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Video Shot Cut Detection Using Statistical Block Based Method

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Abstract :*In this study, a method for retrieving desired frame has been proposed in short, plain, fast and without missing part from video.The number of videos is increasing due to increased multimedia tools, social media and advancing technology.It is difficult to retrieve the request because of the increase in numbers.Video shot cut detection is focused to make this a little easier.Fast and accurate determination of video shot cut detection is an important step.As known, the videos consist of frames.Video shot cut detection was determined using the differences between the frames which constitute the video.Block-based method aims to process the images in blocks for determining of the differences between frames.In addition, it is based on the fact that statistical information is extracted and compared with the next frame.By the addition of statistical information, the difference between the frames has become more sensitive to the block-based method of detection.Using this method, desired frame is acquired quickly and sensitively from large size videos. This method also provides advantages in terms of time and recording.The application of the proposed method was implemented on the Weizmann video dataset.*

Keywords: *shot cut detection, video, block-based, statistic, feature extraction.*

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I. Introduction

The number of multimedia such as image and video is increasing by the rapid development of technology. There are also some challenges in the increase of their quantity. In addition, multimedia data stored in computer environment takes up most of the disk space (audio, video). The biggest difficultyof them is that people can not reachwhat they want from among such large amounts of data within a certain amount of time. Choosing the required one from a dataset is a very difficult process. Especially it is more difficult to do this on the video and perform it manually. At this point, it is a great advantage in terms of time as well as facilitating the work of detecting transitions by splitting a video and making a general judgement about the video.This process is called video shot detection.Shot detection studies; a field that is becoming increasingly widespread and is constantly being developed.In this area, Liu Fang and colleagues presented an article called Enhancement of video shot boundary detection using HSV color space and image subsampling. In this article, HSV color space is suggested to have developed this method in this application area to use RGB more useful and sub-samples on the image [1]. Other works in video shot detection area; in 2014 by Ravi Mishra and his colleagues have studied on the comparison of detection algorithms and dual tree complex wavelet transform for shot detection in videos. Analysis and verification of video summarization using shot boundary detection is researched by Sowmya R. in 2013. Fast video shot boundary detection based on SVD and pattern matching has been studied by Zhe Ming and Friends. Goran J. Zajic and colleagues performed a video shot boundary detection based on multifractal analysis [2-5]. Donate and his colleagues in 2010 have suggested using Shot Detection in Three-Dimensional Tracking Videos to track this video sequence over time to determine the features that make a video stand out [6]. In 2010, LihongXun and colleagues have presented a novel shot detection algorithm based on clustering. In this approach, they first propose some conclusions according to color information and then define the differences of video frames. According to these defined differences, different sub-clusters separated by k-means algorithm [7].

In this study, it became possible to detect video shot cut by looking at some statistic information and block-based method for image. It makes it possible to detectvideo shot cut automatically by evaluating these parameters.Shot detection process is performed by utilizing the differences between the frames. Block-based method with usingof statistical information has become more sensitive to calculate the difference between the frames.Thus, probability of missed shot images is low and information loss is prevented.

II. Material&Methodology

A video consists of consecutive frames.Shots from similar features of frames, scenes from shots and all of them create the video [8].As shown in Figure 1 on the following time axis, the sections forming a video can be structurally shown as a frame, shot and scene.

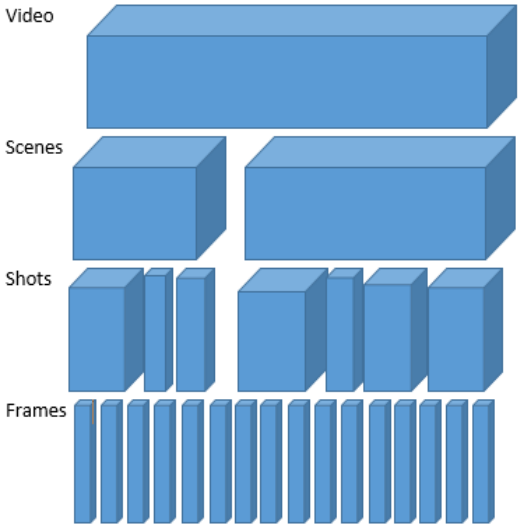

Figure 1. Components of a Video

Sudden transitions in a video are defined as cuts or hard cuts.Shot determination; There is a discontinuity between the current (F_k) frame and the next (F_{k+1}) frames.A variety of methods are used to determine the shot cut points on these transitions in a video sequence. On the other hand, several methods are used to determine shots [9]. In this study, statistical data were used together with block based method.Evaluation; it has been performed on video shot detection to observe the difference between block-based method and statistical block-based method. An overview of the study is shown in Figure 2.

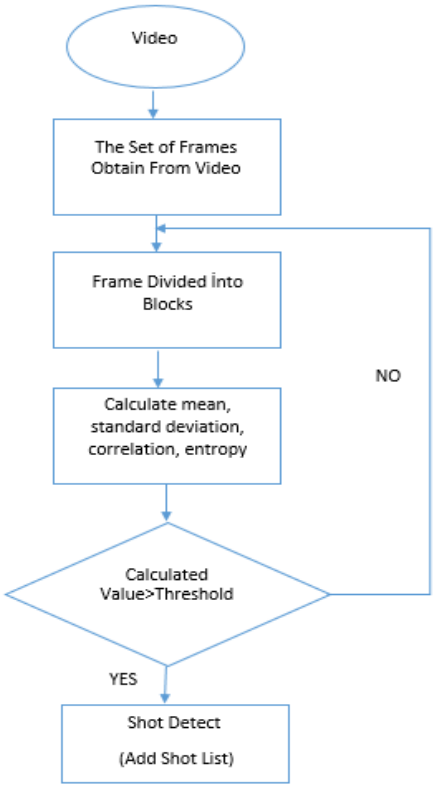

Figure 2. General flowchart of the study

III. Methods

3.1. Pixel Difference Method

This method is considered as a very primitive and simple method. In this method, two frames belonging to the video are treated as inputs and the intensity values of the pixels of these frames are calculated. If the pixel intensity is greater than a certain threshold value, it indicates a shot between these two frames. Intensity calculations and threshold value calculation formulas are given in Eq.(1). In this formula, the intensity and the threshold value are shown I (x, y) and T respectively [10]. We used this equation to calculate the pixel difference.

$$F_{k,k+1}(x,y) = \begin{cases} 1, if|I_k(x,y) - I_{k+1}(x,y)| > T \\ 0, else \end{cases} \qquad (1)$$

The advantages of this method are simple and easy to implement. The disadvantages of this method are camera and event sensibility. Namely, it may not be suitable for events such as tracking an object with the camera.

3.2. Block-Based Method

BBM (Block-Based Method) is a technique that is used by expanding it by taking advantage of pixel differences and it is based on the calculation of pixel values in a certain area on the image using statistical criteria and comparing them with other frames. Mean and standard deviation are used as statistical parameters. Another metric used in here is the probability rate. If the mean distance value is greater than the threshold (T), it is determined as a shot [9,11].

Block-Based method can be run in these steps:

1. Video frames are separated
2. Frames are divided into blocks
3. The pixel intensity is calculated in blocks
4. Compared to threshold value
5. Shot cut detection

3.3. Color Histogram (RGB-HSV) Difference Method

Video shot cut detection method isused commonly.In this method, the RGB histogram difference between two subsequent frames is calculated. If this difference value is greater than the calculated threshold value is called a cut [12]. For HSV, the transition from RGB color space to HSV color space is performed. Histogram difference of H, S and V band is calculated in HSV color space. The largest histogram difference of these bands is obtained and processed. Thus, the histogram difference on the determined band is considered and a comparison with the threshold value is performed. If it is greater than the threshold value, it is a cut point [1,13].Figure 3 shows the calculation of color histogram difference from histogram of frames.According to this histogram, the frames remaining above the threshold value are determined as cut points.

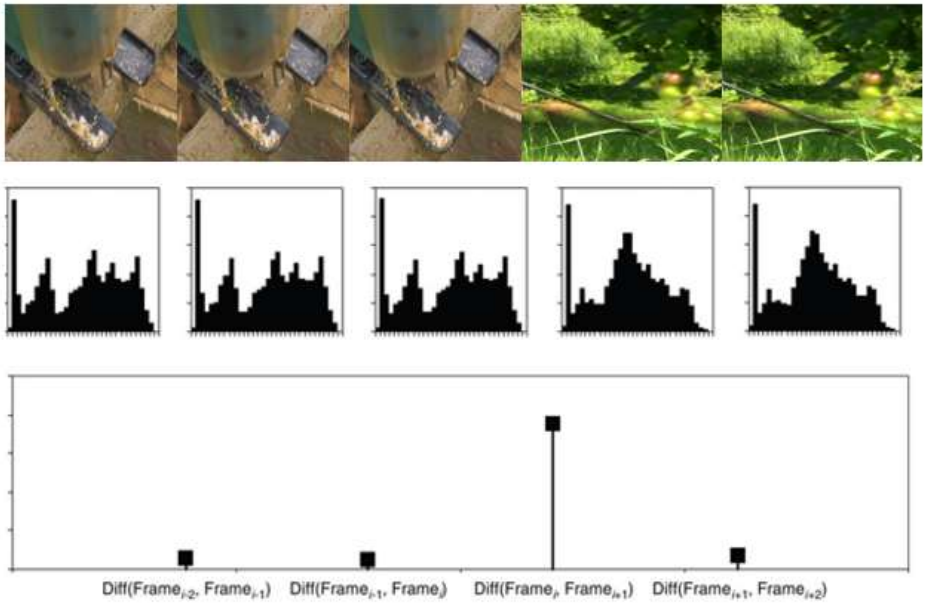

Figure 3. Color Histogram Difference and Shot Cut Determination

In this method; since the two histograms of the two images are the same, whose contents are quite different from each other, only the cuts of these images can be missed, which is the biggest disadvantage.

3.4. Edge-Based Methods

This approach is a method based on the detection of adjacent frames. The adjacent frames indicate that the adjacent frames represent an edge. Many functions known in edge detection (Sobel, Prewitt, Canny ..) can be used. Here, the edges varying between the two frames are calculated and this edge change ratio is compared with a threshold value [13, 15]. If it is greater than the threshold, it is called a cut. The advantage of this method over the color histogram difference method is; there isn't any case of the same histogram in different pictures. In addition, the color histogram varies according to the machine being taken, such a problem does not occur in this method. Because it is studied the gray level images. That is, before the method is applied, the image is converted to gray level [3,15]. The disadvantage is; this method is slow to apply for each frame and detects multiple false cuts during fast movements of the camera.

IV. Application

Methods were performed on Weizmann action movie dataset [16].As you know, video consists of frames. Also, a video shot cut detection is done by taking advantage of differences between frames. The number of frame the loaded video is determined. Then the frames on the video are divided into blocks. Some statistical information is calculated on the frames separated into blocks. Mean, standard deviation, entropy, correlation are calculated as statistical parameters. The calculated statistical information is compared with the threshold value. A function of the Otsu's algorithm was used to calculate the threshold. The video shot cut detection phase is performed using the statistical block-based method. When we examine and record shot cut frames, by less than 85% of the image frame is seen as representing our video recorded. Thus, instead of a long video, it provides convenience in the examination and evaluation of shot frames, as well as in storage. An example of the differences between the video shots is given in Figure 4. The shot-cut frames on the video are detected and written.

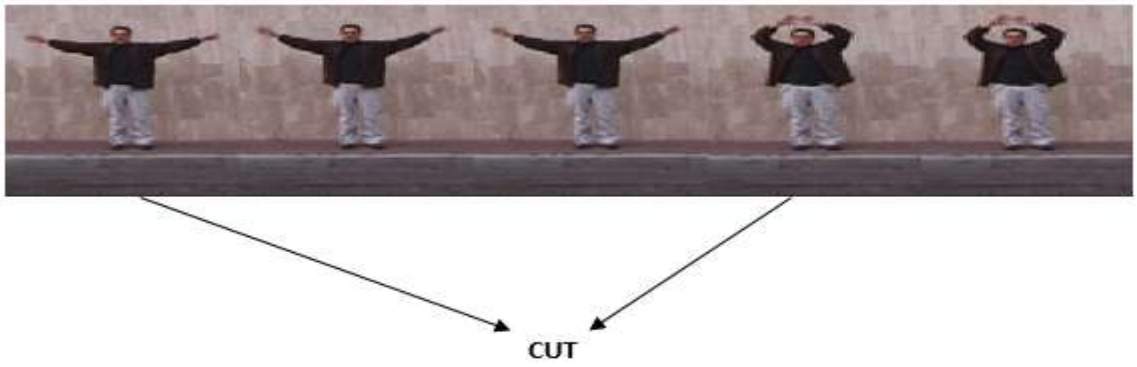

Figure 4. Transition and Shot Cut Detection

I. Result And Conclusion

We empirically evaluate the proposed methods on the Weizmann dataset. This is a way to make it easier if you have difficulty in accessing from a large number of multimedia tools. As a similar matter to this study, video summarization is performed. It has a very wide place in the market as literature and application area. Especially in the TV world and in archives, images draw great interest in terms of retrieving information. The system became more sensitive by using statistical block-based method to calculate the difference between the frames. Thanks to this method, shot cut frames are less likely to be missed and information loss is avoided.Moreover, the recording of videos covering a large area is carried out in a smaller size. Also, access to the searched image becomes faster. Thus, the gain in terms of space and time is provided.

References

[1]. Liu, Fang, and Yi Wan. "Improving the video shot boundary detection using the HSV color space and image subsampling." Advanced Computational Intelligence (ICACI), Seventh International Conference on. IEEE, 2015.
[2]. Mishra, Ravishankar, S. K. Singhai, and Mukesh Sharma. "Comparative study of block matching algorithm and dual tree complex wavelet transform for shot detection in videos." Electronic Systems, Signal Processing and Computing Technologies (ICESC), International Conference on. IEEE, 2014.
[3]. Sowmya, R., and R. Shettar. "Analysis and verification of video summarization using shot boundary detection." Am Int J Res SciTechnolEng Math 3.1: 82-86, 2013.
[4]. Lu, Zhe-Ming, and Yong Shi. "Fast video shot boundary detection based on SVD and pattern matching." Image Processing, IEEE Transactions on 22.12: 5136-5145, 2013.
[5]. Zajić, Goran J., Irini S. Reljin, and Branimir D. Reljin. "Video shot boundary detection based on multifractal analisys." Telfor Journal 3.2: 105-110, 2011.
[6]. Donate, Arturo, and Xiuwen Liu. "Shot boundary detection in videos using robust three-dimensional tracking." Computer Vision and Pattern Recognition Workshops (CVPRW), IEEE Computer Society Conference on. IEEE, 2010.
[7]. Xu, Wenzhu, and Lihong Xu. "A novel shot detection algorithm based on clustering." Education Technology and Computer (ICETC), 2nd International Conference on. Vol. 1. IEEE, 2010.
[8]. Guru, D. S., MahamadSuhil, and P. Lolika. "A novel approach for shot boundary detection in videos." Multimedia Processing, Communication and Computing Applications. Springer, New Delhi, 209-220, 2013.
[9]. Domnic, S. "Video Shot Cut Detection Using Least Square Approximation Method." Computer Networks and Intelligent Computing. Springer Berlin Heidelberg, 161-170, 2011.
[10]. Patel, Upesh, Pratik Shah, and Pradip Panchal. "Shot Detection Using Pixel wise Difference with Adaptive Threshold and Color Histogram Method in Compressed and Uncompressed Video." International Journal of Computer Applications 64.4, 2013.
[11]. Koprinska, Irena, and Sergio Carrato. "Temporal video segmentation: A survey." Signal processing: Image communication 16.5 (2001): 477-500.
[12]. Priya, GG Lakshmi, and S. Domnic. "Video cut detection using block based histogram differences in RGB color space." Signal and Image Processing (ICSIP), International Conference on. IEEE, 2010.
[13]. Hong Shao,Yang Quand Wencheng Cui, "Shot Boundary Detection Algorithm Based on HSV Histogram and HOG Feature", 5th International Conference on Advanced Engineering Materials and Technology, 2015.
[14]. Browne, Paul, et al. "Evaluating and combining digital video shot boundary detection algorithms." (2000).
[15]. Smeaton, Alan F., Paul Over, and Aiden R. Doherty. "Video shot boundary detection: Seven years of TRECVid activity." Computer Vision and Image Understanding 114.4, 411-418, 2010.
[16]. M. Blank, L. Gorelick, E. Shechtman, M. Irani, R. Basri, "Actions as space-time shapes", International Conference on Computer Vision (ICCV), 2005.

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