iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 **Issue:** VI **Month of publication:** June 2023

DOI: https://doi.org/10.22214/ijraset.2023.54467

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue VI Jun 2023- Available at www.ijraset.com

Litter Detection using SSD Mobilenet V2

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Abstract: It is a frequent sight to see people throwing banana peels, tin cans, plastic covers and bottles. Many people while using roads spit there and throw wrappers and other wastes on the roadsides. It is disappointing to see the laziness and indifference of people ruining our environment.
Birds and Animals consume these waste products, confusing them for food. They don't survive. Our system uses the wonders of modern computer vision technology to detect cases of littering from camera video streams. Litter objects in low altitude imagery collected by an unmanned aerial vehicle (UAV) during an autonomous patrol mission. We use the OpenCV library for object detection. Python is used for the core of the project.
We have a database of images of items that are likely to be litter. Tin cans, plastic bottles, plastic bags, etc. More objects can be added as the system gains adoption.

I. INTRODUCTION

It is a frequent sight to see people throwing banana peels, tin cans, plastic covers and bottles. Many people while using roads spit there and throw wrappers and other wastes on the roadsides. It is disappointing to see the laziness and indifference of people ruining our environment.
The problematic waste is usually localized and picked up by designated personnel, which is a tiresome, time consuming task. Despite human beings, other natural living beings like animals and birds are also affected by the littering of waste. They consume waste products, confusing them for food. Sometimes it results in death. So this project helps the blogging site to create a good ecosystem.

II. DATASET

The first and foremost part of creating a model is to collect dataset. Our target is to create a litter detection model so the dataset we need to collect or create is an image dataset.
We created a dataset using our phone camera but it was insufficient and the quality of the images which we got were less . It was not enough to train a model using deep learning algorithm so we decided to use dataset which is already available. We referred and decided to use dataset from kaggle. We took TACO[1] dataset from kaggle. The dataset already contained image annotations file so we didn't do image annotation.

III.EXPERIMENTS

This section contain model creation and validation

A. Model Creation

We created the model using the SSD[2] MobileNet V2 algorithm. We downloaded the predefined COCO[3] model and reconstructed the model with the TACO dataset using the object detection package provided by tensorflow.

B. Model Validation

We performed the model test by passing images and it showed almost 90% accuracy. Further we conducted a live prediction and ensured our model works fine with the real world.

[1] TACO is an open image dataset for litter detection and segmentation, which is growing through crowdsourcing.
[2] Single Shot Detector algorithm is a popular algorithm in object detection
[3] Common Objects in Context dataset is a large-scale image recognition dataset for object detection, segmentation, and captioning tasks

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We performed the test with litter and non litter images. The model detected litters and classified them as litter (Fig 1). Those items which are not litters, the model didn't recognise them as litter(Fig 2). Thus ensuring the model only detects things which are litters and not the other items.



Fig. 1 Model detecting litter as litter

IV. CONCLUSIONS AND FUTURE WORK

The model detects litter from images which contains litter. Images which contain non litter are not classified as litter by model so we can assure the model works fine in litter detection.

The model has 90% accuracy but we are considering the

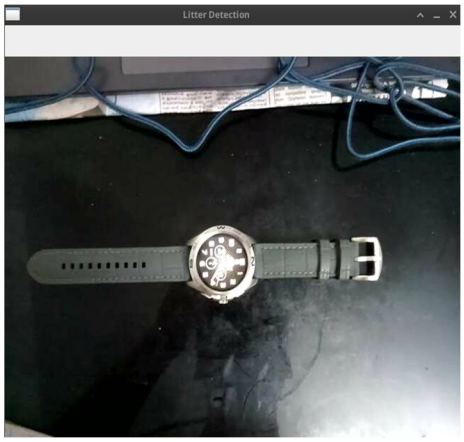
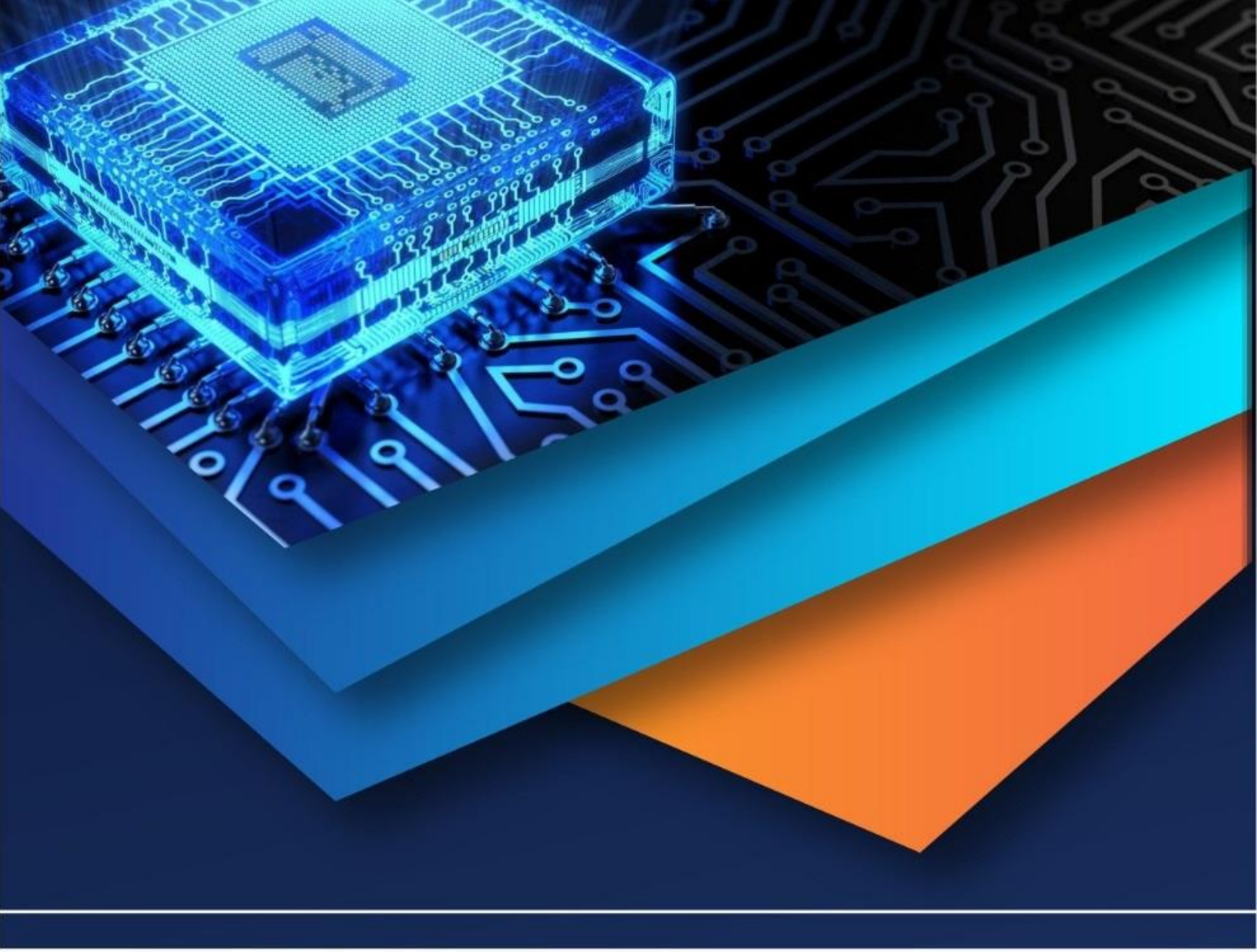


Fig. 2 Model didn't detect non litter as litter

accuracy of the model needs to be increased. More images are to be introduced to identify new litters. External hardware support like drones can be bought and model can be implemented into it. Drone has to be programmed in such a way it doesn't disturb the surroundings while it's doing duty. An arm needed to be attached with the drone to pick the litter. A good camera component is required to effectively capture the images.

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