SMART STREET-AN (AI) ARTIFICIAL INTELLIGENCE POWERED STREET GARBAGE DETECTION AND ALERT SYSTEM

V.RAJESH
Assistant Professor
Department of CSE
Teegala Krishna Reddy Engineering College, Hyderabad

THOTAPALLY SANTHOSH
Department of CSE
santhoshthotapally7@gmail.com
Teegala Krishna Reddy Engineering College, Hyderabad

GANGA SHIRISHA
Department of CSE
Gangashirisha13@gmail.com
Teegala Krishna Reddy Engineering College, Hyderabad

KANUGULA ROHITH
Department of CSE
Rohith02627@gmail.com
Teegala Krishna Reddy Engineering College, Hyderabad

Abstract- The aim of this research is to develop a smart waste management system using TensorFlow based deep learning model. It performs real time object detection and classification. The bin consists of several compartments to segregate the waste including metal, plastic, paper. Object detection and waste classification is done in TensorFlow framework with pre-trained object detection model. This program classifies an input image as clean/unclean. This can later be used to automatically send alerts to respective authorities when a street is found to be unclean. Once a street is found to be unclean, it automatically sends an email alert to the respective authorities who can then take action. It is impossible to manually identify streets that require cleaning at a given time. With "CCTV Street Garbage Detection And Alert System", authorities can get updates about the streets that are unclean.

I. INTRODUCTION

Monitoring and cleanliness assessment of garbage area in urban scenes mainly rely on manual inspection and photographic record, which makes it a difficult and time consuming task. During the inspection process, human intervention and cumbersome problems often happen. The quality of sanitation work has been affected. Different from pedestrians, vehicles and other objects, garbage have no relatively clear definition. Due to the judgment of garbage always has certain subjectivity, in different situations, it will produce different judgment results. Since the diversity of scenes where garbage appears, accuracy of test results will be affected. With the development of smart city, we expect to provide an automatic detection method of urban garbage to help alleviate urban garbage problems. Before the development of deep neural networks, features were manually designed, then followed by a classifier. Some research focused on the classification and recycling of garbage a few years ago. For example, Sudha S et al. proposed a model for classifying objects as biodegradable and non-biodegradable. Although the traditional object detection already has some mature techniques, due to the morphological diversity, illumination diversity, background diversity and other factors of the target object, the detection precision for the unfixed form objects such as urban garbage is still a tough problem to solve. The past decade has witnessed a rapid development of massive data and high-performance computing systems such as graphics processing units (GPUs).Now regionbased CNN detection methods have dominated many tasks of computer vision. It is such an exciting area that can extract the high-level features and the hierarchical feature representations of the objects. Girshick et al. introduced a region-based CNN (RCNN) for object detection, from 2014 to now, R-CNN, Fast R-CNN, Faster R-CNN, ION, HyperNet, SDP-CRC, YOLO, G-CNN, SSD and other increasingly fast and accurate object detection methods have emerged.

Scope of the Project

The scope of the project is Monitoring and cleanliness assessment of garbage area in urban scenes mainly rely on manual inspection and photographic record, which makes it a difficult and time consuming task. Traditional waste management system operates based on daily schedule which is highly inefficient and costly. The existing recycle bin has also proved its ineffectiveness in the public as people do not recycle their waste properly. With the development of smart city, we expect to provide an automatic detection method of urban garbage which makes it easy. This Machine Learning based program is built using tensorflow and classifies images from any CCTV camera to identify streets that are unclean. The model is trained with hundreds of images of clean and unclean images so as to let the program identify a new image as clean or unclean.

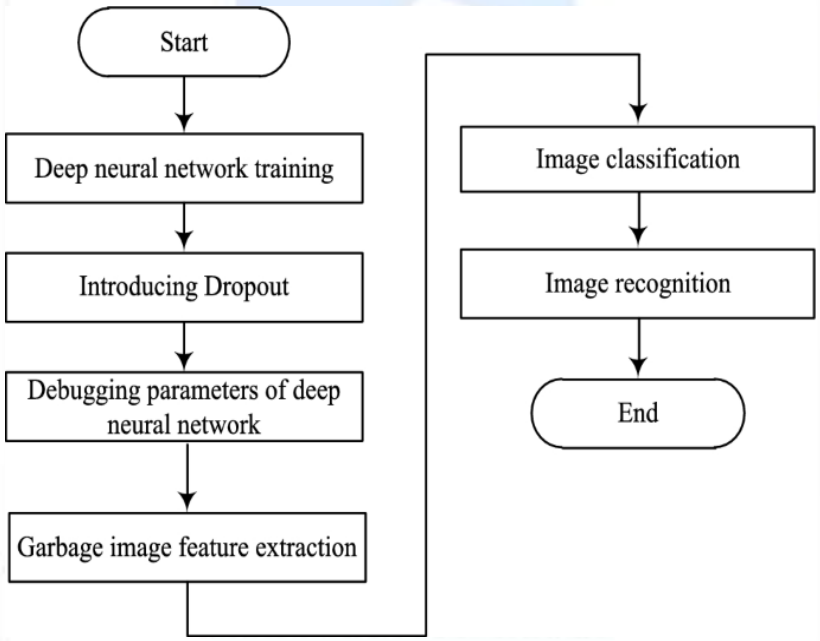
II. LITERATURE SURVEY

The cleanliness of city street is directly related to the city's public image. To maintain the streets clean, different methodologies have been developed in the past years. These methodologies can be classified into two directions: evaluating the street cleanliness, monitoring the waste. In order to evaluate the street cleanliness, Sevilla et al. proposed a clean index for measuring the level of cleanliness of the

city streets, such that the quality and governance of public services can be evaluated. However, the process of measurement requires a lot of human intervention like collecting data and rating data. Lopez et al.developed an App to evaluate the street cleanliness and waste collection service. Specific methodologies for calculating and evaluating 21 indicators have been designed to give a true reflection of the level of city street cleanliness. Although this App can collect information from the user end and store information in the application database, it still needs users to fill the information manually in the App. Li et al.put forward a multi-level assessment system and showed how the cleanliness status of streets is collected by using mobile stations. The results are transmitted through city network, analyzed in the cloud and presented to city administrators online or on mobile. Regarding monitoring the waste, Rovetta et al. used sensors to monitor waste bins based on distributed sensor technology and geographical information systems. Begur et al. focused on illegal dumping problems in the City of San Jose. They proposed an innovative smart mobile-based service system, which supports real-time illegal dumping detection, altering, monitoring, and management. Alfarrarjeh et al. presented an automating geo-spatial classification approach to determine the level of street cleanliness. The experiments compared various combinations of classifier and image features, which show that SVM classifier based on CNN image features obtained good values on both precision and recall. Balchandani et al. proposed a deep learning framework for smart street cleaning, which aims at providing any city with an automated way to monitor the cleanliness of its streets. It is a good idea to use deep leaning technology to automatically detect and classify litter, but this paper only provided with a simple example about separating the street and the curb, and the performance of detection and classification was not discussed. The proposed approach in this paper is also based on recent advances in deep learning. Related work in deep learning is introduced in the next paragraph.

III Methodology

With the development of Artificial Intelligence (AI), the traditional waste management system can be replaced the system to perform real time monitoring and allow for better waste management. The aim of this research is to develop a smart waste management system using TensorFlow based deep learning model. It performs real time object detection and classification. The bin consists of several compartments to segregate the waste including metal, plastic, paper. Object detection and waste classification is done in TensorFlow framework with pre-trained object detection model. This object detection model is trained with images of waste to generate a frozen inference graph used for object detection which is done through a camera.



Existing System

- Traditional waste management system operates based on daily schedule which is highly inefficient and costly The use of OpenCV requires complex code to perform hand tracking.
- The existing recycle bin has also proved its ineffectiveness in the public as people do not recycle their waste properly.

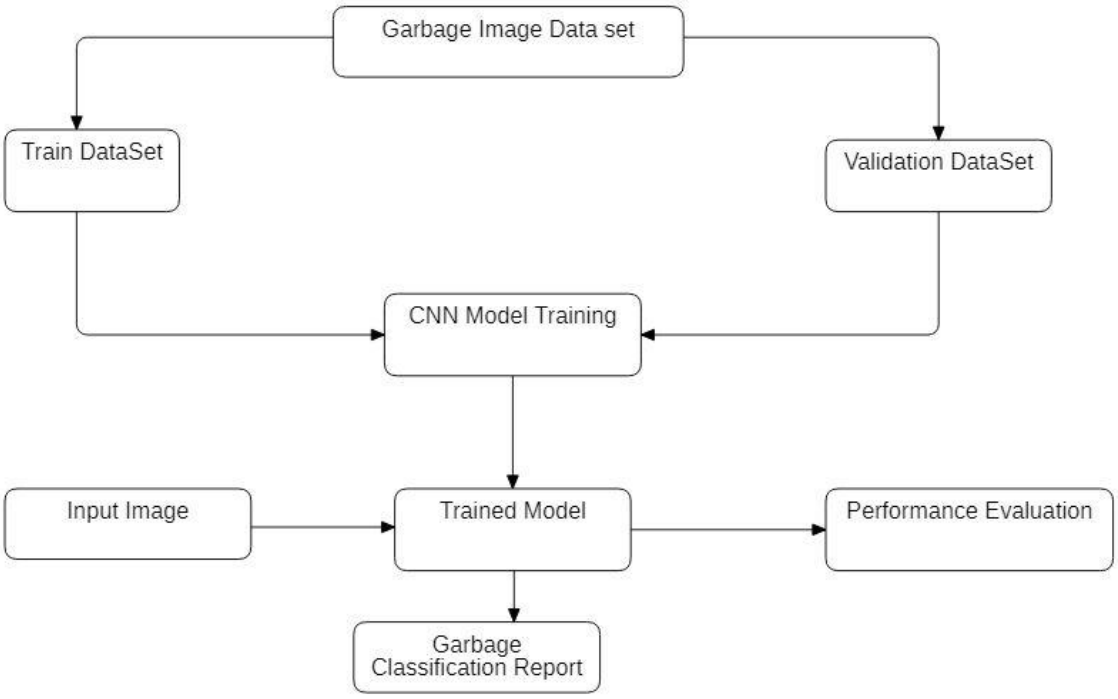
Proposed System

- We develop a Faster R-CNN open source framework with region proposal network and ResNet network algorithm, using ResNet network to replace the previous VGG network as the basic convolution layers.
- To optimize the performance of the model, we collect urban scene images containing garbage and urban scene images without garbage. By using finetuning strategy, we apply the pre-training model parameters which has been trained in coco dataset to our network.
- We propose a dataset fusion strategy, which integrates the garbage dataset with several other datasets of typical categories in urban scenes.

IV Algorithms

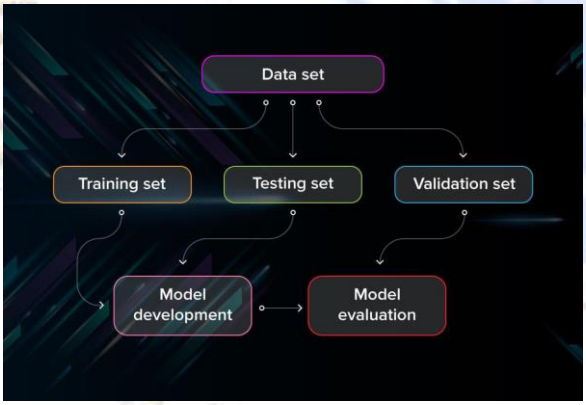
Convolutional Neural Network

A convolutional neural network (CNN) is a type of artificial neural network used in image recognition and processing that is specifically designed to process pixel data. A pre-trained model is created by someone else to solve a similar problem. Instead of building a model from scratch to solve a similar problem, you use the model trained on another problem as a starting point.

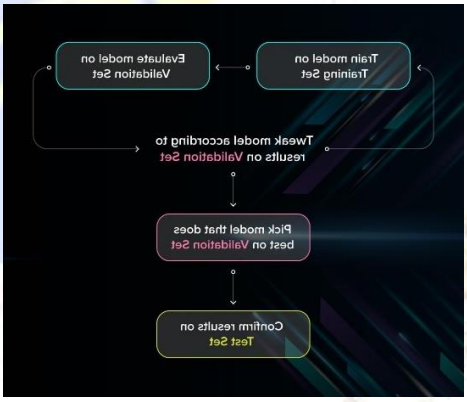


System Architecture

V RESULTS



i. Model Test



ii. Model Test Result

(i)

(ii)

VI CONCLUSIONS

Based on the Faster R-CNN object detection framework, we present a way of using the ResNet network algorithm as the convolutions layers, which improves the accuracy of object detection and location. We achieve the experiment results as expected, the network demonstrates its efficient generalization ability when the small region objects occur. Our data fusion strategy overcomes region misdetection problem. Finally, the near-real time and high-precision detection of garbage in urban scenes is realized, which has high practical value. It remains an open challenge to further reduce the detection time with the aim of rapidly and high precision detectio

VII REFERENCES

- https://www.w3schools.com/
- https://www.mysql.com/
- https://github.com/webyog/sqlyog-community/wiki/Downloads
- https://github.com/
- https://www.djangoproject.com/
- https://www.jetbrains.com/pycharm/
- https://smartstreet.mystrikingly.com/
- https://www.alertsystems.co.uk/