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Compact Video Streaming & Background Extraction using PyramidalOptical flow Reduction

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Abstract

The increasing demand of the cameras for surveillance systems not only requires the large storage devices but also requires the reduction in the time to browse the whole video. The major problem in current scenario is use of the surveillance cameras in which they provide unedited raw data. Video browsing and retrieval are inconvenient due to inherent spatio-temp oral redundancies, where some time intervals may have no activity, or have activities that occur in a small image region. To meet such requirements video summarization is the only solution. Hence in our proposed work video summarization algorithm based on pyramidal reduction for surveillance videos is accomplished. Surveillances video summarization is not only related to reduction of size of the video but also to track the important objects in the video by maintaining the chronology.

Index term:*Background extraction,Pyramidal reduction Optical Flow, Entropy based video summarization.*

INTRODUCTION

With the advance of information technology, the amount of created, transmitted and stored multimedia content constantly increases. As a result, the multimedia content is widely used in many applications. Therefore, there arises the need for its organization and analysis, both from commercial and academic aspects. Computer vision represents a technology that can be applied in order to achieve effective search and analysis of video content.

Existing work methodology

The existing work methodology aims at describing the various approaches to video summarization. The dynamic video synopsis suggested here has the following two properties:

1. The video synopsis is itself a video, expressing the dynamics of the scene.
2. To reduce as much spatio-temporal redundancy as much as possible.

In this method we discuss the following video summary methodologies,

1. Techniques using domain knowledge
2. Stroboscopic approach
3. Techniques based on frame clustering
4. Activity Detection
5. Pyramidal reduction using motion entropy (H)
6. Pyramidal reduction using mutual information

Proposed work methodology

In our proposed work the method for video summarization is achieved on the method of pyramidal reduction using entropy followed by mutual information algorithm.

Entropy based method

Due to inherent spatio-temporal redundancies of the surveillance videos because of the activities occurring in a small image region. Our method aims to remove all the redundant segments viz. segments with low-level of information and preserve only those segments containing the activities of interest, thus retaining their dynamicity.

In this approach, we refer the group of frames as the segments of the video. We initially find the local coherence motion of each frame in the video sequence by using the Lucas Kanades optical flow algorithm [5]. We use these values of local coherence motion to find entropy (H) of the large segments at level 1[4] and remove all the static segments in this level. We again find the entropy of these segments containing more active frames and further divide and discard the low-level segments at level 2.Then by applying a suitable threshold we discard the segments with low-level of information and select only the segments containing more active frames. This process is done repeatedly for a number of levels till we get appropriate results. Figure 3.1 shows pyramidal Lucas Kanade optical flow where the motion estimate at the preceding level is taken as the starting point for estimating motion at the next layer down. Figure 3.2 represents Pyramidal segmentation of video based on the entropy (H), where we can see how segments are taken in successive levels.

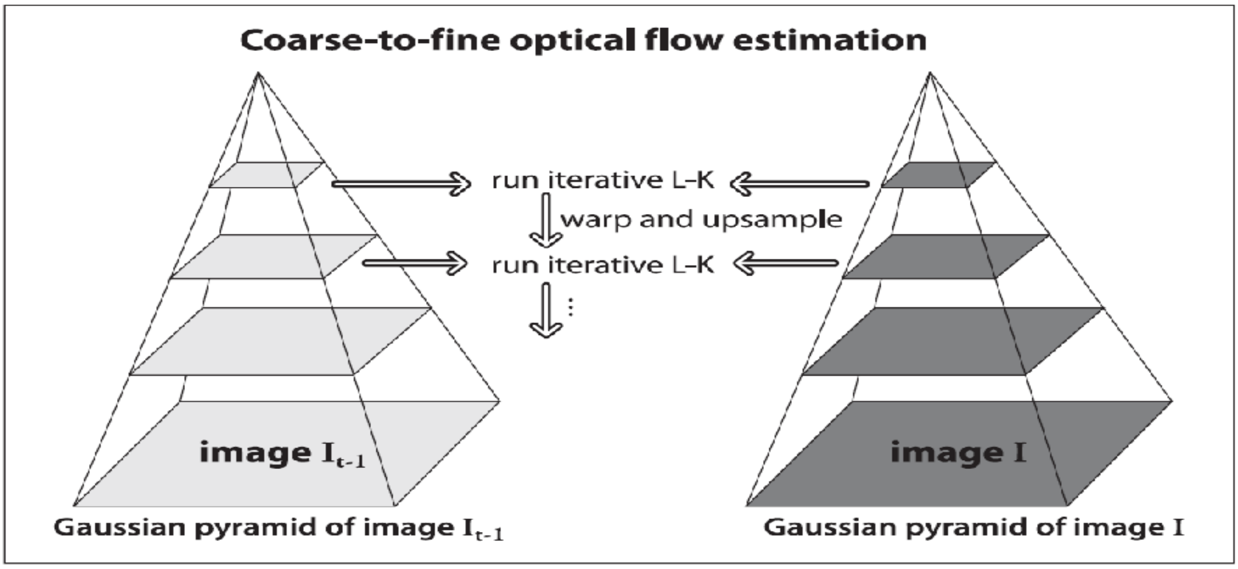

Fig 3.1: *Pyramid Lucas Kanade Optical Flow*

|S| = active S > T
Inactive S < T (3.1)

$$H = -\sum_{i=0}^{n} P_i \log_2 P_i \quad (3.2)$$

Motion Entropy Algorithm

The video synopsis S is constructed from the input video I by following the steps given below:

1. Grab a frame from the input video I from video sequence S.
2. Determine the local coherent motion using the Lucas Kanades Optical flow algorithm.
3. Divide the long video sequence into large segments and compute the entropy of each segment using the formula (3.2)
4. Then by applying suitable threshold, discard those sections that are having relatively less local coherent motion.

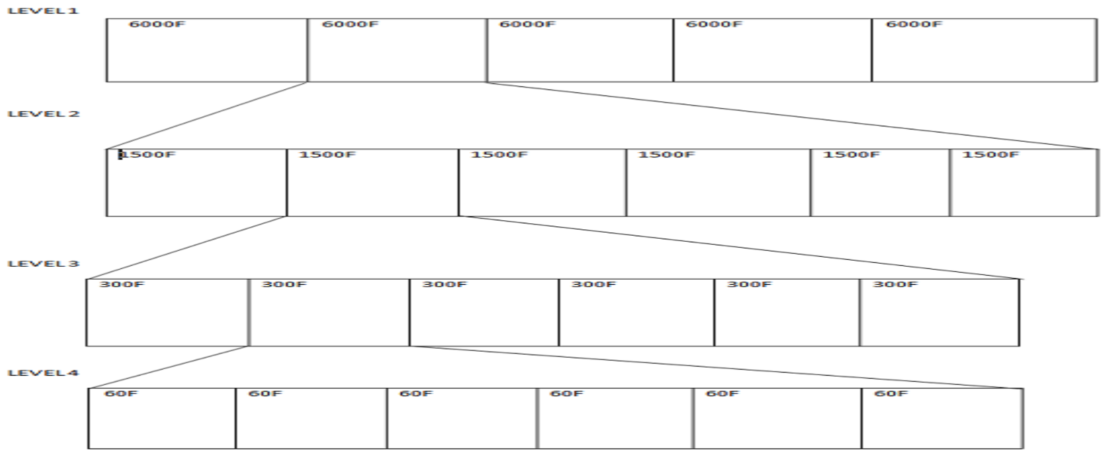

Fig 3.2: *Pyramidal segmentation of video based on the entropy (H)*

5. Again divide those selected long sequences into short segments and calculate the entropy for each using the same formula (3.2) above.
6. Again discard those segments with relatively less entropy using suitable threshold.
7. Perform steps 5 and 6 iteratively till we find the precise results.
8. Construct the summarized video sequence T using all active segments.

Mutual Information based method

In this approach we find the similar segments showing the similar properties and then select the most appropriate segment from those segments as a key segment, thus retaining their dynamicity. Here, we initially find the average pixel value of each frame in the video sequence in the corresponding X and Y direction respectively. We use these values of average pixel value to find mutual information (I) of the large segments. Then apply a suitable threshold to all the similar segments and finally select the key frames from those segments. This process is done repeatedly for a number of levels say level 2, level3, etc.by reducing the segment size till we get appropriate results. Figure3.4 shows how mutual information is the dependence of one random variable on the other.

Xn
$$H[X] = \Sigma P(X = x)\log P(X = x) \quad (3.3)$$
i=0

Xn
$$H[Y] = \Sigma P(Y = y)\log P(Y = y) \quad (3.4)$$
i=0

Xn
$$H[X, Y] = \Sigma P(X = x; Y = y)\log P(X = x; Y = y) \quad (3.5)$$
i=0

$$I(X, Y) = H(X) + H(Y) - H(X, Y) \quad (3.6)$$

Mutual Information Algorithm

The video synopsis T is constructed from the input video S by following the steps given below:

1. Grab a frame from the input video I from video sequence S.
2. Determine the average pixel values H(X), H(Y) and H(X, Y) for these

frames using equations (3.3), (3.4) and (3.5) and obtain the segments.
3. Calculate the mutual information I(X, Y) using equation (3.6).
4. Apply a suitable threshold heuristically, and select the one key segment from the group of similar segments.
5. Again divide those selected long sequences into short segments and calculate the average pixel value for each using the same formula above.
6. Again select key those segments with relatively less mutual information using suitable threshold.
7. Perform steps 5 and 6 iteratively till we find the precise results.
8. Construct the video sequence S using all active segments.

Proposed Algorithm
1. Take video data input.
2. Calculate number of frames in video.
3. Take one frame at a time.
4. Make first frame as reference frame.
5. Pyramidal reduction up to level 4.
6. For total number of frames perform auto-contrast processing.
7. Calculate entropy of each image.
8. Consider background image entropy as reference and store the difference in array.
9. If difference in between current frame and reference frame entropy is more than threshold, store image in video sequence array.
10. After performing processing on all frames, write video sequence with number of frames/sec rate equal to input video rate.

RESULTS
In the provided results of summarized video based on the Compression ratio which is given as,
Compression ratio = number of output frames / number of input frames.
As in this case we have applied the entropy calculation and then discarding the segment by applying a suitable threshold we get various compression ratios for each video.

Fig4.1*indicates the some off the sequence of frames from video outdoor1*

Fig4.2 *indicates the some off the sequence of frames from video outdoor2.*

Fig4.3 *indicates the some off the sequence of frames from video outdoor3*

Fig4.4 *indicates the some off the sequence of frames from video indoor.*

As shown in the Figure 4.1 indicates the some off the sequence of frames from video outdoor1. Figure 4.2 indicates the some off the sequence of frames from video outdoor2. Figure 4.3 indicates the some off the sequence of frames from video outdoor3. Figure 4.4 indicates the some off the sequence of frames from video indoor.

Fig4.5 *indicates the with & without contrast adjustment*

In auto contrast process we adjust each frame with some upper and threshold values to enhance the edges of the images. Figure indicates images with and without contrast adjustments. The differences of the images before and after contrast.

Table 4.1: *Compression Ratio for different types of videos used in experimentation*

Video	Total Frames	Required Frames	Ratio
Outdoor 1	488	373	0.76
Outdoor 2	815	259	0.31
Outdoor 3	1765	812	0.46
Indoor	2859	320	0.1119

Further we have done Gaussian pyramidal reduction of each image. Figure indicates the pyramidal reduction up to 4 levels. Pyramidal reduction here is used with purpose of increasing the processing speed. As image contents are minimized the processing time for each figure will get reduced.

CONCLUSION

We have presented a method to summarize a given video captured from a fixed surveillance camera. The constructed synopsis is based on pyramidal reduction using motion entropy (H) and mutual information (I).It eliminates the static segments and also segments containing low level information. It maintains chronology without destroying the temporal relationship of these activities. Here, relatively less compression is achieved in this approach than in stroboscopic approach but at the cost of less compression we can meet the security issues without missing much of the details in activities.

REFERENCES

1. *"Key clip extraction for Quick Browsing from Surveillance Videos"* International Journal of Engineering Research & Technology (IJERT)Vol. Issue 11, ISSN: 2278-0181, Mr. Gurav.S.S
2. "*Face Identification & Detection Using Eigen faces*" International Journal of Engineering Sciences & Research Technology (IJESRT) ISSN: 2277-9655Mr. Gurav.S.S.
3. "*A System for Video Surveillance and Monitoring*" Robert T. Collins, Alan J. Lipton
4. And Takeo Kanade Robotics Institute, Carnegie Mellon University, Pittsburgh, PA "*An Immersive System for Browsing and Visualizing Surveillance Video*"Philip DeCamp, George Shaw and RonyKubat[2],
5. Springer-Verlag Berlin Heidelberg 2011 "*Moving Object Detection and Tracking in Forward Looking Infra-Red Aerial Imagery*" Subhabrata Bhattacharya, HaroonIdrees, Imran Saleemi, Saad Ali and Mubarak Shah.
6. "*Hybrid Moving Object Detection System Based on Key Frame Extraction"* Yu Du1*, XueyaoWang1, Shi-Ting Wang2, Shuangshuang Xue2, and Zengchang Qin1,3 , 978-1-4244-8755-4/11/$26.00_c 2011 IEEE
7. ISSN: 2277-3754 ISO 9001:2008 Certified International Journal of Engineering and Innovative Technology (IJEIT) Volume 2, Issue 9, March 2013 6 " *A Quick Browsing System with Image Enhancement for Surveillance Videos"* Kirti K. Kamble, S.P.Bhosale, SantoshH.Lavate.
8. "*Interactive Browsing System for Anomaly Video Surveillance*" Tien-Vu Nguyen, DinhPhung, Sunil Gupta and SvethaVenkatesh, Centre for Pattern Recognition and Data Analytics (PRaDA) Deakin University, Australia.
9. Universit_adegliStudi di Firenze Corso di Dottorato in IngegneriaInformatica, Multimedialit_aeTelecomunicazioni Media Integration and Communication Center (MICC) ING-INF/05 "*Supervised and Semi-supervised Event Detection with Local Spatio-Temporal Features"*