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Advanced Robot for Automatic Waste Segregation and Status Alert

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Abstract: *One of the main concerns with our environment has been solid waste management which in addition to disturbing the balance of environment also has adverse effect on health of the society. Effective waste management is one of the major problems of the present era. The segregation, handling, transportation and disposal of waste are to be properly managed so as to minimize the risk to the environment. The economical value of waste is best realized when it is segregated. The traditional way of manually segregating the waste utilizes more human effort, time and cost. This work proposes an economic automated waste segregator which is cheap and easy to use solution for a segregation system at households, so that it can be sent directly for processing. It is designed to sort the refuse into metallic waste, wet waste, dry waste, and plastic waste.*

I. INTRODUCTION

The rising population of India poses serious threats with regard to the availability of living space, utilization of natural resources and raw materials, education and employment. But another serious peril that follows is the escalating amount of waste generated each minute by an individual. Every city is grappling with the menace of ever increasing waste. An astounding 0.1 million tons of waste is generated each day in our country. Sadly, only 5% of this colossal amount of waste is recycled.

In recent times, garbage disposal has become a huge cause for concern in the world. A voluminous amount of waste that is generated is disposed by means which have an adverse effect on the environment. The common method of disposal of the waste is by unplanned and uncontrolled open dumping at the landfill sites. This method is injurious to human health, plant and animal life. This harmful method of waste disposal can generate liquid leachate which contaminate surface and ground waters can harbor disease vectors which spread harmful diseases and can degrade aesthetic value of the natural environment and it is an unavailing use of land resources. In India, rag pickers play an important role in the recycling of urban solid waste. Rag pickers and conservancy staff have higher morbidity due to infections of skin, respiratory, gastrointestinal tract and multisystem allergic disorders, in addition to a high prevalence of bites of rodents, dogs and other vermin. Dependency on the rag-pickers can be diminished if segregation takes place at the source of municipal waste generation.

In India, the collection, transportation and disposal of MSW are unscientific and chaotic. Uncontrolled dumping of waste on outskirts of towns and cities has created overflowing landfills which are not only impossible to reclaim because of the haphazard manner of dumping but also has serious environmental implications. One possible solution for this problem could be segregating the waste at the disposal level itself. When the waste is segregated into basic streams such as wet, dry, metallic, plastic, the waste has higher potential of recovery, and consequently, recycled and reused. The wet waste fraction is often converted either into compost or methane-gas or both. Compost can replace demand for chemical fertilizers, and biogas can be used as a source of energy. The metallic waste could be reused or recycled.

Even though there are large scale industrial waste segregators present, it is always much better to segregate the waste at the source itself. The benefits of doing so are that a higher quality of material is retained for recycling which means that more value could be recovered from the waste. The occupational hazard for waste workers is reduced. Also, the segregated waste could be directly sent to the segregation plant then to the recycling plant.

The economic value of the waste generated is not realized unless it is recycled completely. Several advancements in technology have also allowed the refuse to be processed into useful entities such as Waste to Energy, where the waste can be used to generate synthetic gas (syn gas) made up of carbon monoxide and hydrogen. The gas is then burnt to produce electricity and steam; Waste to Fuel, where the waste can be utilized to generate bio fuels.

We are implementing a smart dustbin which is a cheap, easy to use solution for a segregation system at households, so that it can be sent directly for processing. It is designed to sort the refuse into metallic waste, wet waste and dry waste.

II. METHODOLOGY

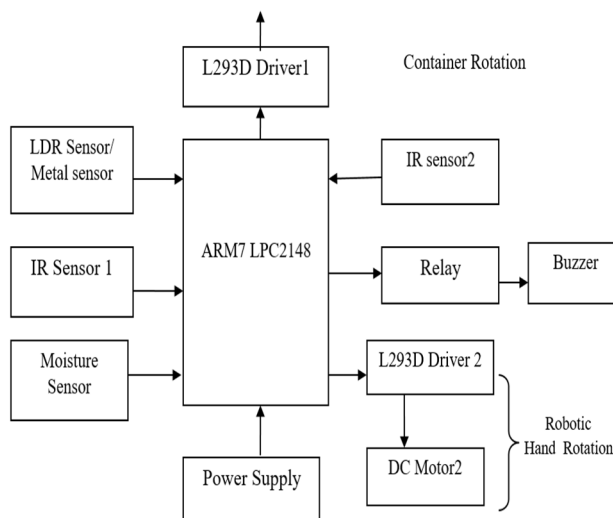


Figure 1: Block diagram of automatic waste segregation and status alert.

The Project basically is having a rotating container having three partitions to hold DRY waste, WET waste and E-waste as shown in above Figure. The container is fixed with a mechanical stand having three sensors namely IR sensor for detecting E-waste, Metal sensor or LDR for detecting DRY and Metallic waste and Moisture sensor for detecting WET waste. On the top of the container there will be a robotic hand to hold and dump the waste into particular partitions. Whenever any kind of waste is placed on the robotic hand the sensors will sense the type of material and container moves in such a way that the particular partition will be exactly below the robotic hand so that robotic hand flips the waste into that particular partition. There is an Ultrasonic sensor to sense the level of garbage. If it is filled then Alarm will turn on giving the user an indication to empty the bin. Since segregation is done before placing into the container it has become very easy for recycling the waste.

III. RESULTS

The proposed system “advanced robot for automatic waste segregation and status alert” sorts wastes into three different categories, namely metal, dry and the wet (organic) waste. Separating our waste is essential as the amount of waste being generated today causes immense problem. Here, we have tested the household wastes which are generated in every home today and we have come up with the following result.

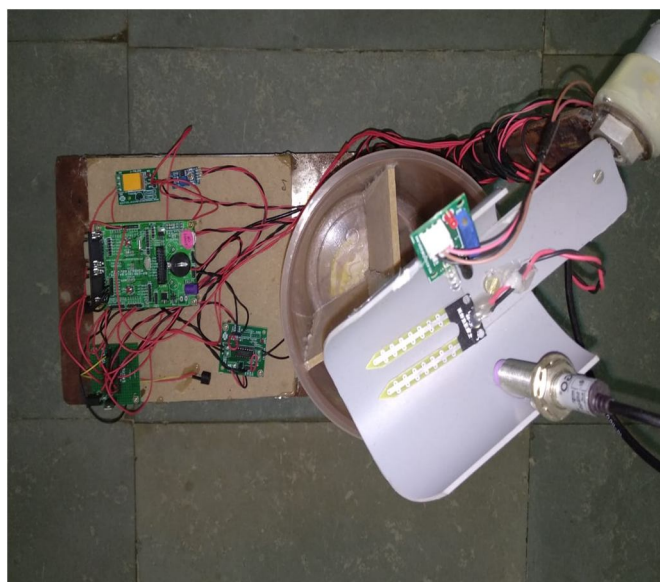


Figure 2: Proposed System.

Whenever any kind of waste is placed on the robotic hand the sensors will sense the Whenever any kind of waste is placed on the robotic hand the sensors will sense the type of material and container moves in such a way that the particular partition will be exactly below the robotic hand so that robotic hand flips the waste into that particular partition and Figure shows the proposed system and the dry waste is segregated.

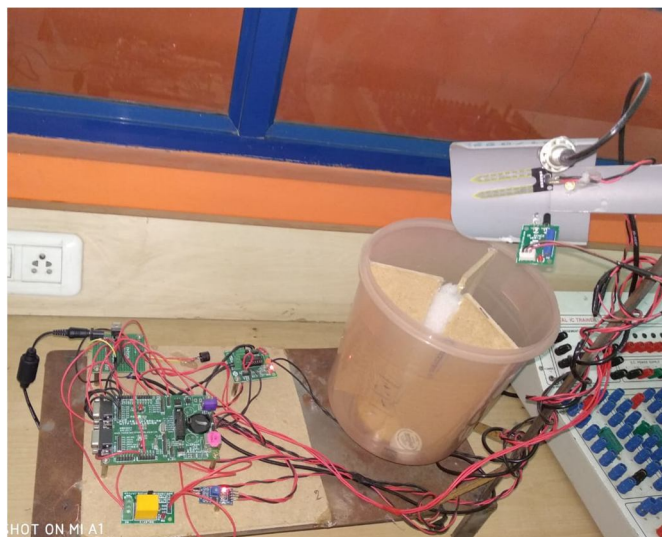


Figure 3: Dry Waste Is Segregated.

There is another IR sensor to sense the level of garbage. If it is filled then buzzer will turn on giving the user an indication to empty the bin.

IV. ACKNOWLEDGEMENT

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V. CONCLUSION

Automatic Waste Segregator has been successfully implemented for the segregation of waste into metallic, dry and wet waste at a domestic level. The system can segregate only one type of waste at a time with an assigned priority for metal, wet, dry and glass waste. The experiment has been conducted for wet, dry, glass and metallic wastes. It is found that the change of capacitive count value is greater for wet waste and very less for dry waste. Other objects like glass and wood have intermediate relative dielectric constant and thus are detected as dry waste. Experimental result shows that the waste has been successfully segregated into glass, metallic, wet and dry using the Automatic Waste Segregator.

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