A REVIEW ON OBJECT TRACKING USING PYTHON

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ABSTRACT

OpenCV object tracking is a widely used technique in the field. A variety of object tracking-specific features are already incorporated into OpenCV. MediandFlow and MIL are some of the object trackers in OpenCV. Tracks the path taken by an object in a movie using an Object Tracking System. We're detecting objects in movies and webcam images with Python and the OPENCV module in this project. "Browse system videos" and "Start webcam video tracking" are two modules included in this application. Working with methods such as frame differencing, color-space transformation, background separation, optical flow, and a classifier based on the Haar cascade, the project entails implementing numerous object recognition and tracking techniques in video. These approaches include: 1. Besides these methods, a widely used and highly effective edge detection method is also used. Python is used for all of the implementations. The results are extensive, and they are thoroughly evaluated.

INTRODUCTION

Tracking an object when there is a lot of variation is extremely difficult. Background movement, partial and complete occlusions of complex-shaped objects, and varying degrees of illumination One of the most crucial applications for industries to ease the user, save time and achieve parallelism is object detection and localization in digital images. A more efficient and precise method of object detection is still needed in order to attain the desired result. The primary goal of computer vision research and study is to design a system that reduces human effort by showing the fundamental block diagram of detection and tracking by using a computer. Detection and tracking are implemented in a python environment using SSD and Mobile Nets-based techniques. Object detection is the process of identifying an object's specific area of interest in a certain type of image. Frame differencing, optical flow, and background subtraction are a few of the ways that can be used. With the use of a camera, this is a way to track down and locate an

object in motion. By extracting the properties of images and videos for security applications, detection and tracking methods are explained.

PROBLEM STATEMENT

- Many problems in computer vision were saturating on their accuracy before a decade.
- However, with the rise of deep learning techniques, the accuracy of these problems drastically improved.
- One of the major problem was that of image classification, which is defined as predicting the class of the image.
- There is no object detection in existing system by using Opencv

Motivation:

Deep learning has gained a tremendous influence on how the world is adapting to Artificial Intelligence since past few years. Some of the popular object detection algorithms are Region-based Convolutional Neural Networks (RCNN), Faster- RCNN, Single Shot Detector (SSD) and You Only Look Once (YOLO).

Objective:

In this project using python and OPENCV module we are detecting objects from videos and webcam. This application consists of two modules such as 'Browse System Videos' and 'Start Webcam Video Tracking'.

PROPOSED SYSTEM

- Dense Optical flow: These algorithms help estimate the motion vector of every pixel in a video frame.
- Sparse optical flow: These algorithms, like the Kanade-Lucas-Tomashi (KLT) feature tracker, track the location of a few feature points in an image.
- Kalman Filtering: A very popular signal processing algorithm used to predict the location of a moving object based on prior motion information. One of the early applications of this algorithm was missile guidance! Also as mentioned here, "the on-board computer that guided the descent of the Apollo 11 lunar module to the moon had a Kalman filter".

ADVANTAGES OF PROPOSED SYSTEM

- Here we can detect the object for uploaded video file

LITERATURE SURVEY

1. Wei Liu and Alexander C. Berg, SSD: Single Shot MultiBox Detector, Google Inc., Dec 2016.

We present a method for detecting objects in images using a single deep neural network. Our approach, named SSD, discretizes the output space of bounding boxes into a set of default boxes over different aspect ratios and scales per feature map location. At prediction time, the network generates scores for the presence of each object category in each default box and produces adjustments to the box to better match the object shape. Additionally, the network combines predictions from multiple feature maps with different resolutions to naturally handle objects of various sizes. SSD is simple relative to methods that require object proposals because it completely eliminates proposal generation and subsequent pixel or feature resampling stages and encapsulates all computation in a single network. This makes SSD easy to train and straightforward to integrate into systems that require a detection component. Experimental results on the PASCAL VOC, COCO, and ILSVRC datasets confirm that SSD has competitive accuracy to methods that utilize an additional object proposal step and is much faster, while providing a unified framework for both training and inference. For \(300 \times 300\) input, SSD achieves 74.3 % mAP on VOC2007 test at 59 FPS on a Nvidia Titan X and for \(512 \times 512\) input, SSD achieves 76.9 % mAP, outperforming a comparable state of the art Faster R-CNN model. Compared to other single stage methods, SSD has much better accuracy even with a smaller input image size. Code is available at https:// github. com/ weiliu89/ caffe/ tree/ ssd.

2. Andrew G. Howard, and Hartwig Adam, MobileNets: Efficient Convolutional Neural Networks for Mobile Vision Applications, Google Inc., 17 Apr 2017.

We present a class of efficient models called MobileNets for mobile and embedded vision applications. MobileNets are based on a streamlined architecture that uses depth-wise separable convolutions to build light weight deep neural networks. We introduce two simple global hyper-parameters that efficiently trade off between latency and accuracy. These hyper-parameters allow

the model builder to choose the right sized model for their application based on the constraints of the problem. We present extensive experiments on resource and accuracy tradeoffs and show strong performance compared to other popular models on ImageNet classification. We then demonstrate the effectiveness of MobileNets across a wide range of applications and use cases including object detection, finegrain classification, face attributes and large scale geo-localization.

3. ShreyamshKamate, UAV: Application of Object Detection and Tracking Techniques for Unmanned Aerial Vehicles, Texas A&M University, 2015.

In this research, the information captured by Unmanned Aerial Vehicles (UAVs) are eminently utilized in detecting and tracking moving objects which pose a primary security threat against the United States southern border. Illegal trespassing and border encroachment by immigrants is a huge predicament against the United States border security force and the Department of Homeland Security. It becomes insurmountable to warranty suspicious behaviour, monitoring by human operators for long periods of time, due to the massive amount of data involved. The main objective of this research is to assist the human operators, by implementing intelligent visual surveillance systems which help in detecting and tracking suspicious or unusual events in the video sequence. The visual surveillance system requires fast and robust methods of detecting and tracking moving objects. In this research, we have investigated methods for detecting and tracking objects from UAVs. Moving objects were detected using adaptive background subtraction technique successfully and these detected objects were tracked by using Lucas-Kanade optical flow tracking, Continuously Adaptive Mean-Shift tracking based techniques. The simulation results show the efficacy of these techniques in detecting and tracking moving objects in the video sequences acquired by the UAV.

4. Adrian Rosebrock, Object detection with deep learning and OpenCV, pyimagesearch.

Deep learning has gained a tremendous influence on how the world is adapting to Artificial Intelligence since past few years. Some of the popular object detection algorithms are Region-based Convolutional Neural Networks (RCNN), Faster-RCNN, Single Shot Detector (SSD) and You Only Look Once (YOLO). Amongst these, Faster-RCNN and SSD have better accuracy, while YOLO performs better when speed is given preference over accuracy. Deep learning

combines SSD and Mobile Nets to perform efficient implementation of detection and tracking. This algorithm performs efficient object detection while not compromising on the performance.

5. AkshayMangawati, Mohana, Mohammed Leesan, H. V. Ravish Aradhya, Object Tracking Algorithms for video surveillance applications International conference on communication and signal processing (ICCSP), India, 2018, pp. 0676-0680.

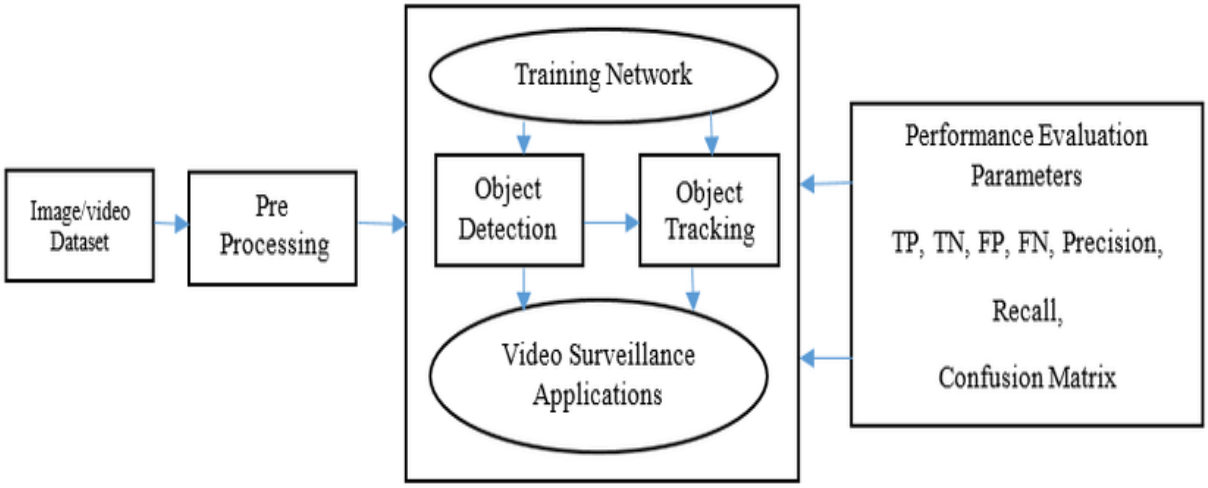
Object tracking is one of the most critical areas of research due to change in motion of object. Specifically, feature selection places a vital role in object tracking. It has wide range of applications such as object detection, traffic control, human-computer interaction, gesture recognition, video surveillance. Many approaches focus on the tracking algorithm to smoothen the video sequence in order to overcome the issues of tracking, related to object movement and appearance. These methods uses object shape, colour, texture, object of interest and motion in multi direction in tracking for video surveillance applications. This paper elaborate the exhaustive survey of various object tracking algorithms under different environmental conditions and identified efficient algorithm in various types of tracking. In this paper objects are tracked based on colour, motion of single and multiple objects (vehicles) are detected and counted in multiple frames. Further single algorithm may be designed for object tracking by considering shape, colour, texture, object of interest, motion of object in multi direction.

INTERACTIVE TRACKING AND DETECTION

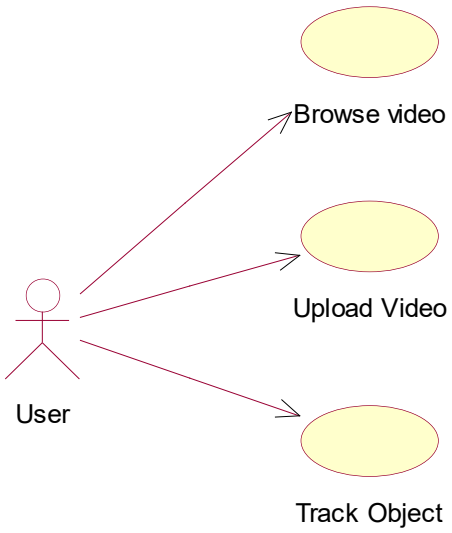
Face detection in OpenCV works in real time, allowing you to identify the face in any given frame. Since tracking is so important, what is its purpose? Instead of simply performing repeated detections, consider tracking moving objects in a movie for a moment. Detection is slower than Tracking: Detection methods are typically slower than tracking systems. It's easy to see why. It's easier to track an object that was previously spotted since you have a good idea of how it will appear. You also know where the object was in the previous frame, as well as its speed and direction of travel. So in the following frame, you can use this information to estimate the location of the object and conduct a brief search around the expected location of the object in order to locate the object more correctly. While a detection algorithm always starts from scratch, a smart tracking program uses all the knowledge it has about the object up to that moment. As a result, when developing an effective system, it is common practice to run an object detection

algorithm every nth frame, followed by a tracking method every n-1 frames. Detect the object in the first frame, and then follow it as it moves around the screen.

ARCHITECTURE DIAGRAM



USE CASE DIAGRAM

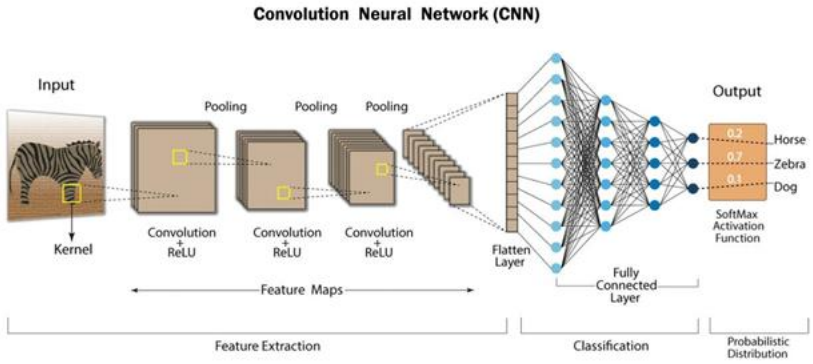


ALGORITHM

CONVOLUTION NEURAL NETWORK

A **Convolutional Neural Network (CNN)** is a type of Deep Learning neural network architecture commonly used in Computer Vision. Computer vision is a field of Artificial Intelligence that enables a computer to understand and interpret the image or visual data.

When it comes to Machine Learning, Artificial Neural Networks perform really well. Neural Networks are used in various datasets like images, audio, and text. Different types of Neural Networks are used for different purposes, for example for predicting the sequence of words we use **Recurrent Neural Networks** more precisely an LSTM, similarly for image classification we use Convolution Neural networks. In this blog, we are going to build a basic building block for CNN.



CONCLUSION

An accurate and efficient object detection system has been developed which achieves comparable metrics with the existing state-of-the-art system. This project uses recent techniques in the field of computer vision and deep learning.

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