Plastic Segregation

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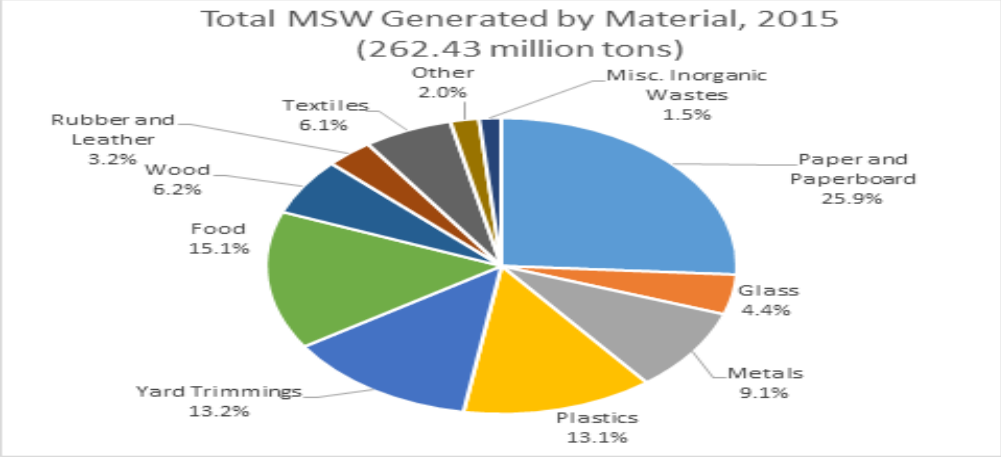
Abstract : Waste management has been one of the concerning issues these days. Improper waste disposal methodologies have led to the generation of tons of waste. About 3.1 million (70-75%) of waste is produced yearly and then dumped straight into the landfill sites–in an unhygienic manner. This results in landfills that run out of space. Lack of segregation is simply the reason why India is drowning in its garbage and hence waste disposal is of utmost importance. Thus one of the most important ways to reduce the landfill run out is to segregate the waste into non-biodegradable and biodegradable. Our project proposes an Automatic Plastic Segregator (APS) which is easy to use solution for the segregation of wet waste, dry waste and plastic so that plastic can be sent directly for processing and then it can be reused. The APS also employs a image processing technique for efficient segregation.

I. INTRODUCTION

A lot of garbage is produced due to human activities every year. Serious environmental pollution would be caused if there is no arbitrary disposal of garbage and lack in the use of methods like re-usability and recycling. Waste segregation is defined as the classification of garbage into its constituent subparts i.e. degradable, non-degradable and recyclable and
carrying out the comprehensive treatment to re-use the garbage and reduce the increasing garbage pressure on the landfills. The world generates 2.01 billion tons of municipal solid waste annually, with at least 33% of that not managed in an environmentally safe manner.



As per the IEEE standard (IEEE CONECCT20141569825603) in this paper, they present an embedded system solution to automate the sorting of different types of plastic by using the concept of near-infrared spectroscopy (NRS). Our project can achieve the automatic, fast and effective separation of wet waste, dry waste and recyclable waste like plastic using laser and an LDR pair. Moreover, for better accuracy, we have also formulated the use of Pi cam which would capture the image and raspberry pi would convert it into a matrix of RGB color which is then converted into HSV value as locating plastic material through an HSV becomes quite easy. The Pre-treatment process of traditional garbage sorting was a cumbersome process, as artificial sorting was a costly process and equipment investment required was quite large. Thus, the newest garbage sorting machine has aimed at changed this cumber-some and realized the maximization of garbage resource utilization and zero landfill target..

Abbreviations and Acronyms

APS: Automatic Plastic Segregator, LDR: Light Dependent Resistor

II. RESEARCH METHODOLOGY

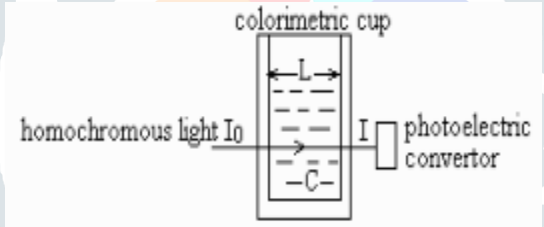
2.1. Data and Sources of Data

1. Adil Bashir et. Al. [1] projected an Automatic Waste Management System: They divided the system into 4 parts namely Automated Trash System. Smart vehicle system, base station and monitoring and controlling hut. Smart Trash System consists of sensors and Radio Frequency Transmitter. The sensors used mainly include load sensor and IR sensor. The load sensor senses the weight of the dustbin and the IR sensor detects the level of waste in the dustbin and then generates a signal to be transmitted by the RF generator. The Local Base Station receives this signal and keeps track of the status of the dustbin via monitoring cum controlling hut over the internet. Smart Monitoring and Controlling Hut decides for waste management of a particular trash bin using a pocket PC and a desktop. The smart vehicle system includes a web interlaced vehicle which is assigned a task of disposing of trash bin using robotic arms. Smart Monitoring and controlling Hut Interface mainly contains a Login Window which allows only the authentic user to login

2. Loana Lonel Al. [2] proposed a method called Incineration which is used to destroy solid, liquid and gaseous waste. It is largely used for the treatment of biological medical waste. Incineration is a process of burning refuse in a controlled manner. The biowaste thus generated after burning results in renewable carbon-neutral fuel. Incineration System generates electricity using stem by capturing heat. When unprocessed municipal solid waste is burnt on a large scale it is called as mass burn technology. However, the disadvantage of using this technology includes degradation in the air quality and improper disposal of ash that is generated after the waste is burnt.
3. Nithya.L [3] projected A Smart Waste Management and Monitoring System Using Automatic Unloading Robot which included Decision Support System for Solid Waste Site Allocation Using GIS (Geographic Information System) which uses Multi-Criteria Decision and stores, manipulates and retrieves a huge amount of spatial data. Development of Decision Support System tools which is used in multi-objective decision-making scenario, input data processing of varying formats. Smartphone Inertial Sensor Based Indoor Localization and Tracking With Ibeacon Corrections for accurate indoor localization. Smartphone-Based Human Fall Detection System is used to detect falls and accidents and GIS-Based Approach for Site Selection is used for identifying areas of the primary landfill using analytical hierarchy process (AHP).
4. MS. SUCHITRA V [4] suggests a concept named as AUTOMATIC WASTE SEGREGATOR. Here Inductive proximity sensor is used to detect the presence of metal in the waste. Wet and dry waste can be classified depending on their weight. A high-speed blower system is used to blow dry waste off the belt while most of the wet waste remains. The belt then rotates causing the waste to fall. It mainly uses an Open Close Mechanism to regulate the waste that falls after the IR sensor senses the waste. Inductive Proximity Sensor is used to the presence of metallic waste, the Slider section to separate the waste that falls on the belt and the Blower Section for separation of dry and wet waste.
5. AUTOMATED DOMESTIC WASTE SEGREGATOR USING IMAGE PROCESSING proposed by J Sanjai et. al. [5] The system is a combination of hardware and software. The hardware consists of a trash bin based on the core module Raspberry Pi and the software is based on a machine learning process i.e. an image classification algorithm. The collection of training database using pi cam and then implementing the feature extraction algorithm on the training data and then applying Machine learning using the SVM algorithm.
6. Balagugan [6] implemented Automated Waste Segregator at Household Level using PIC16F877 microcontroller and sensors like IR (Infrared) sensor, a moisture sensor, and a metal sensor respectively. The IR sensor is used to detect the presence of waste. The metal sensor is used to sense the presence of a metallic body present within the waste. The capacitive and moisture sensor to capacitive plates to detect the wet and dry waste

2.2 Theoretical framework

LAMBERTS AND BEER'S LAW-



The following law defines the absorption of light when it is transmitted. According to Lambert the absorption of light depends upon the thickness while according to Beer it depends upon the material through which it is traveling. Thus combining both we can say that the absorption depends upon both thickness and material of the medium.
This method is then used in our project to identify the range of light intensity obtained at the LDR when a Laser ray is passed through materials having different physical properties

LASER AND LDR PAIR

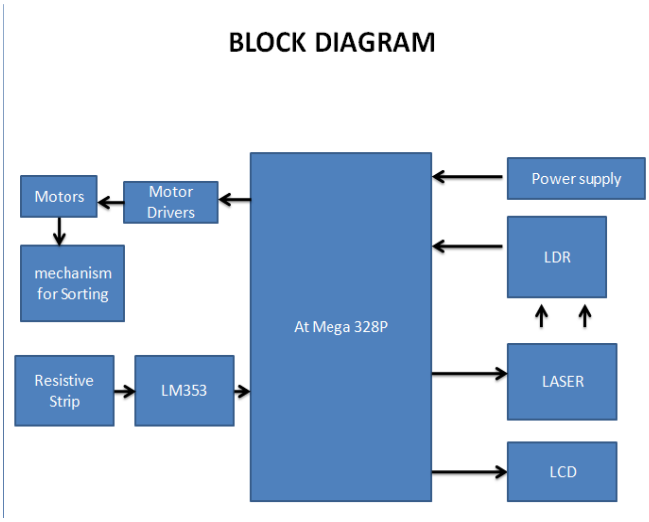
A red laser of wavelength 650nm is made incident on the LDR. The LDR senses the Laser intensity and produces a corresponding change in the resistance which is then converted into analog voltage values by the Arduino. Thus depending upon the type of material placed in between the laser and LDR the light intensity received at the LDR varies.

USE OF MOISTURE SENSOR
The moisture sensor is used to sense if there is a wet material present. If the wet material is detected there is a corresponding change in the resistance which is then sent to the Arduino to get analog values

FEATURES

- To measure the different ranges of light intensity sensed at the LDR depending upon the amount of light transmitted through Laser and the waste material placed in between them
- Implement a sorting mechanism after classifying the waste as dry, wet and plastic.
- The system has to be programmed to define positions for sorting the waste depending upon its category.

- Use of Pi cam and Raspberry Pi for color detection to efficiently find out other contents present within the plastic bag.



III. EXECUTION PHASE

3.1 INITIALIZATION PROCESS:

In the following phase, we have to find the range of light intensity for different materials placed. Initially initialize the Laser LDR pair and do not place any waste material in between them start the Laser and LDR pair and measure the value. Store this value as a range for no waste detected. Now place the wet waste samples and measure the range of the light intensity sensed by the LDR and store the value as range for wet waste. Repeat the process for plastic

3.2 SORTING MECHANISM:

Initially place the waste on the platform and pass it through the Laser LDR pair is less than 900 display trash detected and check the value of moisture sensor. Else display trash not detected. If the value of the moisture sensor is less than or equal to 800 display trash is wet else the trash is dry and again check the value of LDR. If its value is less than 450 no plastic is found else display trash found is plastic

3.3 PROCESS:

Display waste sorting mechanism and place the waste to be sorted on the sorting mechanism platform. Implement the sorting mechanism. If the waste is not dry move to the 3rd position by allocating suitable delay to the dc motor . Else if the waste is plastic carry out color detection using Pi cam and Raspberry Pi and the move to the 2nd position by giving a suitable delay to the dc motor. But if the waste is not plastic move to the 1st position .

IV. RESULTS AND DISCUSSION

For automation and time, the reliability sorting mechanism came into the picture here. An automatic safety system based on A Laser-based fully automated system with no human intervention has overtaken the traditional approach of manually segregating waste material. Dump yards, restaurants , and home automation are where this system can be applied, it collects all the waste generated and automatically classify it as wet, dry, plastic. Not only classification but also segregation of the waste i.e. separating the waste and placing them in the appropriate dustbins also takes place automatically. Plastic can then be further checked for the presence of any other material present within it using a Raspberry and a Pi Cam. Thus the system makes segregation more compatible and easy. It reduces the risk of the concerning issuers like landfill run out as the wet waste collected can be used as a manure for farms and other agricultural processes while the plastic that is been segregated can be recycled while the dry waste can be reused.

IV. REFERENCES

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