Object Tracking in Real Time Videos using Mean Shift Algorithm

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Abstract— The complex task in a running video is to efficiently track the target object. The Mean Shift algorithm can be applied robustly and quickly to track the object. Local binary pattern is the technique through which a neighborhood of a pixel is determined by its binary derivatives. So the LBP can be employed in the field of pattern and movement recognition.

In the proposed work mean shift algorithm will effectively track the target object applied along with LBP and joint color histogram in real time videos.

Key words: Mean Shift, color histogram, LBP, Tracking

I. INTRODUCTION

Object tracking actually aims at estimation of states of an object under severe varying visual conditions in a video sequence. There has been a great increase in the availability and amount of video information due to the ever increasing use of videos in several applications such as activity recognition, visual surveillance and intelligence user interface. In order to start with object tracking, the first and foremost step is to detect the moving object in video streams.

Many tracking algorithm [1] have been proposed to overcome the difficulties arising from noise, occlusion, clutter and changes in foreground object or in the background environment. Among the various algorithms available, the algorithm which has gained popularity is Mean Shift because of its simplicity and efficiency.

II. MEAN SHIFT

Fukunaga and Hostler proposed Mean shift in 1975. At that time, it served the purpose of performing data clustering. In 2002 Comiciou and Meer successfully applied mean shift to serve the purpose of image segmentation and object tracking. Mean shift is a non-parametric approach. Here the assumption is made that the estimated unknown probability density function is used from which the data in the feature space is actually sampled. Mean shift follows two steps in object tracking as given below:

- Appearance details
- Tracking

Figure 1 shows the work flow of mean shift algorithm.

Fig. 1: Mean Shift Work Flow

The mean-shift method is widely used to locate a target object quickly in sequential image. It takes advantage of a color distribution with a uniform quantization. Conventional mean shift algorithm will be enhanced and its modification will be used for tracking objects in running Videos for error free target detection. In our modified mean shift algorithm we will be utilizing color features and texture features for object tracking. In order to extract the texture features from object we will apply LBP (Local Binary Pattern) technique. In the proposed method, comparison will be made between LBP and simple RGB technique with the help correlation factor.

A. LBP

In order to extract the texture feature LBP operator is applied here. It actually labels the pixel in an image by thresholding its neighborhood with the center value and the final result is considered as a binary number.

Fig. 2: LBP Workflow

B. Color Histogram

Histograms are a common feature vector representation that measures the frequency with which the feature appears in an image or in an image window. With histograms features are quantized into a finite number of bins. Histogram-based holistic representations are widely used with color, edge, lines. The color histogram of an image defines the image color distribution. Color histogram determines the color space and hold the count of pixels for each color zone.

III. LITERATURE REVIEW

According to [4], in order to determine the candidate target region, mean shift algorithm was utilized and then a judgment on the tracking effect was made according to the Bhattacharyya coefficient. In case of tracking failure, the candidate area was matched with the target model by SIFT feature. In the next and final step a new track position was determined.

According to [16], the iterative procedure called ’mean-shift’ is a simple robust method for finding the position of a local mode (local maximum) of a kernel-based estimate of a density function. A new robust algorithm was developed that presented a natural extension of the ’mean-
shift’ procedure. The new algorithm simultaneously estimates the position of the local mode and the covariance matrix that describes the approximate shape of the local mode. They applied the new method to develop new 5-degrees of freedom (DOF) color histogram based non-rigid object tracking algorithm.

According to [17], the mean shift algorithm has achieved considerable success in object tracking due to its simplicity and robustness. It finds local minima of a similarity measure between the color histograms or kernel density estimates of the model and target image. The most typically used similarity measures are the Bhattacharyya coefficient or the Kullback-Leibler divergence. In practice, these approaches face three difficulties. First, the spatial information of the target is lost when the color histogram is employed, which precludes the application of more elaborate motion models. Second, the classical similarity measures are not very discriminative. Third, the sample-based classical similarity measures require a calculation that is quadratic in the number of samples, making real-time performance difficult. To deal with these difficulties they proposed a simple method to compute and more discriminative similarity measure in spatial-feature spaces. The new similarity measure allows the mean shift algorithm to track more general motion models in an integrated way. To reduce the complexity of the computation to linear order they employed the improved fast Gauss transform. That leads to a very efficient and robust nonparametric spatial-feature tracking algorithm.

IV. DESIGN METHODOLOGY
In order to start with object tracking, a video file is read using .avi extension. After this the Target window is selected. The first window is taken as reference model while the wholesome of next target windows are considered as candidate model. Finally the target model is compared with the candidate model to estimate whether the object of tracking has been correctly tracked or not. Fig 3 shows working of algorithm . The target model is first built with the initial position of the target in the target window. Based on the position of the target in the window, during tracking candidate model is built. Both these models are then compared and then the final judgment is made regarding the proper tracking of target.

V. EXPERIMENTAL SETUP
For experimental purpose “MATLAB 2013a” is used to execute all source codes. Here the search window used is 5. The number iterations taken here is 15 and the distance between the two consecutive frames is 0.3. The procedure first executes a file to convert the selected .avi file videos in frame. Here the comparison is made between the two techniques RGB and LBP. The conventional mean shift algorithm and modified mean shift algorithm will be compared.

VI. RESULTS
Figure 4 shows how the target window is selected in first frame. According the object to be tracked the user has to choose the target window.

![Selection of target window](image)

**Fig. 4:** Selection of target window

![Parameter Calculation using LBP and RGB](image)

**Fig. 5:** Parameter Calculation using LBP and RGB

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<tr>
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**Fig. 6:** Bins calculation using Simple RGB and LBP

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VII. CONCLUSION

In proposed work we are working on mean shift algorithm. Our emphasis will be on improvising the conventional mean shift algorithm with the application of LBP technique histogram for color feature extraction. Further modification will be applied to LBP and color histogram to make the object tracking more robust in comparison to the Simple RGB method along with the application for texture feature extraction and joint color histogram and further with correlation.

REFERENCE


