A REVIEW OF REAL TIME OBJECT DETECTION AND TRACKING USING LPOG WITH KALMAN FILTER

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ABSTRACT

*The ongoing research on object tracking in video sequences has attracted many researchers. For object tracking, Object detection is an important step in any video analysis. Difficulties of the object detection are finding hidden objects and finding unrecognized objects. Although many algorithms have been developed to avoid them as outliers, occlusion boundaries could potentially provide useful information about the scene's structure and composition.When objects are occluded, some parts may not be visible to human vision. Object detection is a difficult job in real time tracking of multiple objects due to occlusion. This paper presents a survey on detection of occlusion. Similarly occlusion at faces may be leads to performance degradation of face recognition algorithms. Many methods were developed to detect occlusion in present and previous works. The aim of developing such intelligent system is to detect the object and identify them actively under various performance reducing parameters***.**

Keyword: - *object tracking, object detection, occlusion handling, Viola Jones, LPOG, LBP, FW-PCA, Kalman filter, OLPP*

1. INTRODUCTION

Visual surveillance system is used to detect, recognize, and track certain objects in a scene. This type of system was mainly used in applications such as security for human, important building, military target detection and traffic surveillance in cities. It is essentially a video recording system that is used for post-event analysis. In the earlier stages, human beings are watching the videos in such type of systems to check for any unusual activities. These systems cannot provide sufficient security by various issues. The aim of efficient systems is to replace passive video surveillance. An efficient video surveillance system must be fast, reliable and use of robust algorithms for moving object detection, classification, tracking and activity analysis. So such system has to raise warning on the occurrence of any suspicious events. Moving object detection is the important phase for further analysis of the video.

Occlusion is one of the main performance reduction problems in video surveillance systems. All automated occlusion detection system should accurately monitor occlusion. When the detected objects in a scene come behind another object, some parts in the objects become undetected due to occlusion. Under occlusion human bodies will be overlapped and walking together in a scene. Occlusion can be of three types: self occlusion, inter-object occlusion, back ground occlusion [1]. When some parts of object is occluded, called self occlusion. This will occur frequently. When two or more objects occluded each other, inter object occlusion occurs. Background occlusion occurs if objects are hided due to back ground objects in a scene. There are verities of occlusion detection algorithms to monitor the objects from visual video. Face recognition algorithm has so

much importance in video surveillance [2]. The faces might be masked either purposely using sun glasses or mask unintentionally like scarves or crowded places. Depending up on the places such as banks, the occlusion may be suspicious. Because of face occlusion, the performance degradation of system will occur. So researches in the last decade have concentrated on improving the performance of the human detection.

1.1 Object Detection

The goal of object detection is to detect all instances of objects from a known class, such as people, cars or faces in an image. Typically only a small number of instances of the object are present in the image, but there are a very large number of possible locations and scales at which they can occur and that need to somehow be explored. Object detection involves identifying whether a known object is in a scene and, if so, determining the location of the object detection in images and videos is important in a wide range of applications that intersect with many aspects of our lives: surveillance system and airport security, automatic driving and driver's assistance system in high-end cars, human-robot interaction and immersive and people-finding for military application [1].

Object detection is to identify objects of interest in the video sequence and to cluster pixels of these objects. Object detection involves identifying whether a known object is in a scene and, if so, determining the location of the object [5]. There is shown in figure 1.

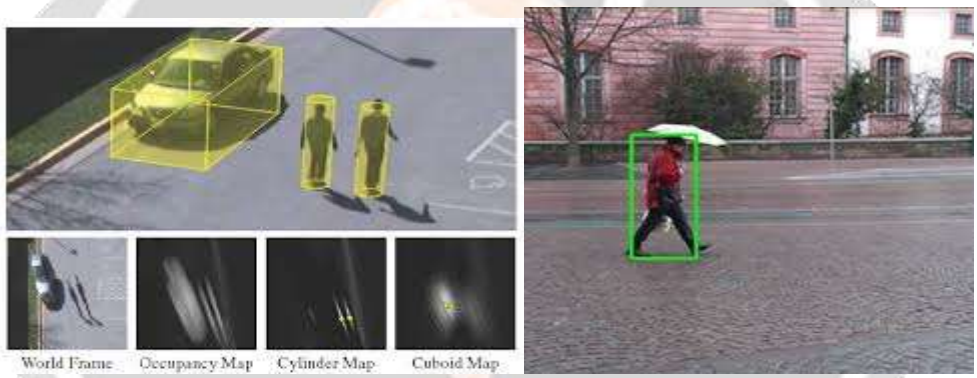

Figure 1:- Object detection [2]

1.2 Object Tracking

Object tracking means identifying and following same object in sequences of video frames. Camera is used as input sensor to acquire frames to form the video. The object of interest once detected and recognized can be easily tracked. Tracking involves tracing path followed by the object of interest. Real tracking is achieved using simple and fast motion detection method based on frame substation. Object tracking is defined as the process of finding an object of interest in the video by keeping track of its motion, orientation, and occlusion, etc. to get the useful information [5].

Tracking can be defined as the problem of approximating the path of an object in the image plane as it moves around a scene. The purpose of an object tracking is to generate the route for an object above time by finding its position in every single frame of the video. Object is tracked for object extraction, object recognition, detection and tracking, and decisions about activities [3]. Object to be tracked depends on application. People may be targeted in various area such as buildings, corporate offices, airports, railway stations, market places, public places for surveillance or target may be a moving car in an application like gaming shown in figure 2.

Figure 2:- object tracking[1]

Tracking becomes difficult for target object due to is change in the appearance when target oject get occluded by the other objects such as bridge, wall, etc. shown in figure 2

Figure 3:- Occlusion [1]

II. RELATED WORK

2.1 Viola jones Face Detection Algorithm

The Viola Jones object detection framework is that the initial object detection framework to produce competitive object detection rates in period of time planned in 2001 by Paul Viola and Archangel Jones. Albeit it is often trained to discover a range of object categories, it absolutely was motivated principally by the matter of face detection. This face detection framework is capable of process pictures very quickly whereas achieving high detection rates. Disadvantages: It takes very long coaching time, restricted head poses and we cannot find black Faces or gray scale images.

The characteristics of Viola–Jones algorithm which make it a good detection algorithm are:

- Robust – very high detection rate (true-positive rate) & very low false-positive rate always.
- Real time – For practical applications at least 2 frames per second must be processed.
- Face detection only (not recognition) - The goal is to distinguish faces from non-faces (detection is the first step in the recognition process).

The algorithm has four stages: Haar Feature Selection, Creating an Integral Image, Adaboost Training, and Cascading Classifiers

2.2 *Local Binary Pattern (LBP)*

This technique is incredibly effective to explain the image texture options. LBP has benefits akin to high-speed computation and rotation changelessness that facilitates the broad usage within the fields of image retrieval, texture examination, face recognition, image segmentation, etc. Disadvantages: It is a planned methodology isn't sensitive to little changes within the Face Localization, and victimization larger native regions will increase the errors. It is inadequate for non-monotonic illumination changes and is solely used for binary and gray pictures. The LBP operator used in order to express the texture of image Evaluation of Histograms Local Features and Dimensionality Reduction for 3D Face Verification patches. LBP has been widely applied with various algorithms of face recognition systems as a local feature extraction method. The LBP description of a pixel image is produced by thresholding the 3×3 neighborhood with the central pixel and devolving the result as a binary code.

2.3 Local Patterns of Gradients (LPOG)

Feature extraction method named as local patterns of gradients (LPOG) for robust face recognition.LPOG uses block-wised elliptical local binary patterns (BELBP),a refined variant of ELBP, and local phase quantization (LPQ) operators directly on gradient images for capturing local texture patterns to build up a feature vector of a face image. From one input image, two directional gradient images are computed. A symmetric pair of BELBP and a LPQ operator is then separately applied upon each gradient image to generate local patterns images. Histogram sequences of local patterns images' non-overlapped sub-regions are finally concatenated to form the LPOG vector for the given image. Based on LPOG descriptor, LPOG method is faster than many advanced feature extraction algorithms and can be applied in real-world applications.

2.4 Kalman Filter

Kalman filter are based on Optimal Recursive Data Processing Algorithm]. Here Gaussian state distribution is assumed. Kalman filtering is composed of two stages, prediction and correction. Prediction of the next state using the current set of observations and update the current set of predicted measurements. The second step is gradually update the predicted values and gives a much better approximation of the next state. Kalman filter tries to find a balance between predicted values and noisy measurements. The value of the weights is decided by modeling the state equations. Kalman filter track the system in discrete interval of time

2.5 Orthogonal Locality Preserving Projections (OLPP)

Face recognition methods extract high-dimensional face information from face data and project such data to a lower dimensionality space, where new face samples are classified. For example, the eigenfaces method uses Principal Component Analysis (PCA) to map high-dimensional grayscale face images to a lower dimensionality space while trying to preserve most of the data variability. To preserve the data discriminative properties, the Laplacianfaces method uses locality preserving projections (LPPs) to learn a lower dimensionality subspace, which represents the intrinsic geometry of the data and its local structure. To preserve better the data geometry in the lower dimensionality space, the orthogonal LPP (OLPP) method adds orthogonal property to the transformation matrix obtained by the LPP method.

OLPP is based on the LPP algorithm, which aims at finding a linear approximation to the Eigen functions of the Laplace Beltrami operator on the face manifold. However, LPP is non- orthogonal and this makes it difficult to reconstruct the data. The OLPP method produces basis functions and can have more locality preserving power than LPP. Since the locality preserving power is potentially related to the discriminating power, the OLPP is expected to have more discriminating power too.

III Proposed work

In proposed technique, object detection and object tracking process is done parallel. First from the input video ,it divide into frames then from each frames extract object with background subtraction particular human in this proposed system ,here face is detect using Viola-Jones algorithm , here it tests either object occluded or not, if it is occluded then using LPOG ,LBP,OLPP and FW-PCA find out particular occluded object face with comparison of

human feature such as eye,nose,lip then reconstruct the image. After fetching object face then track that object using morphology with filtering approach here use kalman filter.

3.1 Object Detection and track occluded face flow graph

Step 1: Take input as a image.
Step 2: Face detection step: viola Jones algorithm
Step 3: Check for Occlusion:
- If occlusion not detect then go to step-4.
- If occlusion detect then
  - ✓ Reconstruct the image using FW-PCA.
  - ✓ Test image with eye , nose , lip.
  - ✓ Feature execution using LPOG or LBP algorithm using with kalman filter.
  - ✓ Dimensionality and reduction using OLPP.

Step 4: Test input face from training data.
Step 5: Track the object

3.3 Literature survey

No	Title	Strong point	Weak point
1.	Patch-based Object Tracking Using Corner and Color with Partial Occlusion Handling	Robust ,accurate, efficient then state-of-art	Boundaries and corners are not identified, less accurate
2.	SURF-based human tracking algorithm for a human-following mobile robot	Out of plane rotation ,pose change occlusion still tracking possible	Only Single human tracking possible, poor accuracy when implement on hardware
3.	Real-Time Human Face Detection In Noisy Images Based On Skin Color Fusion Model And Eye Detection	Variant lightning conditions & pose robust detection of face &skin region	Only small and middle size face detect easily for large face result not accurate
4.	Multiple kernel Adaptive Segmentation And Tracking (Mast) For Robust Object Tracking	Shadow removal , same color background & object still it can track , accuracy provide	High memory required
5.	Simultaneous Face Detection and Recognition using Viola-Jones Algorithm and Artificial Neural Networks for Identity Verification	87% accuracy gain	Within 150cm Camera range only track
6.	An efficient scheme for face detection based on contours and feature skin recognition	Good accuracy, great speed ,simple computation ,multi face image rotate face detect	Too short and large edges are ignored

IV. CONCLUSION

There are number of methods and technique available in real time human detection and tracking ,still there are limitations like low accuracy ,occlusion detection, recovery and classification .so, In propose flow graph combine object detection and object tracking along with occlusion so it will give high throughput rate , accuracy and

recover occluded face ,particular human motion tracking by using VIOLA-JONES , LPOG with LBP , FW-PCA,OLPP .

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