Journal of Engineering Sciences

Vol 12, Issue 7, July/2021
ISSN NO:0377-9254

HUMAN & OBJECT DETECTION USING SURVEILLANCE SYSTEM

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ABSTRACT: Object detection is a subfield of computer vision that deals with the localization and identification of objects. Object localization and identification are two distinct tasks that are combined to achieve the single goal of object detection. Object localization is the process of specifying the location of an object in an image or using a surveillance camera, whereas object identification is the process of assigning the object to a specific label, class, or description. Developers can use computer vision to do things like embed surveillance tracking systems for security enhancement. To overcome the detection issue, tracking related to object movement and appearance is used. The majority of the algorithm focuses on the tracking algorithm to smoothen the video sequence. Few methods, on the other hand, make use of previously available information such as object shape, colour, texture, and so on. This study discusses and analyses a tracking algorithm that combines the above-mentioned object parameters. The purpose of this paper is to analyze and review previous approaches to object tracking and detection using images and surveillance camera sequences at various stages. Identify the gap and propose a new approach to improve object tracking over images and surveillance camera.

KEYWORDS : Open CV, MobileNet SSD, Deep Learning, Caffe Framework.

1. INTRODUCTION

Recently, advances in technology and lower camera costs have favoured the development of large-scale camera networks. With an increasing number of cameras, it may be possible to develop novel signal processing applications that make use of multiple sensors in a wide range of applications. Object tracking is a novel method for detecting moving objects in real time by using a camera.

The basic goal is to connect the target humans and objects as well as their shape or attributes and place in successive video sequences. As a result, object recognition and identification are critical for object tracking in computer vision applications. Furthermore, tracking is the first stage in locating or detecting the item in the images or surveillance camera. Following that, detected objects might be classified as birds, humans, automobiles, and so on. However, detecting humans and objects using images or a live camera is a difficult task in this approach. Furthermore, various issues appear to be attributed to occlusion of the object to scene, object to object, complex object motion, real-time processing needs, and incorrect object shape.

The objective of this project is to detect humans and objects in images as well as in surveillance cameras. However, there are numerous advantages to this tracking, including traffic monitoring, vehicle detection, surveillance and security, and screen appears in public areas such as subway stations, airports, and large gatherings to detect human motion using live cam and to detect objects in live cam recordings by displaying boxes around the humans and objects.

Images and surveillance cameras are used as input for this project.

The following are three key steps in image & surveillance camera analysis:

1. Detection of the targeted object in a moving sequence.

2. Object tracking from one frame to the next.

3. Object tracking from camera to camera.

2. LITERATURE SURVEY

Xinrui Zou et al., [1] This article presents a review of object detection techniques. Firstly, the existing methods based on traditional machine learning are summarized and introduced. Then, two main schools of deep learning methods, R-CNN and YOLO, are selected for analysis and introduction. At the end of the article, the methods mentioned are briefly compared and discussed.

Gomathy Nayagam Meenakshi Sundaram et al., [2] This paper provides an overview of Real-Time Object Detection and Tracking Algorithms.

Xinlong Li et al., [3] Trident SSD: A Trident Single-Shot Multibox Object Detector with Deconvolution.

S Kanimozhi, G Gayatri, T Mala et al., [4] Multiple real-time object recognition using a single shot Multi-Box detection.

W. Liu, D. Anguelov, D. Erhan, C. Szegedy, S. Reed, C.-Y. Fu, et al.,[5] "Single shot multibox detector", European Conference on Computer Vision.

J. Redmon, S. Divvala, R. Girshick and A. Farhadi, et al., [6] "You only look once: Unified real-time object detection".

3. PROPOSED SYSTEM

System Design:

The proposed system focuses on automating the manual identification of Humans & Objects. Fig 1 depicts the system's block diagram.

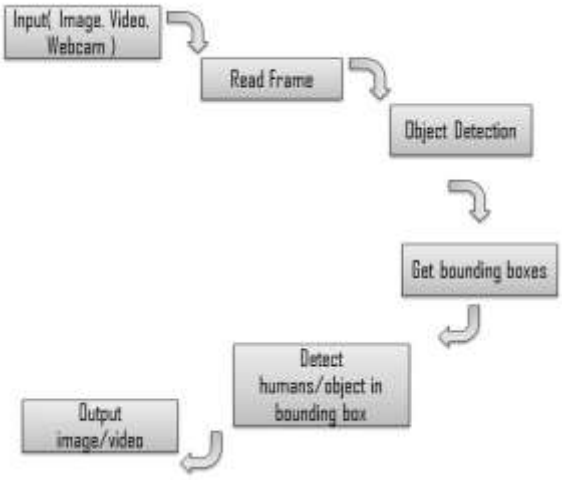
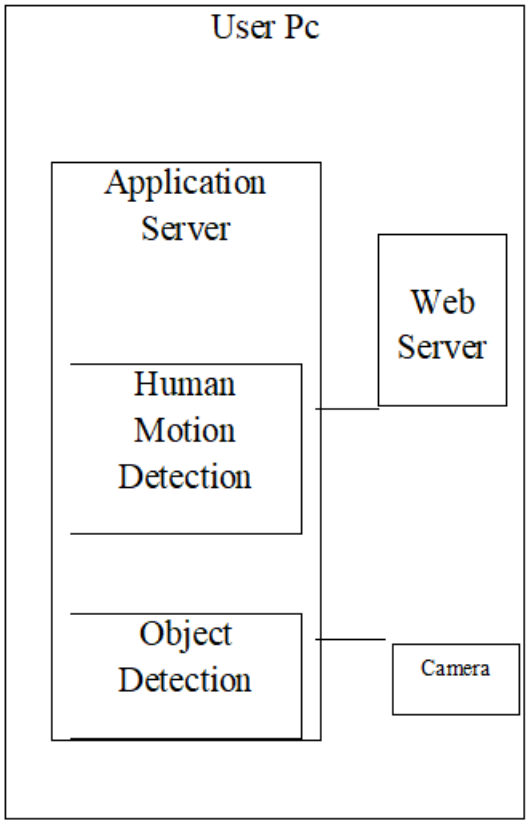


Fig 1: Block diagram of the system.

This system is installed in combination with a camera that captures images and monitors surveillance cameras in public areas. Initially detects humans and objects from captured images or pictures. We are using a mobilenet model, which is a Deep Neural Network Object detector in OpenCV, to detect humans and objects. Only when the human is detected does detection occur. We use pretrained Single Shot Detector (SSD) to construct the model that identifies the person, and a light-weight deep neural network architecture to develop the model that classifies whether they are persons or objects. The built model takes the image frame and classifies the output.

The workflow of the system is shown in Fig 2.



System Requirements:

The hardware requirements of the system are:

Camera: It is used for capturing a video.

Intel CORE i3 or above.

The software requirements of the system are:

OpenCV: It is a Python library with several built-in functions for image processing and machine learning tasks. It is primarily concerned with capturing the video and extracting the features. It is useful for detecting objects and faces. For the purpose of loading darknet models.

MobileNet SSD Architecture:

MobileNet SSD is a one stage detector. The working of one stage detectors is shown in Fig 3.

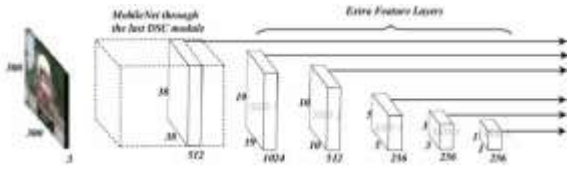


Fig 3: MobileNet SSD Architecture

Dataset:

Image Net, one of the most popular datasets for Computer Vision research, provides an accessible image database organized according to the WordNet hierarchy. WordNet has over 100,000 synsets, and ImageNet gives an average of 1,000 photos to accompany each synset in WordNet. It provides tens of millions of nicely sorted images for the majority of the WordNet hierarchies.

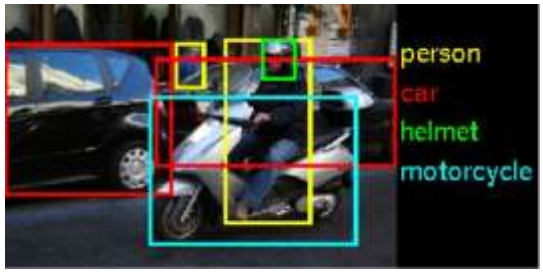


Fig 4: Sample dataset images

Implementation:

The proposed system can be developed by following the below steps:

Step I- Training and saving weights of Human motion & Object Detection model: Before going to object detection, it is necessary to develop a model to detect objects. A object detection model can be developed using many algorithms like YOLOv4. But here we are using a Fast R-CNN detector MobileNet SSD using OpenCV, as it can detect a objects and humans in a single pass. It is a SSD model that takes one single shot to detect multiple objects within the image.

Step II- Developing, training, and testing a Human and Object Detection model. The steps to train and test the model are given below:

A.Images were annoted using ImageNet.

B. Create prototxt file (.prototxt), .caffemodel and install pretrained weights of MobileNet SSD.

C. So this is the main file which you can run from terminal. And it is required that you should have a proper installation of OpenCV. In your system to properly.

D. Train and test the performance using .caffemodel & prototxt file.

Step III- Testing with dynamic input:

A. The first step is to load a pre-trained object detection network with the OpenCV's dnn (deep neural network) module. This will allow us to pass input images through the network and obtain the output bounding box (x, y)-coordinates of each object in the image.

B. Start the web application then user selects input type.

C. If input type is image resize the image into equivalent dimensions as network size and preprocess the image.

D. Start the video streaming and web camera starts receiving the video and converts it into frames.

E. With the help of a human detector module detects persons, and using object detection

model detect the objects in each image and in web cam.

F. Show the object names eg. If the object detector detects 'chair' it shows the object name as "Chair" in the bounding boxes.

4. RESULTS

As we discussed in the previous section, a human and object detection model has been developed and trained. We have trained our dataset using MobileNet SSD.After training the model, the working of the system was tested with the dynamic input. The results obtained during the system working are shown in Fig 5

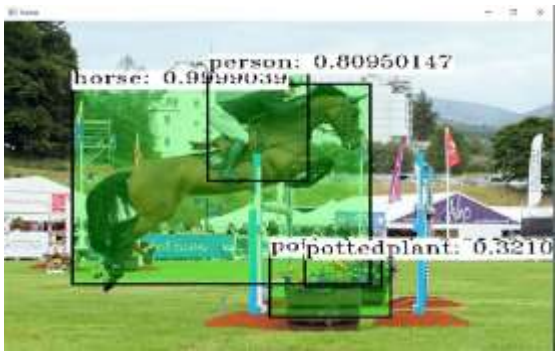


Fig 5 : Output

5. CONCLUSION

In this paper, review on different object detection, tracking, recognition techniques which is based on the video frame and various tracking technologies. From web cam or images given by user, human and object detection takes place by using the MobileNet SSD. However, these technique needs to concentrate towards handling sudden illumination changes, darker shadows and object occlusions. We have identified and discussed the limitation/future scope of various methods.

6. ACKNOWLEDGMENT

This research project was partially supported by the Department of Computer Science and Engineering, Andhra Loyola Institute of Engineering and Technology, Jawaharlal Nehru Technological University. We are grateful to Ms K.Sunitha, Assistant Professor for leading us to develop and contribute a Research paper for publication.

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