

Garbage Classification System

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Abstract: *The accumulation of garbage in the urban area is a great concern, and it would result in environmental pollution and may be hazardous to human health if it is not properly managed. In this paper, proposes an intelligent garbage material classification system, using YOLOv5 algorithm. The system classifies garbage accurately that can save manpower and improve work efficiency. The purpose of the system is to build a real-time application which recognizes the type of garbage and categorizes it into a defined category. The experiment result shows that the proposed system can accurately identify the garbage's type.*

Keywords: Deep Learning, YOLOv5, Garbage Classification, Computer Vision

I. INTRODUCTION

Garbage generation has expanded vastly around the world in recent decades, and there are no signs and symptoms of it slowing down. By 2060, global municipal garbage generation is anticipated to have extended by roughly 70 percent to 3.4 billion metric tons. However, much less than 20 percent of garbage is recycled every year, with large portions still dispatched to landfill sites. A huge quantity of garbage is increasing each and every day and only less amount of garbage is recycled. The only solution to this problem is to identify and classify the garbage at the initial stage by itself. These system can detect different type of garbage in real-time. The project aims to reduce the physical effort and effectively segregate the garbage's. The proper separation process of garbage is managed so as to get less risk to our health and also speed up recycling process.

II. PROPOSED SYSTEM

The proposed system, automatic Garbage Classification System using Deep Learning aims to reduce manual effort and time consuming segregation process of garbage by utilizing computer vision and machine learning algorithm. It offers accurate real-time garbage classification method than the traditional segregation process. The proposed system is developed based on YOLOv5 object detection algorithm. The paper establish a garbage dataset with seven kind of common garbage such as paper, cardboard, plastic, metal, glass, bottle, food waste. The characteristic information of the input image is extracted and the image is divided into $N \times N$ grids. If the center of an object falls on a grid, that grid is responsible for predicting the object.

III. METHODOLOGY

The proposed system utilizes a methodology consisting of several steps for classifying different type of garbage's in real-time. First, garbage image acquisition are made the through data cleaning and labeling, a garbage dataset was constructed. After training, the garbage classification model was obtained for garbage detection. The model is then tested on separate datasets to evaluate its performance. Once validated the model is integrated into a real-world for classifying different type of garbage. This methodology aims to classifies garbage accurately that can save manpower and improve work efficiency

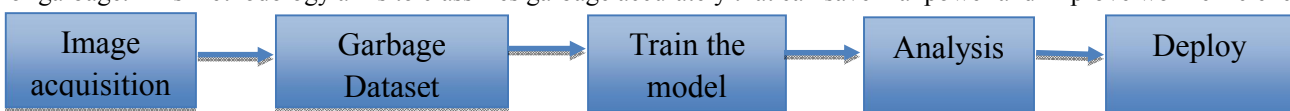


Fig. 1. Work flow

IV. ALGORITHM MODEL

In the field of object detection, YOLO is a typical detection algorithm based on deep learning. It has a good global receptive field, grid division, anchor frame matching and multi-semantic fusion detection mechanism. Compared with the traditional object detection methods, YOLO model recently predict bounding box and probabilistic probability of image object through CNN, so as to effectively improve detection accuracy. YOLOv5 is based on PyTorch framework, and its detection speed is very fast, which can reach 140 fps. Compared with previous YOLO series, YOLOv5 is faster and accuracy, its model is light and suitable for deployment to embedded devices. YOLOv5 adopts the same Mosaic data enhancement method as YOLOv4. By stitching the input image by random scaling, random cropping and random arrangement, the detection performance of small target is improved.

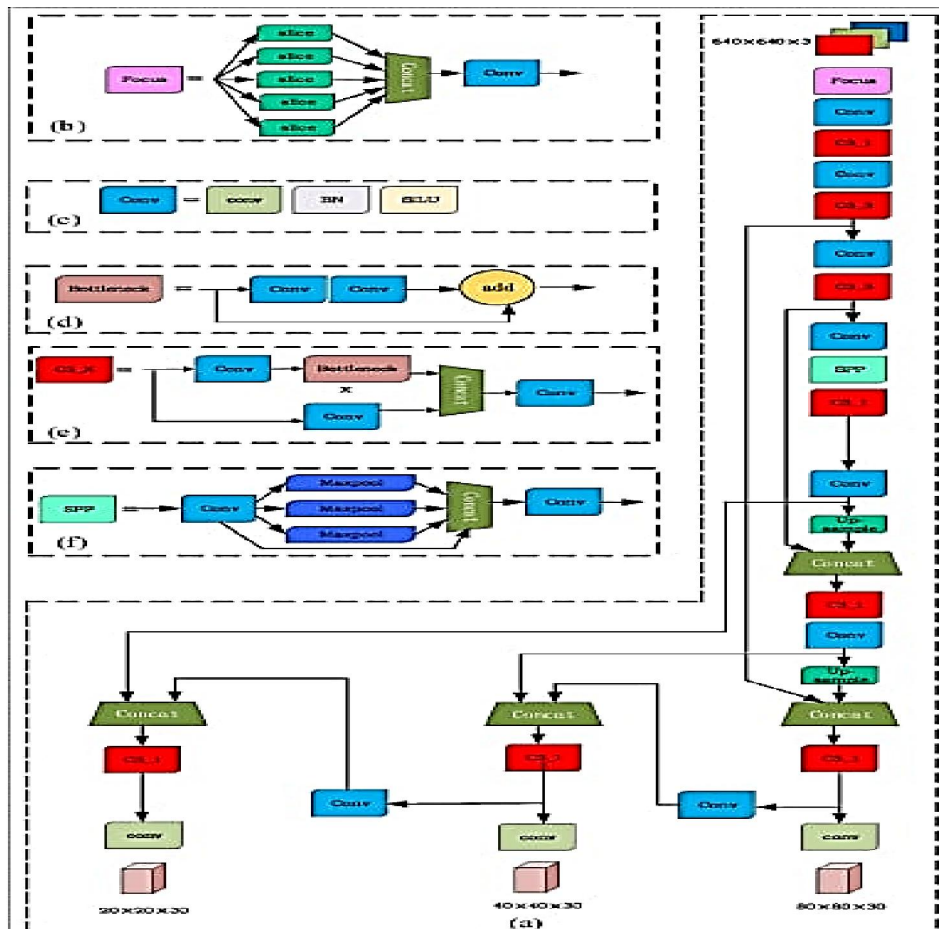


Fig.2. Structure of YOLOv5

IV. CONCLUSION

This paper implements a garbage classification model based on deep learning. A garbage classification model based on YOLOv5 object detection method. Firstly common daily garbage category, seven typical kinds of garbage were selected, data cleaned, labeled, and a garbage dataset. Further the model was built and trained on our dataset. The experimental result shows an accuracy of more than 98%. In real scene the model is deployed and the test result shows that this garbage classification model can accurately identify different garbage types and is able to achieve high detection accuracy. These results show that the proposed method is successful in classifying different types of garbage. Suggest that the proposed method offers a new method to be used in other target environments to classify garbage for the effective garbage management purposes.

V. FUTURE SCOPE

There are many ideas that is to be included in the coming updates. By utilizing robotic arms technology and mechanical systems with various end-effectors to physically separate and sort garbage into different bins based on their type. Also the use microcontroller and multiple sensors the overall system performance and accuracy of the garbage classifier can improve.

REFERENCES

- [1] Garbage Detection and Classification using Faster-RCNN with Inception-V2. Asif Iqbal Middy, Debjani Chattopadhyay, Sarbani Roy in 2021 IEEE 18th India Council International Conference (INICON)
- [2] Garbage Classification Using Random Forest Algorithm Dr.S. Ramesh (member, ieee), Dr.J.S. Kanchana(Associate Professor), K.P. Siranjeevi , M.N. Yashwanth Kumar. In 2022 Journal of Emerging Technologies and Innovative Research.
- [3] Trash Classification: Classifying Garbage using Deep Learning By the author Ishika Mittal, Anjali Tiwari, Bhoomika and Pratibha Singh. In 2020 Journal of Engineering Science.
- [4] Intelligent Waste classification System Using Deep Learning Convolutional Neural Network by the author Adedeji Olugboja, Zenghui Wang. In 2019 2nd International Conference on Sustainable Materials Processing and Manufacturing (SMVM-2019).