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Object Detection and Tracking using OpenCV

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ABSTRACT - In image processing area and segmentation algorithms based on thresholding,the intensity of the image (grayscale) is usually obtained in order to differentiate the regions of the objects and the background. The segmentation based on the threshold works well when the image has a high intensity in the contrast, this characteristic is key to make a good classification of the pixels. This document will explain some theoretical concepts to identify objects by means of their color (thresholding), this technique was implemented in the development of a game program. Furthermore, the thresholding range for the red, yellow and green colors was found in order to achieve a better approach in the object detection. This project used the python programming language, Pygame graphical interface libraries and the OpenCV library free open source about artificial vision. This proposed system will be used to detect and track the objects in the image and video.When we provide the input image/video to the system it will detect the objects in the given image/video.And same can done with tracking also if we provide image/video live it will detect and track the objects. Object detection Frame differencing Frames are captured from camera at regular intervals of time. Difference is estimated from the consecutive frames. Object detection can run on slow frame rates looking for objects to lock onto and once those objects are detected and locked, then object tracking can run at a faster frame speed. For example the tracking of cars: Two ways in which the object can be tracked in the above example are: (1)-Tracking in a sequence of detection. In this method a CCTV video sequence of a traffic which is in motion takes place. Suppose someone wants to track a car or person's movement here, he will take different images or frames at different intervals of time. With the help of these images one can target the object like a car or person. Then, by checking how my object has moved in different frames of the video, we can track it

Keywords: object detection, object tracking, detection, system , OpenCV.

1. INTRODUCTION

In recent years, there has been extensive research in the field of object detection and tracking. Many remarkable algorithms have been developed for object detection and tracking, including colour segmentation, edge tracking and many more. Imagine waiting for your turn in a shopping line at a busy department store. Your visual system can easily sense humans and identify different layers of their interactions. With the help of this technology these kinds of tasks will become easy to perform. With the rapidly growing importance in military and security applications visual surveillance1, 2 has become a necessary area of research. It becomes cumbersome for human operators to monitor for long durations. In order to identify important events in real-time in an avid manner, an intelligent visual surveillance system is proposed to assist the human operators. The goal of this research is to detect and track moving objects from Unmanned Aerial Vehicles (UAVs), in order to protect the United States southern border from illegal border crossings. UAVs have played an important role in modern wars and industries. Aerial surveillance has higher mobility and large surveillance scope in contrast to fixed cameras. However, it has imperfections such as unstable background, low resolution and illumination changes. Detection of moving objects3, 4 can be a daunting task and the objects can be detected using several methods such as Histogram of Oriented Gradients (HOG) descriptors 5, 6, 7, background subtraction8, 9, 10, adaptive background subtraction using Gaussian mixture models11, 12, 13. The images were captured by a UAV called the "Phantom", which is a multi-rotor aerial filming system and has a unit range of 300 meters on the remote control and a speed of 6mph in the air. The camera is a GoPro Hero 3 black

edition which is mounted on the base of the Phantom and is capable of producing videos containing up to 30 frames and 4K resolution. The acquired images are pre-processed to remove the noise and stabilize the images, before proceeding to the object detection stage. There are myriad of techniques for detecting and tracking objects of interest from a stationary camera. However, dynamic camera makes it very onerous to detect objects. Object tracking is the consequent step in the process and is one of the important components of many vision systems. It has numerous applications in traffic control, humancomputer interaction, digital forensics, gesture recognition, augmented reality and visual surveillance. For object tracking the focus will be on Continuously Adaptive Mean-Shift tracking14, 15, Lucas-Kanade optical flow16, 17 tracking[1].

2. PROBLEM STATEMENT

To design and develop an application for object detection and tracking using open cv.

3. LITERATURE REVIEW

1.SSD: Single Shot MultiBox Detector Authors: Wei Liu and Alexander C. Berg Year:2016

Abstract:This paper present a method for detecting objects in images using a single deep neural network. It uses an 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. This SSD model is simple relative to methods that require object proposals because it completely eliminates proposal generation and subsequent pixel or feature resampling stage 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, MS COCO, and ILSVRC datasets confirm that SSD has comparable accuracy to methods that utilize an additional object proposal step and is much faster, while providing a unified framework for both training and inference.

2.MobileNets: Efficient Convolutional Neural Networks for Mobile Vision Applications Authors: Andrew G. Howard, Menglong Zhu, Bo Chen, Dmitry Kalenichenko, Weijun Wang, Tobias Weyand, Marco Andreetto, Hartwig Adam Year:2017

Abstract:This paper presents 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 hyperparameters 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 Mobile Nets across a wide range of applications and use cases including object detection, fine grain classification, face attributes and large scale geo-localization.

3.Real Time Object Detection and Tracking Using Deep Learning and OpenCV Authors: Justin Lai, Sydney Maples Year:2017.

Abstract: This paper uses OpenCV packages, convolution neural network(CNN),YOLO,SVM classifier and evaluation protocol map as to finish the task of detecting object in picture or a video. 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. YOLO based algorithm by using concepts of deep learning will give good accuracy for feature extraction and classification.

4.Object Detection Algorithms for Video Surveillance Applications Authors: Apoorva Raghunandan; Mohana; Pakala Raghav; H. V. Ravish Aradhya Year:2018

Abstract: Object Detection algorithms find application in various fields such as defence, security, and healthcare. In this paper various Object Detection Algorithms such as face detection, skin detection, colour detection, shape detection, target detection are simulated and implemented using MATLAB 2017b to detect various types of objects for video surveillance applications with improved accuracy. Further, various challenges and applications of Object Detection methods are elaborated.

5.Evaluation of Object Tracking System using Open-CV In Python Authors: Hemalatha Vadlamudi Year:22 sept 2020

Abstract: This paper uses Object Tracking System to track the motion trajectory of an object in a video. First, It uses OpenCV's function, select ROI, to select an object on a frame and track its motion using built-in-tracker. Next, Instead of using selectROI, It uses YOLO to detect an object in each frame and track them by object centroid and size comparison. Then It combines YOLO detection with the OpenCV's built in tracker by detecting the object in the first frame using YOLO and tracking them using selectROI. The video tracking is widely used in multiple purposes such as: human –computer interaction, security and surveillance, traffic control, medical imaging, and so on.

4.IMLEMENTAION DETAILS OF MODULES

Modules of the system

Object detection:

Object Detection from Image: Users will provide images as input to the object detection system. Object detection system will give the list of available objects in that image.

Object Detection from Recorded Video: Users will provide Recorded video as input to the object detection system. Object detection system will give the list of available objects in that total video.

Object Detection from Live Video: Users will switch on the live camera. Object detection system will detect objects which are available in the live camera and it will display the list of detected objects.

Object tracking:

Object Tracking in Recorded Video: User will provide the recorded video as input our object tracking system will track the objects which are moving in the video.

Object Tracking in from Live Video: User will switch on the live camera out object tracking system will track the objects which are moving in the live

Object searching:

Searching for a particular object from a given image and if the object is present it results in object is available if not it results in object not available.

5.PERFORMANCE AND SCALABALITY

This model has high performance and accuracy in detecting objects from the images and videos.

Performance Requirements: This system is developing in the high-level languages and using advanced front end and back end technologies. It will give response to the end user on client system with in very less time.

Usability: Ease of use requirements address the factors that constitute the capacity of the software to be understood, learned, and used by its intended users.

Scalability: Scalability is the property of a

system to handle a growing amount of work by adding resources to the system.

Reliability: Reliability specifies the capability of the software to maintain its performance over time. It refers to the system performing consistently well.

6. CONCLUSION

The proposed algorithm for object detection and tracking was extensively tested to operate in a complex and real world. It was found to possess remarkable accuracy and precision of 98%. We have tested the proposed algorithm to track assorted objects against an environment consisting of cluttered objects of varying sizes, shapes and colors. The implementation of the algorithm was found to be extremely fast and robust.

7. REFERENCES

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