JOY OF ENGINEERING

Solid Dry and Wet Waste segregation bin (using Arduino)

Project Report

SUBMITTED IN PARTIAL FULFILLMENT REQUIREMENT FOR THE AWARD OF DEGREE OF

BACHELOR OF TECHNOLOGY

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UNDER THE SUPERVISION OF

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SCHOOL OF ENGINEERING AND TECHNOLOGY

BML MUNJAL UNIVERSITY™
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BML MUNJAL UNIVERSITY Gurugram, Haryana - 122413

December 2022

CANDIDATE'S DECLARATION

We hereby declare that the work on the project entitled, "*Solid Dry and Wet Waste segregation using Arduino",* in partial fulfillment of requirements for the award of Degree of Bachelor of Technology in School of Engineering and Technology at BML Munjal University, having University Roll No.1232434, is an authentic record of my own work carried out during a period from September 2022 to December 2022 under the supervision of Dr. Hirdesh Kumar Pharasi.

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Chauhan)
(Akshay
Korrapati)

SUPERVISOR'S DECLARATION

This is to certify that the above statement made by the candidate is correct to the best of my knowledge.

Faculty Supervisor Name:
Dr. Hirdesh Kumar Pharasi
Signature:

ABSTRACT

Solid waste segregation is the process of separating different types of waste materials, such as paper, plastic, metal, organic matter, and other types of waste, into separate bins or containers for collection and disposal. This process is important for several reasons, including improving the efficiency of waste collection and transportation, and reducing the volume of waste sent to landfills. However, manual segregation of waste can be time-consuming and labor-intensive. To address this challenge, many organizations are turning to automated systems that use sensors and other input devices to identify the type of waste and sort it into the appropriate bin or container. In this work, we describe a solid waste segregation system using Arduino that is designed to automatically sort dry and wet waste materials. The system includes sensors and other input devices to identify the type of waste, and control mechanisms to sort the waste into the appropriate bin or container. Overall, our system demonstrates the potential of Arduino and other microcontrollers to automate the process of solid waste segregation, improving efficiency and reducing the environmental impact of waste disposal.

ACKNOWLEDGEMENT

We would like to express gratitude to our professor Dr. Hirdesh Kumar Pharasi, who motivated us and gave us this golden opportunity to do this project “Solid Dry and Wet waste segregating bin (using Arduino). We would also like to take this opportunity to give special thanks to Yazpal sir, who provided us plywood and guided us into how to use the tools and etc. And Amit sir, who provided us with Arduino, jumper wires, sensors and etc. We are grateful to all of those who have helped us to build this project . I would also like to thanks my seniors for their constant guidance and support throughout this project .

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1. INTRODUCTION

Waste management is a very serious issue that is impacting the life of people on a daily basis. Soil, water, and air pollution can all be a result of improper waste management. Solid waste segregation is the process of separating different types of waste materials, such as paper, plastic, metal and other types of waste, into separate bins or containers for collection and disposal. This process is important for several reasons. First, it allows for the more efficient collection and transportation of waste, as different types of waste may be collected an transported using different methods. Second, segregation of waste can help to reduce the overall volume of waste that is sent to landfills, as certain materials, such as organic matter and paper, can be composted or recycled.

One challenge in managing solid waste is the need to sort waste materials manually, which can be time-consuming. To address this challenge, many organizations are turning to automated systems that use sensors and other input devices to identify the type of waste and sort it into the appropriate bin or container. Arduino is a popular open-source platform that we have used for building the electronic devices, and we have used it automate the process of solid waste segregation.

There are many examples in the society about the problems of segregation and how it affects life of people because of no awareness of segregating the waste.
One prominent example is the Bandhwari landfill. The main reason for this issue is because a large portion of our population is not aware of the hazards of improper waste management, they have a mindset that it is not their responsibility it is the authority's responsibility to segregate the waste when it's as simple as putting the waste in the correctly labelled bin Therefore, to help with this persistent issue our project is aimed towards the idea of segregating the waste from our houses itself, as PM. Narendra Modi has initiated the Swachh Bharat Mission that says that making our country clean starts from our houses itself. We have built a prototype that is intended to be kept in our kitchens that will segregate dry and wet waste automatically

2. LITERATURE REVIEW

There has been a growing interest in using Arduino and other microcontrollers to automate the process of solid waste segregation. Many studies have demonstrated the potential of these systems to improve the efficiency and accuracy of the segregation process and to reduce the environmental impact of waste.

One example of research on solid waste segregation using Arduino is a study published in the Journal of Environmental Management in 2017. In this study, the authors described the design and implementation of an automated solid waste segregation system using Arduino, which was designed to sort dry and wet waste materials. The system included sensors and other input devices to identify the type of waste, and control mechanisms to sort the waste into the appropriate bin or container. The authors conducted a series of tests to evaluate the performance of the system and found that it was able to accurately sort waste materials with a high level of accuracy.

Another example of research on solid waste segregation using Arduino is a study published in the Journal of Cleaner Production in 2018. In this study, the authors described the development of a smart waste segregation system using Arduino, which was designed to sort household waste into different categories, including paper, plastic, metal, and organic waste. The system included a number of sensors, including IR sensors and ultrasonic sensors, to detect the type of waste, and a robotic arm to sort the waste into the appropriate bin. The authors found that the system was able to sort waste materials with a high level of accuracy and concluded that it had the possibilities to enchance the efficiency and effectiveness of solid waste segregation. Overall, this research on solid waste segregation using Arduino suggests that these systems have the potential to improve the efficiency and accuracy of the segregation process, and to reduce the environmental impact of waste disposal. Further research is needed to explore the potential of these systems in different settings and to identify the most effective approaches for automating solid waste segregation

2.1 Research Gap

Many of the smart dustbins in market provide various features but we haven't come across any dustbin that segregates waste into dry and wet automatically for general public. Majority of the smart bins in the market are touchless lid opening or capacity notifier. But none of them help to solve the issue at hand of segregating waste automatically.

3. Objectives of Project

The Objective of our project is to:

1- Segregate dry and wet waste automatically. With the help of capacitive moisture sensor and a DC servo motor. The waste will be separated in different bins according to the moisture content present in the waste.

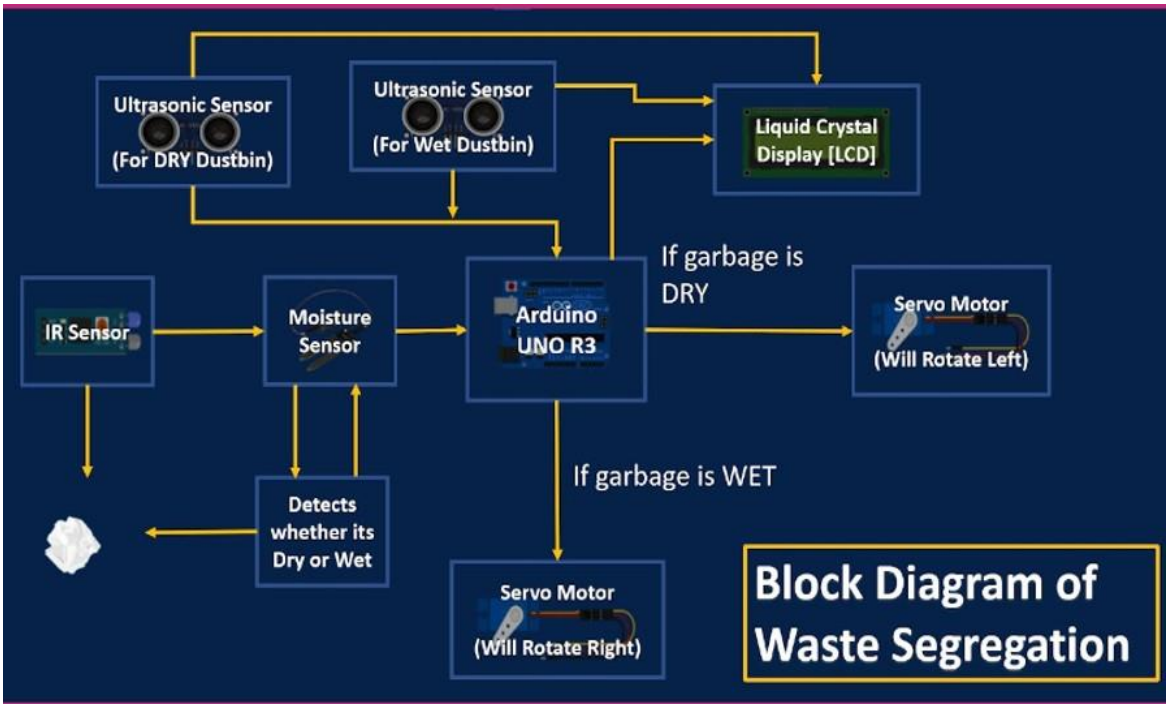
2- Notify about the space left in each compartment. With the help of two ultrasonic sensors, each placed in the two compartments. It will measure that how much the dustbin compartment is filled with waste and accordingly will notify us on LCD Screen.

3- Provide the required messages using an LCD screen (16x2). The LCD Screen will notify about the waste whether it is dry or waste and it will also show us the moisture content present in the waste. It will also notify us about how much the dustbin compartment is filled with waste.

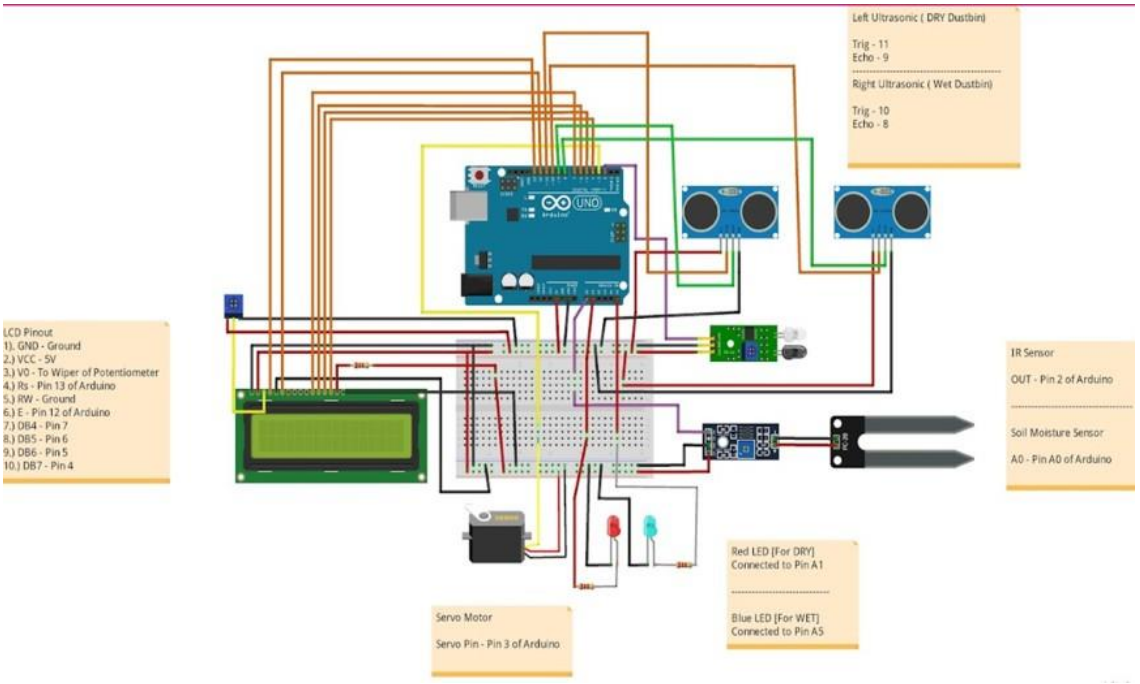
4. EXPERIMENTAL SETUP

4.1 Conceptual sketch

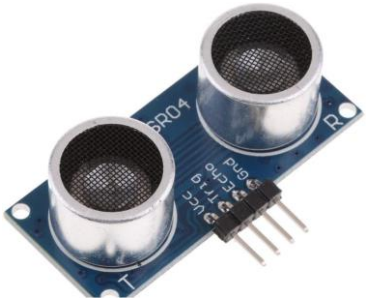
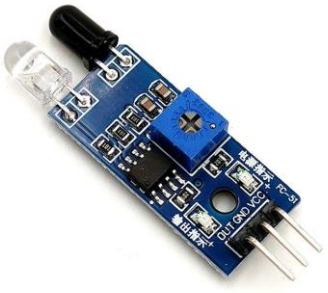
Block Diagram:

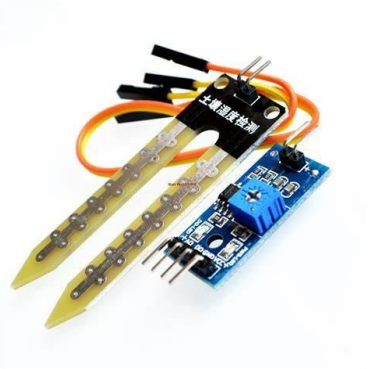


Circuit Diagram:



5. Material used

Components used	Description	Appearance
Ultrasonic sensor	An ultrasonic sensor is sensor that uses high-frequency sound waves to compute the distance, speed and other physical characteristics of an object. It works when a beam of high-frequency wave is emitted and converts the reflected sound waves into an electrical signal. Ultrasonic sensor waves travel faster than the speed of sound that a human can hear. It has two components, one is transmitter and other is receiver.	
Infrared Sensor	An infrared (IR) sensor is an electronic device that uses an infrared radiation (IR) to determine objects and compute physical properties, such as temperature or distance. It has many applications in real life like it can used in burglar alarm, Human body detection etc. We have used IR sensor in this project	

	to detect the presence of waste when we put on the lid of the bin.	
Soil Moisture Sensor	A moisture sensor is used to compute the moisture content of a substance or material. It can be integrated into systems using an Arduino or other microcontroller and can be used to trigger actions based on the moisture content of the material being measured. We are using this in our project to detect the waste whether is it dry or waste	
Arduino Uno	We have used Arduino Uno which is a microcontroller board . In the context of a solid waste segregation system, the Arduino Uno could be used to control the various components of the system, such as sensors and other input/output devices. It could be used to read data from sensors, process this data, and trigger actions based on the results	
Servo motor	A servo motor is an	

	electrical motor that is particularly designed to be used in a closed-loop control system. It comprises a DC motor, a gear train, and a control circuit, and is used to control the position, speed of a system. In the context of a solid waste segregation system, a servo motor is used to control the movement of the arm, . It is used to sort waste materials.	
LCD display	An LCD (liquid crystal display) which uses liquid crystals to create an image. It consists of a layer of liquid crystals between two layers of glass or other transparent material and is lit by a backlight. In the context of a solid waste segregation system, an LCD display is used to display information about the system, such as the types of waste materials that are being sorted, the status of the system.	

6. RESULTS AND OBSERVATIONS

We have constructed a box of plywood of dimensions

1. 15 x 12 inch - 3 pieces

2. 15 x 15 inch - 1 piece

3. 15 x 8 inch - 1 piece

4. 10 x 12 inch - 1 piece

5. 15 x 5.5 inch - 1 piece

Then we assembled all the components like IR sensor, Ultrasonic sensor, Soil Moisture sensor with Arduino and did code. We have set int the code that the wet waste will be segregated in right component of bin and the dry waste will be segregated on the left component of the bin. When the waste will be segregated, the LCD screen will show whether it is dry or wet waste. The servo motor will turn about the angle 60 to 120 to segregate. We are using IR sensor in this project to detect the object. The soil moisture sensor will be used to detect the presence of moisture of the waste. We have adjusted multiple values of the moisture sensor in every environment. The Ultrasonic sensor will be used to tell how much the bin is full and will send the message to the LCD screen.

Dry Waste

Wet Waste

- Image of our prototype:

7. CONCLUSIONS AND FUTURE SCOPE

In conclusion, the use of Arduino to automate the process of solid waste segregation has the potential to improve the efficiency and accuracy of the segregation process, and to reduce the environmental impact of waste disposal. By integrating sensors and other input devices into a system that is controlled by an Arduino, it is possible to accurately sort waste materials into the appropriate bins or containers based on their characteristics. This can help to streamline the waste collection and disposal process and can also help to reduce the volume of waste sent to landfills.

It can also help to reduce the labor costs associated with manual segregation of waste and can improve the safety of the waste collection and disposal process. While implementing the project we came across many problems like the accuracy of the moisture sensor, debugging the code to accurately perform, adjusting the servo motor and many more but we did the modifications in our system and made the system as reliable as we can.

Future Scope:

- Currently our project falls short in many areas as we lack the advanced knowledge for better implementation. But the future scope is quite vast.

- In the future, we can implement a better way to segregate the garbage without using the moisture sensor.

- We can provide notifications via Bluetooth on our smartphones rather than displaying on an LCD screen.

- The project has a lot of potential and with appropriate knowledge and skills it can be a better and more refined version.

8. REFERENCES

[1] What is the Current Status of Waste Management in India?
https://www.drishtiias.com/current-affairs-news-analysis-editorials/news-editorials/29-09-2022/print/manual#:~:text=About%2043%20million%20tonnes%20(70,are%20dumped%20in%20landfill%20sites.

[2] This is the link we used:
https://youtu.be/JFt8l9Ei8Hw

[3] Link to our code for the dustbin:
https://drive.google.com/file/d/1gcTAgo2kVZYGQWidhe97eUHvf6zCTRP1/view?usp=sharing