

Report On **Real Time Object Detection**

Submitted in partial fulfillment of the requirements of the Mini project in
Semester VII of Final Year Artificial Intelligence And Data Science

by

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CERTIFICATE

This is to certify that the Mini Project entitled “**Real Time Object Detection**” is a bonafide work of **Chetan Sapkal (37), Shubhamkar Patra (35)** submitted to the University of Mumbai in partial fulfillment of the requirement for the award of the degree of “**Bachelor of Engineering**” in Semester VII of Final Year “**Artificial Intelligence And Data Science**”.

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Contents

Abstract	i
Acknowledgments	ii
List of Figures	iii
1 Introduction	1
1.1 Introduction	1
1.2 Problem Statement & Objectives	1
1.3 Scope	2
2 Literature Survey	3
2.1 Survey of Existing System	3
2.2 Limitation Existing system or Research gaps	3
3 Methodology	5
3.1 Introduction	5
3.2 Architecture/ Framework/Block diagram	5
3.3 Algorithm or Process Design	6
3.4 Details of Hardware & Software	6
4 Result and analysis	8
4.1 Output	8
4.2 Analysis	9
5 Conclusion	
References	11
Annexure	

Published Paper /Camera Ready Paper (if any)

Abstract

Computer Vision is the branch of the science of computers and software systems which can recognize as well as understand images and scenes. Computer Vision is consisting of various aspects such as image recognition, object detection, image generation, image super-resolution and many more. Object detection is widely used for face detection, vehicle detection, pedestrian counting, web images, security systems and self-driving cars. In this project, we are using highly accurate object detection-algorithms and methods such as R-CNN, Fast-RCNN, Faster-RCNN, Retina Net and fast yet highly accurate ones like SSD and YOLO. Using these methods and algorithms, based on deep learning which is also based on machine learning require lots of mathematical and deep learning frameworks understanding by using dependencies such as TensorFlow, OpenCV, image etc, we can detect each and every object in image by the area object in an highlighted rectangular boxes and identify each and every object and assign its tag to the object. This also includes the accuracy of each method for identifying objects.

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List of Figures:

Sr. No.	Name of Figure	Page no.
1.	Process Design	5
2.	Implementation (Home page)	8
3.	One Object Detection	8
4.	Multiple Object Detection	9

1. Introduction

1.1. Introduction

This project is about how to detect an object. Object detection is a computer vision technique in which a software system can detect, locate, and trace the object from a given image or video. The special attribute about object detection is that it identifies the class of object (water bottle, dining table, sofa, chair, etc.) and their location-specific coordinates in the given image. The location is pointed out by drawing a bounding box around the object. The bounding box may or may not accurately locate the position of the object. Face detection is one of the examples of object detection. We will be able to run it in real time while single or multiple common objects. In the earlier days, object detection has been a big challenge in the field of machine learning. But with advanced technology and object detection algorithms it has become very easy to detect objects accurately. One of its real-time applications is self-driving cars.

Object recognition is a kind of simple process for human beings but for computers it is not that easy task as it consists of a step-by-step process of recognizing, identifying, and locating the objects with input with a given degree of precision. Recognition basically consists of classification and detection. Objects can be divided into their respective classes by performing three steps - feature extraction, localization, and classification on the objects. In classification, the algorithm recognizes the class of the object with a degree of confidence. After classification, we know that the particular class of the objects from which this object belongs. Now, in detection, we put a bounding box around the object in the picture.

1.2. Problem statement & Objectives

The statistics of the World Health Organization (WHO) shows that the number of visually impaired is growing day by day. On average, the number of visually impaired is 285 million of whom 39 million are sightless and the rest 217 million are suffering from low vision. To keep doing their daily tasks, vision-impaired people usually seek help from others.

To develop a system that can identify indoor and outdoor objects. The proposed system assists the visually impaired to recognize several objects and provides an audio message to aware the user.

Objectives:

- The main purpose of object detection is to identify and locate one or more effective targets from still image or video data. It comprehensively includes a variety of important techniques, such as image processing, pattern recognition, artificial intelligence and machine learning.
- It has broad application prospects in such areas such as road traffic accident prevention, warnings of dangerous goods in factories, military restricted area monitoring and advanced human–computer interaction.
- Since the application scenarios of multi-target detection in the real world are usually complex and variable, balancing the relationship between accuracy and computing costs is a difficult task.

1.3. Scope

The life of a blind person is quite challenging. They face lots of problems in their daily life especially when they are traveling from one place to another, so we are trying for them also. The future scope of object detection technology is in the process of proving itself, and much like the original Industrial Revolution, it has the potential to free people from menial jobs that can be done more efficiently and effectively by machines.

2. Literature Survey

Research Paper 1: Object Detection and Recognition in Images

This paper[1], Here, object detection is a single regression problem which detects directly from bounding box coordinates and class probability. Every object has its own class such as all circles are round, which are used while recognizing the objects. At the prediction time, our model generates scores for the presence of the object in a particular category. It makes predictions with a Single network evaluation. Here object detection is a regression problem to spatially separated bounding boxes and associated class probabilities. This paper helped us realize the importance of Object Detection on a deeper level and also helped us get aware of various challenges we might face in the process of Real Tim Object Detection.

Research Paper 2: A Real-Time Object Detection Algorithm Optimized for Non-GPU Computer

In this paper[2], This paper[1], —This paper focuses on YOLO-LITE, a real-time object detection model developed to run on portable devices such as a laptop or cellphone lacking a Graphics Processing Unit (GPU). The model was first trained on the PASCAL VOC dataset then on the COCO dataset, achieving a mAP of 33.81% and 12.26% respectively. YOLO-LITE runs at about 21 FPS on a non-GPU computer and 10 FPS after implemented onto a website with only 7 layers and 482 million FLOPS. Through these Paper we get to know about various Dataset like “COCO Dataset” and also YOLO Algorithm

Research Paper 3: A Real-Time Object Detection System on Mobile Devices

This paper[3] shows that increasing need of running Convolutional Neural Network (CNN) models on mobile devices with limited computing power and memory resource encourages studies on efficient model design. In this study, they propose an efficient architecture named PeleeNet, which is built with conventional convolution instead.. This paper helped us realize the real-time prediction for image classification and object detection tasks on mobile devices.

Research Paper 4: Real-time object detection method for embedded devices

This paper[4] This paper proposes an improved YOLOv4-tiny method in terms of network structure. To reduce the consuming time of object detection, they use two same ResBlock-D modules to replace two CSPBlock modules in YOLOv4- tiny network to simple the network structure. This helped us to understand the YOLOv4-tiny method has Fatser Speed then YOLOv3-tiny.

3. Methodology

3.1. Introduction

Object detection is used in industrial processes for the identification of different products. So, you want your machine to only detect objects of a particular shape, you can achieve it very easily for e.g., Hough circle detection transform can be used for detecting circular objects. Identification of unwanted or suspicious objects in any particular area or more specifically object detection techniques are used for detecting bombs/explosives. It is also even used for personal security purpose. Like this there are various application of object detection.

Proposed System:

The main purpose of object detection that it deals with identifying object at real time. It can detect single or multiple objects at the same time. A box will be drawn around the object. This application will show the confidence level. The confidence level indicates that how much confident our application is in detecting object and provide an audio message.

Activate camera: - User open the camera by clicking start video button on screen.

Object Detection: - User can click on start detection button and detect single or multiple objects in real time.

Dataset Comparison: - Real time Image is compared with existing dataset.

System Result: - After the object is detected, a box is drawn around the object and a label (object name) are displayed on the screen. The user can also see the confidence level of the software.

3.2. Architecture/ Framework/ Block diagram:

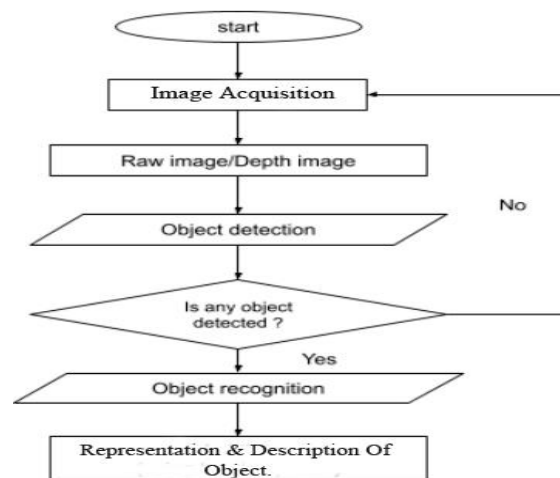


Fig 1: Process Design

3.3. Algorithm or Process Design:

Single Shot Detector (SSD) is a method for detecting objects in images using a single deep network. The SSD approach discretises the output space of bounding boxes into a set of default boxes over different aspect ratios. After discretising, the method scales per feature map location. The Single Shot Detector network combines predictions from multiple feature maps with different resolutions to naturally handle objects of various sizes. SSD completely eliminates proposal generation and subsequent pixel or feature resampling stages and encapsulates all computation in a single network. Easy to train and straightforward to integrate into systems that require a detection component.

SSD has competitive accuracy to methods that utilise an additional object proposal step, and it is much faster while providing a unified framework for both training and inference.

Working:

To build deep learning-based real-time object detector with OpenCV it will need to:

- (1) firstly login the page, access our webcam/video stream in an efficient manner
- (2) apply object detection to each frame.

When objects detect in the input frame. It's time to look at confidence values.

Start by looping over our detection, keeping in mind that multiple objects can be detected in a single image.

It will also apply a check to the confidence (i.e., probability) associated with each detection. If the confidence is high enough (i.e. above the threshold), then it will display the prediction as well as draw the prediction on the image with text and a colored bounding box.

3.4. Details of hardware & software:

Hardware Requirements:

- I3 Processor Based Computer or higher
- Memory: 2 GB RAM
- Hard Drive: 50 GB
- Monitor
- Internet Connection

Software Requirements:

- Windows 7 or higher
- Programming language: Python
- IDE used: Jupyter notebook
- Technology used: Opencv ,Tkinter

4. Result and Analysis

4.1. Output

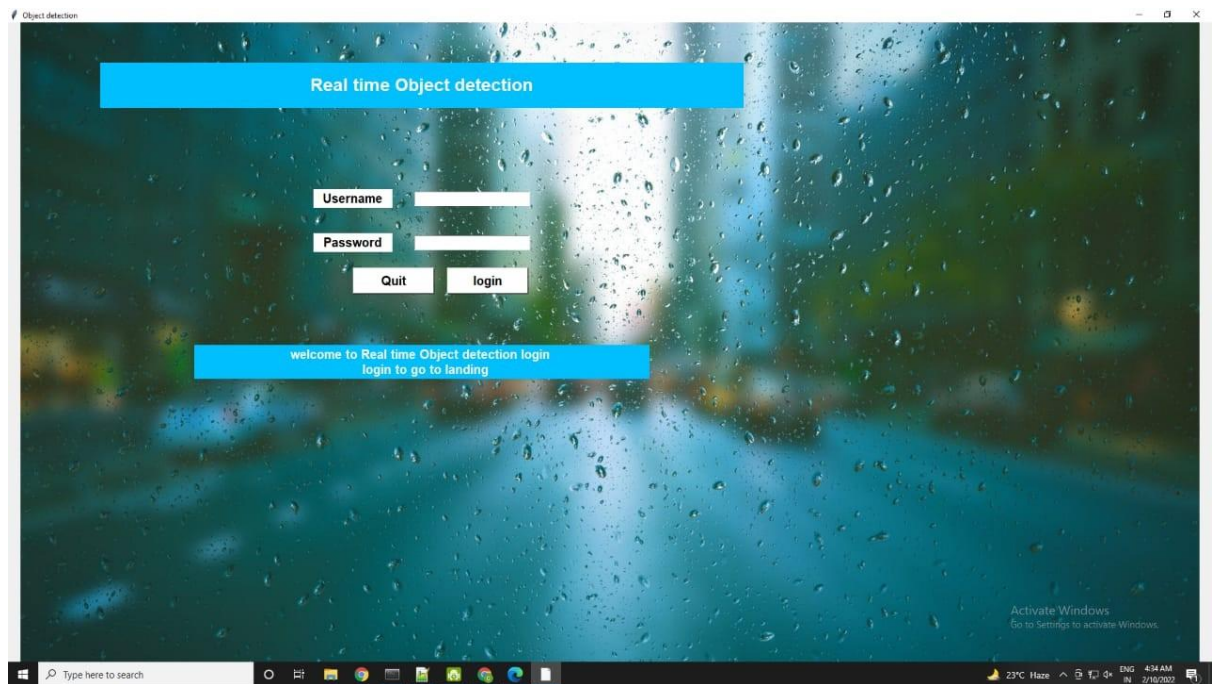


Fig 2: Implementation (Home page)

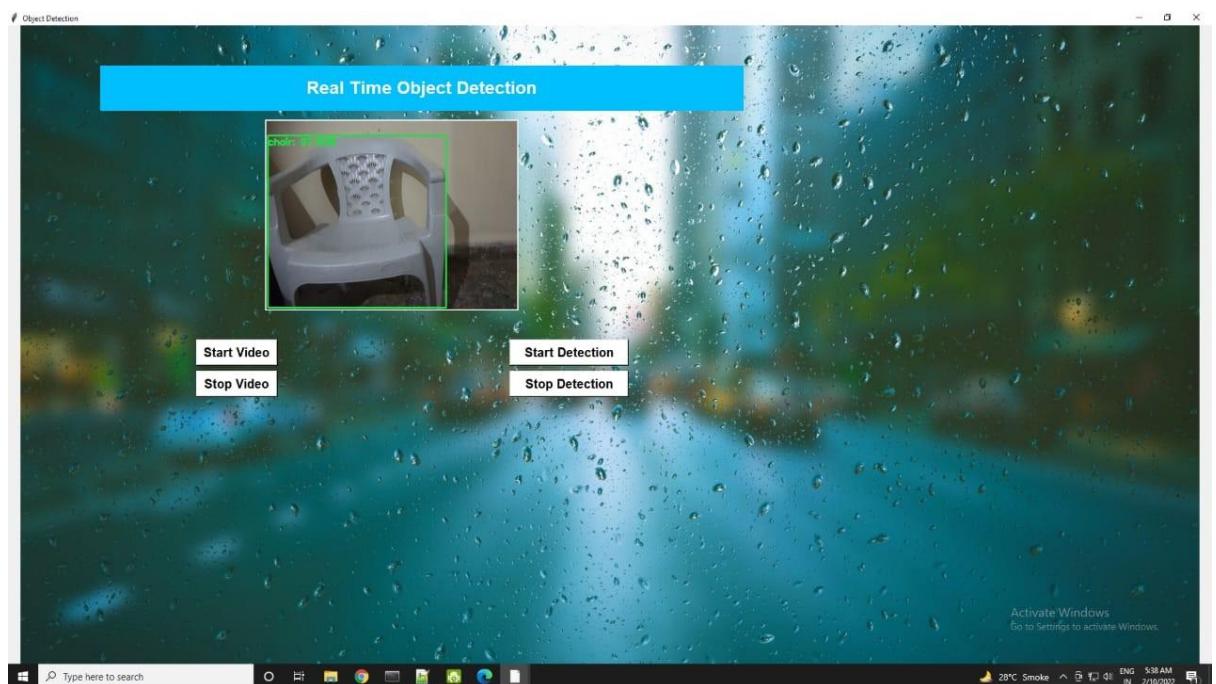


Fig 3: One Object Detection

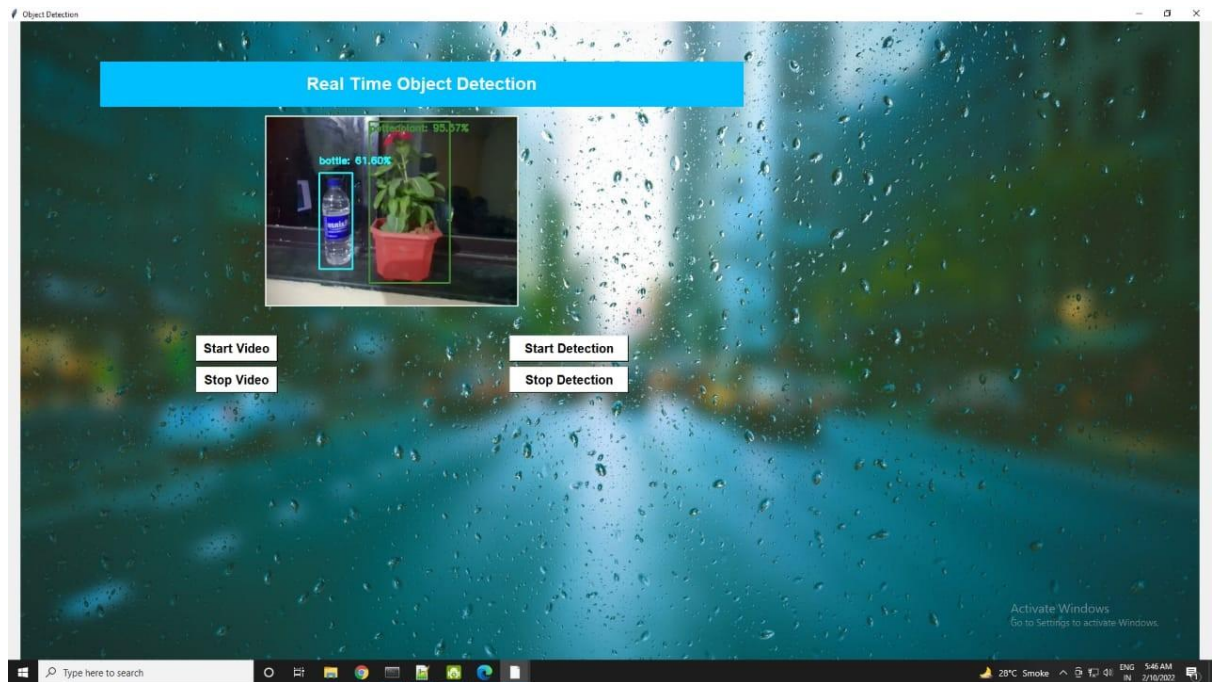


Fig 4: Multiple Object Detection

4.2. Analysis:

Feature understanding and matching are the major steps in object detection and should be performed well and with high accuracy

The goal of object detection is to recognize instances of a predefined set of object classes (e.g. {chair, water bottle, sofa, dinning table, people, cars, bikes}) and describe the locations of each detected object in the image using a bounding box

5. Conclusion

With the help of OpenCV it has become very easy to implement Real Time Object Detecion which have made this task faster and simpler. This project helps us to build and learn various aspects of programming. In future we will make these project compact which will result in Application for Blind People.

6. References

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