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Wastage Seperation System

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ABSTRACT

The idea of keeping cities clean is becoming increasingly important as the number of smart cities grows. The amount of waste produced is excessive, and waste separation is a necessary precondition for effective waste recycling. Waste separation determines whether the full waste recycling and reduction process can be completed, and the physical labor necessary to handle it is extremely tiresome task. The problems due to the wastage are air pollution, soil pollution, water pollution, and causes landfills and when different wastes are mixed together, they will release harmful greenhouse gases So, we will create a microcontroller-based waste separation system that separates waste into different categories such as dry waste, wet waste, and e-waste(or) metal waste. By using our project, the whole process of wastage separation is automated.

KEYWORDS—*Microcontroller, Dry Waste, Wet Waste, Metal Waste, e-waste. Air pollution, Water Pollution, Soil Pollution.*

1.INTRODUCTION

According to the report published by "Atul Kumar Pandey, Rohit Sahu and Ram Veer Tyagi" Waste Management and segregation is a much-needed process in metro cities and urban areas due to spreading of diseases. It is estimated that India produces 42.0 million tons of municipal solid waste annually at present. Waste lying littered in the surrounding, dumped on open lands, becomes a major problem for various types of disease-causing bacteria and viruses hence, segregation, transport, handling and disposal of waste must be managed properly to minimize the risks of the public and environment.[1] When mixed dry and wet waste breaks down in lowland, it creates nasty greenhouse gases. Segregation makes it attainable to utilize and recycle the waste effectively.

Then the wastage separation comes into picture for carrying the process of 3R's effectively:

1. Reduce.
2. Reuse.
3. Recycle.

2. LITERATURE SURVEY

[1] Cherry Agarwal, Bhavesh Yevale, Chaithali Jagadish, "Automatic Waste Segregation and Management", International Journal of Engineering Research & Technology (IJERT), Vol. 9 Issue 06, June-2020.- This paper uses a conveyor belt mechanism along with capacitive sensor and proximity sensors are interfaced with the Arduino UNO microcontroller.

[2] M. K. Pushpa, Aayushi Gupta, Shariq Mohammed Shaik, Stuti Jha, Suchitra V," Microcontroller Based Automatic Waste Segregator", International Journal of Innovative Research in Electrical, Electronics,

Instrumentation and Control Engineering Vol. 3, Issue 5, May 2015.-This paper uses an 8051 based system with an Open-Close Mechanism. Along with that it uses a blower on a conveyor belt

3. EXISTING METHOD

1. Based on Size

The present systems in waste separation systems which are used in the garbage processing plants is based on the size not on the type. Because in this system a conveyor belt is used to move the waste from one place to another place before that the iron scrap is separated from the waste then the remaining waste will be driven to next stage via a conveyor belt in the second stage the waste will be given to a rotating drum. This rotating drum contains holes in different sizes and below each hole there will be a drum to collect. When a suitable size of object appears at hole then it will pass through it and fell into that container.

2. Based on Type

The present automatic waste separation systems which we have studied are capable of separating the waste into 3 categories. They are:

a. Dry Waste.

b. Wet Waste.

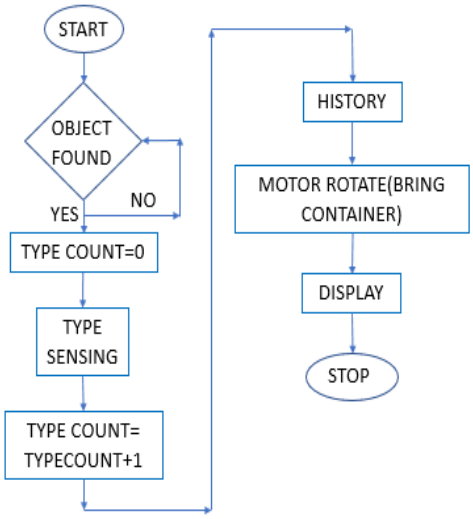
c. Metal Waste.

The most commonly used approaches for the present automatic waste segregators which we have gone through our study some projects have used soil moisture sensor for the identification of the wet waste, some projects uses magnets for identifying metal waste, some projects uses ultrasonic sensors for object detection and some projects uses servo motors for movement.

In earlier days this separation process either it is size-based or type-based has more human involvement because the workers in plant have separated the materials by using their hands. Some projects use blower to separate dry waste.

In the present system the metal objects and electronic circuits are categorized by hands when they are dropped in bins together. The present system of processing of electronic boards is done by using chemicals to melt the items on electronic board and extracts the metals like gold, silver, platinum, cobalt, tin, copper, iron, aluminium and lead for recycling and then after we will grind the remaining materials for processing. [6]

4.PROPOSED METHOD



5. COMPONENT DESCRIPTION:

ARDUINO MEGA 2560

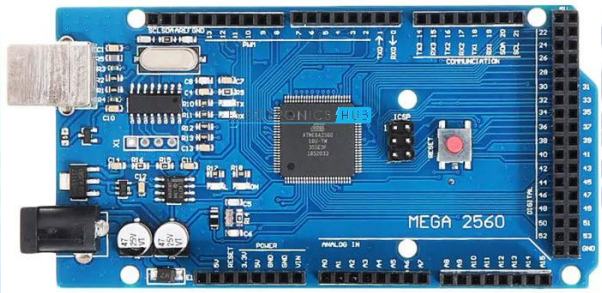


FIG 1: ARDUINO MEGA 2560

The Arduino Mega 2560 is an ATmega2560-based microcontroller board (datasheet). There are 54 digital input/output pins (14 of which can be used as PWM outputs), 16 analogue inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button on this board. It comes with everything you'll need to get started with the microcontroller; simply plug it into a computer with a USB cable or power it with an AC-to-DC adapter or battery. The Arduino Mega 2560 is a successor to the Arduino Mega. The Mega 2560 is an update to the Arduino Mega, which it replaces.

INDUCTIVE SENSOR

FIG 2: INDUCTIVE SENSOR

An inductive proximity sensor is a non-contact sensing device that detects metal targets using electromagnetic energy. An inductive proximity sensor's sensing range varies depending on the type of metal detected.

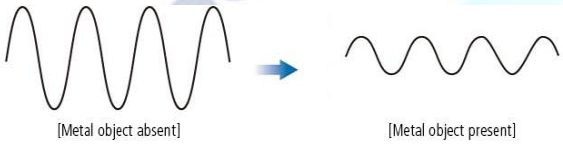


FIG 2.1: INDUCTIVE SENSOR RESPONSE

COLOR SENSOR

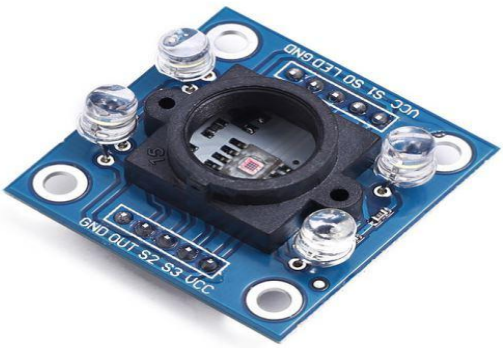


FIG 3: COLOR SENSOR

To detect the color of material three main types of equipment are required. A light source to illuminate the material surface, a surface whose color has to be detected and the receivers which can measure the reflected wave lengths. Color sensors contain a white light emitter to illuminate the surface. The way of detecting color is by illuminating the material surface by Red, Blue and Green LED's one at a time. Here the sensor contains no filters but light to voltage converter.

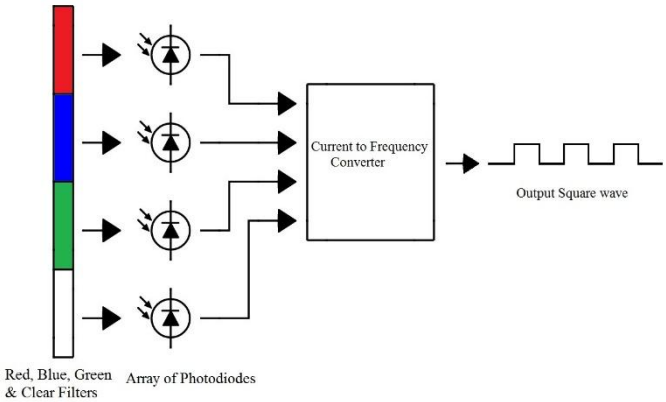
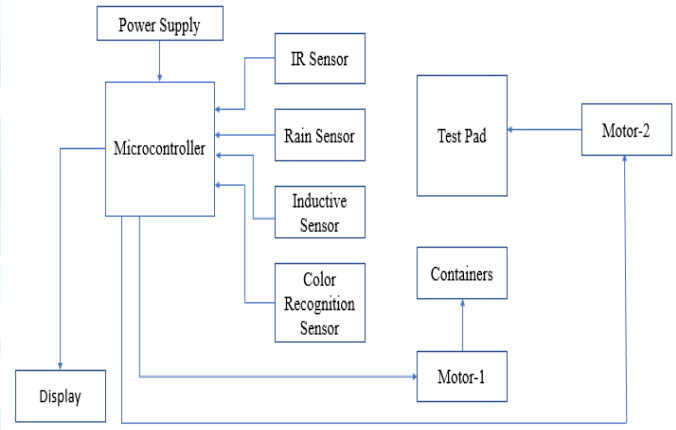


FIG 3.1: COLOR SENSOR OPERATION

Based on the activation of these filters, the color of the material is categorized. A light to voltage converter is also present in the sensor. The sensor responds to color by generating a voltage proportional to the detected color. The highest amount of light reflected back by the material surface while illuminated with the red, blue and green light is calculated to detect the color.

6. BLOCK DIAGRAM



7. WORKING

When the device is turned on the microcontroller (Arduino MEGA 2560 in case of our project) monitors the input from all sensors which are attached to it continuously but according to specified source code when the state of IR sensor went from LOW to HIGH then the type classification process starts. For type classification we are using 3 sensors (excluding the IR sensor) in our project. They are:

1. Raindrop Sensor.
2. Inductive proximity Sensor.
3. Color Sensor.

Along with the 3 sensors the source code mainly 4 methods for the type classification. They are:

1. isDry(int).
2. isWet(int).
3. isMetal(int).
4. isElectronic(int).

The int parameter in every method defines the no. of steps that motor-1 has to rotate.

isDry(int)- This method is used to identify the dry waste for identification the system uses the following conclusion. The rain sensor and inductive sensor should not be in a HIGH state and the color sensor output should not be either green or blue.

isWet(int)- This method is used to identify wet waste for identification the system analyzes the state of rain drop sensor module it works on the principle of variable resistance when there is water on the nickel coated lines the lines will get short circuited and creates a low resistance path that leads to sensor output as HIGH if its state is HIGH then the material is considered as wet waste. The resistance of rain sensor is inversely proportional to the amount of water present on the sensing pad.[2]

isMetal(int)- This method is used to identify the metal waste for identification the system analyzes the state of inductive proximity sensor. The inductive sensor is used to identify metal targets by observing the variations between radiated signal from the sensor and the signal received at the sensor [3] if its state is HIGH then the material is considered as metal waste.

isElectronic(int)- This method is used to identify the electronic waste(or) e- waste for identification the system analyzes the state of color sensor if the microcontroller receives the input from color sensor as green or blue (Circuit boards have major portion of green or blue on it. So, it is taken based on that assumption) then the material is considered as e- waste. The color sensor which uses photodiode array which consists of four filters (R, G, B, Clear) it senses the color of the object based on the red, green, blue intensities in the reflected light using current to frequency converter. [4,5]

The status of each sensor for determining the type of material is shown in table-1

Sensor	Rain Sensor	Inductive Sensor	Color Sensor
Status	HIGH	HIGH	Green(or) Blue
Type of material which satisfies the condition	Wet Waste	Metal Waste	E-waste

Table-1: Status of Sensors

In every method there is a variable called "present" and it will modify according to the method if the conditions in the method are satisfied. And the "present" variable is used to hold the current item type. After that the first stepper motor will rotate and bring the respective container beside the test pad and the second stepper motor is used to throw the material into the container. A stepper motor is a special type of motor which rotates according to the voltage applied [7] the motor which we have used for this project has 200 steps. Later on, the value of present is assigned to another variable called "history" this variable is used to keep the last identified type data which helps the microcontroller to make the effective rotation in stepper motors for the next material. The motor rotation angle for present materials based on the past value is listed in all possible ways in the source code. For better understanding refer the following table-2. The effective operation of the project is depending on the value in "history" variable. After that the type count will be increased then finally the number of materials in each container will be displayed on LCD display.

History	Present	Motor Rotation Angle(degrees)
D	D	0
	W	-90
	M	180
	E	90
W	D	90
	W	0
	M	90
	E	180
M	D	180
	W	90
	M	0
	E	-90
E	D	-90
	W	180
	M	90
	W	0

Table-2: Motor rotation plan based on the value of history variable

The programming concepts used for this project is taken from the e-book written by Rui Santos and Sara Santos [8] and followed by some other web resources [9,10].

8.RESULTS

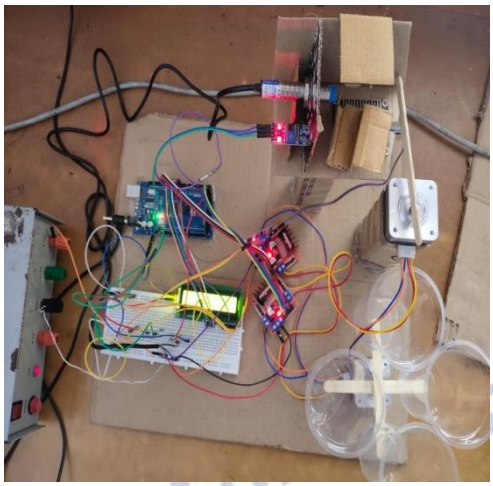


FIG 4: EXPECTED OUTPUT

We have developed the system which is capable of separating the waste into dry waste, wet waste, metal waste till now but we are trying to improve our system to make it capable of separating e- waste.

CONCLUSION

The technology we've proposed has the capability of classifying the garbage into four categories:

1.Dry Waste.

2.Wet Waste.

3.Metal Waste and

4.Electronic Waste

Using the various sensors that are available on the market. For the purpose of automating the waste separation

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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