DEVELOPMENT AUTOMATIC DRY & WET WASTE SEGREGATOR SYSTEM

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Abstract – *The exponential increase in population has precipitated a corresponding escalation in the daily generation of waste. This uptick in waste production, attributable to the continuous expansion of urban areas and industrial activities, has emerged as a significant challenge for local and national governmental bodies. The indiscriminate waste dumping, particularly in landfills, poses a grave predicament for municipal authorities. The meticulous segregation of waste underscores the intrinsic economic value of waste materials.*

In India, the conventional method of [1] waste segregation relies on manual labour, primarily performed by rag pickers. However, this approach is time-intensive and exposes individuals to potential health hazards associated with handling waste. To address these challenges, we advocate for the implementation of an Automatic Waste Segregator (AWS), which offers a cost-effective and user-friendly solution for household waste segregation.

The AWS is engineered to categorise waste into two distinct groups: dry and wet waste. There is no automated system for waste segregation at the household level. This paper presents the development of a smart trash bin capable of autonomously separating dry and wet waste, thereby streamlining the [2] waste management process at the grassroots level.

1. INTRODUCTION

Waste management [2] presents a significant challenge in contemporary society, with the disposal of vast quantities of waste having detrimental effects on the environment. The prevalent practice of haphazard open dumping in municipal landfills has far-reaching consequences, impacting human health, as well as flora and fauna. This method of waste disposal produces harmful chemicals that contaminate both surface and groundwater, posing serious health risks and facilitating the spread of disease vectors.

To mitigate these issues, there is a pressing need to implement [1] waste segregation practices at the source of municipal waste generation. While large-scale industrial waste segregators exist, the effectiveness of segregation is maximized when performed at the household level. Presently, however, there is a notable absence of efficient systems for segregating dry and wet wastes at the household level.

The objective of this project is to develop a compact, cost-effective, and user-friendly waste segregation system tailored for urban households. By streamlining the [2] waste management process at the grassroots level, this system aims to reduce dependency on manual segregation methods and promote more sustainable waste management practices.

NEED OF AN ATTACHMENT

The reason behind the selection of the Design & Development of an Automatic Dry & Waste Garbage Segregation System is to make the segregation process easy and familiar for common people.

Solutions:

1. To prevent the complications which occur due to the mixture of wet and dry garbage.
2. To develop a system that can sense the moisture in the waste.
3. To resolve the problem of garbage segregation in local sectors.
4. It should be an automatic system.

So, to overcome this Design & Development of an Automatic Dry & Waste Garbage Segregation System is important.

2. PROBLEM STATEMENT

- To reduce the cost of dry and wet garbage segregation used in large-scale industries which is highly costly and runs on heavy machines.
- To get rid of the traditional method of separating waste in India is through rag pickers which is time-consuming and can have adverse effects on the health of rag pickers.

OBJECTIVE

- To develop a system to provide automatic segregation of dry and wet waste garbage.
- To develop a garbage segregation system.
- To provide automation in the waste plate on the dustbin
- To provide the sensor that will tell the level of the dust bin is full with the help of a buzzer.

3. METHODOLOGY

CONCEPT

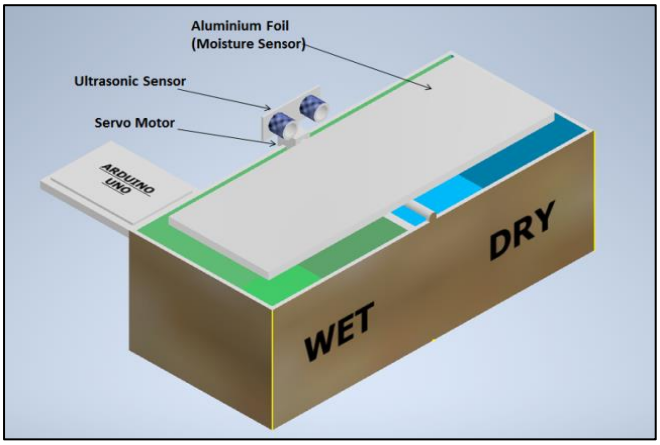

Fig.1. System setup

The operational sequence begins with the provision of power to the system. Subsequently, wet or dry garbage is placed onto the plate, which is shielded by an aluminium foil. Upon detection of an object on the plate by the ultrasonic sensor, a signal is relayed to the Arduino UNO microcontroller. Acting as the central controller, the [3] Arduino UNO processes the received inputs. Utilizing ultrasonic sensors, the [3] Arduino UNO determines the nature of the object placed, distinguishing between wet and dry garbage. Upon receiving instructions from the ultrasonic sensor, the [3] Arduino UNO initiates commands to the servo motor. The servo motor then rotates the plate rightward for dry garbage and leftward for wet garbage, facilitating segregation.

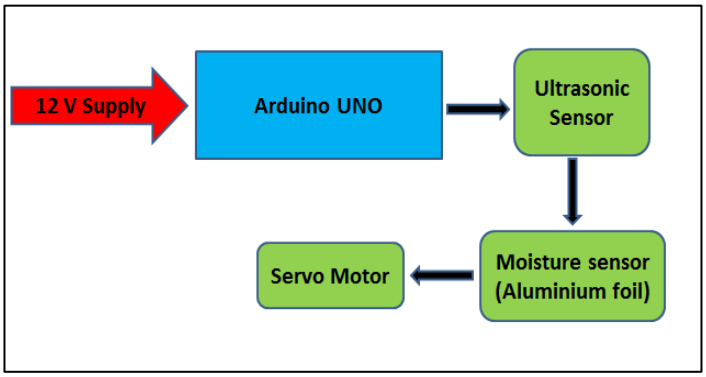

Fig.2. Block Diagram

The code of an Arduino sketch that reads data from a moisture sensor and an ultrasonic sensor and controls an LED and a servo motor based on the sensor readings

1. The code includes the Servo library and defines the pins for the soil moisture sensor, LED, servo motor, ultrasonic sensor trigger pin, and echo pin
2. A Servo object 'myservo' is created
3. In the setup() function:
   - The pin modes are set for the LED, servo motor, ultrasonic sensor trigger pin, and echo pin.
   - The servo is attached to the specified pin.
   - Serial communication is initialized at a baud rate of 9600
4. The 'getDistanceUltrasonic() function is defined to calculate the distance measured by the ultrasonic sensor.
   - It triggers the ultrasonic sensor, measures the duration of the echo pulse, and calculates the distance in centimetres
5. In the loop() function:
   - Analog readings from the soil moisture

sensor and distance readings from the ultrasonic sensor are obtained.
- The readings are printed to the Serial Monitor.
- Two dry thresholds (dry Threshold' and 'dry Threshold1') are defined.
- If the ultrasonic distance is less than 4:
- If the soil moisture is above 'dry Threshold', the LED is turned on and the servo motor is rotated to 180 degrees.
- If the soil moisture is below 'dry Threshold1', the LED is turned on and the servo motor is rotated to 0 degrees.
- If the ultrasonic distance is not less than 4, the LED is turned on and the servo motor is set to 90 degrees.

The flow of the code can be represented in a vertical mermaid syntax as follows

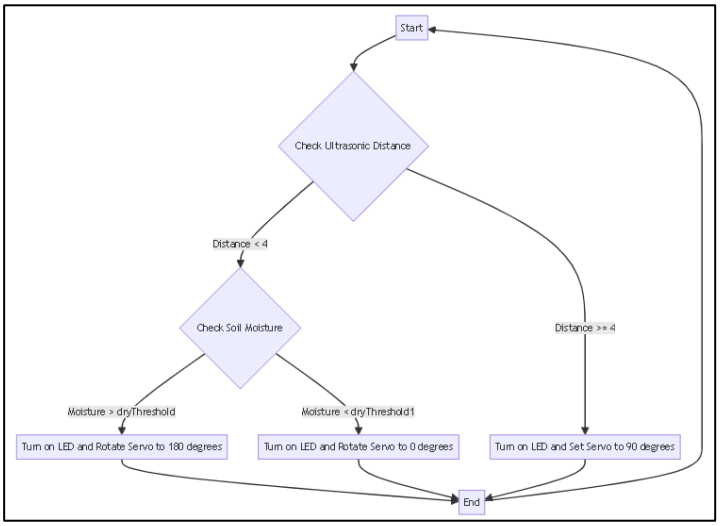

Fig.3. Flowchart

MATERIAL TO BE USED

Through the help of automation, the garbage segregation process has become easier. By just placing the object on the plate our system will segregate the garbage.

1. Ultrasonic sensors will initially sense the object whether it is kept or not.
2. Moisture sensor (Aluminium Foil) will further sense the moisture on the object.
3. A plate will rotate in the respective direction with the help of the servo motor by reading the command from Arduino software.
4. Arduino UNO [3] will control the whole system, by taking the inputs from other parts and will send the command according to the programming provided.

4. ADVANTAGES

- Efficiency: The automatic segregation system eliminates the need for manual sorting of waste, leading to increased efficiency in [2] waste management processes.
- Resource optimization: Proper segregation of dry and wet waste at the source enables more efficient resource utilization, such as recycling and composting, leading to reduced waste generation and environmental impact.
- Time-saving: By automating the segregation process, the system saves time for both waste management personnel and users, allowing for quicker disposal and processing of waste.
- Accuracy: Automated systems can accurately identify and segregate dry and wet waste based on predetermined parameters, reducing the risk of errors or misclassification.

5. SCOPE OF RESEARCH WORK

Waste segregation facilitates the process of reuse, recycling and recovery of waste.
Segregating waste can improve the recycling process.
These are the future aspects of project development in this particular field

6. CONCLUSIONS

Deploying this system within local environments such as residential complexes and educational institutions holds the potential to alleviate the operational burden

on municipal authorities. The integration of an automated waste segregator represents a significant stride towards establishing an efficient and cost-effective [2] waste management framework characterized by minimal human intervention and reduced occupational hazards. Leveraging a conveyor belt mechanism enhances system precision, cost efficiency, and ease of installation, rendering it suitable for domestic applications. Moreover, implementing waste segregation at the household level yields time-saving benefits. Throughout the implementation phase, various challenges were encountered, including the limited sensing range of inductive proximity sensors, accuracy issues with moisture sensors, and the calibration of IR sensors. Despite these challenges, iterative modifications were applied to enhance system reliability, albeit perfection remains an ongoing pursuit

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8. REFERENCES

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