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Segmentation of Video Using local Descriptors and Optical flow Techniques

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Abstract— **Dynamic textures are textures in motion, defined as sequences of frames (images) of moving scenes. The segmentation represents the image into much better way and which can be quick and easier to analyze.**
But the segmentation of such dynamic textures is a difficult task. Because of its random nature .dynamic textures have features spatial (appearance) and temporal (motion) and they may be different from each other.
Thus in our paper, we combine the spatial and temporal modes , to achieve robust segmentation specially for cluttered dynamic textures. The techniques we are using is local descriptors including local binary pattern (LBP) and Weber local descriptor (WLD), these two features are computed for every frame in the video and accordingly the equivalent histograms are being obtained which are further compared With set threshold, thus obtaining the dynamic texture segmentation.Optical flow technique is used for representing the movement of objects , we also compute the histogram of oriented optical flow (HOOF) to arrange the optical flow of region.

Keywords— **dynamic texture, Weber's law, optical flow, HOOF,Local descriptors.**

I. INTRODUCTION

In real world it is experienced that a large class of scenarios consist of a large group of particles or objects in motion for example, it may be foliage flying in wind, fire, smoke or even a moving object and dynamic textures refers to the frames of these moving objects. Characterization of moving objects has much importance in areas of challenging environment. For example , traffic monitoring which is the basic need today ,security purpose. Segmentation Of such areas is a basic difficulty in computer vision[1][2][3].
As compared to the static case, dynamic texture is difficult because of its unknown random nature and motion fields.Dynamic textures involves separation of particles showing different random motion fields.

In this paper, a method based on appearance and motion mode details is used for segmentation of dynamic textures. For appearance, local spatial texture descriptor is employed , for motion mode we use optical flow and local temporal texture descriptors to represent the object movements . HOOF (histogram of oriented optical flow) is used to organize the optical flow of the region.
In optical flow we basically deal with the information regarding direction of pixels in motion. For computation of distance between two HOOF's we used technique known as Weber's law, which is simple and effective. The local descriptors used are LBP and WLD. Furthermore for threshold, we use method of offline supervision, where we can adjust the values of threshold.

2. METHODS AND PROCEDURES

The framework followed in our paper is shown in Fig(1)
The video is given to as input and firstly converted into frames and then preprocessing is done with help of filtering and resizing. The LBP_{TOP} and WLD_{TOP} features and their histograms has being calculated which is shown in results section. To compute the optical flow we used the method in [7],we call the descriptor as HOOF following the idea in [6]. Segmentation of the video is done which includes three processes, these are splitting, agglomerative merging and pixelwise classification.

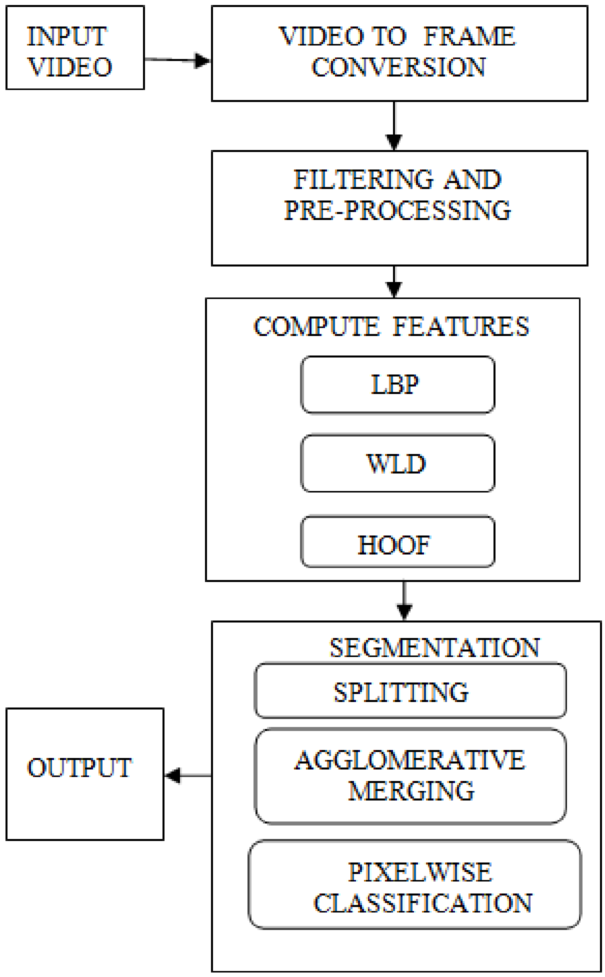


Fig (1) Frame work of implementation

3. FEATURE COMPUTATION

3.1 Local binary pattern

From the input video the LBP is calculated. This texture descriptor is called as spatiotemporal descriptor [4] as this is used in special and temporal domain. orthogonal planes are being considered as XY, XT and YT. Where XT plane indicates the deviation in pixels row- over temporal domain, similarly YT plane indicates the deviation in pixels column wise over temporal domain and XY indicates the appearance mode. For each plane LBP is calculated using equation as follows:

$$LBP_p = \sum_{P=0}^{p-1} s\,(g_p - g_c)2^p \text{ , where}$$

$$s(A) = \begin{cases} 1, & \text{if } A \geq 0 \\ 0, & \text{otherwise} \end{cases} \qquad \ldots\ldots\ldots\ldots (1)$$

Where gp ,corresponds to the gray values of P number of neighboring pixels on the rectangle of length $2L_x+1$ and $2L_y+1$ ($L_x>0$ and $L_y>0$). All three orthogonal planes are used to concatenate the histogram of LBP_{TOP} . Fig(2) is similar as given in [5] and equation(1) taken from [4]. It is based on uniform pattern.

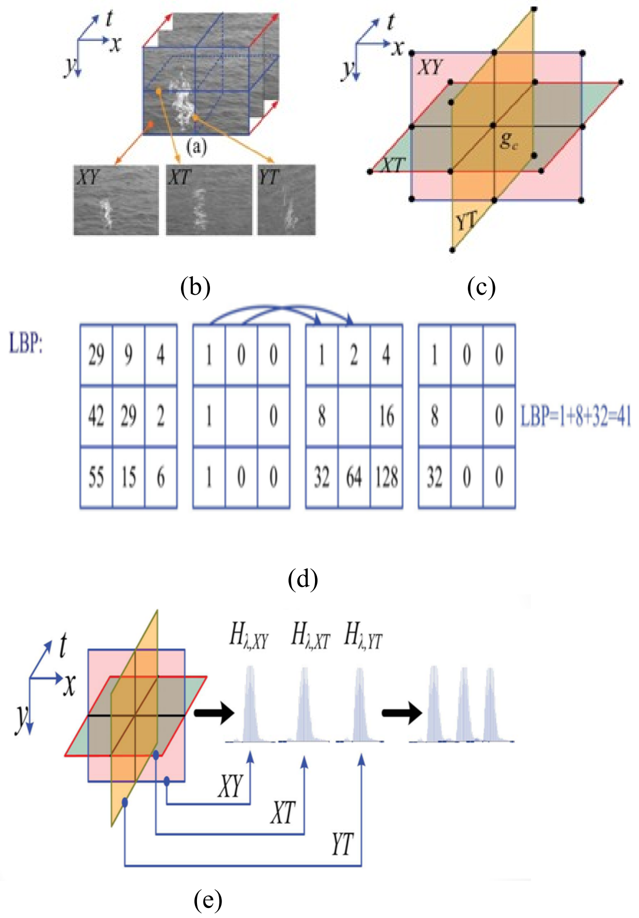


Fig (2) Computation of LBP_{TOP} for a dynamic texture.

(a) sequence of a DT, (b) three orthogonal planes of the given DT,(c) vertex co-ordinates,(d)computation of LBP of pixel,(e)computation of sub-histograms for LBP_{TOP}.

3.2 Weber local descriptor

We use its one component i.e differential excitation of [9] it is calculated by using equation (2)

$$WLD\ (I_C) = Sigmoid(x) = \frac{1-e^{-x}}{1-e^{-x}}$$

$$\text{Where, } x = \sum_{i=0}^{p-1} \frac{(I_i - I_c)}{(I_c + C_0)} \qquad \ldots\ldots\ldots\ldots(2)$$

where , I_c is the center pixel , I_i are the neighbors , and p is number of neighbors. C_0 is the constant to avoid case of I_c is equal to zero. We also calculate three orthogonal planes of WLD feature known as WLD_{TOP}.

3.2 HOOF (histogram of optical flow)

Optical flow is calculated for each pixel, using method in [6]. The descriptor used is known as HOOF.

3.3 Distance measure

In this part we present the distance measure for LBP,WLD, and HOOF. histogram intersection is used for LBP/WLD and for HOOF we use technique called Weber distance.The similarity between the two histograms , is calculated using histogram intersection.

4. STEPS FOR SEGMENTATION

Firstly as shown in fig (1), after the preprocess step video is splitted into equal number of sections , entire frame is splitted into 17X17 equal sections. By using these frames LBP and WLD features are computed. The segmentation is done into two distinct steps called agglomerative merging and pixelwise classification.

4.1 Agglomerative merging

After the input frame has been split into patches of roughly uniform texture, merging of adjacent region showing similar properties is done until a stoping criteria is satisfied.

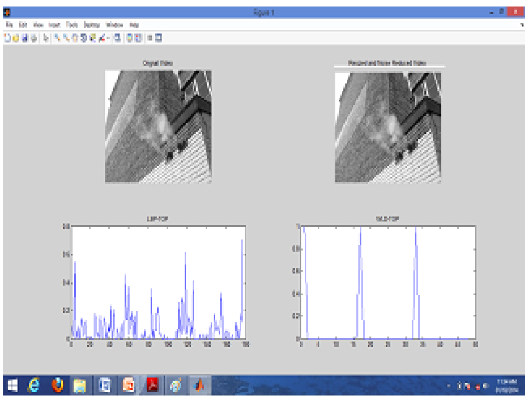
4.2 Pixelwise classification

The localization of the boundaries is improved,using pixelwise classification, histograms is calculated and compared with the threshold. The boundary is classified as dynamic texture.

5. RESULTS

We are performing segmentation on mainly well known DynTex data set called as dynTex [11]. We are limiting test video where video sequences are shot by stationary camera.segmentation is performed on the sequence 648ea10, taken from dynTex database. The result analysis is shown, the implementation of our project is based on four parts, namely splitting, pre-processing, feature computation and segmentation. firstly, as shown in fig (5.1) the original video is pre-processed so that the quality of the video is better for further operation. Noise probably distracts the quality of video frames, each type of filters noise is reduced using various filters which are suited well for these noises,as shown in fig (5.2) .Then the pre-processed video is passed for feature computation, which computes the histogram of LBP,WLD and thus we perform segmentation as shown in Fig (5.4) each frame is segmented further and pixelwise classification.

Fig(5.1) ORIGINAL VIDEO



Fig(5.2)FILTERING,PRE-PROCESSINGAND HISTOGRAM OUTPUT

Fig (5.3) SEGMENTED FRAME

Fig (5.4) PIXELWISE CLASSIFCATION

6. CONCLUSION

Segmentation is implemented by new framework, which uses spatial and temporal descriptor and optical flow of pixels. By using XT and YT planes histograms of LBP and WLD is calculated ,that are use to describe its motion field. Thus method used is effective for DT segmentation. It works better on cluttered background .Most of the existing methods require previous information about the DT in the test set during segmentation. Methods used are applicable for day–to-day applications as traffic monitoring, forest fires to prevent disasters, security ,animal behavior for scientific studies.

7.ACKNOWLEDGMENT

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8. REFERENCES

[1] T. Amiaz, S.Fazekas, D.Chetverikov, and N.Kiryati, "Detecting regions of dynamic texture," *in Proc. Conf.Scale Space Variat.Methods Comput.Vis.,2007,* pp.848-859.

[2] D.W.Murry and B.F.Buxton, "Scene segmentation from visual motion using global optimization," *IEEE Trans. Pattern Anal. Mach. Intell., vol. 9, no. 2,* pp. 220-228, March .1987

[3] R.Polana and R. Nelson. *"Temporal texture and activity recognition", in Motion-Based Recognition*.Norwell,MA:Kluwer;1997

[4] G .Zhao and M.Pietikainen,"Dynamic texture recognition using local binary patterns with an application to facial expressions,*IEEE Trans. Pattern Anal. Mach. Intell*., vol.29,no.6,pp.915-928,June.2007

[5] Jie chen ,Guoying Zhao, Mikko salo, Esa rahtu, and Matti pietiahen, automatic dynamic texture segmentation using local descriptors and optical flow,*IEEE Trans.on image processing* , Vol 22(1) , pp 326-339,2013.

[6] T.Brox, a, Bruhn, N. Papenberg, and J. Weickert, "High accuracy optical flow estimation based on theory for warping," in *Proc. Eur. Conf. Comput. Vis.,* 2004, pp.25-36.

[7] R. Chaudhry, A. Ravichandran, G. Hager, and R. Vidal, "histograms of oriented optical flow and Binet – Cauchy kernels on nonlinear dynamical systems for the recognition of human actions,"*in Proc.IEEE Int.Conf. Comput. Vis. Pattern Recognit.,* June. 2009, pp. 1932-1939.

[8] D.Chetverikov and R. Peteri, "A brief survey of dynamic texture description and recognition*",in Proc,4th Int.Conf.Comput.Recognit.Syst.,2005,* pp. 17-26.

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