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Arduino-based Wastage Segregator for Efficient Waste Management

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ABSTRACT

The Wastage Segregator project aims to address the increasing problem of waste management by developing an automated system that segregates waste materials into their respective categories. The project employs various techniques such as image processing, machine learning, and robotics to identify and sort different waste types, including plastic, paper, glass, and metal. The system is designed to be user-friendly and can be easily installed in public places such as parks, markets, and residential areas. This project has the potential to significantly reduce the amount of waste that ends up in landfills, which can help preserve the environment and promote sustainability.

KEYWORDS: *Arduino, Adapter, Segregation, Motor, Programming, Sensors, Servo, Ultrasonic, Conveyor belt*

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1. INTRODUCTION

Wastage Segregator is a cutting-edge waste management system designed to tackle the growing problem of waste pollution in urban areas. This innovative technology leverages artificial intelligence to sort and segregate different types of waste, making it easier and more efficient to recycle and dispose of waste in an environmentally friendly manner. In this project, we aim to develop a prototype of this technology and test its efficacy in a real-world setting.

Wastage Segregator using Arduino Uno is a novel waste management system designed to segregate different types of waste automatically. This project employs the use of an Arduino Uno microcontroller, which acts as the brain of the system, and several sensors to detect and sort waste. With this technology, we aim to develop a cost-effective and efficient solution to the growing problem of waste pollution.

The rampant growth of urbanization has led to an increase in waste generation, making waste management a pressing issue in modern times. Project Wastage Segregator aims to address this problem by developing an automated system for waste segregation that can accurately identify and sort different types of waste. This project involves the use of advanced computer vision and machine learning techniques to create a prototype system that can be deployed in various settings, such as public places, residential buildings, and commercial areas.

The amount of waste generated globally is increasing at an alarming rate, leading to serious environmental and health concerns. Project Wastage Segregator is a research initiative that seeks to develop an innovative waste management system using advanced technology. The proposed system will use machine learning algorithms to identify and classify different types of waste, making it easier for waste management professionals to dispose of waste in an eco-friendly and sustainable way.

The Arduino Uno-based Project Wastage Segregator is a promising initiative that can help reduce the impact of waste pollution on the environment. This project employs a system that is capable of detecting

and segregating different types of waste using sensors and microcontrollers. With the ability to sort waste automatically, this technology can streamline waste management operations and reduce the workload of waste management professionals.

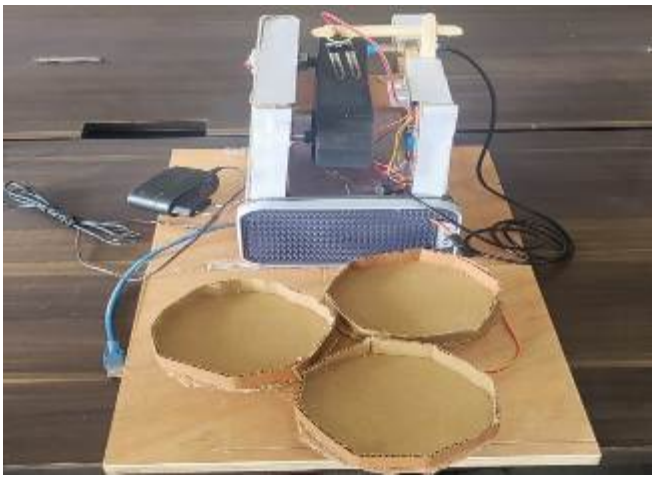

Fig. 1: The model of the waste segregation

2. OVERVIEW OF COMPONENT

Automatic waste segregation is a process of sorting waste into different categories such as organic, recyclable, and non-recyclable waste. This process has become increasingly important in recent years due to the growing concern for the environment and the need for sustainable waste management. One way to achieve automatic waste segregation is by using the component Arduino Uno, ultrasonic sensor, moisture sensor, inductive proximity sensor, I2C 16x2 LCD, buzzer, and servo motor.

Arduino Uno is a microcontroller board that is widely used in electronic projects. It is equipped with several digital and analog pins that can be used to interface with different sensors and actuators. The Uno is the brain of the waste segregation system, which receives inputs from different sensors and uses them to control the servo motor.

Ultrasonic sensors are devices that use sound waves to detect the distance between objects. In the waste segregation, the ultrasonic sensor is used to detect the presence of waste in the bin. When the bin is full, the ultrasonic sensor sends a signal to the Arduino Uno, which triggers the servo motor to rotate and move the bin to the next stage of the waste segregation process.

Moisture sensors, on the other hand, are used to detect the moisture content in the waste. Organic waste typically has a higher moisture content than recyclable or non-recyclable waste. By using a moisture sensor, the system can differentiate between organic waste and other types of waste. The moisture sensor sends a signal to the Arduino Uno, which uses this information to control the servo motor.

Inductive proximity sensors are sensors that detect the presence of metal objects. In the waste segregation system, the inductive proximity sensor is used to detect the presence of metal in the waste. Some types of waste, such as aluminum cans or steel containers, are recyclable and can be sorted using this sensor. When the inductive proximity sensor detects the presence of metal, it sends a signal to the Arduino Uno, which controls the servo motor to move the metal waste to the appropriate bin.

The I2C 16x2 LCD is a display module that can be used to show information such as the status of the waste segregation system, the type of waste being sorted, and any errors or warnings. The I2C interface is used to communicate with the Arduino Uno, which sends information to the LCD module to be displayed.

The buzzer is used to alert the user of the system when there is an error or when the waste segregation process is complete. For example, if the moisture sensor detects a high level of moisture in the waste, the system may emit a warning sound to notify the user that the waste needs to be dried before it can be sorted.

Finally, the servo motor is the main actuator of the waste segregation system. The servo motor is used to rotate the waste bin to the appropriate position based on the signals received from the different sensors. For example, if the ultrasonic sensor detects that the bin is full, the servo motor will move the bin to the next stage of the waste segregation process. Similarly, if the moisture sensor detects that the waste is organic, the servo motor will move the bin to the organic waste bin.

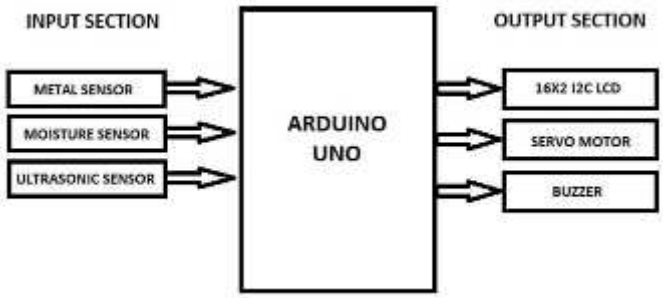

Fig. 2: Block diagram of waste segregation

In summary, the system uses the ultrasonic sensor, moisture sensor, and inductive proximity sensor to detect the physical properties of the waste material. The Arduino Uno receives the inputs from the sensors and decides which waste materials to sort out. The servo motor is used to move the sorting mechanism to sort out the waste materials, while the I2C 16x2 LCD displays the status of the system. Finally, the buzzer is used to alert the user when the system has finished sorting the waste.

3. WORKING

The Project Wastage Segregator is designed to segregate different types of waste materials based on their nature using a conveyor belt. The system uses

various sensors to detect the type of waste material, and a buzzer is activated, and LCD displays the type of waste material detected.

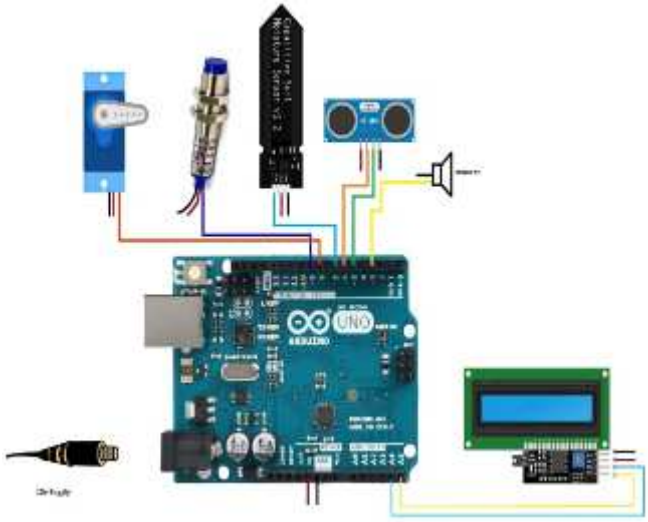

Fig. 3: Circuit Diagram of waste segregation

The first sensor used in the system is the inductive proximity sensor, which detects metal waste such as aluminum foil. If the waste is detected as metal, the system will rotate the dustbin for metal waste.

If the waste material is not detected as metal, the system uses a soil moisture sensor to detect if it is wet waste. If the moisture level in the waste is high, then it is considered wet waste, and the system will rotate the dustbin for wet waste.

If the waste material is not detected as wet waste, the system uses an ultrasonic sensor to detect if it is dry waste. The system will rotate the dustbin for dry waste.

To control the speed of the conveyor belt, a 10k potentiometer and IZF44N MOSFET are used to regulate the voltage supplied to the DC motor. The DC motor is powered by a 12V adapter, while the Arduino Uno is powered by a 5V adapter.

The system uses a servo motor to rotate the appropriate dustbin according to the nature of the waste material. The rotation of the dustbin is controlled by the program uploaded to the Arduino Uno. The LCD used is a 16x2 I2C LCD, which displays the type of waste material detected.

The circuit is connected using jumper wires, which connect the different components to the Arduino Uno. The program is uploaded to the Arduino Uno, which controls the entire system.

In summary, the Project Wastage Segregator is a system designed to segregate different types of waste materials based on their nature. The system uses various sensors to detect the type of waste material and a buzzer and LCD display to notify the user of the waste type detected. The speed of the conveyor belt is regulated using a potentiometer and MOSFET, and the circuit is connected using jumper wires. The program is uploaded to the Arduino Uno, which controls the entire system.

4. CONCLUSION

- This paper has described a specific objective of the concepts which are used in the area. The project presents the implementation of automatic waste segregation that successfully able to segregate the waste into their respective bins.
- Arduino Uno is an accessible and affordable microcontroller board that can be easily programmed to perform a wide range of tasks, including waste segregation. The system is highly customizable, and it can be adjusted to fit the specific needs of different environments, such as homes, offices, or public spaces.
- The project describes the methodology of interfacing of various components to the Arduino.
- Overall, automatic waste segregation using Arduino Uno is a promising technology that can help reduce the environmental impact of waste and promote sustainable practices. With further development and widespread adoption, this technology can have a significant impact on waste management practices worldwide.

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