



# Smart Plastic Management System - A Literature Review

Sruthi Pankajakshan  
Department of Computer  
Engineering  
SIES Graduate School of  
Technology  
Navi Mumbai, India  
sruthi.nanatty@gmail.com

Ishwari Kadam  
Department of Computer  
Engineering  
SIES Graduate School of  
Technology  
Navi Mumbai, India  
kadamishwari239@gmail.com

Pooja Nandekar  
Department of Computer  
Engineering  
SIES Graduate School of  
Technology  
Navi Mumbai, India  
poojanandekar24@gmail.com

**Abstract**— In India, the amount of plastic wastage produced is significantly increasing as there are a variety of applications including as food packaging covers, bags, sachets, etc. This project uses IoT for segregating plastic from non-plastic and also measuring the level of plastic waste in a bin. The project also uses Machine learning algorithm of image processing for further classification of types of plastic. This paper presents a broad survey of such plastic management systems based on IoT and ML techniques.

**Keywords** — plastic management, IoT, sensors, waste segregation, image processing, classification

## I. INTRODUCTION

Today, plastic is a major concern in our country for having a better environment. There is a buildup of domestic and commercial sources of plastic garbage. To track and collect the plastic a smart IoT based system is proposed which will segregate plastic from other types of waste and also measure the amount of waste collected in a bin using sensors. This information will be passed on to the cloud. On the other hand, using Machine learning algorithms such as image processing we can further get the classification of different types of plastic material being used for the dumped plastic product which will be beneficial for waste management as to whether it is recyclable or not. When waste is segregated into different types such as metal, plastic, it has a higher potential for recovery, recycling and reuse.

## II. LITERATURE SURVEY

Plastic products have a wide variety of uses and are found everywhere. They come in different shapes, sizes and material used. There are various types of plastic material such as polyethylene terephthalate (PET), High-Density Polyethylene (HDPE), Polyvinyl chloride (PVC), low-density molecules (LDPE), Polypropylene (PP), Polystyrene (PS), polycarbonates (PC). These types can be identified to further categorize into disposable or recyclable plastic items.

[1] A paper named IoT based design for a smart plastic waste collection system published in 2019 discussed the management of plastic waste from its source point. The proposed system aimed to help municipalities for monitoring and managing waste collection and disposal in a centralized

manner. The model was completely IoT based and used ultrasonic, IR sensors, Arduino, RFID tags, LCD and cloud. The idea was installing smart automated bins at particular locations which detected the presence of plastic waste in a bin and also the amount of waste collected was calculated and communicated to the server using the WIFI module. This model can further be expanded to segregation of plastic waste by the type of plastic material used.

[2] In the year 2021, a paper named IoT Based System for Garbage Segregation proposed an IoT approach for segregation of dry, wet, metallic and plastic waste. The goal was to create a system which will collect and segregate the waste in a way which can be sent directly to the recycling plant. In this paper, various methodologies were discussed such as use of optical sensors with a mechanical separating system, image processing to classify waste as recyclable and non-recyclable materials, etc. The system proposed in this paper used Raspberry Pi cameras to capture waste, process it through image processing and identify whether it is plastic/paper and collect it into a biodegradable bin and for capturing metal objects, an inductive sensor is used. This Automated Material Segregation system is able to identify metallic and plastic waste.

[3] The paper Automatic Plastic Waste Segregation and Sorting Using Deep Learning Model published in the year 2020 described a system for collection, classification and sorting of different types of plastic bottles. Convolution Neural Networks were employed to classify the plastic bottle images into different classes such as PP, HDPE and PET. Feature extraction method using the surf algorithm was implemented for detecting the features and calculating the feature vectors of the object in the image. The calculated feature vectors were then used for training and testing the neural network model. The CNN model provided a good accuracy for recognition and detection of bottles. The proposed model ensured effective automated waste management without any human intervention.

[4] In the paper Image Classification Approaches for Segregation of Plastic Waste Based on Resin Identification Code published in the year 2022 various approaches to classify different types of plastic waste on the basis of resin identification code were discussed. The system was modeled on the fact that plastic waste made up of the same resin code showed more similarity than those made from different resin codes. The model was built using the Siamese and triplet loss

convolutional neural network. For evaluating the results obtained, a 10-fold-cross validation method was used to determine the accuracy. This paper proposed a CNN based classification model which classified plastic waste based on the images.

### III. Conclusion

Plastic Waste is a major concern today and various approaches have been developed for its management either implementing some traditional methods or using advanced technologies. Based on findings, our model will be using two techniques primarily IoT technology for smart segregation of plastic waste from non-plastic waste and in second phase machine learning algorithm to get classification of various types such as PET, PP, HDPE, etc.

to make decisions for plastic disposal or recycling methods ahead.

### REFERENCES

- [1] Anju Pratap, Aiswarya Maria Joshy\*, Manumol Mathew, Elizebeth John, Jasmine Treesa James “IoT based design for a smart plastic waste collection system” International Conference on Sustainable Computing in Science, Technology & Management (SUSCOM-2019), February 2019
- [2] Radhamani.V, Dr.B.Priya, Dr.Asha.A, Gokul. S , Aravindh. RM “IoT Based System for Garbage Segregation” Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 4, 2021, Pages. 15415 - 15420, April 2021
- [3] Meeradevi, Sharavana Raju K. Vigneshkumaran, “Automatic plastic waste segregation and sorting using deep learning model, vol. 9, issue 02, February 2020.
- [4] Shivaank Agarwala, Ravindra Gudi, and Paresh Saxena, “Image classification approaches for segregation of plastic waste based on resin identification code,” Transactions of Indian National Academy of Engineering 7(4), pp.739-751, February 2022.

