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SMART TRASH MONITORING SYSTEM

Madhura Haldipur[1], Dynaneshwar Muley[2], Shubham Diwane[3]
Student, *Electronics and Telecommunication, SKNSITS, Lonavala, India*
Mrs. Seema M. Borawake[4]
Asst. Professor, *Electronics and Telecommunication, SKNSITS, Lonavala, India*
madhurahaldipur23@gmail.com , dmuley123@gmail.com , shubh.diwane023@gmail.com , seema.borawake.sknsits@sinhgad.edu

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Abstract: In the recent years, one of the underlying effects of a growing population is environmental hazard. Of these problems, the increasing amount of trash is the most critical. As the world's population continues to rise at an unprecedented rate, waste management is seen as an effective solution to mitigate the issue. Segregation of wastes at junk yards is a tedious and time consuming process hence recycling of wastes is not effectual. These drawbacks can be overcome by proper waste management at domestic level. The main objective of this project is effective and efficient methods of waste collection and segregation at domestic level Specifically, we developed a trash bin equipped with sensors, which can intelligently segregate waste system that provides monitoring report of waste collection. Image recognition was used to process automatic classification of trash using machine learning technique. Upon training more than 2000 samples for biodegradable and non- biodegradable waste, the developed prototyped were able to classify trash efficiently

Keywords: *Rapid industrialization, Ultrasonic Sensors, Unhealthy atmosphere, Improper waste management, Biodegradable and Non-Biodegrable waste, waste separation system, Raspberrypi3, Pi camera, Servomotor.*

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I INTRODUCTION

Healthy environment is a better place to live in. In the present scenario environment is polluted by different means, one of which is improper disposal of waste. Inefficient methods of waste disposal like dumping of waste in the landfills have adverse effects on environment and human kind. It would not be wrong to say that most of the cities suffer from problems emanating from either bad or nonexistent waste management. Since there is rapid increase in population there is an increase in waste production. Hence waste management plays a major role to curb pollution. management includes segregation, recycling and proper disposal.

For a waste management system to be effective in this project, sensors were used to integrated along with a monitoring platform. IOT serves as a backbone in this projectby collecting information from sensors and used this in providing data analysis and interpretation in the developed system.

In this paper, a fully automated waste separation system to discriminate residual and recyclable household waste is proposed. The system is designed to focus on household waste, since household waste ranks the highest volume of waste among others.

II PROBLEM STATEMENT

Inefficient methods of waste disposal like dumping of waste in the landfills have adverse effects on environment and human kind. It would not be wrong to say that most of the cities suffer from problems emanating from either bad ornonexistent waste management. Since there is rapid increase in population there is an increase in waste production.

III OBJECTIVE AND SCOPE OF PROJECT

The project is an IOT-based implementation of automatic waste segregation and garbage monitoring system. This project aims to introduce technology through the use of sensor for waste segregation and garbage collection

IV PROPOSED MODEL

The main objective of this paper is segregation of wastes i.e. biodegradable, metal and plastic. The waste dropped into the dustbin is segregated at the panel with the help of sensors and the corresponding valves of the segment are opened and the waste is dumped into their respective segment.

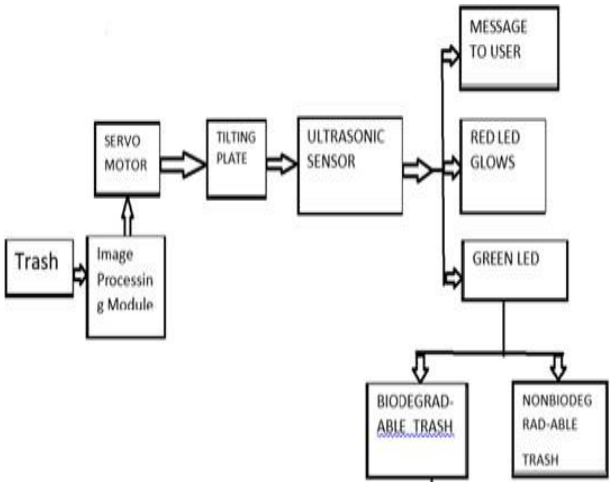
Each segment is equipped with a level detecting sensor to indicate the level of waste collected in each segment and when a threshold level is reached in each segment message is displayed on the dustbin as a particular segment is filled and the same message is sent to the authorities by the means of Cloud.Each segment of the dustbin can be detached separately in order to dispose the trash in an accomplished manner, so that the segregated waste can be recycled and utilized.

V LITERATURE SURVEY

Sr.	Title	Author name	Technology used
1.	Ibin:An Intelligent Trash bin For Automatic Waste segregation and monitoring system	1.Miko Pamintuan 2.Shiela Mantiquilla 3.Mary Jane	Using IOT Technology and LinkIt by Mediatek
2.	SmartDustbins-Automatic Segregation &Efficient Solid Waste Management	1. Viral Rambia 2. Aman Valera 3.Rahul Punjabi	Using Arduino and Moisture Sensors
3.	Eco-Friendly IOT Based Waste Segregation and Management	1.Santosh Kumar 2.Varalakshmi N 3.Soundarya S Lokeshwari	STM 32 Industry level microcontroller. IOT is used for continuous monitoring of physical devices.

TABLE 1 TABLE LITERATURE SURVEY

VI BLOCK DIAGRAM AND ITS DESCRIPTION



The above diagram is of Proposed Model. The block diagram shows that the trash once classifies using image processing module whether the trash is biodegradable or not. Once classified then it is tilted using servo motor and lands the trash into designated bins. If the Bin is full then Message is sent to user using Twilio that Bin is 80% full. The components used in the diagram are detailed below.

A. Image Recoginition Module

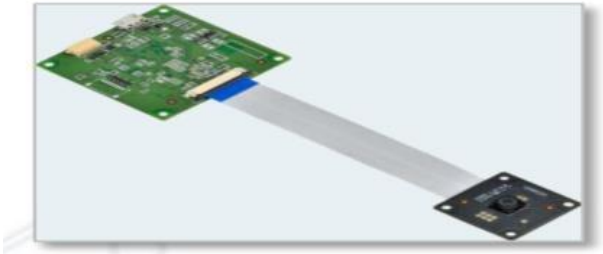
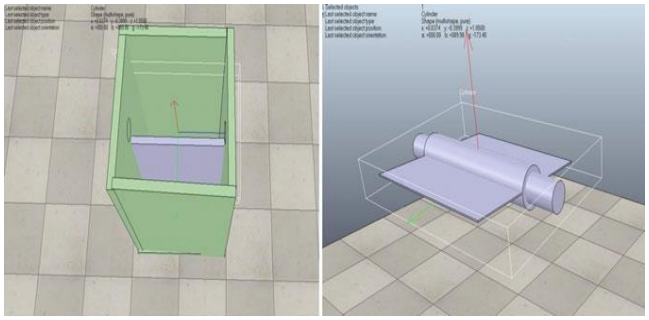


Image Recoginition refers to the task of inputting an image into a neural network and having it output some kind of label for that image. The label that the network outputs will correspond to a pre-defined class. There can be multiple classes that the image can be label as, or just one. If there is a single class, the term "recognition" is often applied, whereas a multi-class recognition task is often called "classification".A subset of image classification is object detection, where specific instances of objects are identified asbelonging to a certain class like animals, cars, people orGarbage.

This module will let the system know what kind of garbage is tossed inside the trash can. To be able to recognize what category the thrown trash is with an acceptable accuracy, Machine Learning and TensorFlow are used to retrain the model

B. Tilting Plate

A basic RLC metal detector circuit is used. It is excited with a square wave pulse and the output voltage is taken across the capacitor. When a metal is placed in the vicinity of the coil, the inductance of the coil will increase. This will change the output voltage across the capacitor. If the change is beyond a threshold, the object is classified as a metal and the plate tilts to one side



If a metal is not detected, the plate tilts to the other side. The plate tilts with the help of a servo motor attached in diametrically opposite ends of the bin. Through this method, metal/non-metal segregation is achieved within the bin itself. The collected metal can laterbe sent to industries as scrap. This is one of the key features in the bin and can help link scrap collection and waste collection.

C. Ultrasonic Sensor

Ultrasonic sensors are designed for non-contact detection of solid and liquid objects. These sensors are used for a wide variety of functions from monitoring the level of water in a tank to fluid identification/concentration, to detecting object proximity. Ultrasonic sensors have become indispensable for IoT delivery and are widely used for building smart, connected products. Understand more about the different types of sensors, how they work, and their applications for everything from smart car reversal systems to smart waste bins.

Features

Here's a list of some of the HC-SR04 ultrasonic sensor features and specs:
Power Supply :+5V DC
Quiescent Current : <2mA
Working Current: 15mA
Effectual Angle: <15°
Ranging Distance : 2cm – 400 cm/1″ – 13ft
Resolution : 0.3 cm
Measuring Angle: 30 degree
Trigger Input Pulse width: 10uS
Dimension: 45mm x 20mm x 15mm

D. Raspberry Pi 3

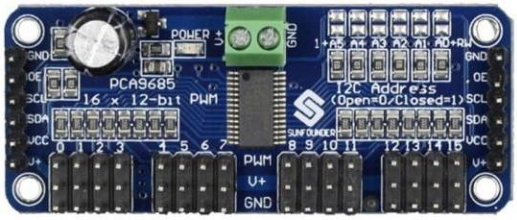
This is the main computer used for the Automatic Waste Segregation Module. This sufficiently handles the image processing of the captured images at an inexpensive price Raspberry Pi 3 is the third generation of Raspberry Pi and it packs quite a formidable punch in its credit card-sized package. Most notably, in addition to the standard features of the Raspberry Pi (such as four USB 2.0 ports and built-in Ethernet), it has:
A 1.2GHz 64-bit quad-core ARMv8 CPU
802.11n Wireless LAN
Bluetooth 4.1 Low Energy (BLE)
The powerful CPU coupled with Wireless LAN and Bluetooth 4.1 radio makes it an ideal candidate for IoT projects, because multiple sensors can be connected to it simultaneously. In addition, the Raspberry Pi has a 40-pin GPIO (General Purpose I/O) connector for interfacing with external sensors.
The Raspberry Pi Zero is the smallest Raspberry Pi evermade, and although it doesn't have a processor that's as powerful as the Pi 3, its small size is especially suited for embedded projects (such as wearables, etc.), where space is a premium.

E. Servomotor

A **servo motor** is an electrical device which can push or rotate an object with great precision. If you want to rotate andobject at some specific angles or distance, then you use servo motor. It is just made up of simple motor which run through **servo mechanism**. If motor is used is DC powered then it is called DC servo motor, and if it is AC powered motor then it is called AC servo motor. We can get a very high torque servo motor in a small and light weight packages.Doe to these features they are being used in many applications like toy car, RC helicopters and planes, Robotics, Machine etc.

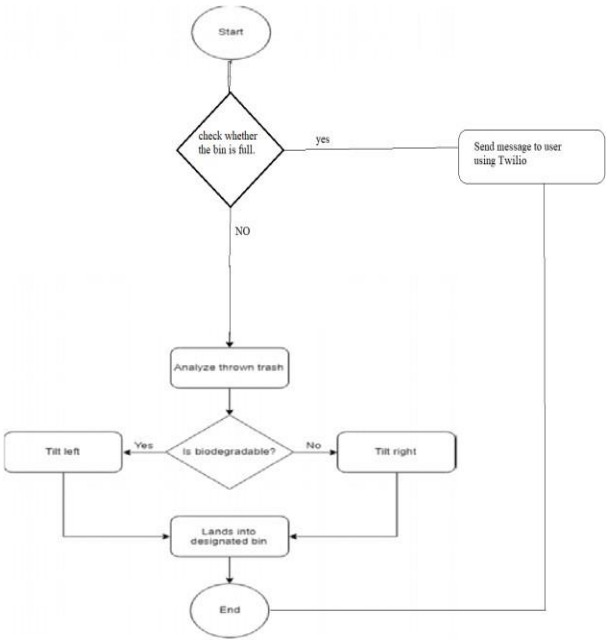
Servo motors are rated in kg/cm (kilogram per centimeter) most hobby servo motors are rated at 3kg/cm or 6kg/cm or 12kg/cm. This kg/cm tells you how much weight your servo motor can lift at a particular distance. For example: A 6kg/cm Servo motor should be able to lift 6kg if the load is suspended 1cm away from the motors shaft, the greater the distance the lesser the weight carrying capacity.
The position of a servo motor is decided by electrical pulse and its circuitry is placed beside the motor

F.PCA 9685



The PCA9685 is a 16-channel I2C-bus controlled LED controller optimized for Red/Green/Blue/Amber (RGBA) color backlighting applications. Each LED output has individual 12-bit resolution (4096 steps) PWM controller with a fixed frequency. The controller operates at a programmable frequency from a typical 24 Hz to 1526 Hz with a duty cycle that is adjustable from 0% to 100% so the LED can be set to output a specific brightness. All outputs areset to the same PWM frequency. With the PCA9685 as the master chip, the 16-channel 12-bit PWM Servo Driver only needs 2 pins to control 16 servos, thus greatly reducing the occupant I/Os. Moreover, it can be connected to 62 driver boards at most in a cascade way,which means it will be able to control 992 servos in total.

VII ALGORITHM AND FLOWCHART



1. Start
2. Check whether the bin is full or empty3.If full send message to the user
5. If empty then Analyze thrown trash
6. Is Trash biodegradable ?? tilt left or right accordingly
7. Land the trash into designated bin
8. Stop

VIII SYSTEM TO BE IMPLEMENTED

Fig . Sample Waste of Biodegradable Trash

Fig. Sample Images of Non-Biodegradable Trash

IX CONCLUSION

In waste segregation, waste will only be categorized as: Biodegradable or Non-biodegradable. The recognizable types of trash in Biodegradable are as follows: Cardboard, Paper, Organic Waste. For Non-biodegradable trash are: Glass Bottles, Shattered Glass, Aluminum Cans, Plastic Utensils, Plastic Bags.
This project aims to help in garbage collecting and in segregating of waste through the use of sensors for garbage collection and machine learning for waste segregation. With the current build of the monitoring system The above proposed approach eases the segregation of wastes at source level and thereby reducing the human interaction and curbs pollution caused by improper segregation and management ofwastes at source level.

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BIOGRAPHY

Ms.Madhura Haldipur is currently pursuing B.E degree in Electronics and Telecommunication at SKN Sinhgad Institute of Technology & Science, Kusgaon(Bk.), Pune

Mst.Dnyaneshwar Muley is currently pursuing B.E degree in Electronics and Telecommunication at SKN Sinhgad Institute of Technology & Science, Kusgaon(Bk.), Pune.

Mst.Shubham Diwane is currently pursuing B.E degree in Electronics and Telecommunication at SKN Sinhgad Institute of Technology & Science, Kusgaon(Bk.), Pune.

Mrs. Seema Borawake currently workingas Assistant Professor in Electronic and Telecommunications Deparment and she is ME E& TC (VLSI and Embedded systems).

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Address for Correspondence SKN Sinhgad Institute of Technology and Science Lonavala, Pune. 410 401, MS, India.

Website: www.sinhgad.edu

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