Smart Waste Management System

Mini Project Report submitted in partial

fulfillment of the requirement for the degree of

T. E. (Information Technology)

Submitted By
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2019-2020

CERTIFICATE OF APPROVAL

For
Mini Project Report
This is to Certify that
Aniket Sawant
Sneha Mane
Anuja Dhanu
Shraddha Gurav

Have successfully carried our Mini Project entiled
"Smart Waste Management System"
in partial fulfilment of degree course in
Information Technology
As laid down by University of Mumbai during the academic year
2019-2020

Under the Guidance of
"prof. Neha Kadu"

Signature of Guide

Head of Department

Examiner 1

Examiner 2

Principal

Dr. S.A Patekar

ACKNOWLEGEMENT

We thank God for giving us the ability or this undertaking. This acknowledgement is not something which has been written in a day but we have been longing, right from the time we were allotted our guide, to express our gratitude. This is just a channel for our expression.

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The days we have spent in the institute will always be remembered and also be reckoned as guiding in our career.

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Abstract

Dynamic increase in the amount of waste and despicable dumping waste has become a matter of concern because of the threat it causes to the environment. There comes the pivotal role of an automated waste segregate which avoid the plight and also reduces the difficulty of recycling. The importance and the economic value of waste is realized only when it is segregated. Currently there is no such system for segregation of metal, dry and wet waste. This project proposes a spot automatic waste segregation unit that effectively gives a solution to this problem. In order to segregate the metallic waste a inductive proximity sensor is used, for dry waste a IR sensor is used and for wet waste a moisture sensor is used. The benefits of this work are, the waste has a higher potential for recovery and the occupational hazards of waste separating workers is also reduced.

1. Introduction

This project proposes a prototype of a municipal waste segregator, which can segregate the dumped waste immediately, leading to more recyclable paper. The Smart bin can be programmed to send information about the dumped garbage, such that respective action can be taken. Various sensors and motors are interfaced with Arduino board in this system.

With economic developments the globally generated wastes are increasing. The current global Municipal solid waste generation levels are approximately 1.3 billion tonnes per year and are expected to increase to approximately 2.2 billion tonnes per year by 2025. India with a population of 1.35 billion has per capita waste generation ranging from 0.12 to 5.1 kg per person and an average of 0.45kg/ capita/ day.

Segregation of waste helps increase the recyclable materials and control unwanted degradation, which might result in emission of harmful gasses. In India the segregation of domestic waste is done at the municipal factories, where huge machinery are used for separating recyclable materials. Implementation of separate bins for collection of waste materials is done, but it does not yield it's purpose due to lack of awareness, ignorance and negligence. The existing system for collection of municipal solid waste does have any means to verify the proper disposal or its timely maintenance.

2. Aim & Objectives

Our Project deals with the most blistering topic i.e. waste segregation. An efficacious management needs to be materialized for better planet to live in. Hence, with our cost effective project proposal, we try to bring in the change. It deals with the minimization of blue-collar method utilization for exclusion of waste into an automated panache. An automation of this style not only saves the manual segregators of the numerous health issues, but also proves to be economical to the nation. Besides, this system utilizes low cost components for the successful segregation of most types of waste. When installed in apartments or small colonies, it proves to be beneficial in sorting the waste at the site of disposal itself. This is the objective of our project.

3. Problem statement

Design a system which commences the check on the solution needed for increasing the utilizable resources is through setting up automated bins which can identify the type of garbage dumped into the bin. This helps negate the effects of human negligence and also reduce the chances of available recyclable materials getting contaminated.

4. Proposed System

The proposed design aims to implement a automatic waste segregation system, which is easy to use and economical for the user. Once the input waste is placed on the conveyer belt, the conveyer belt starts moving and all the sensors are turned on and the sensing and segregation start. The metal sensor, the moisture sensor, the IR sensor and the motor sensors that are used to get the segregators in place are given as input to Arduino UNO. The output is the final segregated wastes into different bins.

4.1 Block Diagram:-

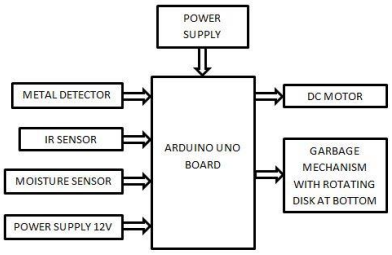


Fig 1.1: Block Diagram

4.2 Flow Chart:

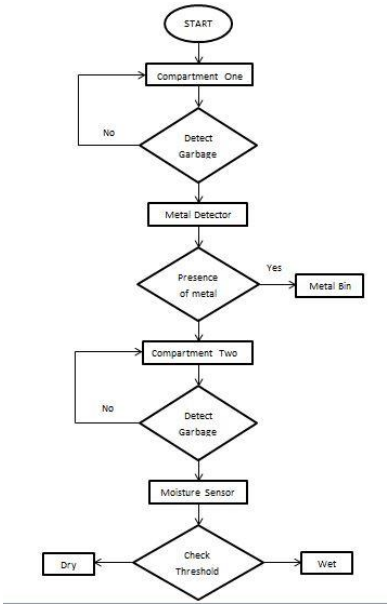


Fig 1.2: Flow Chart

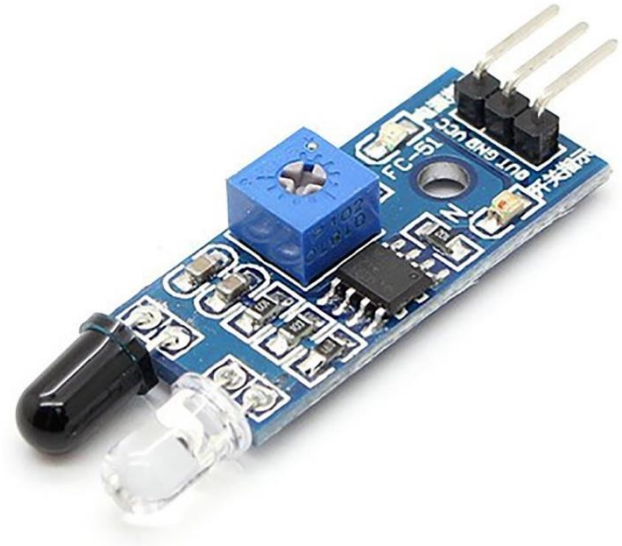
5. Components

5.1 Hardware:

Arduino Uno Board:

It is used to get the analog value which is more accurate that digital value which gives output as 0 or 1 from MQ2 Gas Sensor and send the data to Raspberry pi 3 Board.

IR Sensor:



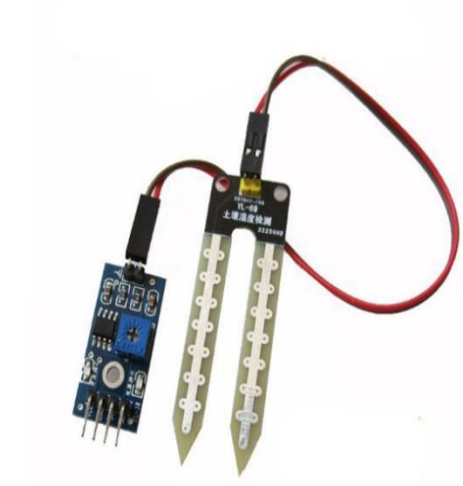
IR sensor is one of the most commonly used sensors in the field of electronics, it has a large number of applications at the domestic as well as at the industrial level. IR module is a sensor module that consists of both IR transmitter and a receiver. Operating voltage of this module is 5 volts and the obstacle detection range is 5 cm that can be increased by 15 cms. An IR sensor can detect the heat of an object as well any motion in the surrounding. The functioning of an IR module is pretty straightforward. As the module contains both transmitter and receiver. When powered, IR transmitter starts to transmit continuous IR waves, if an obstacle is placed in the path of the waves, they get reflected back from the obstacle and are received by the receiver.

Inductive Proximity Sensor:

An Inductive Proximity Sensor is a non-contact electronic proximity sensor used for the detection of metals. Sensing range of this sensor completely depends upon the metal being detected. Their working principle is based on a coil and an oscillator that generates an electromagnetic field in the surrounding of the sensing range. Presence of any metallic substance in the sensing range causes dampening of oscillation amplitude.

Rise and fall of amplitudes is detected by a threshold circuit that causes a corresponding change in the output of the sensor. If a metal contains some percentage of ferrous, the sensing range is longer, while non-ferrous metals like copper reduce the sensing range by 60 percent. There are two possible outputs of this sensor, hence it is also called inductive proximity switch. Common applications of inductive sensors include metal detectors, traffic lights, etc and a plethora of industrial automated processes.

Moisture Sensor:



As the name indicates, this sensor is used to measure the moisture content in a given material. These sensors use the volumetric water content indirectly by making use of some other properties like electrical resistance, dielectric constant. In general cases, the sensor generates a voltage proportional to the dielectric permittivity and therefore measures the moisture content of a material

DC Motor:

It stands for the direct current motor. It is an electrical machine that converts direct current electrical energy into mechanical energy. Mostly all types of DC motors have an internal mechanism to reverse the direction of current flow in part of the motor. Smaller versions of this motors are exercised in toys and also many home appliances. Larger DC motors are used in the propulsion of electric vehicles, elevator, and hoists, or in drives for steel rolling mills. DC motors are of two types viz. Brushed and Brushless DC motors.

Jumper Wire:

The jumper Wires are used to connect gas sensor to the arduino uno board.

5.2 Software:

Arduino IDE:Software provided by ARDUINO to code using different languages and make the Arduino UNO work accordingly.

6. Logic:

The IR sensor is connected to Arduino UNO board on port 2 which reads digital data from the sensor, and on 5v port for voltage input and on GND port it is used to detect the presence of an object.

The Inductive Proximity Sensor is used to detect a metal waste it is connected to Arduino Board on port A1 which reads the analog data from the sensor, and on 5v port for voltage input and on GND port. The Moisture sensor is used to detect wet waste it is connected to Arduino Board on port A0 which reads the analog data from the sensor, and on 5v port for voltage input and on GND port.
A conveyor belt is used to move the object in forward direction, motors are used to move the conveyor belt which has given 5v input. A motor is moved in clockwise and another motor in anti-clockwise so as to move the conveyor belt.

At the end of the conveyor belt there are 3 dustbins on a disk which are dry, wet and metal to store the segregated waste below the disk a servo motor is connected to move the disk in clockwise and anti-clockwise as per the detected data. For example, if a metal waste is detected by the metal sensor then the disk will rotate and bring forward the metal dustbin and the waste will fall into the metal dustbin. The servo motor is given 5v voltage input and connected to the port 5 which reads digital data. The output of all the sensors are displayed on the serial monitor.

7. Code:

```
#include <Servo.h>
float metalDetected;
float wetDetected;
int monitoring;
int metalDetection = 1;
int IRSensor = 2;

int flag=1;
int servoPin = 5;
Servo Servo1;

void setup(){
  pinMode (IRSensor, INPUT);
  Servo1.attach(servoPin);
  Serial.begin(9600);
}

void loop(){
  int a=1;
    int statusSensor = digitalRead (IRSensor);
    int sensorValue = analogRead(A0);
    monitoring = analogRead(metalDetection);
    metalDetected = (float) monitoring*100/1024.0;
    wetDetected=((float) sensorValue*100/1024.0)-100;
  if (monitoring > 250){
    Servo1.write(180);
    Serial.print("Metal is Detected");
    Serial.print(" Metal is Proximited = ");
    Serial.print(metalDetected);
    Serial.println("%");
    a=0;
    delay(5000);
  }
  else if(sensorValue<900)
  {
    Servo1.write(0);
    Serial.print("WET: ");
    Serial.println(sensorValue);
    a=0;
```

```
    delay(5000);
  }
  else if(a==1 && statusSensor == 0){
    Servo1.write(90);
    Serial.println("DRY");
    delay(5000);
  }

}
```

8. Implementation

8.1 Working

1. When the waste enters the conveyer belt motor turns on and the conveyer belt starts moving.
2. The microcontroller, all the motors and sensors are turned on.
3. The waste is sensed by the inductive proximity sensor to detect if it is a metal or no.
4. If the waste is metal waste then it is turned on and the waste is pushed into the metal waste bin.
5. If the waste is dry waste then IR sensor is turned on and the waste is pushed into the dry waste bin.
6. If the waste has some humidity it is detected as wet waste and is turned on and the waste is pushed into the wet waste bin.
7. Finally the waste are dropped into the respective bins and the segregation process is completed.

8.2 Circuit Diagram

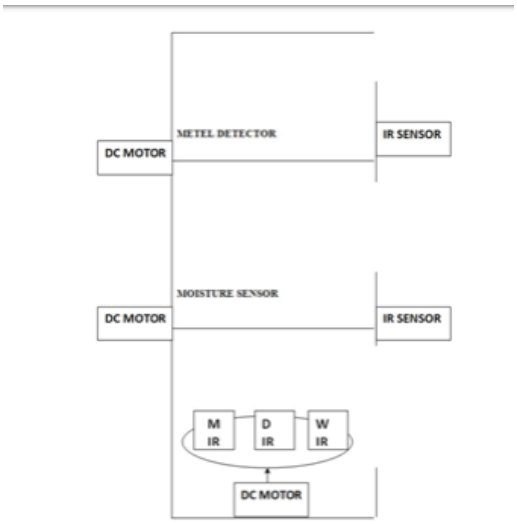


Fig 8.1: Circuit Diagram

9. Deployment of Testing:

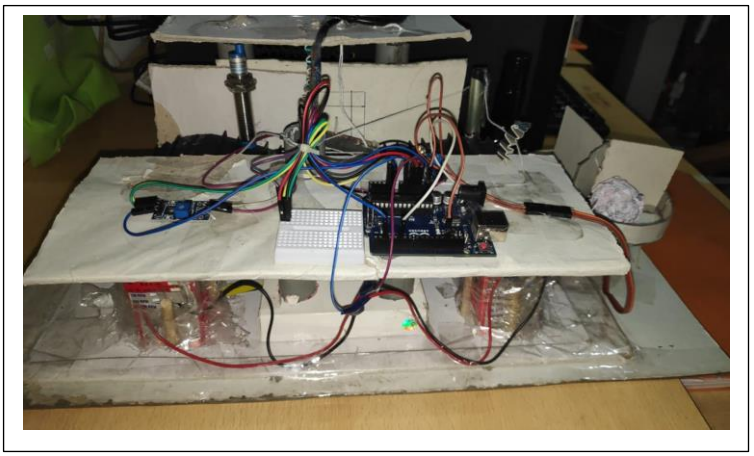


Fig. 9.1 Waste Segregation Setup

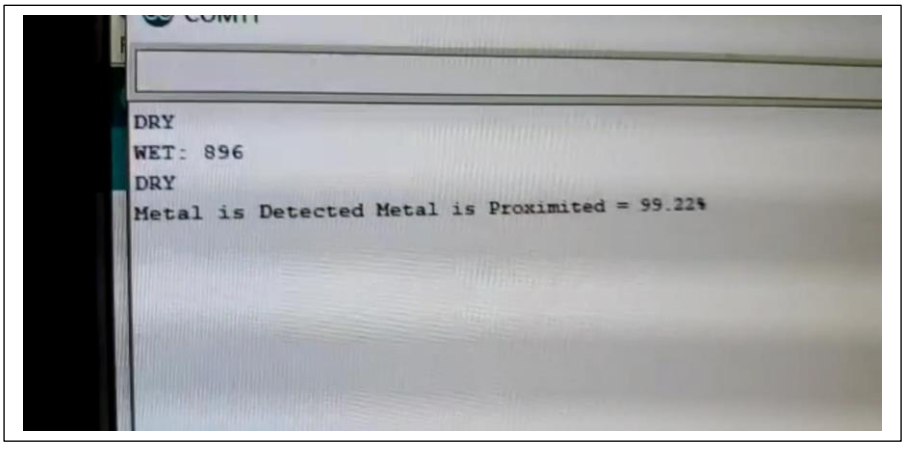


Fig. 9.2 Final output of waste detection

10.Conclusion & Future Scope

Implementation of this system at a local level like societies, educational institutes, etc. can reduce the burden on the local authorities. The automatic waste segregator is one small step towards building an efficient and economic waste collection system with a minimum amount of human intervention and also no hazard to human life. Using a conveyor belt makes the system far more accurate, cost-effective and also easier to install and use at a domestic level. Segregating all these wastes at a domestic level will also be time-saving. While implementing our system we came across many problems like the sensing range of inductive proximity sensor, the accuracy of the moisture sensor, adjusting the range of IR sensors and some more, but using some modifications we tried the make the system as reliable as possible but not completely perfect.

This type of product can be used in housing societies, offices, etc. Since it is cost effective, it can be implemented on a large scale as well with some modifications. Using a robotic arm along with a conveyor belt will make the process of segregation easier. Also, more sensors can be used to segregate bio-degradable and non-bio-degradable waste, plastics, recyclable waste, e-waste, and medical waste.

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