

AUTOMATED WASTE SEGREGATION

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I. ABSTRACT

To ensure the minimal risk to the environment and human health, it is necessary to take meticulous measures when segregating and transporting waste. The traditional method used for segregating of waste in India is through rag pickers which are time-consuming and can have adverse effects on the health of the people who are exposed to such wastes. Here we propose the use of an Automatic Waste Segregator (AWS) which is cheap and also an easy to use solution for segregation of household waste. It is designed to segregate the waste into three categories viz. metallic, dry and wet waste. It is evident from experimental reports that segregation of waste using AWS has been successful.

Keywords - Arduino Uno, Gear motor, Moisture Sensor, Power supply, Inductive Proximity Sensor, Stepper Motor.

II. INTRODUCTION

Waste disposal is a huge cause for concern in the present world. The disposal method of a voluminous amount of generated waste has had an adverse effect on the environment. Unplanned open dumping at landfill sites made by municipal is a common method of disposal of waste. Human health, plant and animal life are affected due to this method. The harmful method used for waste disposal generates harmful chemicals which contaminate surface and groundwater. It can give rise to disease vectors which spread harmful diseases.

In India, rag pickers play an important role in the recycling of urban solid waste. Dependency on the rag-pickers can be diminished if segregation takes place at the source of municipal waste generation.

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 (syngas) made up of carbon monoxide and hydrogen.

When the waste is segregated into basic streams such as wet, dry and metallic, the waste has a 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 the 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 recycling and processing plant instead of sending it to the segregation plant than to the recycling plant. The purpose of this project is the realization of a compact, low cost, and user-friendly segregation system for urban households to streamline the waste management process.

III. OBJECTIVES

A trend of significant increase in municipal solid waste generation has been recorded worldwide. This has been found due to over population growth rate, industrialization, urbanization and economic growth which have ultimately resulted in increased solid waste generation. Final destination of solid waste in India is disposal. Most urban solid waste in Indian cities and towns is land filled and dumped. Our Project deals with the most blistering topic i.e. wastes segregation. Hence, with our cost-effective project proposal, we try to bring in the change. This is the objective of our project.

IV. SYSTEM DESIGN

The main goal of the project is to design and develop a sorting system that sorts and waste automatically into three categories namely dry waste, wet and metal waste. Fig 1 shows the block diagram of automated waste segregator. It consists of certain blocks which are explained as follows:

A: Controller Unit: Arduino Uno is a microcontroller board. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with USB cable or power it with an AC-to-DC adapter or battery to get started.

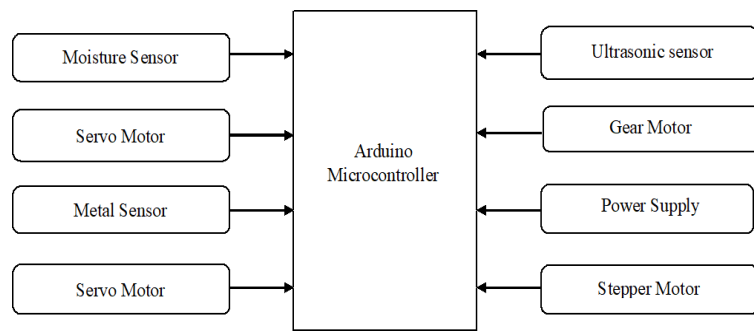


Figure 1 block diagram of automated waste segregator

B: Sensor Unit: This unit includes two types of sensors, they are: ultrasonic sensor, Moisture sensor.

1. Ultrasonic Sensor:

An optical sensor has a transmitter and receiver, whereas an ultrasonic sensor uses a single ultrasonic element for both emission and reception. In a reflective model ultrasonic sensor, a single oscillator emits and receives ultrasonic waves alternately. This enables miniaturization of the sensor head. We are using this sensor to check whether the bin is full or not if bins are full it will rotate and another bin will come.



Figure 2 Ultrasonic Sensor

2. Moisture Sensor:

The Moisture sensor is used to measure the water content(moisture) of soil. when the soil is having water shortage, the module output is at high level, else the output is at low level. We are using this sensor to see if the waste is wet.

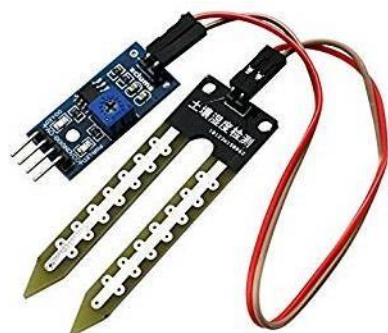


Figure 3 Moisture Sensor

C: Power Supply Unit (Adapter)In this project, circuits, sensors &motors are used, which require +12V & +5V (DC) supply. To fulfil this requirement, we have used following distributor circuit of power supply which gives power to all the sensor from adapter.



Figure 4 Distributor Power Supply

D: Gear Motor:

Gear Motor A small motor (ac induction, permanent magnet dc, or brushless dc) designed specifically with an integral (not separable) gear reducer (gear head). The end shield on the drive end of the motor is designed to provide a dual function.



Figure 5 Gear Motor

E: Servo Motors:

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors. We are using servo motor as flap so the waste goes to bin.



Figure 6 Servo Motor

F: Stepper Motor:

Stepper motors are DC motors that move in discrete steps. They have multiple coils that are organized in groups called "phases". By energizing each phase in sequence, the motor will rotate, one step at a time. We are using this motor to rotate the bin.



Figure 7 Stepper Motor

G: Inductive Proximity Sensor:

An Inductive Proximity Sensor is a non-contact electronic proximity sensor used for the detection of metals. Sensing range of this sensor completely depends upon the metal being detected. Their working principle is based on a coil and an oscillator that generates an electromagnetic field in the surrounding of the sensing range. Presence of any metallic substance in the sensing range causes dampening of oscillation amplitude.



Figure 8 Inductive Proximity Sensor

H: Conveyor Belt:

It is used to pass the waste to its respective bin.

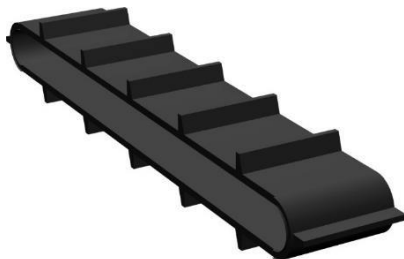


Figure 9 Conveyor Belt

V. HARDWARE REQUIREMENTS

Arduino Uno

The Arduino Uno is a popularly used open-source micro-controller board that runs on ATmega 328P micro-controller. This board contains a set of digital and analog I/O data pins that are used to interface this board with

other electronic components. Arduino Uno consists of 14 digital pins and 6 analog pins. This board can be programmed with the help of Arduino IDE (Integrated Development Environment) that supports embedded C, its back-end is constructed using JAVA. Uno consists of a USB port through which the code can be uploaded on to the board. This post can also be used to power the board by connecting it to a laptop, PC, etc. Along with a USB port, it also has a DC input power jack. An external battery of 9V can also be used to power Arduino board.



Figure 10 Arduino Uno

VI. SOFTWARE REQUIREMENTS

Arduino IDE

Arduino IDE (Integrated Development Environment) is a software platform that enables a user to program Arduino or any controller of the ATmega family. The back-end of this software is developed using JAVA. This IDE provides a user the liberty to program an Arduino using C language. It connects to the Arduino and hardware to upload programs and communicate with them.

VII. RESULTS

The automated waste segregator exactly fits at the source itself. The authorities in each city will collect the segregated wastes in separate containers and dispose the waste accordingly. Connect the Arduino board to PC by using cable. Open the Arduino IDE software, take a new file and type a program then verify/compile the code. After code compilation, go to Tools select Port: "Arduino/Genuino Uno" in that select "Arduino Genuino Uno". After that again go to tools select "Port: "COM4 (Arduino/Genuino Uno)". In the next step we are going to upload the program to our Arduino board. Once code is uploaded, we get done uploading command.

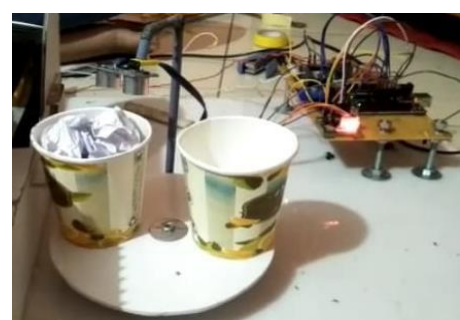


Figure 11 Bin Spinner

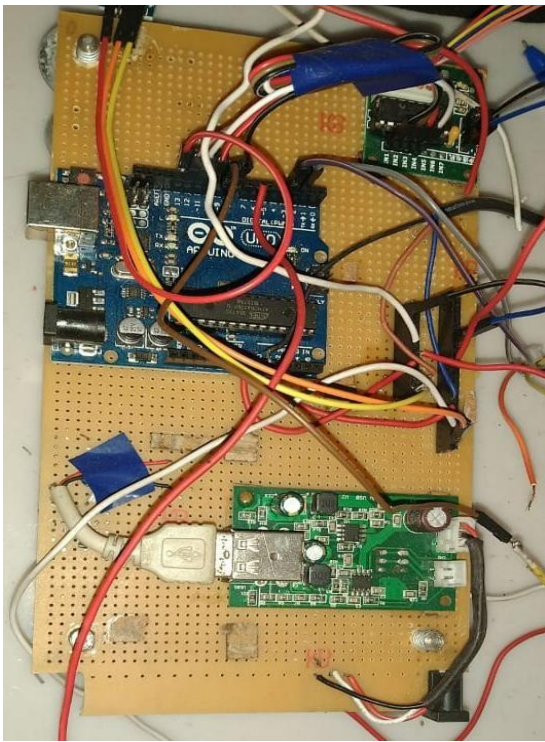


Figure 12 Model of automatic waste segregation

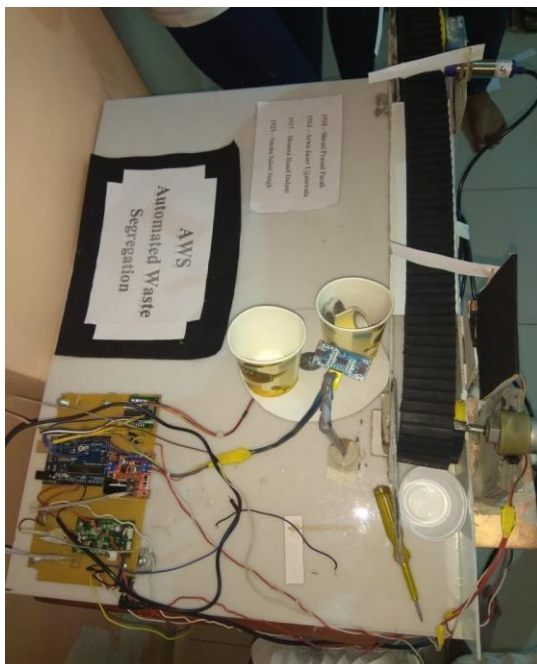


Figure 13 Automatic Waste Segregation

VIII. 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.

IX. FUTURESCOPE

Every project is always having scope for improvement, perhaps the most pressing issue of separation of waste is when their dispose simultaneously. The waste segregator can be improvised to include the separation of paper and plastic, safe segregation of biomedical waste generated at home, compact and aesthetic Mechanical design.

This type of product can be used in housing societies, offices, etc. Since it is cost effective, it can be implemented on a large scale as well with some modifications. Using a robotic arm along with a conveyor belt will make the process of segregation easier. Also, more sensors can be used to segregate bio-degradable and non-bio-degradable waste, plastics, recyclable waste, e-waste, and medical waste.

X. REFERENCE

- [1] J.S. Bajaj, Urban Solid Waste management in India, Planning Commission Government of India, NEW DELHI, 1995.
- [2] Automation of Waste Segregation System using PLC Rashmi M. Kittali and Ashok Sutagundar, 29 October 2016.
- [3] Nishigandha Kothari, Waste to Wealth, NSWAI, New Delhi, Jul. 2013.
- [4] Rajarajeswari College of Engineering, Bengaluru, Karnataka, India. Assistant professor Vol-2 Issue-5 2017.
- [5] Parvez Vaghela – Computer Department
- [6] Nagnath Kavhale – Electronics and Telecommunications