International Journal of Modern Developments in Engineering and Science
Volume 1, Issue 6, June 2022
https://www.ijmdes.com | ISSN (Online): 2583-3138

Waste Segregation Using Robotic Arm

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***Abstract*: Rapid urbanization without good planning has created a waste problem, making it difficult to dispose of garbage. Overpopulation in India is one of the main causes of waste, and as the population grows, so that the amount of waste has produced This must be handled properly in terms of waste segregation, handling, transportation, and disposal in order to reduce complications, which improve people's and the environment's health and safety. Wastes should be treated safely and hygienically for the benefit of people's health, on Robotic waste segregation with the Raspberry Pi smart waste segregation which eliminates human contact waste and improves health.**

***Keywords*: Waste segregation.**

1. Introduction

In early garbage disposal has caused a huge concern to the world. In huge volume the waste is generated is disposed by adverse effect on the environment. The disposal of the waste is a common method which is uncontrolled and unplanned to open dumping at the landfill sites. This landfilling is very dangerous to human being, animal and plants. This hazardous waste disposal method can produce liquid leachate, which can contaminate surface and ground waters, contain disease vectors, and destroy the natural environment's aesthetic value. It is also an inefficient use of land resources. Rag pickers play a critical part in the recycling of urban solid trash in India. Skin infections, respiratory, gastrointestinal, and multisystem allergic illnesses, as well as a high prevalence of mouse, dog, and other vermin bites, cause increased morbidity in rag pickers and conservancy employees. Segregation at the source of municipal waste generation can reduce reliance on rag pickers. The economic value of created waste is not recognized unless it is totally recycled. Several technological breakthroughs have also enabled garbage to be turned into valuable entities, such as Waste-to-Energy, in which waste is utilized to make synthetic gas (syngas) made up of carbon monoxide and hydrogen. The gas is subsequently burned to generate electricity and steam in a Trash-to-Fuel process, in which the waste is converted into biofuels. When garbage is separated into fundamental streams like wet, dry, and metallic, it has a higher chance of being recovered and, as a result, recycled and reused. The wet waste component is frequently processed into compost, methane gas, or a combination of the two. Compost can be used to replace chemical fertilizers, and biogas can be used as an energy source. Metal trash could be recycled or reused. Despite the presence of large-scale industrial waste segregators, it is always preferable to segregate garbage at the source. The advantages of doing so include retaining a higher quality of material for recycling, which implies that more value may be recovered from waste. Waste employees. occupational risk is also decreased. Also, instead of being routed to the segregation facility and from there to the recycling plant, the segregated garbage might be sent directly to the recycling and processing plant. At the moment, there is no system in place to separate dry, wet, and metallic waste at the household level. According to J. S. Bajaj, a low-cost, acceptable technical option for safe management should be devised. The goal of this project is to provide a small, low- cost, and user-friendly trash segregation system for urban households in order to simplify garbage management.

2. Literature Survey on Raspberry Pi

In our project we will be doing the waste segregation using Robotic arm with the help of Raspberry Pi and enhance our project from the previous projects.

Aravindaraman B. A., P. Ranjana proposed a work on design of a Monitoring System for Waste management Using IoT. In this paper we can see that the level of waste disposal is being determined to reach the goal of cleanliness in the city in a smart way using raspberry pi. Where the ultrasonic sensor is being used to determine the depth of the wastage disposal which in turn provides information to the nearby governing body to remove the wastage. Gas sensor is also used to determine the toxic gasses which are being released inside the disposal container.

Teoh JI Sheng, Mohammad Shahidul Islam, Norbahiah Misran, Mohd. Hafiz Baharuddin, Haslina Arshad, MD. Rashedul Islam, Muhammad E. H. Chowdhury, Hatem Rmili & Mohammad Tariqul Islam proposed a work on An Internet of Things Based Smart Waste Management System using LoRa And Tensorflow Deep learning Model in this paper we can see that the traditional waste management system can be replaced with smart sensors to perform real time management system by using a LoRa communication protocol which sends the sensor data tensorflow it is a pre-trained detection model where the images of the waste and inference graph level Gps module is used to detect the location and real time of the bin.

Megha S. Chaudhari, Bharti Patil, Vaishali Raut proposed a work on IoT based waste collection management system for Smart Cities in this paper we can see that smart bin is built a

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microcontroller from raspberry pi Uno board is interfaced with GSM modern ultrasonic sensor is placed at the top to read the status of the bin and weight sensor where weight sensor is placed at the bottom of the bin to detect the weight of the dustbins when the threshold limit is reached to an extend then the GSM modem will be indicated by area expert will send message to the separate administrator and get refuse with the assistance of robot component.

Mary Jane C. Samonte, Shaddi Hercules baloloy, Carl Kenneth, J. Datinguinoo proposed a work on e-Tap On: Solar-Powered Smart Bin with Path based Robotic Garbage Collector in this paper we can see that AGV (automated guided car) idea is adapted it is mainly used to build in industrial machineries and also to design robotic garbage collector an addition for the solar powered, infrared sensor assembled with HC-SR04+Ultrasonic sensor and SG90 servo motor. etap-on system will display the percentage of the bin weather it is full are not and also reflects the green line around the percentage if it is full then it monitors the status through the display.

Aishwarya, Parth wadhwa, Owais, and Vasudha Vashisht proposed a work on A Waste Management Technique to detect and separate Non-biodegradable waste using machine learning and YOLO algorithm. In this paper we can see that it works on the principle of machine learning and YOLO (you only look once) algorithm used to detect the custom object and also non-biodegradable waste so that the waste can be easily separated from the bins where each image is labelled by labelling tool in the format of Yolo

Amrutha Chandramohan, Joyal Mendonca, Nikhil Ravi Shankar, Nikhil U Baheti, Nitin Kumar Krishnan, Suma M S proposed a work on Automated Waste Segregation In this study, we can see that AWS is a low-cost, easy- to-use option for a home segregation system that can be transmitted straight to processing. Its purpose is to classify garbage into three categories: metallic waste, wet waste, and dry waste. To recognize metallic materials, the AWS uses a parallel resonant impedance sensing method, while capacitive sensors distinguish between wet and dry waste. The segregation of garbage into metallic, wet, and dry waste has been successfully implemented utilising AWS, according to experimental data.

S. Vinoth Kumar, T. Senthil Kumaran, A. Krishna Kumar and Mahantesh Mathapati suggested a project using the Internet of Things to create a Smart Garbage Monitoring and Clearance System. The IoT-based smart waste management system in this article uses sensor systems to check the waste level above the dustbins. As soon as it was recognized, the system was changed to concern permitted via GSM/GPRS. Where the Microcontroller is used as an interface between the sensor system and the GSM/GPRS system to monitor and integrate an android application for the needed information relating to various levels of waste in various locations.

Mohammed Rafeeq, Ateequrahman, Sanjar Alam, Mikdad. In the Scarp Industry, a work on Automation of Plastic, Metal, and Glass Waste Materials Segregation Using Arduino. In this document, we can see that it is designed to classify trash into metallic waste, plastic waste, and glass waste, so that they can be handled independently for the next step of the process. The approach uses inductive sensors for metallic products and capacitive sensors for dry waste.

T. M. B. Shankar Balu, R. S. Raghav, K. Aravinth, M. Vamshi, M. E. Harikumar, Rolant Gini J. A., work on an Arduino-based Automated Domestic Waste Segregator was offered. We can see that segregation at the primary level builds the groundwork for recycling programs at a higher level and also helps in successful waste collection. The signals from the inductive and capacitive proximity sensors are evaluated using an Arduino UNO, and servo motors are used to move and sort the debris. The sort of waste deposited on the segregating bin and whether the bins are full are displayed on an LCD.

Shamin N, P. Mohamed Fathimal, Raghavendran R, Kamalesh Prakash proposed work on Smart garbage segregation and management system using internet of things and machine learning. In this paper we can see that a smart trash segregation and management device that is connected to the internet of things that detects garbage in the environment. Sensor devices are used to monitor the dustbins, and as soon as it is full, it is emptied. The waste substances in it will be identified and sorted with the help of sensors, and data is immediately sent to a cloud database via IoT. The microcontroller serves as a link between the sensors.as well as an IoT module to differentiate the objects, an ultrasonic sensor is used. Proximity to the waste material the moisture sensor is used to determine the amount of moisture in the air. And the moisture content of the garbage, as well as if there is any moisture in the waste If there is no content accessible, the waste cannot be thrown away. Metal sensors are used to separate metal things, which are then divided into sections. Plastics and biodegradable objects are identified using an image processing method and split into various groups. The data from the dustbins is uploaded to the cloud in real time utilizing IoT. This aids in the efficient and effective removal of waste from the trash can.

Nandhini. S, Mrinal Sharma. S, Naveen Balachandran, K. Suryanarayana, D. S. Harish Ram Prakash proposed work on Electronically assisted automatic waste segregation. In this paper we can see that the robotic arm is set in place and can spin 360 degrees to cover its workspace, and it can work in any flat environment. Within its work space, the robot can transport objects from one location to another, but only one object at a time. The major goal is to create a robot that can pick up household waste such as paper, plastics, and board from one location and deposit it in the classifier platform.

Pratyaksh P. Rao, Siddhanth P. Rao, Rohit Ranjan proposed work on Deep learning based smart garbage monitoring system. In this paper we can see that a deep learning model was utilized to estimate future garbage levels. With an accuracy of 80.33 percent, the suggested neural network model was able to forecast garbage levels. The findings support the accuracy of the rubbish level forecast. Bar charts were also used to analyses the data. The combination of IoT and deep learning can result in a technological revolution that can be used to trash management. As a result, forecasting and examining garbage levels may assist municipal authorities in implementing an efficient garbage management system and reducing rubbish bin

overflow.

From the literature survey that we have gone through we have decided to improve the project and make it useful and productive the society.

3. Block Diagram

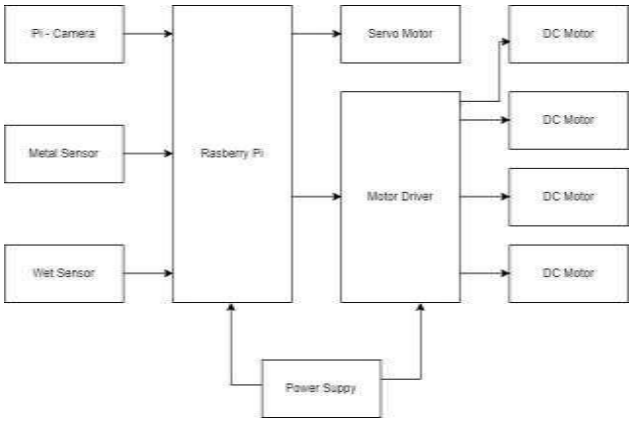

Fig. 1. Block diagram of waste segregation using Raspberry Pi

Raspberry pi 3B: Raspberry Pi is very easy to integrate with internet and also it can handle high resolution camera module. An easier communication bridge can be established between Motor driver and raspberry pi.

Motor Driver L293D: L293D is a typical motor driver IC which allows dc motor to drive on either direction. L293D is a 16-pin IC which can control a set of two dc motors simultaneously in any direction.

Power supply: Rechargeable power bank batteries which 10,000mah are used to power all the servo and helps in multiple reusability.

Pi Camera: It is a portable light weight camera that supports Raspberry Pi. It communicates with Pi using MIPI (mobile industry protocol interface) camera serial interface protocol.

Metal Sensor: Is used to detects the presence of metal nearby.

Wet Sensor: Is used to estimate volumetric water content.

IR Sensor: Is used to measure and detect infrared radiation in its surrounding environment.

4. Conclusion

This paper has been addressed an overview of many technologies and its applications on Waste Segregation, and also made a review on existing systems. The robotic based waste segregation is very effective to detect the waste and segregate the waste into different categories.

There are many sensors used to detect the waste in the surroundings and the data is sent to the controllers, from which the robot moves accordingly. The sensors used over here are IR sensor, wet sensor, metal sensor, pi camera, motor driver, power supply etc. These above components are used for the function of the robot for segregating the waste. This method can be used for a clean environment and help to reduce pollution.

Acknowledgment

I would like to express my special thanks of gratitude to my college Atria Institute of Technology and guide Dr. Mangala Gowri who gave us this opportunity to do this project on “Robotic Waste Segregation using Raspberry Pi”. This is has given us a lot of experience and knowledge about this paper.

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