the compartment and the process of separation begins. once garbage is detected by the IR sensor the metal detector becomes active and verifies if the garbage is of metal wastes.

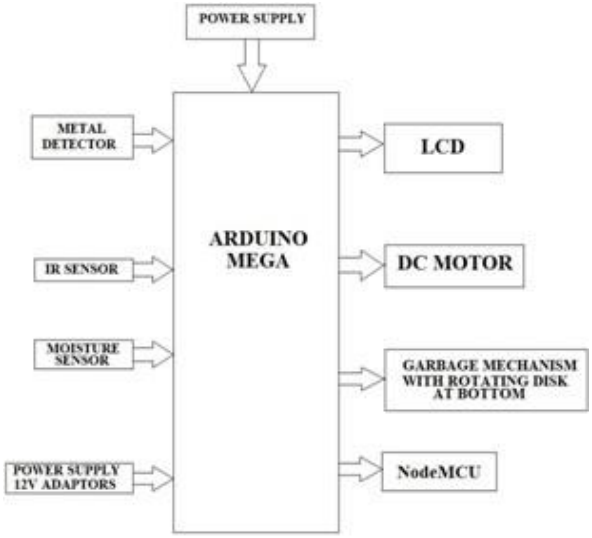

Fig -1: Block diagram

When any metal object is present near the metal sensor the magnetic field around it induces current in the metal object, hence creating a loss and change in the electric field. Once metal is detected the contents in the first compartment are sent directly to the storage compartment, where three separate bins are used for metal, dry and wet waste.

When the contents of the first compartment are deemed to be non-metallic, they are sent to the second compartment where an IR sensor is used to verify the presence of the garbage. Depending on the output given by the IR sensor the moisture sensor [4] gets activated or stays inactive. When the garbage is detected in the second compartment, the moisture sensor becomes active and is used to decide if the contents to be dry or wet waste. The decision is made using the change in the dielectric constant (solid bulk permittivity). Higher permittivity suggests that the garbage contains water content and hence is deemed to be wet waste. Depending on the decision made by the moisture sensor the contents are sent to their respective bin.

The storage compartment consists of a rotating table with three bins namely dry, wet and metal. The rotating table rotates according to the type of garbage detected in the previous compartments, for collecting the respective waste and after collection of garbage resets to a default position. The placement of the bin for collection is programmed using delay/time taken for the table to rotate.

We have interfaced a NODEMCU module [1] [3] [5] which gives us a feedback on the filling of bins. This module also helps us to send information about the filling of bins to municipal corporation [3] so that they can come and collect the waste.

Initially all the servo motors are set to the home position and all the sensor are switched on. When the garbage dropped on the sensing board all the sensors sense the waste and give the sensed output to the Arduino. And the Arduino analysis the outputs to find the appropriate waste material type. Once the waste material is identified then servo motor rotate predefined angle to put the waste in the appropriate bin.

In this proposed model we try to differentiate three waste materials namely wet, metal and dry.

3. CONCLUSIONS

In this paper, the development of automated waste segregator system is presented to effectively sort waste according to its base. During the process of development, the bin prototype and sensing mechanism are integrated with an Arduino Mega microcontroller. It is a low-cost system and it requires less amount of power supply. Implementation of this system at a local level like societies, educational institutes, etc. can reduce the burden on the local authorities. The automatic waste segregator is one small step towards building an efficient and economic waste collection system with a minimum amount of human intervention and also no hazard to human life. Due to rise in urbanization the waste is increasing very fast. Therefore, waste management is the vital need to protect the environment. This system is helpful in dry and wet waste separation, and monitoring the garbage containers. The system is an efficient step towards cleanliness. As it is being said that the technology which goes parallel with environment is the need of the hour. Our project is a step towards such green technology.

ACKNOWLEDGEMENT

The heading should be treated as a 3rd level heading and should not be assigned a number.

REFERENCES

1. “Intelligent System for Garbage collection: IoT technology with Ultrasonic sensor and Arduino Mega” , Najaf Ali ,M. Muzammul and Ayesha Zafar September 2018.
2. “IoT Based Automated Waste Segregator for Efficient Recycling” ,T.Saminathan,Akash Musipatla, P. Manideep Varma, P. Shahid Khan, G.Mahesh Kumar April 2019.
3. Monika K A, Rao N, Prapulla S B and Shobha G 2016 Smart Dustbin-An Efficient Garbage
4. Navghane S S, Killedar M S and Rohokale D V 2016 IoT Based Smart Garbage and waste collection, International Journal of Advanced Research in Electronics And Communication.