An Insight on Video Segmentation Techniques
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Abstract:
Video information has come to stay and has become an inseparable part of our day to day life. It has found significance in a variety of applications such as Forensic, Navy and Military, Medical, Multimedia applications. Proper processing of acquired video has helped in motion detection and object tracking. Segmentation of the acquired video plays a major role in motion detection and estimation. This review work presents a review on the present days video segmentation & tracking methods. Tracking basically an advanced process which works upon the location and shape of the object in every frame. In this we have tried to review various segmentation algorithms and present a comparison between them.

Keywords- Clustering, Motion Detection, Object tracking, Thresholding, Video Segmentation

I. INTRODUCTION
Segmentation is a scheme where the data is divided into groups of subsets having similar nature. Segmentation has turned out to be an indispensible technique for semantic content extraction and plays an essential role in pattern recognition, digital multimedia processing and computer vision.

A. Image Segmentation
At base image segmentation is quite a challenging process but is a necessary preprocessing element in Image analysis. It is irreplaceably used in high-level image interpretation and understanding such as robot vision, object recognition, geographical imaging and medical imaging. In general, image segmentation is a process of partitioning an image into non-overlapped, consistent regions that are uniform with respect to some characteristics like intensity, color, tone or texture, and more. There are different techniques for image segmentation e.g. thresholding, clustering, classifications, artificial neural networks (ANNs), region growing, edge detection etc.

B. Clustering
Classification of similar objects in groups is called Clustering. Alternately it may be called as division of data set into subset grouped on the basis of some similarity or trait. Clustering schemes may be classified as hard clustering scheme and soft clustering schemes. The conventional hard clustering scheme restricts each point of the data set to entirely just one cluster. The result hard clustering gives sharp results with each pixel belonging to just one class exactly. Many a times the images are infested with problems like poor contrast, limited spatial resolution, overlapping intensities, intensity in-homogeneities variation and noise rendering the hard clustering a difficult task. In fuzzy (soft) clustering, data elements can belong to more than one cluster. The fuzzy set theory described by a membership function. [2] The most popular method among the fuzzy clustering methods is fuzzy c-means (FCM) algorithm. Because it gives much more information than the hard segmentation methods and has robust characteristics for ambiguity.

C. Motion Detection
Motion detection is essential in many fields, such as pattern recognition, object tracking, traffic surveillance. At present the concerned approaches of moving target detection are background difference, time difference (frame difference) and
optical flow. Motion detection algorithm operates in a specific area to observe the change of image for detecting the moving object. However, the change in the environment disturbs the motion detection seriously: illumination, noise, shadow and so on. Lots of current motion detection algorithm fails to be effective and fast at the same time. Thus our task is to detect the motion detection algorithm which finds the balance between effectiveness and complexity.

**D. Object Tracking**

Processing the video scene and keeping track of its motion, orientation, occlusion etc. in order to extract useful information of an object of interest from a video scene is object tracking. The goal is to review the state-of-the-art tracking methods, identify new trends and classify them into different categories. Object tracking, in itself is quite challenging due to abrupt motion of object, changing appearance patterns of the object and the scene, non-rigid object structures, object-to-scene and object-to-object occlusions, and camera motion, which bring forth a lots of difficulties in tracking of objects.

**E. Video Segmentation**

Dividing a video into meaningful elementary parts is having a storing correlation with the real world contained in the video data. The result of video segmentation is a set of segments that collectively cover the actual entire video data. The video signal differs from image signal as it contains temporal information, which includes camera motion and introduces the concept of object motion, therefore Video has temporal nature as well as spatial (static) nature. Hence the video segmentation can be temporal, spatial or spatio-temporal. where processing in spatial domain is just like a static image and segmenting a sequence of video frames in temporal domain is called temporal segmentation or shot detection.

**F. Video Segmentation Categories**

Video Segmentation techniques of one kind concentrates on the source of attributes available and some other techniques employ the motion estimation criteria.

1) Based on source of attributes:

Videos are classified on the basis of the features available with the input video data. Lots of methods are available in this category the different methods
are Pixel based methods, Region based methods, Edge based methods, Content based methods, Object based methods, Semantic and many more.

2) Based on the model employed:

In this category the segmentation is achieved using different available models such as the Gaussian mixture models, Bayesian learning, Stochastic modeling such as Markov random fields/Gibb’s distributions, Bayesian inferences.

3) Based on the strategies involved:

As per the strategies followed it is classified as strategy in which the segmentation starts in spatial domain followed by tracking along temporal domain. It is also base on clustering wherein the trajectories of points or regions of interest are extracted based on motion similarity along temporal direction, trajectories may then be grouped. Applied to 3D spatio-temporal pixel of image sequence so that the evidence of similarity is collected in the joint dimensions without favoring one dimension over another.

II. RELATED REVIEW WORK

In the literature survey carried out we come to an observation that lots of researchers have worked upon video segmentation, motion tracking and object tracking with many publication and research reports wherein the researchers have worked upon different techniques and have tried to improve the performance of the available systems. Shaoping Xu (2013), in his work has proposed a novel cluster number adaptive fuzzy c-means image segmentation technique (CNAFCM) for naturally grouping the pixels of an image into different homogeneous regions for a situation when the cluster number is not clear beforehand. The author takes help of GLCM (Grey Level Co-occurrence Matrix) feature extracted at the image block level instead of at the pixel level to calculate the cluster number, which is used as initialization specification of the following FCM clustering. Meenakshi M. Devikar (2013) [3], in her work proposed Histogram based skillful fuzzy c-means algorithm for the segmentation. Robustness against noise is improved by using the spatial probability of the nearby pixel. The medical images are denoised with effective denoising algorithm before to segmentation. S.M. Ali (2013) [2] in his work shows that the MRLs are pre-processed with bilateral filtering to reduce noise and retaining the edges between brain tissues and using K-Means algorithm image is segment into five and six clusters, but the FCM is used to produce six clusters. Spatial enhancement method highlights the band density of the field of interest (tumor). To extract the tumor object of each slice morphological operations are used. According to Jiamin Ning (2013) [4], has combined adaptive background model in HSV color space with dynamic object segmentation based on fuzzy clustering for extracting dynamic objects from frame. The adaptive background restores the background due to the correct description of the HSV color space, and distinguishes the moving area and noise area wherein the dynamic object segmentation based on fuzzy clustering is used by the adaptive selection of threshold. Sudhanshu Sinha(2014) [5], has used the simplified mean-shift filter and K-Means clustering for background modeling based on mixture of Gaussian (MOG), Kernel Density Estimation (KDE). With some of the aforementioned models comparison of the proposed approach have been made. D. W. Chinchkhede (2012)[1], uses background subtraction for finding moving objects in a video sequences. A rough approximation to the task of classifying each pixel on the frame of present image, locate slow moving objects or video having poor image qualities and distinguish shadows from dynamic objects by using modified background subtraction method.

Rajasekhar Nalabolu (2014) [7] has proposed a motion recognition system based on background subtraction using fuzzy color histogram and morphological processing. The morphological process remove the unwanted pixels The background subtraction algorithm uses a clustering-based quality, called fuzzy color histogram (FCH), which has an ability of extremely attenuating color variations generated by background motion. Nookala Venu (2015)[10] has integrated the Gaussian kernels based fuzzy c-means (MPVKFCM) algorithm and mean and peak-and-
valley filtering wherein the mean and peak-and-valley filtering algorithm is used for denoising the image. Secondly, image segmentation algorithm with Gaussian kernels based fuzzy c means is performed on the image that are denoised.

### III. PAGE STYLE

#### TABLE I

<table>
<thead>
<tr>
<th>Author Name</th>
<th>Year</th>
<th>Technology Used</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr. D. W Chinchkhede</td>
<td>2012</td>
<td>Modified Background Subtraction</td>
<td>Perfectly handle slow moving objects and slow image quality of videos</td>
</tr>
<tr>
<td>Shaoping Xu</td>
<td>2013</td>
<td>CNAFCM</td>
<td>Estimate cluster number with minimal time cost.</td>
</tr>
<tr>
<td>Meenakshi M. Devikar</td>
<td>2013</td>
<td>Histogram Based FCM Algorithm and Spatial Prob.</td>
<td>Improved segmentation accuracy for noisy images</td>
</tr>
<tr>
<td>S.M Ali</td>
<td>2013</td>
<td>Clustering and Enhancement Methods</td>
<td>Detect and extract the brain tumor in MRI images</td>
</tr>
<tr>
<td>Jiamin Ning</td>
<td>2013</td>
<td>Optimizing Motion Detection algorithm</td>
<td>Suppress the effect of noise</td>
</tr>
<tr>
<td>Sudhanshu Sinha</td>
<td>2014</td>
<td>Simplified Mean Shift Filter and K- Means Clustering</td>
<td>Easily understandable to non-mathematicians</td>
</tr>
<tr>
<td>Nookala Venu</td>
<td>2015</td>
<td>Kernal Based Fuzzy C Means Algorithm</td>
<td>Increase the performance and decrease the computational complexity</td>
</tr>
</tbody>
</table>

Thus we observe in table I that there are lots of schemes which are being employed to carry on the segmentation. Practically a hybrid approach is followed where one or more schemes are combined to give out a better result.

### IV. CONCLUSIONS

The Video processing or computer vision inherently rely on video object segmentation. It helps to accentuates partitioning the video frames to semantically meaningful video objects and backgrounds. Video object segmentation is a vital operation for content-based video coding, multimedia content description, intelligent signal processing and more. We have been able to review the various techniques which have been employed by the researchers over the years. We observe that every technique scores over the other in one or two way but also carries out some disadvantage over the scheme in comparison.

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