



# IMAGE SEGMENTATION AND CLASSIFICATION FOR VISION BASED DETECTION AND TRACKING OF MOVING OBJECT IN VIDEO SURVEILLANCE.

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*Abstract: Moving object detection and tracking field gains a vast interest in it. Most of the moving objects detection methods operate by trying a binary classifier to sub-windows of an image, after that a non-maximum suppression step comes where detections on overlapping sub-windows are eliminated. As the number of feasible sub-windows in even middling sized image datasets is very large, the classifier is usually learned on only a subset of the windows. This circumvent the computational complexity and difficulty of dealing with the entire set of sub-windows, however, this paper address that, it leads to sub-optimal detector performance. Specially, the main offering of this paper is the initiation of a new method, Max-Margin object detection (MMOD), for understanding how to detect objects in images. This method does not execute any sub sampling, but instead optimizes overall sub-windows. MMOD is used to enhance any object detection method which is linear in the learned parameters, such as Histogram of Oriented Gradient (HOG) or bag-of-visual-word models. Using this strategy we manifest substantial performance gains in publicly available datasets. We represent that a single firm HOG filter can overcome a set-of-the-art deformable part model on the object detection data set and benchmark when the HOG filter is assimilated via MMOD.*

*Keywords: Python, Open CV component, video surveillance, detection, tracking, moving images, object detection.*

## I.INTRODUCTION

Nowadays, most of the living locality parks, metro stations, streets, shopping malls, schools and banks are supervise by video surveillance systems. accordingly, the researchers has been concentrating on moving object detection and tracking. These system predominantly comprise an breakthrough component for motion detection, object recognition, tracking, performance learning, video retrieval. The technological advancement of cameras and computers used for recording and scrutinizing the video leads the requirement of automatic video scrutiny. But the fully automated surveillance systems are still deficient, So many research work has been done in this emanating field[4].

This paper addresses the real time object detection and tracking which are predominant and challenging function in many computer vision applications such as video surveillance, robot navigation, vehicle navigation & blind man navigation system. Object detection includes detecting the object in a succession of frames. Every tracking technique needs object detection mechanism either in each frame or in the video sequence.

Moving (mobilise) object tracking in real time basis is the process of locating an object or multiple objects using either static or dynamic webcam. Video surveillance makes it feasible that the computer can involuntarily locate, perceive and track the changes by the automatic examination of images in an order which is recorded by cameras in natural circumstances. Each and every application needs disparate requirements to use video processing by systematic manner. However, the common first step between all applications is finding regions that related to moving object. Motion detection is a difficult problem because of changes in scenes [4].

The accessibility and availability of high power computers, high quality and low cost camera increases interest in object tracking algorithms. Three key steps for video analysis are: Detection of moving Objects, Tracking of that objects from frame to frame, Analysis of Object tracking to recognize their performance. The main application areas of object detection and tracking are: Motion based recognition, automated surveillance, video indexing, traffic monitoring, vehicle navigation and etc

Nowadays Image segmentation and classification for vision based detection and tracking of moving object in video surveillance is very useful for industrial purpose and also in security system .if we used this technique as security system in banking, court , hospitals ,school etc.. then it will be very useful for them. For example in a bank thief entered with a knife, gun etc., and when it is captured by the webcam then it automatically margin that particular image ,capture the photo of that image and send it on a mobile of authority as a alert message to them.

In this paper we are using MMOD algorithm. Max-Margin Object Detection (MMOD), used for learning to detect objects in images. This technique does not carry out any sub-sampling, but instead optimizes over all sub-windows. On all datasets, using MMOD to discover the parameters of the detector lead to substantial enhancement [10].

## II. LITERATURE REVIEW

Staffan Reinius et al. [1] proposed a work on Object recognition using the Open CV Haar cascade-classifier on the iOS platform. The aim of this project was to recognize four objects on the car dashboard using OpenCV on the iOS platform. Open CV Haar cascade classifier can also separately arrange that 4 objects.

Souhail Guennouni et al.[2] proposed a work on Multiple Object Detection using Open CV on an Embedded Platform. This work represent multiple objects detection based on Open CV libraries. The offered application accord with real time systems execution and the results gives a sign of where the cases of object detection applications is more difficult and where it is simpler.

Sabri M.A.A Ahmed et al.[3] proposed a work on vision based detection and tracking of moving target in video surveillance. This paper represent real time detection and tracking of moving object, in which continuous object tracking uses kalman filter, because of that tracking system can recover a target shape and successfully track a moving target.

M. Gomathy Nayagam et al.[4] proposed a work on Real time Object Detection and Tracking Algorithms .This paper represent the various object detection and tracking algorithms. Author address some object detection techniques which are Point Detector, Background Modelling, Segmentation, Optical Flow and Supervised Classifier and for tracking Silhouette Tracking, point tracking, Kernel Tracking etc which helps us to understand which one is better technique.

Far'es Jalled et al.[5] proposed a work on object detection using image processing. The main purpose of this article is to thrive an OpenCV-Python code using Haar Cascade algorithm for object detection. Currently, Unmanned ariel vehicle (UAVs) are used for detecting and attacking the invaded ground targets. The main issueofr this type of UAVs is that sometimes the object are not properly detected, which thereby causes the object to hit the UAV. This project aims to avoid such unwanted collisions and damages of UAV.

Mrs Poonam Khare et al.[6] proposed a work on the various methods of object detection in video surveillance systems. .In this paper study of various phases of video surveillance system is made and for each phase various alternative solutions with their advantages and disadvantages have been discussed. For image acquisition author used RGB colour space along with edge ratio that allows determining moving object and shadow separately. Author used technique for feature selection and extraction like edge information, texture, time-domain characteristics etc.

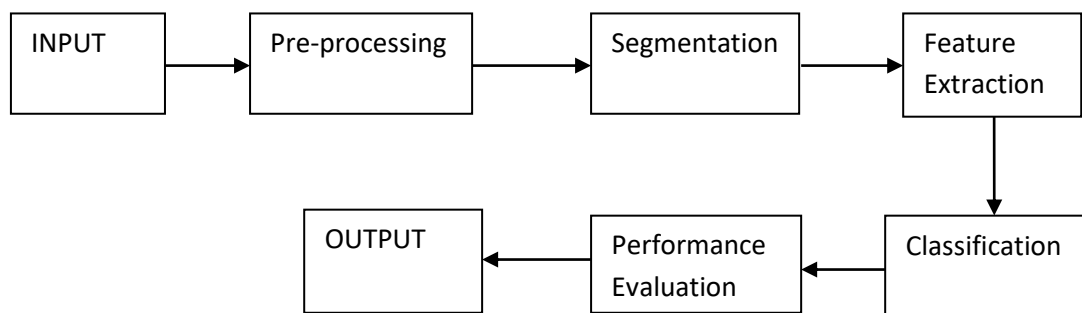
Bhumika Gupta et al.[7] proposed a work on Study on Object Detection using Open CV – Python. Object detection usingof OpenCV library of python 2.7, improves the efficiency and accuracy. The main objective is to recognize a specific object in real time from a large number of objects.

Wu Runze et al.[8] proposed a work on Improved Object Tracking Algorithm Based on Tracking-Leaning-Detection Framework. 'Tracking-Leaning-Detection' was proposed by Zdenka Kalal. Long-term tracking is the process of locating an object in a video succession, where the object moves in and out of the camera view, first, we propose a tracking framework (TLD) that fragmented the long-term tracking task into three subtask. These three tasks are: tracking, learning and detection. The tracker and the detector work concurrently to get the location of the object independently, and the learning is an information exchange between tracker and detector .For real time purpose TLD is a very good framework.

Zhong-Qiu Zhao et al.[9] proposed a work on Object Detection with Deep Learning. Object detection based on traditional architecture are complex and to overcome this difficulty deep learning is used, which has more powerful tools which are able to understand high level features of the object. Overcoming the object detection issues means placing a tight bounding box around these objects and associating the correct object class with each bounding box. Deep learning is the state-of-art method to accomplish object detection. Region-based convolutional neural networks, or R-CNNs, are some deep learning techniques.

### III. PROPOSED METHODOLOGY

In computer vision province/field, moving object detection and tracking plays vital role. Object detection means fixing moving objects in frame of video sequence and tracking means the process of locating single moving object or multiple moving objects over a period of time using camera. Technically, tracking is evaluation method of an object in the image.



**Figure1: Block diagram of moving object detection and tracking.**

#### A. Object Detection:

Object detection is the methodology/technique of determining the occurrence/appearance of the class to which the object belongs and evaluating the location of the object by bounding box around the object. Detecting single appearance of class from image is called as single class moving object detection, and detecting the classes of all objects present in the image is known as multi class moving object detection. Different challenges such as partial/full occlusion, varying illumination circumstances, poses, scale, size etc are required to handle while performing the object detection. The object detection is the operation of locating objects in the succession of frames. Every tracking algorithm needs an object detection methodology either in every frame or when an object occurs newly in a frame. There are some object detection methods which are: 1. Point Detector, 2. Background Modelling, 3. Segmentation, 4. Optical Flow and 5. Supervised Classifier [11].

#### Challenges of moving object detection:

- There is a loss of information caused by the 3D world on a 2D image.
- Noise in images.
- Complex or difficult moving object motion.
- There is Non-rigid or articulated nature of objects.
- There are partial or full moving object occlusions.
- Complex object shapes.
- Scene illumination changes



**Figure 2: Image of object detection and instance segmentation**

#### B. Pre-processing:

It is process in which the image is converted into frames. Pre-processing is a ordinary/common name for operations with images of the very low level of abstraction, both input and output are intensity images. The goal of pre-processing is an enhancement of the image data that represses unwanted deformations or enhances some image features vital for further processing.

### C. Segmentation:

Image **segmentation** is the procedure of dividing a digital image into multiple **segments**. The aim of **segmentation** is to simplify and change the depiction of an image into something which is more significant and easier to scrutinize. There are various types of segmentation algorithm accessible such as 1) Watershed algorithm, 2) sliding window, 3) region proposal, 4) Max-Margin object detection (MMOD). And segmentation techniques are thresholding method, edge detection technique and region based technique. In this paper we are using MMOD algorithm. Max-Margin Object Detection (MMOD), used for learning to detect objects in images. This method does not execute any sub-sampling, but instead uses over all sub-windows. MMOD can be able to enhance any object detection method.

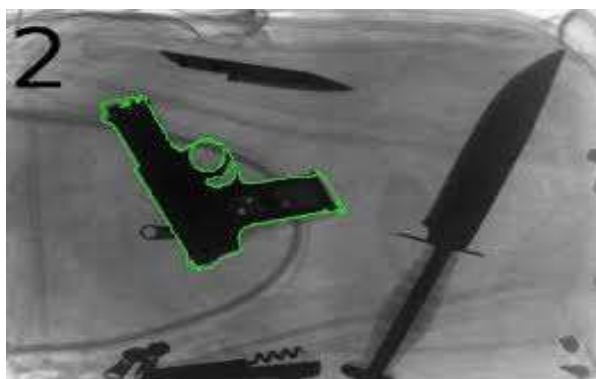


Figure 3: Images of edge detection of objects (weapons).

### D. Informative region selection:

While dissimilar/different moving objects may emerge in any view point of the image and have different aspect ratios or sizes and shapes, it is a natural choice to scan the entire image with a multi-scale sliding window. This strategy can find out all feasible positions of the objects, its faults are also obvious. Due to a large number of candidate windows, it is economically expensive and creates too many unessential windows. However, if only a specified number of sliding window templates are applied, undesirable regions may be produced [9].



Figure 4: Informative region selection from multiple objects.

### E. Feature extraction:

To recognize different objects, we need to extract visual features which can furnish a semantic and strong delineation. scale-invariant feature transform (SIFT), Histogram oriented gradient (HOG) and Haar-like ,deep learning, gray-level co-occurrence matrix (GLCM) features are some techniques. However, due to the diversity of emergence, illumination conditions and backgrounds, it's strenuous to manually design a robust attribute descriptor to excellently describe all kinds of objects [9].

### F. Classification:

A classifier is required to discriminate a targeted moving object from all the other classes and to make the delineation more hierarchical, semantic and informative for visual recognition. Generally, the Supported Vector Machine (SVM), random forest and Deformable Part-based Model (DPM) are good choices. Among these classifiers, the SVM A support vector machine (SVM) is machine learning algorithm that scrutinizes data for stratification and regression analysis. SVM is superintend learning technique that focuses on data and sorts it into one of two categories. An SVM results a map of the sorted data with the boundaries between the two as far apart as possible. SVMs are utilized in text categorization, image stratification, and in handwriting recognition. A support vector machine is also known as a support vector network (SVN) [9].

### G. Open CV:

Open CV is an open source computer vision library that is used in real time . Open CV was evolved by Intel and now assisted by Willow Garage. Open CV is constructed & optimized for real time applications, though it is developed in C and C++ languages, it is a cross-platform library that runs on Linux, Windows and Mac OS . The Open CV library consists hundreds functions that cover many areas in computer vision such as robotics, medical image processing, and security [2].

### H. HOG:

The histogram of oriented gradients (HOG) is attribute descriptor used in computer vision and image processing for the motive of moving object detection. This method counts instances of gradient orientation in localized parts of an image. This method is corresponding to that of shape contexts, edge orientation histogram, & scale-invariant attribute transform descriptors, but varies in that it is determined on a dense grid of consistently spaced cells and uses overlapping local different normalization for improved precision.

### I. Confusion matrix:

A confusion matrix presents the number of correct and incorrect projections made by the stratification model compared to the authentic results (target value) in the data. It is a  $N \times N$  matrix, where  $N$  represents number of target values. Accomplishment of such models is generally estimated using the data in the matrix.



Figure 5: image of percentage of accuracy of detecting object

## IV. ADVANTAGES, DISADVANTAGES AND APPLICATIONS.

### Advantages:

1. It reduces the manual interruption.
2. Accuracy of the system is good.
3. By increasing dataset we can increase the efficiency of the system.
4. This system alerts authorities by detecting suspicious object and send message.

### Disadvantages:

1. It cannot detect long distance moving objects with good accuracy.
2. The lightning condition may differ during the different time of the day, also weather conditions may affect the lightning in an image.
3. The occlusion effect also occurs.

### Applications:

1. **Counting objects/peoples:** Moving object detection can be also used for counting purpose, For e.g. in a group photograph it can count the number of persons and if utilised smartly we can also find out different people with different costumes.
2. **Industries:** Moving object detection is also used in industrial processes for the identification of different products. If we want our machine to only detect objects of a particular shape, we can achieve it very easily.
3. **Detection:** This is a simple application of object detection that we see in our daily life. For example Facebook, Instagram etc.. detects face by using this method.
4. **Security:** Identification of unwanted or suspicious moving objects in any specific area object detection techniques are used for detecting guns, knives and bombs/explosives.
5. **Biometric recognition:** Biometric recognition uses physical or behavioural features of humans to recognize any individuals for security and authentication purpose.
6. **Surveillance:** Moving objects can be recognized and tracked in videos for security purpose. Object recognition is required so that the suspected people or vehicles can be tracked.
7. **Medical analysis:** Object detection is used to detect diseases like a tumour, kidney stones, cancer in MRI image.

## V. RESULT AND DISCUSSION

### A. RESULT:

Image segmentation and classification for vision based detection and tracking of moving object in video surveillance. Based on the survey, we observed that moving object detection and tracking is prime research field today. Day by day crimes are increasing and to prevent it, security system is necessary and we can use this object detection and tracking technique in banks, hospitals, school etc. for example if criminals entered the bank with knife, gun etc, then it is harmful to banks and people, but by video surveillance object detection and tracking we can get the message of that harmful object on a mobile of authority as a alert to them.



Figure 6: Images of detected targeted moving object.



Figure 7: Alert message send to the mobile of authority

### B. FUTURE SCOPE:

This thesis has been proposed with an objective/motive of developing a low cost software model for moving object identification and to carry out the estimation of motion analysis of the object. Moving Object detection function with motion estimation needs to be fast enough to be implemented for the real time system. Still there is a scope for developing faster algorithms for moving object identification on real time basis. Such algorithms can be developed using FPGA or CPLD for fast execution. The strategy using (MMOD) max margin multiple object detection with (HOG) Histogram oriented gradient can also manifest substantial performance gains in three and four publicly available datasets.

## VI. CONCLUSION

The moving target detection and tracking is an important research field of real time moving object detection and tracking processing for its great potential in military, security and civil applications. In this paper the presented framework can used to detect important moving objects and ignore the others based on size; and tracked the object movement through the camera. The results shown that the tracking can work well on a single object and give good results; even when the part of the target object is hidden behind another object.

This paper shows Python has been preferred over MATLAB for integrating with Open CV because when a Matlab program is run on a computer, it gets busy attempting to explain entire Matlab code which is built on Java. Open CV is fundamentally a library of functions written in C\C++ languages. Furthermore, Open CV is easier to use for someone with little programming background. So, it is better to use any concept of object detection using Open CV-Python.

In this paper we are using Max-Margin object detection (MMOD) technique which can be used to enhance any **object detection technique** which is linear in the learned parameters, such as HOG or bag-of-visual-word models. Using this perspective we show significant performance gains on three publicly available datasets. This system is very useful for security purpose.

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