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# Real Time Waste Segregation

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**Abstract**—Today, solid waste segregation is the biggest challenge faced by urban areas and metropolitan cities across the world. Especially, in a country like India which has weak environmental regulations, the situation is becoming worse. Generation of waste is an inevitable consequence of development and industrial progress. The economic value of waste is best realized when it is segregated. As it is said that everything starts at home, this paper proposes a solution for automated waste segregation at source-level. It is a cheap and easy solution for waste segregation at home so that it can directly be collected and processed further. The use of capacitive sensors helps us to classify wet and dry waste based on the dielectric values. We have also used IR proximity sensors to detect if a waste is being dumped or not.

**Keywords**—*Arduino UNO, IR Module, Inductive Proximity Sensor, Capacity Proximity Sensor.*

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## I. INTRODUCTION

Waste management can be defined as the efficient characterization, monitoring, treatment, handling, reuse and residual disposition of solid waste. The common method of waste disposal is by uncontrolled and unplanned open dumping at landfill sites. This is a crude method and create adverse effects on the health of the society living in and around the area. Segregation of waste is generally done by hand-picking methods. This method is carried out by people who generally are unaware of the after-effects of this method. When the waste is segregated into basic streams, 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 the material is retained for recycling which means that more value could be recovered from the waste [3]. The occupational hazard for waste workers is reduced. Also, the segregated waste could be directly sent to the recycling and processing plant instead of sending it to the segregation plant then to the recycling plant. Currently there is no system of segregation of mixed waste into metal, wet and dry. 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.

## II. LITERATURE SURVEY

Rapid increase in volume and type of solid and hazardous waste as a result of continues economic growth had become a major problem for the nation. So effective management of waste is really important. It was estimated that in 2006 the total amount of waste generated was about 2.02 billion tones, showing 7 percent rapid increase since 2003. the segregation, handling and transportation of waste must be properly managed. In order to reduce the risk to health of public and to ensure the safety of environment. The economic value of waste is best realized when it is segregated properly. Poor waste disposal activities engender severe environmental problems on a location. Improper waste disposal is the disposal of waste in a way that has negative consequences for the environment. Examples include hazardous waste that is dumped into the ground, and not recycling items that should be recycled. currently there is no system to separate Waste dry and metal waste. so such a system can be introduced so that waste could be separated at the source level.

Conveyer belt is a machine transporting material in continues way by friction drive. It can be a slide and is controlled by gravitational force. It is a rubber or textile structure with a belt shape close ring, with metallic joint, used for material transportation. It is composed of end to end pulleys and a closed conveyer belt. The pulleys that drive conveyer belt is called driver pulley. The belt is actually driven by the instructions given by microcontroller. The waste is initially dumped to the roller part roller is usually a cylindrical structure it can be used to separate waste by providing continues rotation and vibration. how it separate waste is based on that when we put different types of waste together to the roller part due to its rotation and

vibration we can see that the waste falls one by one towards the conveyer belt.

### III. EXISTING SYSTEM

In the current waste segregation systems are mainly used on the Image signal processing. In this only one waste material is passed to the system which will takes some time to detect the product and gives the final output the main drawback of such systems are there size and time which they tke process as ordinary peoples doesn't wait for such long time and drop the waste individually. The cost is another thing that comes in which the bulk production of such systems can't be huddled by small organizations and households. The implementation of such system in a public place is not possible. In order to avoid all these problems we have comes with the new system which is cost effective and place in all public place and have a much more speed response to the inputs given. The new system will provide much easier way of operations so that ordinary persons can use

#### A. Proposed System

aste is pushed onto a roller which is rotating and vibrating continuously so as to separate the waste based on mass and size. Waste coming out from roller is made to fall down into a conveyer belt so as to slow down and create a delay for proper sensing. The presence of waste is first identified by the use of infra-red sensor at start end of the conveyer belt, the waste moves further for detection with inductive sensor to detect whether it is metal or nonmetal. If it is detected as a metal, motor rotates in a direction to collect the metallic waste, for nonmetal it moves further with capacitive proximity sensor for detection of wet or dry waste. With detection of wet or dry waste, motor rotates in the other direction to collect them in separate bins.

#### B. Technical Background

The mixed waste is sorted based on the conventional methods at the industrial level [5]. Normally most of the unused and waste materials are found to be metal, biodegradable and non-biodegradable etc. The primary aim of objective of proposed work is to segregate mixed waste materials [14] such as metals, biodegradable and non-biodegradable waste [15]. Here two sensors are used namely inductive proximity sensor and capacitive proximity sensor. For level detection infrared sensors are used to indicate the bins are full. The three classifications mostly in waste are Metal, Wet and Dry [16]. There are numerous benefits of recycling the waste materials.

### IV. DESIGN AND IMPLEMENTATION

#### A. Block Diagram

The block diagram shown in figure 1 represents the Real Time Waste Segregator where three types of materials are segregated namely Metal, Wet and Dry. The controller

used is Arduino UNO. Waste is dumped into a roller which continuously rotates and vibrates. The waste coming out from roller is made to fall in a conveyor belt which pushes the waste in corresponding detection. The delay helps ineffective sensing. The waste is first detected by inductive proximity sensor to check whether it is metal or non metal. It is then moved towards capacitive proximity sensor for wet and dry detection which uses the dielectric value of waste materials. Depending upon the type of waste, motor interfaced to the controller is made to rotate so as to collect the waste in the corresponding bins. The IR sensor module monitors the level of waste inside the bins.

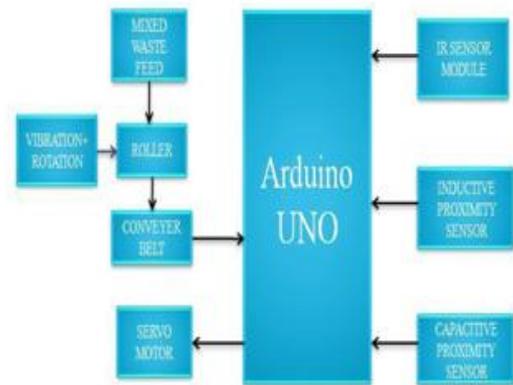
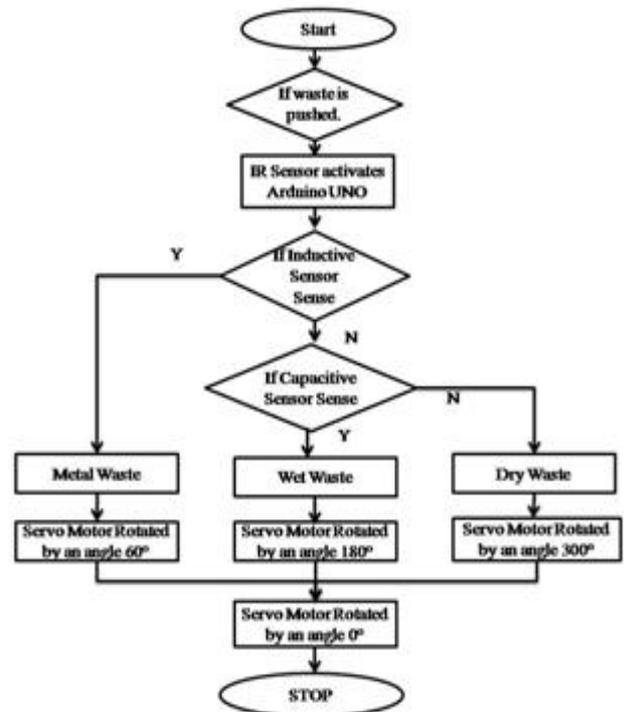


Fig. 1. Block Diagram

#### B. Flow diagram of Real Time Waste Segregation

The figure 2 illustrates the flow diagram of Real Time Waste Segregation of lower system which sort the waste into metal, wet and dry.



Waste coming out from the roller is moved through a conveyer belt which has got sensors embedded into it at the extreme two ends. Inductive proximity sensor is placed first to detect whether the waste is metal or non metal. If the waste is detected as metal the motor is programmed to rotate by an angle  $60^\circ$  and fall into a metal bin. If it is non metal, it is detected by capacitive proximity sensor which detects wet waste based on their dielectric value. A threshold value is set to sort the waste into wet or dry. For wet waste the value is high. An intermediate value is set as threshold by taking different samples. If the waste is wet the motor is programmed to rotate by an angle  $180^\circ$  and if the count is low below a threshold value the waste is dry waste. For dry waste motor is programmed to rotate by an angle  $300^\circ$ . Each time the motor come back to its original state.

## V. CONCLUSION

The proposed method is an efficient solution to the current waste management problem which effectively segregates metal, glass and plastic which can also be used to segregate wet waste, dry waste etc. This system can be effectively deployed in industrial material segregation, scrap shops etc. The Automated Material Segregation system (AMS) effectively employs inductive proximity sensor to identify metallic items, and capacitive proximity sensors to identify wet and dry waste. It is the first step towards recycling. Recycling the waste materials has a huge impact on the economic condition of the country since recycling of plastic can reduce the manufacture of plastic using renewable resources and it also has an immense effect on the environment by effectively managing the solid waste. However, many up gradations can be done to our existing project.

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## REFERENCES

- [1] D. Eason, B. Noble, and I.N. Sneddon, —On certain integrals of Daniel Hoornweg et al., —what a waste- A Global Review of Solid WasteManagementl, Urban Development & Local GovernmentUnit World Bank, Washington, DC., No.15, Mar. 2012.
- [2] Nishigandha Kothari , —Waste to Wealthl, NSWAI,New Delhi, Jul. 2013
- [3] Claudine Capel, —Innovations in Wastel, Waste management-world, Volume 11, Issue 2, Mar 2010.

- [4] J.S. Bajaj, Urban Solid Waste management in India,Planning Commission Government of India, New Delhi, 1995
- [5] Claudine Capel,-Waste Sorting - A Look at the Separation and Sorting Techniques in Today's European Marketl,Waste-management world, Volume 9, Issue 4, Jul 2008.
- [6] LDC1000 Inductance to Digital Converter, Texas instruments, Dallas, TX,Sept 2013
- [7] MSP430x2xx Family User's Guide, Texas instruments, Dallas, Tx, Dec 2004—Revised Jul 2013
- [8] D. Eason, B. Noble, and I.N. Sneddon, —On certain integrals of Daniel Hoornweg et al., —what a waste- A Global Review of Solid WasteManagementl, Urban Development & Local GovernmentUnit World Bank, Washington, DC., No.15, Mar. 2012.
- [9] NishigandhaKothari , —Waste to Wealthl, NSWAI, NewDelhi, Jul. 2013
- [10] Claudine Capel, —Innovations in Wastel, Waste management-world, Volume 11, Issue 2, Mar 2010.
- [11] J.S. Bajaj, —Urban Solid Waste management in India,Planning Commission Government of India, New Delhi, 1995
- [12] Claudine Capel, —Waste Sorting - A Look at the Separation and Sorting Techniques in Today's European Marketl,Waste-management world, Volume 9, Issue 4, Jul 2008.
- [13] LDC1000 Inductance to DigitalConverter,Texasinstruments, Dallas, TX,Sept 2013
- [14] MSP430x2xx Family User's Guide, Texas instruments, Dallas, Tx, Dec 2004—Revised Jul 2013
- [15] "Relative Dielectric constant r(dk value) of liquids and solid materials",EndressHauser, Weil am Rhein,Baden-Württemberg, 2000 M.S. Venkatesh et al., "An Overview of Microwave Processing and Dielectric Properties of Agri-food Materials",Biosystems Engineering (2004)