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A SURVEY ON VIDEO OBJECT TRACKING SYSTEM

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Abstract—

In real-time application, most of the research is focused in visual tracking system. Since this is mainly used for the application of robotics, surveillance tracking, human to machine interface, etc. to extract the target status. There are more number of visual tracking system to identify the targeted region from the frame of given video. Since the performance of tracking can affect by sudden illumination changes, shadowing effect and uneven background. In moving object detection system, it suffers from dynamic background changing and shadow effect present in the video frames. Due to this, tracking of targeted region may **misclassified and results in false detection of moving objects**. To rectify this problem there are many techniques to detect and eliminate the shadow from frames like **K-Means clustering, Fuzzy C-Means, etc**. which are to segment both foreground and background from each frames. Then they remove/suppress shadow region and track the target. Since in that methods, segmentation is based on **non-changing background** of surveillance area. In order to overcome the drawbacks of the existing techniques an efficient and a novel method is proposed for the video tracking systems. The shadow in the video frames are removed using the Neighborhood Chain Prediction (NCP) method and then the features from the video frames are extracted using the Differential Binary Patterns (DBP). The Machine Learning Classification (MLC) method is used to classify the target features and the performance rate is increased for the video tracking system

Keywords - Machine Learning Classifier (MLC), Neighborhood Chain Prediction (NCP), Differential Boundary Pattern (DBP), Video tracking, Video processing

1. INTRODUCTION

The main objective of computer vision is to allow computer to capture motion and indulgent of human vision. Video object tracking has been emerged as important and challenging topic in research. The base of video object tracking is to estimate the motion of the object in each frame of the input sequence of images. Object can be defined as item, thing, entity of interest which used for further research .For example, person on the road fish on sea, vehicles in stand, etc.

Tracking is concept about movement of an object which are moving under the action of given forces. Increase use of computer based applications object tracking technique has been very essential in the field of video surveillance, healthcare, traffic control , robotic system etc. In video surveillance system object tracking is used to identify and track doubtful object behaviour. It is mainly focused for object detection and calculating various movement types in the systems. object tracking in traffic used to track the vehicles and observe the current traffic inorder to avoid any jams. Mainly ,Video object tracking is useful in nationalized banks, parking areas, shopping malls for observing activities of human . It is difficult due to assigning 3D into 2D image which leads to information loss. Object tracking is affected by the sudden distraction in image, noises and the illumination changes of the object. Occlusion is main problem in the object tracking.

Hence proper method must be selected or proposed on account of the where object tracking is being used. In this review paper different techniques are discussed and used for object tracking.

2. BASIC CONCEPTS OF VIDEO TRACKING

In this section, we describes the object shape representations and detection which used for object tracking.

An object generally from a video sequence, is separated into two pixel set. The first set contains the pixels which related foreground objects while the second one contains the background pixels. This result will be in binary or as mask. It is complicated to identify to what should be foreground and what should be background to be marked .Usually foreground objects are moving objects like people, ven and tree and remaining one is considered as background. Mostly ,shadows are taken as foreground object and give improper output. The basic steps for tracking an object are described below.

- Representation of Objects
- Detection of Objects
- Tracking of Objects

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Representation Of Objects:

we cannot perform the tracking object without any idea of what to track In that case, Object representation gives the way to follow the the various methods how the objects can be represented e.g., ellipse, contour, point, etc.

Generally objects are represented

- Shape
- Appearances.

This figure shows [2] centriod ,multiple points, rectangularpatch, elliptical patch part-based multiple patches, object skeleton, complete object contour, control points on object contour, object silhouette of object representation methods

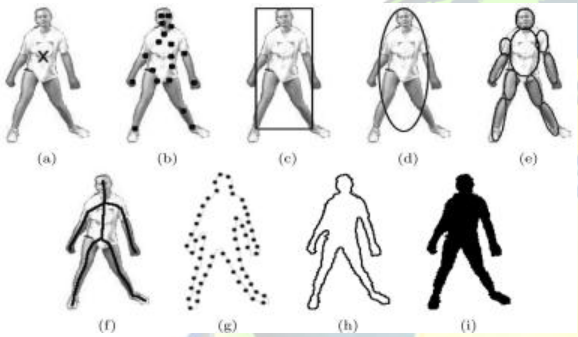

Fig. 1. Object Representations

This figure shows [2] centriod ,multiple points, rectangularpatch, elliptical patch part-based multiple patches, object skeleton, complete object contour, control points on object contour, object silhouette of object representation methods

Detection Of Objects:

Once the object representation method is determined next object detection method are used on the objects in the frame of the video . Object Detection identifies objects in the video sequence and then it clusters the pixels of those objects. several techniques like frame differencing[1], Optical flow[2] and Background subtraction[3][15] are used for detecting the objects.

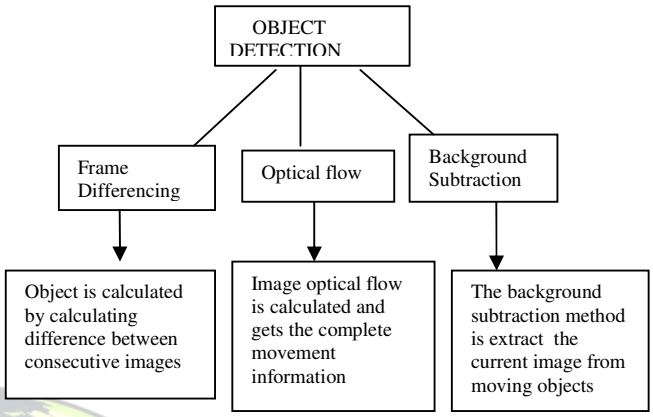

Fig 2 Object Detection Methods

Tracking Of Objects:

After detecting the object , object tracking methods is used. Tracking is defined as the problem of approximating the path of an object in the image plane as it moves around a scene[3],[14].Each object in an image will have differentshape and sizes. All images of shape and size are stored in workspace as library templates. By comparing the results of shape and size of the image produced by workspace with the stored value in the library templates, object in a frame can be recognized. The detection of object and their movement is an initial process for the tracking. The tracking must be supported by additional methods for clear cut object classification.

Object tracking is complex due to:

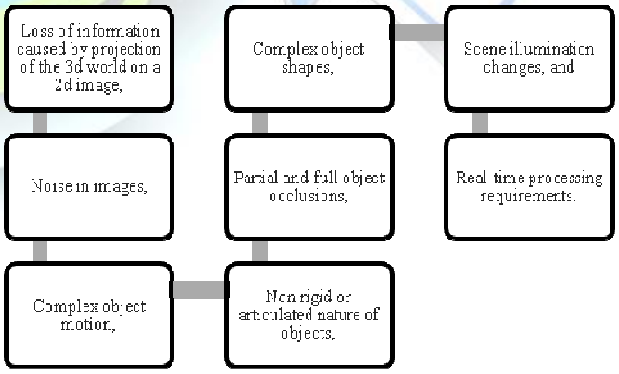

Fig 3 Difficulties Of Object Tracking

Techniques of tracking

There are main three mainly methods focused while tracking the object The techniques of object tracking are

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- Point Tracking,
- Kernel Tracking
- Silhouette

Point Tracking:

In video , moving objects are represented by their feature points. the problem of false detection of object occurs.due to occlusions. Point methods are divided into two categories, The deterministic method use qualitative motion heuristics to oblige the problem of Correspondence. Probabilistic methods take the object measurement and uncertainties into account to establish correspondence .

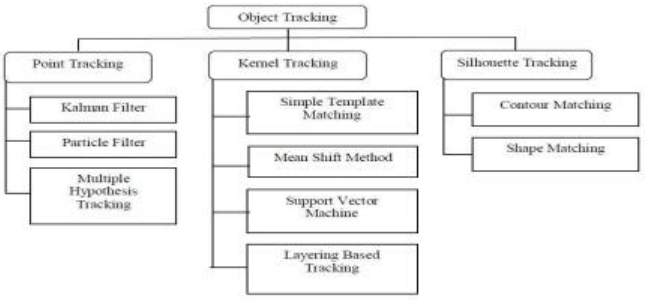

Fig 4 Methods of object tracking

Silhouette Tracking:

The aim of this tracking[1] is to locate the object region in each frame by means of an object model which are created by the previous frames. This method is able todeal with multiples object shapes, Occlusion and spliting and merging of objects. [1].

Kernel Tracking:

Kernel tracking performed by motion of object form frame to frame .The object motion are in parametric motion or dense flow field that are computed in successive frames

III . LITERATURE REVIEW

In this section we are presenting the work research of some authors in the field of video tracking and giving Some information regarding techniques

1 . In this paper [6], they proposed a robust tracking system based on the learning method of sparsity structure of the video, they perform a basic vector matrix for extracting the full targeted region. Here they present merging of various number of frames to predict the hidden object in the video. then they provide tracking on that area.

Merits:

- The merging of various number of frames in the video will predict hidden object present in the frame.
- This increase the precision rate when compare with existing work.

Demerits

- In this registration based targeted tracking system, this will consume more time to get the reconstructed frame result.
- If there is any sudden movement in the video, then this will also give misclassified result.

2 .In this paper[7] ,they proposed tracking of text detection and tracking in the given video. This is done by using the line mapping method with sub graph grouping based on the edge region in that frame. Here for the edge detection, they presented canny edge detection method to extract a smoothened level region prediction. From this edge region, they perform Delaunay triangulation and edge pruning to extract the targeted text location

Merits

- By using the canny edge detection method, this will predicts the thin line in the text.
- This can also predicts the text region in the basis of multi-scale text integration method.

Demerits

- Since in this method, they presented only the edge based tracking system which may results in misclassify the video frame border as text.
- Threshold for edge detection is in manual form.

3. In the paper [8], they proposed fast visual tracking system by using sparse representation of the target. The target is saved as the Dictionary features to get training for the classification process. Then from that training set, they perform Dictionary Learning process for the sparse representation of the frame. Then they extract coefficient for the sparse matrix and verify the target region present in the frame

Merits

- This is robust for various expression changes.
- The sparse representation will reduce the feature dataset which increase speed of tracking.

Demerits

- If there are any shadow present in the given video, this is also consider as the moving object.
- This system needs huge amount of training set for tracking a single target

4. In the paper [9] performs a discriminative structure prediction model from video frames. This compare the previous and current frame data to find the matching point from targeted image and video frames. This performs weight updation from the grid formation of present frame.

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According to the weight vale the target region was tracked by using the thresholding method from various parameters.

Merits

- This track the target region in robust video type.
- This improves MOTA score compare to other methods

Demerits

- Since this method suffer from shadow masking in the video frames.
- Same intensity grid may misclassify the targeted region**.**

5. In the paper [10] presents multi-target tracking system by link formation of objects with minimum cost data. This was achieved by using a Multi-way data association based optimization method to get he link between interacted objects in the current frame and targeted image. this verify the neighboring pixel intensity of the video frame and provide contour over it. This contour represent the targeted region**.**

Merits

- This track the target region even it is appear in the small object size.
- This reduces FP and FN of classification rate which improves the accuracy.

Demerits

- In this the initial target region must be given by user in perfect manner.
- If the pixel intensity is relevant to target, then it also provides contour over it.

6.In the paper [11] presents a multi-view SVM based object tracking system. For this process, there are three number of feature extraction types were included to represent the targeted region in that current frame. Here SVM performs classification of positive and negative target features from Gray features, HOG features, and LBP texture features. This performs verification of target region with various feature combination to indicate the correct targeted region.

Merits

- Due to different feature extraction method, the targeted region was verified in different pattern.
- Due to various verification model, this reduces the tracking failure rate.

Demerits

- Since more number of training for tracking the target leads to delay in that tracking.
- This reduce performance rate for fast moving object.

7. In the paper [12] proposed video segmentation and tracking process using online j=kernal based slow feature analysis. This method retrieve the feature matching by using kernal based Slow feature analysis (SFA). This includes Incremental kernal PCA model to reduce the dimensionality of feature and select best feature attributes from overall input signal stream..

Merits

- This reduces the feature size by kernal based PCA component extraction.
- This may track the object even it is in occluded stage.

Demerits

- For sudden change of motion, this may misclassify the position of target.
- Intensity variation affects performance of false rate.

IV PROPOSED WORK

This section illustrates the proposed work,and model for the extraction of the patterns from the video frame and the removal of shadows are described in detail

In the existing work[13], they performed targeted tracking system by merging the different frames.This extract the target region even it is in occluded state.In this stage, the best selection of matched frame was chosen by classification of image features.with the fusion technique the frames are fused to get clear view of target region. Then from that reconstructed image, the target was tracked.

Limitations

- Due to verification of target region with multiple reference of frames, this may consume bulk amount of training features to predict the matched point. .
- This method verify matching points from multiple number of frames with the given target image which may vary the region while sudden change in intensity

In this work, novel model of image normalization and feature extraction method is to minimize the limitations occur due to background variation and illumination changes.so,. It consists of the following stages such as:

- Shadow suppression using NCP
- Extraction of pattern using DBP
- Feature Classification Using MLC
- Tracking objects

Neighborhood chain Prediction(NCP)

The NCP and DBP performs clear representation of targeted region from given video frames.The NCP method provides the clustering form of image pixel by chain link formation with nearest neighborhood pixels.This clustered result separates shadow from the frame and perform image normalization over it .

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Differential Boundary Pattern (DBP)

DBP is to extract texture of the frame for suppressing shadow pixels present in the frame. This is done by estimating lowest intensity present in that frame and predict the area by using DBP method and enhance the pixel to suppress shadow region. From this equalized frame of the given video, we split the frame into several grids. Then from that grid formatted frame, we extract histogram features of the targeted frame and provide classification for each grid in that frame.

Machine Learning Classification (MLC)

In that classification can be done by using **MLC** method. This matched grid is consider as the tracked region and provide binary label to separate background and foreground. This type of visual tracking system is robust over sudden illumination changes and dynamic background by using the texture pattern analysis.This improves classification rate by retrieval of clear matching point. Thus it achieve better performance level when compare with existing system

Merits

- The shadow elimination method and texture pattern extraction method extract the clear structural information about target region in that present frame.
- This is effective for robust target tracking process

VI ALGORITHM FOR OBJECT TRACKING

The basic steps for tracking is to read frames in video and fliter them (noise removal) and form chain link formation to separate shadow region and increase the pixe intensity to normalized the image and form Grid pattern and extract the feature and classify the object

STEPS

1. Read Frames in video.
2. Filtering for pre-process the frame.
3. Extract chain link formation for connected components.
4. Separate shadow affected region.
5. Enhance the pixel intensity on the shadow region.
6. Normalize image.
7. Grid formation.
8. Pattern extraction using DBP.
9. Features for pattern.
10. Classify pattern to predict background and target region using MLC
11. Track the object

VII CONCLUSION

In this paper we introduce a new novel method of (NCP) based shadow suppression provides enhanced and normalized frasme. This improves the image quality and provides clear edge view to extract matching points. Then the novel texture extraction method of (DBP) performs multi-angle projection for feature extraction to represent the target region better than traditional texture pattern extraction methods. The MLC method classify the target pattern which will improves rate of accuracy better than existing classification method.

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