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Automatic Waste Segregation System

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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.

I. INTRODUCTION

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. As per the algorithm used, if the waste is metallic then the mechanism will bring the metal collecting bin below the pipe and with the help of servo motor the waste will fall into the metal bin. Similarly, the process will repeat if wet waste is sensed. If the sensor doesn't activate both the sensor category, then the waste will be considered to be a dry waste. Segregation of collected waste is essential due to the fact that if all waste materials such as polythene bags, old furniture, and e-waste get mixed up in the landfills, it could lead towards contamination of the land through leaking toxic substances. Wet waste fraction is converted either into compost or methane gas. Compost can replace chemical fertilizers demands, and biogas can be used as a source of energy. The metallic, plastic and paper waste can be reused or recycled. An automated waste segregation process is the most basic requirement for kick-starting management process. Thus in this paper, we have compared various automated waste segregation processes implemented using different technologies.

1.1Problem Definition

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. This can be diminished if segregation takes place at the source of the municipal waste generation which will also give a higher quality of the material is preserved for recycling thereby recapturing more value from the waste. This not only reduces occupational hazard for rag pickers but also reducing the processing time of segregating the waste after collection. The economic value of the waste generated is realized after it is recycled completely and there are different techniques available to recycle and reuse the municipal solid waste. When the waste is segregated into basic categories such as wet, dry and metallic, it has an intense perspective of improvement, and accordingly, recycled and reused.

1.2 Aim & Objectives

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.

1.3 Scope

Waste segregation is extremely crucial due to the fact that if all waste materials such as polythene bags, old furniture, and e-waste get mixed up in the landfills, could lead to contamination of the land and water through leaking harmful substances in the atmosphere. Moreover, non-segregation also affects climate change which may lead to drought conditions. Thus, it is essential to separate waste before disposing into the landfill. Waste segregation is also not only important but also beneficial for human beings. The recyclable parts of the waste can be recycled into useful resources after the segregation process. It has a large meaning for the current society which is facing the problem of resource shortage. If we segregate waste at the source itself, it solves more than half of our task and the main problem that we face in managing solid waste would lessen considerably. Only we need to behave responsibly to accomplish the goal of waste separation. To increase the activity of recycling, a basic requirement is to concentrate on waste segregation that helps to recognize the degradable and non-biodegradable parts of the waste. Since the degradable waste is organic, its disposal does not cause any harm. The non-biodegradable waste is the inorganic part that is good for recycling. The biggest danger is when the inorganic waste finds its way back to the earth and raises the pollution measurement besides causing other damages to the environment. The inorganic waste reaches the market that deals in scrap materials where further segregation breaks it into its elements like paper, plastic, metal, etc. These materials ultimately pass through the market chain and reach the manufacturers who use it as raw material.

Figure 1Waste Segregation

1.4 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.

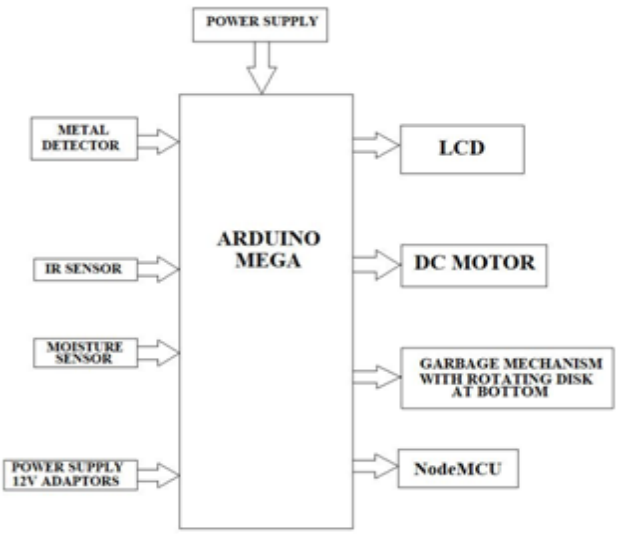

Figure 2 block diagram

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.

is extremely crucial due to the fact that if all waste materials such as polythene bags, old furniture, and e-waste get mixed up in the landfills, could lead to contamination of the land and water through leaking harmful substances in the atmosphere. Moreover, non-segregation also affects climate change which may lead to drought conditions. Thus, it is essential to separate waste before disposing into the landfill. Waste segregation is also not only important but also beneficial for human beings. The recyclable parts of the waste can be recycled into useful resources after the segregation process. It has a large meaning for the current society which is facing the problem of resource shortage. If we segregate waste at the source itself, it solves more than half of our task and the main problem that we face in managing solid waste would lessen considerably. Only we need to behave responsibly to accomplish the goal of waste separation. To increase the activity of recycling, a basic requirement is to concentrate on waste segregation that helps to recognize the degradable and non-biodegradable parts of the waste. Since the degradable waste is organic, its disposal does not cause any harm. The non-biodegradable waste is the inorganic part that is good for recycling. The biggest danger is when the inorganic waste finds its way back to the earth and raises the pollution measurement besides causing other damages to the environment. The inorganic waste reaches the market that deals in scrap materials where further segregation breaks it into its elements like paper, plastic, metal, etc. These materials ultimately pass through the market chain and reach the manufacturers who use it as raw material.

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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,AkashMusipatla, P. Manideep Varma, P. Shahid Khan, G.Mahesh Kumar April 2019.

[3] 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.

[4] Monika K A, Rao N, Prapulla S B and Shobha G 2016 Smart Dustbin-An Efficient Garbage