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An Insight on Video Segmentation Techniques

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Abstract:

Video information has come to stay and has become an in separable part of our day to day life.It has found significance in 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 in to 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 softclustering 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.

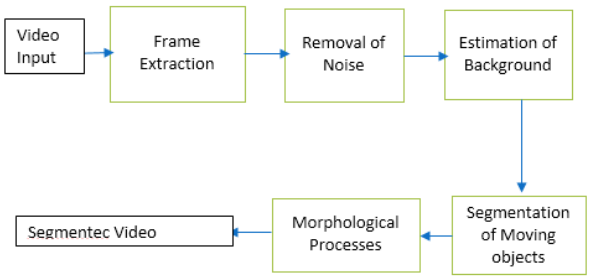

Figure 1: Block diagram of the proposed video object segmentation approach.

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.

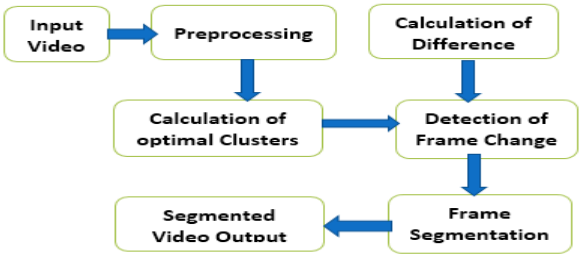

Figure2. Block diagram of Video Segmentation

For video data temporal segmentation determines boundary of shots and operates both in compressed and uncompressed domain. Applications of segmentation include region-based image and video description, indexing and retrieval, interactive region-based annotation schemes, video summarization, detection of objects that can serve as cues for event recognition, region-based coding, etc. especially image and video description, indexing and retrieval have been on the focus of attention of many researchers working on segmentation.

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 MRIs 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. columns.

III. PAGE STYLE

TABLE I
COMPARATIVE ANALYSIS OF DIFFERENT TECHNIQUES

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

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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REFERENCES

[1] Mr. D. W. Chinchkhede1 & Mr. N. J. Uke, “Image Segmentation in Video Sequences Using Modified Background Subtraction” , International Journal of Computer Science & Information Technology (IJCSIT) Vol 4, No 1, Feb 2012.

[2] Meenakshi M. Devikar and Mahesh Kumar Jha, “ Segmentation of images using histogram based FCM clustering algorithm and spatial probability”, Department of Telecommunication Engineering, CMRIT, Bangalore, India, International Journal of Advances in Engineering & Technology, Mar. 2013.

[3] Shaoping Xu, Lingyan Hu, Xiaohui Yang and Xiaoping Liu, “A Cluster Number Adaptive Fuzzy c-means Algorithm for Image Segmentation” , International Journal of Signal Processing, Image Processing and Pattern Recognition Vol.6, No.5 (2013), pp.191-204.

[4] S.M. Ali, Loay Kadom Abood, Rabab Saadoon Abdoon , “Clustering and Enhancement Methods for Extracting 3D Brain Tumor of MRI Images”, Remote Sensing Research Unit, Dept. of Computer Science University of Baghdad, Department of Physics, University of Babylon,Volume 3, Issue 9, September 2013.

[5] Jiamin Ning, Yang Yang, and Fei Zhu, “ Background Modeling and Fuzzy Clustering for Motion Detection from Video” , School of Computer Science and Technology, Soochow University, Suzhou, Jiangsu, China, 215006, JOURNAL OF MULTIMEDIA, VOL. 8, NO. 5, OCTOBER 2013.

[6] Sudhanshu Sinha, Manohar Mareboyana, “Video Segmentation into Background and Foreground Using

Simplified Mean Shift Filter and K-Means Clustering", Bowie State University, Bowie, MD 20715, April 3-5, 2014.

[7] RAJASEKHAR NALABOLU, D. V. S. NAGENDRA KUMAR, "Object Identification in Digital Videos using Color Histogram Bins and Fuzzy C-Means Clustering Techniques" , Mahathma Gandhi Institute of Technology, Hyderabad, India, ISSN 2319-8885 Vol.03,Issue.46 December-2014.

[8] S.padmakala and Dr. G.S Anandhamala "A Novel Video Objevt Segmentation Appraoch for Noisy Video Sequences towards Effective Video Retrival", International Journal Of Computer Theory And Engineering, Vol.2, No.6, December 2010.

[9] Mada Amarnadh, S. Asif Hussain, M. Janardhana Raju, "A Review of Video Segmentation Techniques", Global Journal of Advanced Engineering Technologies, Special Issue (CTCNSF-2014).

[10] Nookala Venu, B. Anuradha, "Medical Image Segmentation Using Kernal Based Fuzzy C Means Algorithm" , Research Scholar, Dept. of ECE, SVU College of Engineering, Sri Venkateswara University, Tirupati-517502, India. Volume 4, Issue 1, 2015 IJEIR.