

REVIEW ON WASTE SEGREGATION USING DIFFERENT TECHNIQUES

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Abstract: The increasing urbanization and growth all over the world, we need a stable and sustainable development plan. One of the important parts of the urban development plan is proper waste management in which waste collection is a very complicated process which involves efficient management of the entire system, beginning with the collection to the dumping of wastes hygienically. The amount of waste has been increasing due to the increase in human population and urbanization. In cities, the overflowed bin creates an unhygienic environment. Thus, degrades the environment, to overcome this situation “Automatic Waste segregator” is developed to reduce to work for the ragpickers the waste wastes are segregated by the human beings which lead to health problems to the workers. Here the waste segregated into dry, wet and metallic waste. Wet waste fraction is converted either into compost or methane gas. The metallic, plastic and paper waste can be recycled or reused. Thus, in this paper, we have compared various automated waste segregation processes implemented using different technologies.

Index Terms - Urban development, Automated waste segregation, Recycled.

I. INTRODUCTION

The abundant increase in population led to the improper waste disposal. Managing the garbage consumes more time and requires a lot of manpower. In recent years the waste disposal is becoming a huge cause. The most of common method of waste disposal is unplanned and it is dumped at the landfill sites this method causes ill effects to all living beings. This method can generate liquid leachate and other fungus which pollute the surface and underground water also accelerates harmful diseases which leads to the degradation of an aesthetic value of environment. In India recycling of solid waste is done by the ragpickers who play an important role in this process will doing the rack pickers get affected with many health problems such as skin infections, respiratory problems the dependent of rack pickers can be reduced if the automatic waste segregation takes place in dustbin. The wastes are generated into basic main streams such as metallic, dry and wet these wastes have a large potential of recycled and reused even through there are multiple industrial waste segregators present, it is always better to segregate the waste at source itself. The advantage of doing this type of segregation is, there is no need of rag pickers to segregate the waste. In addition to it the segregated waste can be directly sent to the recycling plant, instead of sending the waste to segregation plant and then to recycling plant.

1.1 CATEGORIES OF WASTE

Waste can be classified into different categories. Moreover, some types of wastes can be recycled, and others may not.

Liquid waste- Liquid waste usually found in both in homes as well as in industries. It includes dirty waste, wash water, organic liquids, waste detergents and even rainwater.

Solid waste- Solid waste can include items found in your household along with commercial and industrial locations. Commonly broken down into several types.

Paper waste- Includes packing material, newspapers, cardboard, etc. Paper can be recycled and reused thus should be disposed of in recycling bin.

Metals- Mostly generated as industrial or household waste. It can be recycled thus should be preferably disposed of separately.

Plastic waste- consists of bags, jars, bottles, etc. that can be found in the household. It is non-biodegradable, but most of them can be recycled.

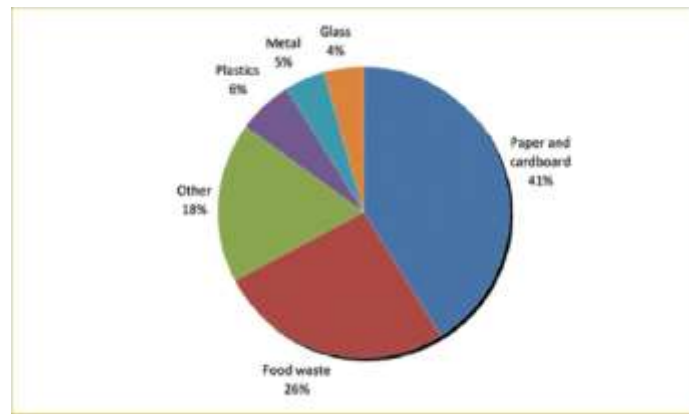


Fig.1: Distribution of different types of waste

II. CURRENT SCENARIO

In the present world of digitizing everything in our surroundings have been equipped with modern technology and the internet to ease our work and gain more efficiency. But the systems existing today for waste management are the same as they were before in most of the countries. Currently, for the collection of waste in some countries, we have a door to door collection systems that require a lot of efforts and money. Also in some countries, systems do exists in which waste is collected from the trash bins of each colony, but this system also brings some disadvantage that many a time dustbins are overfilled and waste isn't collected from it, as waste is collected on a particular day and not according to its status. This also makes dustbins, a place facilitating bacterial growth, feeding animals and a breeding places for insects.

III. NEED OF WASTE SEGREGATION

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.

IV. LITERATURE SURVEY

This section covers the work done by various researchers using different technologies for segregating the waste. Mainly 3 techniques used for waste segregation namely—Internet of Things (IOT), Arduino UNO, programmable logic controller (PLC)

4.1 IOT based waste segregation techniques:

In [1], authors T. Saminathan proposes a prototype of a municipal waste segregator, which can segregate the dumped waste immediately, leading to more recyclable paper. The smart being is divided into 3 components each component has their own function, the first component consists of an IR sensor and a metal detector and the second compartment consist of another IR sensor and a moisture sensor for detecting dry and wet waste, the last compartment is divided into 3 bins for collection of the segregated waste respectively. The whole system is controlled by ARDUINO MEGA board each component is interfaced to the ordinary board.

The necessary code for controlling the sensors on the Motors is Coded using embedded C language, in which the input 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 and liquid crystal display device to display the decisions made by the ordinary processor. NodeMCU is a component which can be used to connect to a Wi-Fi 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 the specific server, from where the status of the device can be monitored.

In [2], authors V. Sowndarya proposed system separates the waste into three categories namely wet, dry and metallic waste. This developed system is not only cost effective also makes the waste management productive one. Each of the wastes are detected by the respective sensors and gets segregated inside the bins which is assigned to them the details of amount of waste disposal is updated in the server regularly.

The foremost goal of this project is to automatically segregate the waste and to pursue the level of the dustbins which is delivered through wireless mesh network. With such information litter bin provides and cleaning contractors can make better decision for the efficient disposal. IR sensor identifies the objects, moisture and metal sensor detects the wet and metal waste. Ultrasonic sensor absorbs the level of the bin. The waste is dropped inside the bin where the sensor identifies the type of the

waste. The bin consist of 3 partitions inside were each bin collects each waste respectively. The motor then rotates, and respective partitions gets opened and respective wastes or collected. The status of the bin is displayed in Thing speak server.

In [3], authors Wesley Pereira proposed system main feature is garbage segregation. Smart bin will have 4 different compartments for the waste: for plastic, wet, dry and lastly for the wastewater from the auto clean feature. Apart from this, it will also have ultrasound sensors for the bin to open when a person approaches the dustbin to throw garbage thus making it hand-free and evidently more hygienic. The smart bin will also have an analysis done to tell the user the amount and type of garbage they dispose of. Daily, weekly and monthly garbage disposal will be analyzed through graphs and data through live data reception. The bin will also have a reminder sent to the phone from the app connected to the bin to tell us that it is time to throw the garbage. This idea will help us to dispose of the waste separately and thus also be able to distinguish the recyclable and non-recyclable waste. The smart bin is an efficient and hygienic waste disposal and segregation system with will eventually help in waste optimization.

4.2 Arduino UNO and Programmable logic controller-based waste segregation techniques:

In [5], the author E. Malleswari proposed system uses a metal detector to find the metal elements in the within the garbage. Once it detects the metal, the system can open the corresponding gate else it will open another gate. The soil witness detector can find the presence of the dry waste or wet waste. The system encompasses a DC motors interfaced with the small controller that rotates the belt.

The conveyor belt is employed to carrying the waste by utilizing DC motor through the sensors to the dustbins. The metal detection sensing element detects the metal wastage so corresponding gate can open. Then that wastage is false to the corresponding waste bin. If the dry waste comes then it falls to the corresponding waste bin. Similarly, the soil wet sensing element detects the wet wastage, so it falls to the corresponding waste bin.

In [6], author S M. Dudhal This paper describes an automatic waste segregation; we're developing a prototype for separating out metals from waste materials using programmable logic controller. In this system the waste will be fed to the conveyor belt through an automatic feed system which will comprise of a hopper and other mechanism. Sensor will detect the waste material on the conveyor belt and start the rotation of conveyor belt. After these metal sensors which are clamped below the conveyor belt will sense the metal particles and in turn stop the conveyor belt. A robotic arm to which an electromagnet is attached will extract the metal from the waste and will deposit it into a bin. The waste metal will be carried on further once the metal is extracted and dumped into a waste bin.

V. COMPARATIVE ANALYSIS

After detailed study of various techniques used for automating the segregation process, we can say that IoT based technique is used more than the PLC and Arduino UNO and the main advantage of IoT based system has been that it collects accurate data on real time and load cell calibration approach simplifies the calibration process. We can use Raspberry Pi with the IoT system's and disadvantage is its expensive hardware nowadays. In Arduino we can't able to use Raspberry Pi and it is less flexible and less features compared to IoT. PLC can be used but little bit bulky in size and expensive.

VI. CONCLUSION

In this paper, we have studied various ideas proposal for proper waste segregation. Since a stabilized system is needed for preventing harm caused to the environment due to improper disposal. The study shows that mainly IoT based techniques are mostly used for waste segregation but the cost of implementing IoT based system is very high. To make a cost-effective solution, artificial intelligence and machine learning based system were developed for automating the process of waste segregation with maximum efficiency and low cost.

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