Department of Electrical and Electronics Engineering

19EEL59 Mini Project - III

Report on
SMART SEGREGATION BIN

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Under the Guidance of
Mr. Kartheek Vankadara
Dissertation submitted in partial fulfillment of the requirements
For the award of the Degree of

BACHELOR OF ENGINEERING
in
ELECTRICAL AND ELECTRONICS ENGINEERING

VISVESVARAYA TECHNOLOGICAL UNIVERSITY
"Jnana Sangama", Belgaum – 590018, Karnataka, India

2022-2023

BONAFIDE CERTIFICATE

This is to certify that the project report entitled, "**Smart Segregation Bin**" is a Bonafide record of work of the following candidates who carried out the Mini Project work under my supervision during 2022-2023:

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of New Horizon College of Engineering, Bengaluru of Visvesvaraya Technological University, Belgaum during the Even semester, academic year 2022-23.

It is certified that all the corrections / suggestions indicated for Internal Assessment have been incorporated in the report deposited in the department library. The project report has been approved as it satisfies the academic requirements in respect of Mini Project - III work prescribed for said Degree.

Signature of guide   Signature of head of department   Signature of Principal

Mr. Kartheek Vankadara   **Dr. Sujitha. S**   **Dr. Manjunatha**

Semester End Examination held on _____

(External Examiner) …………………….   (Internal Examiner) …………………….

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We wish to extend our profound sense of gratitude to our parents for all the sacrifices they made during our project and providing us with moral support and encouragement whenever required.

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DECLARATION

We BHARATH. T - 1NH20EE022, DAYAS.A. DIXEN - 1NH20EE029, DONY SNEHIT. P - 1NH20EE035, INFANCIA PRAGNA - 1NH20EE042 students of New Horizon College of Engineering hereby declare that this project work entitled "**Smart Segregation Bin**" is an original and Bonafide work carried out at New Horizon College of Engineering in partial fulfillment of Bachelor of Engineering in Electrical and Electronics Engineering of Visvesvaraya Technological University, Belgaum.

We also declare that, to the best of our knowledge and belief, the work reported here does not form part of any other thesis or dissertation based on which a degree or award was conferred on an earlier occasion by any student.

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PLAGIARISM REPORT

ABSTRACT

The quantity of waste is increasing along with the Growing human population and urbanization. In metropolitan areas, the overflowing and improper segregation creates an unhygienic environment. Thus, to overcome this situation "Smart Segregation Bin" is developed to minimize the amount of work for the rag pickers, wastes that are segregated directly by human beings lead to several health-related problems for the workers. The proposed system separates disposed waste into three different categories namely wet, dry and metallic waste. This proposed system is cost-efficient and makes waste management more productive. Each of these wastes is sensed or identified by the respective sensors and gets directed towards the bin's opening of that waste where the waste will move upon the conveyer and the bin is rotated 180 degrees by the servo motor.

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LIST OF FIGURES

AIM

The aim is to segregate different types of waste such as wet, dry, and metal. Segregation is done at the initial stage itself different types of waste can be identified, and the servomotor is able to rotate to the particular bin opening of the particular waste.

OBJECTIVE

1. Auto Waste Segregator (AWS) is a cheap and easy-to-use solution for the segregation of dry, wet, and metallic waste.
2. To recycle waste products.
3. Reduce the volume of waste sent to landfills
4. Promoting the reuse of different things that have fulfilled their purpose.
5. Promote the recovery of energy from waste materials.

CHAPTER 1
INTRODUCTION

Waste management has become a serious problem nowadays where in India improper disposal has become a serious threat and hazard for both people and the environment because still, we are following the traditional method of garbage segregation and distribution where human labor are being used to segregate waste by direct contact, which may lead them to several diseases. Most of the time due to this inefficient way of segregation, wastes are being dumped into landfills and dump yards just like that. To solve this problem the very first thing we can do is segregate waste properly by using smart techniques. We have come up with the idea of a smart dustbin where segregation is done at the initial stage itself that means by using sensors different types of waste can be identified and the servomotor be able to rotate to the particular bin opening of the particular waste.

CHAPTER 2
PROBLEM STATEMENT

Unconventional treatment of waste causes serious health and pollution problems in developing countries**.** Improper disposal has become a serious threat and hazard for both people and the environment because we are still following the traditional method of garbage segregation and distribution where human labor is being used to segregate waste by direct contact, which may lead to several diseases. Most of the time due to this inefficient way of segregation, wastes are being dumped into landfills and dump yards, causing pollution and causing several diseases to people nearby.

CHAPTER 3
COMPONENTS LIST AND FIGURES

SL NO.	COMPONENTS REQUIRED	COST (in rupees)
1.	Inductive Proximity Sensor	280
2.	Capacitive Soil Moisture Sensor	60
3.	12v DC Motor	140
4.	Servo Motor 5V	79
5.	Arduino Nano	319
7.	Ultrasonic Sensor	75
8.	Connecting Wires	150
9.	Wheels	20
10.	Bread Board	69
11.	Pot -meter	20
12.	Bread Board Power Supply Module	75
13.	12V 1A Wall Adapter	160
	Total cost	1447

COMPONENTS DESCRIPTION

HARDWARE DESIGN

1.   The inductive proximity sensor, capacitive soil moisture sensor, and ultrasonic sensor are connected to the Arduino board.
2.   The inductive proximity sensor is used to detect metal waste.
3.   The capacitive soil moisture sensor is used to detect wet waste.
4.   The ultrasonic sensor is to detect other waste such as dry/plastic.
5.   The conveyer belt is equipped with all 3 sensors.
6.   At the end of the belt a bin is placed that is connected to a servo motor which is controlled by an Arduino board.

Arduino Nano

The Arduino Nano is a little, complete, and breadboard-friendly board based on the ATmega328P released in 2008. It offers the same connectivity and specs as the Arduino Uno, more modest structure factor.

The Arduino Nano is equipped with 30 male I/O headers, in a DIP-30-like configuration, which can be programmed using the Arduino Software integrated development environment which is common to all Arduino boards and runs both online and offline. The board can be powered by a type-B mini-USB cable or a 9 V battery.

Figure 1

Soil Moisture Detector Sensor

The soil moisture detector is employed to calculate the content of water in the soil. It detects loss of wetness over time because of evaporation and plant uptake. It carries with it 2 probes that are employed to detect the meter content of water. The probes permit this to experience the soil, so it gets the resistance worth to live the wet worth. once there's a lot of water the soil can conduct a lot of electricity which implies that there'll be less resistance, thus wet levels are higher and vice-versa for dry soil.
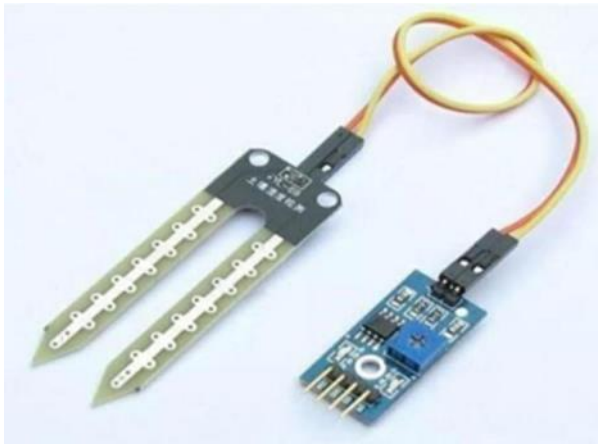

Figure 2

Inductive Proximity Sensor

An inductive proximity sensor can detect metal targets approaching the sensor, without physical contact with the target. Inductive Proximity Sensors are roughly classified into the following three types according to the operating principle: the high-frequency oscillation type using electromagnetic induction, the magnetic type using a magnet, and the capacitance type using the change in capacitance.

Figure 3

Ultrasonic Sensor

An ultrasonic sensor is an electronic gadget that measures the distance of a target object by producing ultrasonic sound waves and converts the reflected sound into an electrical signal. Ultrasonic waves travel quicker than the speed of perceptible sound. ultrasonic sensors have two main components: the transmitter and the receiver.
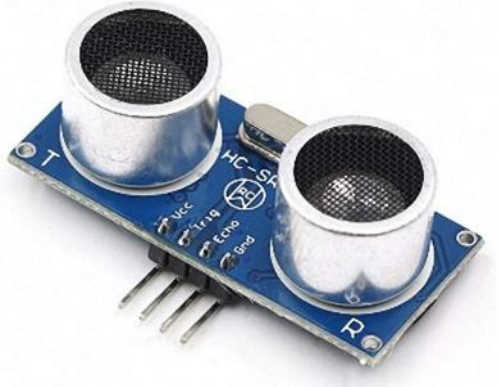

Figure 4

Servo Motor

A servomotor is a rotary actuator or linear actuator that considers exact control of angular or linear position, velocity, and acceleration. It comprises a suitable motor coupled to a sensor for position feedback. It also requires a relatively moderately modern controller, often a dedicated module designed specifically for use with servomotors. Servomotors are not a specific class of motor, although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system. Servomotors are utilized in applications such as robotics, CNC hardware, and automated manufacturing.

Figure 5

12-Volt DC Motor

A 12-volt DC motor is a rotary motor that can convert direct current into mechanical energy or convert mechanical energy into DC power. It means that the 12-volt DC motor can interconvert electric energy and mechanical energy. At the point When it is operated as a DC motor, electric energy is converted into mechanical energy.

Figure 6

Potentiometer

A potentiometer is a three-terminal resistor with a sliding or rotating contact that forms an adjustable voltage divider. If only two terminals are used, one end and the wiper, it acts as a variable resistor or rheostat. The measuring instrument called a potentiometer is essentially a voltage divider utilized for measuring electric potential, the component is an implementation of the same principle, hence its name. Potentiometers are commonly used to control electrical devices such as volume controls on audio equipment. Potentiometers operated by a mechanism can be used as position transducers, for example, in a joystick. Potentiometers are rarely used to directly control significant power since the power dissipated in the potentiometer would be comparable to the power in the controlled load.
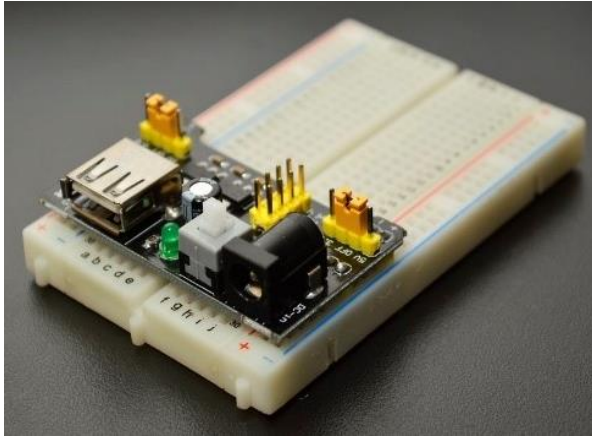

Figure 7

Bread Board Power supply Unit.

This component will power up our circuit. This will be directly plugged into the breadboard. From this board, we can take both 3.3v and 5v.

Figure 8

Wall Adapter 12V 1A

This adapter is used to power up our conveyor belt. This device will convert 230V Ac to 12V DC. The motor of our conveyor belt uses 12V DC.
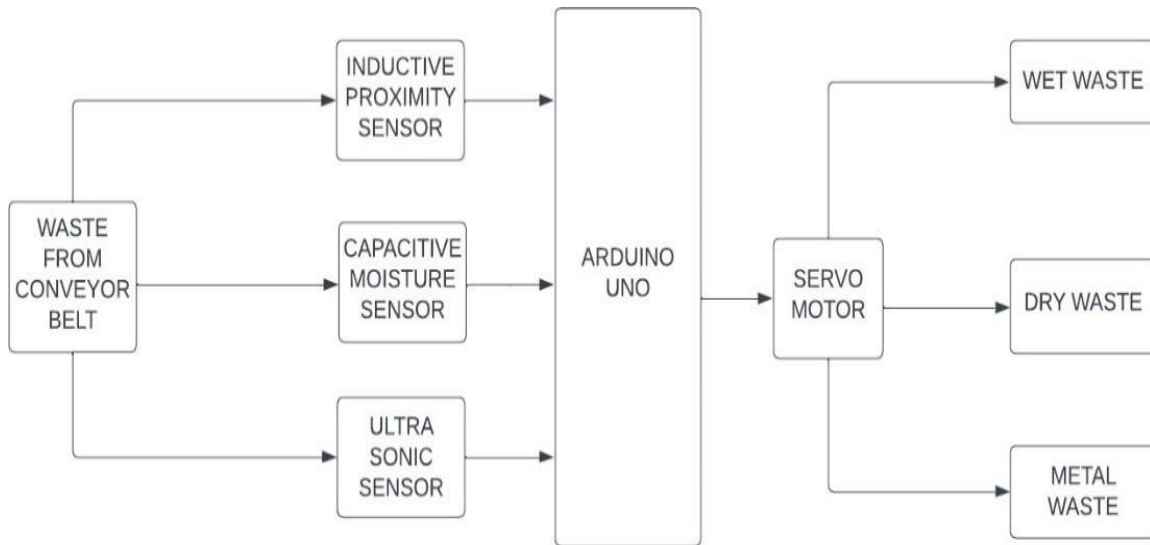

Figure 9

CHAPTER 4.1
BLOCK DIAGRAM
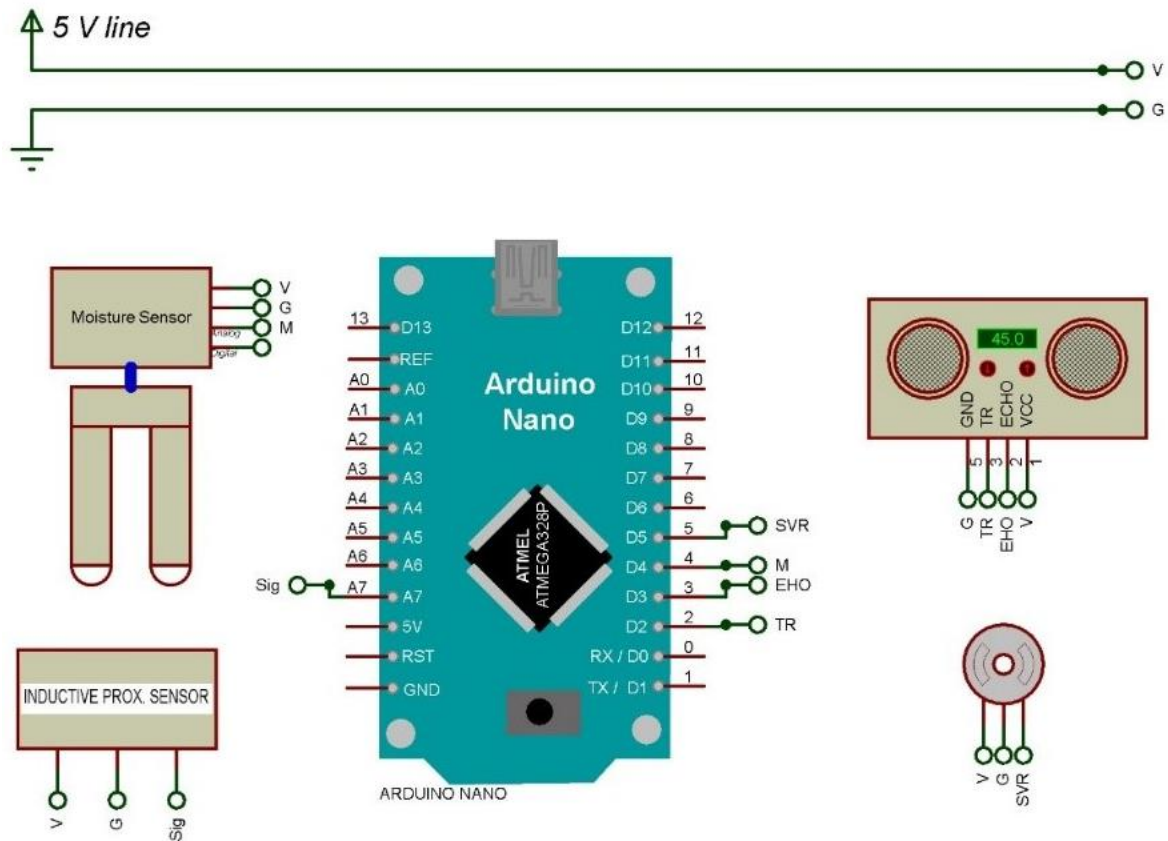

Figure 10

CHAPTER 4.2
CIRCUIT DIAGRAM

Figure 11

CHAPTER 4.3
CONSTRUCTION

1. Components are connected as per the above circuit diagram.
2. The power is supplied through a breadboard power supply unit.
3. The microcontroller is connected to Arduino IDE through USB B(mini) cable for uploading the code. After the code is dumped the system will take power from the power supply unit.
4. The ultrasonic sensor's Trigger pin is connected to D2, and the Echo pin is connected to D3, and it is powered by 5V.
5. Moisture sensor is connected to D4.
6. Analog data pin from the Inductive proximity sensor is connected to A7 of Nano, the sensor is powered by the regulated 5V.
7. The servo is connected to D5 pin of Nano, and power by 5V.

CHAPTER 4.4
WORKING

1. The waste is put on the conveyer belt which is run by a 12-volt DC motor.
2. Once the waste is put on the belt it must pass through 3 sensors.
3. The first one is an inductive proximity sensor, the second one is a capacitive soil moisture sensor and the third one is an ultrasonic sensor.
4. If the waste is of metal type, then the inductive proximity sensor senses it and displays it on the serial monitor.
5. If it's not metal then the capacitive soil moisture sensor senses it and displays it on the serial monitor.
6. If it's neither of both (metal or wet waste) then the ultrasonic sensor senses it and displays it on the serial monitor indicating it's dry/plastic waste.
7. The servo motor is placed at the very end of the conveyer belt.
8. The servo motor turns to a certain angle for waste making sure the thrown waste is segregated precisely.

SOFTWARE DESIGN

Arduino Integrated Development Environment (IDE) is employed to write down the program. The Arduino IDE could be a cross-platform application (for Windows, macOS, Linux) that is employed to write down and transfer programs to Arduino-compatible boards and additionally with development boards like Arduino Nano.

Coding Nano using Arduino IDE

Step 1: Connect the Arduino Nano with your PC or laptop with a mini-USB B cable.
Step 2: Download and install the drivers, you can download the driver for Mac, Linux or windows
Step 3: Open Your Arduino IDE, then open preference from the file menu
Step 4: Installing Board, Open board manager from tools -> board -> board manager. And search from "Nano"

>Then select the latest version from the dropdown menu and click install and restart the Arduino IDE.
>If everything is installed properly then you should be able to see the newly installed boards under tools -> board.
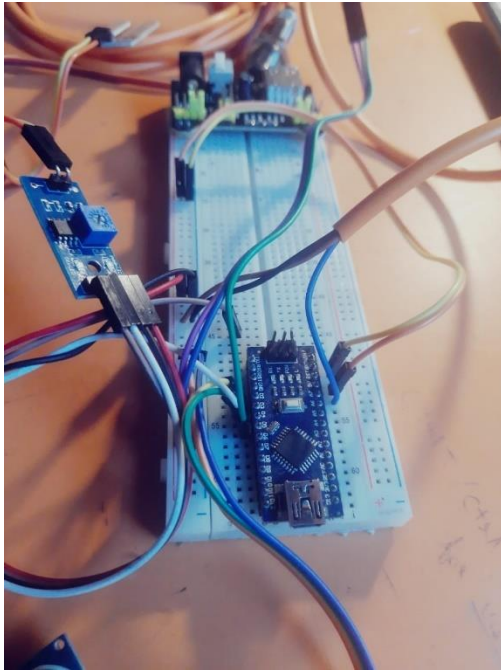
CHAPTER 4.6
HARDWARE PICTURE
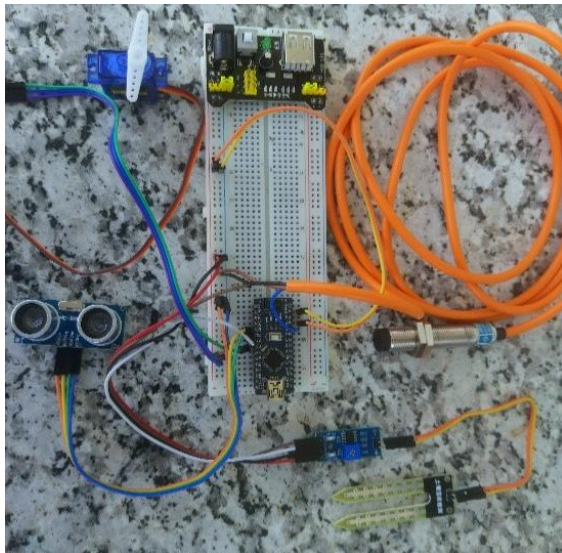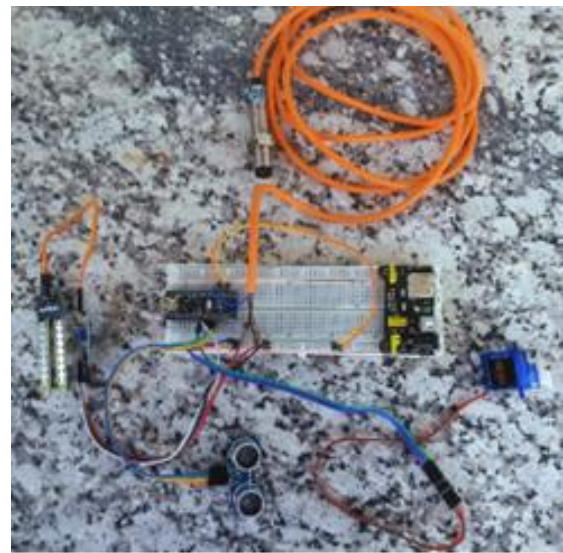

Figure 122

Figure 13

Figure 14

Figure 15

CHAPTER 5

APPLICATIONS

1. It can be implemented by BBMP for large-scale waste segregation.
2. Food manufacturing industries.
3. Gated communities and apartments.
4. Agricultural sector, where wet waste can be decomposed and reused as organic matter.

Advantages

1. It makes the task of recycling waste easier.
2. It is effective on a large scale.
3. Reduces landfill impact.
4. No human efforts are required.
5. Reduces environmental pollution.
6. Waste accumulation caused by diseases can be avoided.

FUTURE SCOPE

1. Real-time data can be obtained by using IoT.
2. Accurate moisture sensor can be added which makes segregation more effective.

CONCLUSION

With growing urbanization and increasing population, effective waste disposal is a major concern. Manual waste segregation is very expensive, time-consuming, and inefficient. This model presents a smart and cost-effective solution for waste segregation. The proposed Smart Bin is an efficient waste segregation system that requires no human intervention to separate dry, wet, and metal waste and paves the path for timely collection and disposal.

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