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Comparision of Techniques for Detection of Fades and Dissolves in Video Sequences

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ABSTRACT*: Retrieval of video from large digital video storage is challenging task. Video segmentation is first step in the process of efficient video indexing and retrieval. Video shot boundaries needs to be clearly detected which will help in key frame extraction and then video retrieval. The shot transitions are of two types i.e. Abrupt Transition & Gradual Transition. In Gradual Transition, there are three types- fade in / fade out, dissolve and wipe. The detection of cuts are somewhat easier task, however the gradual transition detection is challenging task. Also discriminating gradual transition effect from camera motion and object motion is still an open problem. In our topic we are going to compare various metrics and techniques which are generally used for shot boundary detection. In our future work, Dual tree complex wavelet transform will be used for feature extraction and the classification of various gradual transitions will be done by some learning algorithm. The performance metrics such as recall and precision will be calculated for validation of our algorithm.*

Keywords*: Dual tree complex wavelet transform, Precision, Recall, Shot boundary detection, Traditional metrics.*

I. INTRODUCTION

The detection of shot boundary is a base for video abstraction and video analysis, such as: indexing, browsing, searching, summarization and retrieval of video based on its content. Recent advances in video compression standards, broadcast networks and high-speed network connection and cable modem have enabled a device a large volume of video to be available online. Production of digital videos has become available to the masses with introduction of high performance, low-cost digital capturing and recording devices. Movie and TV broadcast is also moving into digital era. For efficient video storage and management, video segmentation must be performed prior to all other processes. Video segmentation is a technique that divides video into physical units, generally called shots.

This topics focus on comparison of video shot boundary detection methods which are discussed below. Pair-wise comparison, likelihood ratio and histogram comparison have been used as a different metrics for shot boundary detection. Object motion and camera motion have been observed as the major source of false positives. In future, we are going to develop an algorithm which will be an essential tool for shot boundary detection, especially in the presence of camera and object motion.

1.1 Previous Work

Detection of gradual transition i.e. fade-in, fade-out and dissolves by selecting threshold by considering an adaptive, robust and analytical study of mathematical model of transition is proposed in [1].Here the objective has been to accurately classify the type of transition (fade-in, fade-out, and dissolve) and to precisely locate the boundary of the transition. The false detection is removed by motion transition removal. A PETRI-NET Model to detect video shot boundary detection is explained in [2]. In this approach difference between two frames is determined by the mutual information calculated separately for each of the HSV color component. Petri-Net Model describes boundary frames combination which indicates a shot boundary is created. The approach to detect shot boundaries in video sequences based on Textural Features is explained in [3]. Here the box-counting is used to extract texture and judging the shot boundaries by an improve method to get dynamic threshold is proposed. The amount of computation is reduced and goes on improving the performance of the gradual transition shot boundaries detection. An effective shot boundary detection method based on the local colour features of interest point is explained in [4].Here interest points are detected for each frame. Then local images are obtained based on interest points. Finally, shot boundaries are detected based on the histogram difference of local image. The approach to detect efficient shot boundary detection based on scale invariant features is explained in [5].Here to improve the performance of the algorithm and reduce the computational cost, the frames that are not clearly seen are first removed from the original video and calculates various features only for the parts of the video. Video shot boundary detection using motion activity descriptor is explained in [6].Here the motion activity information is extracted in uncompressed domain based on adaptive root pattern

search (ARPS) Algorithm. The validation of this motion activity descriptor in the aim of its real time implementation with reasonable high performances in shot boundary detection. Fade-in and fade-out detection in video sequences using Histogram is explained in [7]. Here result shows that proposed algorithm can be used in both uncompressed and compressed video to detect fade regions with a high reliability and less computational computations. Histograms have been used as a reliable technique for sudden scene change detections.

II. WHAT ARE THE TYPES OF TRANSITIONS?

Shot transition detection is used to split up a film into basic temporal units called as shots.

There are two types of transition:

2.1. Abrupt transition: This is a sudden transition from one shot to another, i.e. one frame belongs to the first shot, and the next frame belongs to the second shot. They are also known as hard cuts or simply cuts.

2.1. Gradual transition: In this kind of transitions the two shots are combined using chromatic, spatial or spatial-chromatic effects which gradually replace one shot by another. These are also often known as soft transitions and can be of various types, e.g., fade, dissolves, wipes.

Fades: A fade is a gradual transition between a scene and a constant image (fade-out) or between a constant image and a scene (fade-in).

Fade in: It is a gradual transition of a scene by increasing overall brightness and contrast until it is full.

Fig2.1. Frames in fade in

Fade out: It is a gradual transition of a scene by diminishing overall brightness and contrast until it is gone.(usually a black frame)

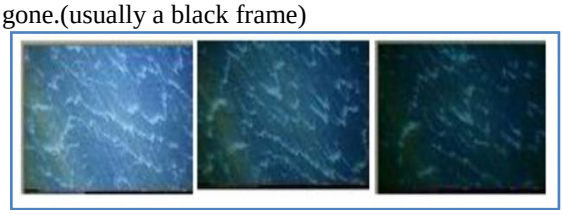

Fig.2.2. Frames in fade out

Dissolves: A dissolve is a gradual transition from one scene to another, in which the first scene fades out and the second scene fades in.

Fig2.3. Dissolve transition

Wipe: Another common scene break is a wipe, in which a line moves across the screen, with the new scene appearing behind the line. A wipe involves one shot replacing another, travelling from one side of the frame to another. The wipe has several types like horizontal, diagonal, star, heart shape, zig-zag, vertical, clockwise, anti-clockwise, door etc.

Fig2.4: Wipe effect

III. MAJOR METRICS USED FOR SHOT BOUNDARY DETECTION

Following major metrics used for shot boundary detection.

3.1. Pixel Differences: The simplest approach to detect, if the two images are significantly different, is to count the number of pixels that have changed. A shot boundary is declared if more than a given percentage of the total numbers of pixels have changed. The pixel differences denoted as PD. This technique is very sensitive to camera and object motion.
3.2. Likelihood Ratio: A likelihood ratio test based on the assumption of uniform second order statistic. It is a standard hypothesis test in which a ratio of probabilities is used as the test statistic. This is statistical method which expands on the idea of pixel differences by breaking the images into regions. LHR denotes Likelihood Ratio. This method is reasonably tolerant of noise, but is relatively slow due to the complexity of statistical formulae.
3.3. Histogram Difference: Histograms are the most common method used to detect shot boundaries. The histogram comparison algorithm is less sensitive to object motion than pixel difference.
3.4. Chi- square Test: When experimented with histogram and pixel difference metrics, and concluded that histogram metrics are most effective. It found the best results by breaking the images into 16 regions, using a Chi-square test on color histogram of those regions. Chi square test denoted as CS.
3.5. Color Histogram: The color histogram-based shot boundary detection algorithm is one of the most reliable variants of histogram-based detection algorithms. Its basic idea is that the color content does not change rapidly within but across shots. Color histogram comparison is calculated by histogram comparison of each color space of adjacent two frames.
3.6. Color spaces: Beside gray scale, considered other color spaces like RGB, HSV and YIQ in the 64 bin histogram difference method.

IV. TECHNIQUES USED IN VARIOUS SHOT CHANGE DETECTION METHOD

4.1. Thresholding: This means comparing the computed discontinuity value with a constant threshold. This method only performs well if video content exhibits stationarity with time, and only if the threshold is adjusted by hand.
4.2. Adaptive Thresholding: The obvious solution to the problems of the simple thresholding is to vary the threshold depending on the average discontinuity within a temporal domain.
4.3. Probabilistic Detection: A rigorous way to detect shot changes is to model the pattern of specific types of shot transitions and perform optimal a posterior shot change estimation, presupposing specific probability distributions for shots.
4.4. Trained Classifier: A radically different method for detecting shot changes is to formulate the problem as a classification task, with the classes being “shot change” and “no shot change”. SVM, Neural n/w, Interactive Genetic Algorithm are used as trained classifiers.
4.5. Heuristics: A number of authors use various domains –specific heuristics for the detection of different transition types.
4.6. User interactive: If automatic procedures fail, cut detection in ambiguous cases can be resolved by user input.

V. EVALUATION CRITERION

Traditionally, Recall and Precision are the two metrics used for evaluation of shot detection algorithms. Recall is defined as the fraction of all known transitions that are correctly detected and it is given by

$$R = \frac{C}{C+M}$$

Whereas, Precision is defined as the fraction of reported transitions that match the known transitions recorded in the reference data and is given by

$$P = \frac{C}{C+M}$$

Where, C is the number of shot boundaries correctly detected by the algorithm, M is the number of shot boundaries missed by the algorithm; F is the number of shot boundaries falsely detected by the algorithm.
F1 is a combined measure that results in high value if, and only if both precision and recall result in high values. I.e. harmonic average of Recall and Precision and is defined as

$$F1 = \frac{2*P*R}{P+R}$$

VI. PROPOSED ALGORITHM

We proposed an algorithm for shot boundary detection by using dual tree complex wavelet transform (DT-CWT) for feature extraction and algorithm for classifying the different gradual effects will be developed.

Complex wavelet transform (CWT) has poor directionality selectivity and also lacks shift invariance.
The DT-CWT has been developed by Kingsbury, which allows perfect reconstruction in addition to shift invariance and directional selectivity.
DT-CWT is explored to find shot boundaries in video.

VII. FEATURES USED

Almost all shot change detection algorithms reduce the dimensionality of video domain by extracting a small number of features from each video frame. These are extracted from the whole frame or from a subset of it which is called a region of interest (ROI).Such features include

7.1. Luminance/color:
The simplest feature that can be used to characterize a ROI is its average grayscale luminance.
This, however, is susceptible to illumination changes.
A better choice is to use some statistics of the values in a color space.

7.2. Luminance/color histogram:
A richer feature for a ROI is the gray scale or color histogram.
It is easy to compute and mostly insensitive to translational, rotational and zooming camera motion.

7.3. Image edges:
An obvious choice of feature is edge information in a ROI
Edges can be used as is, be combined into objects or used to extract ROI statistics.
They are invariant to illumination changes and most motion, and they correspond somewhat to the human visual perception.
Their main disadvantage is computational cost, noise sensitivity and high dimensionality.

7.4. Transform coefficients (DFT, DCT, and wavelet):
These are a classic way to describe the texture of a ROI.
The DCT coefficients are also present in MPEG encoded video streams or files.
Their greatest problem is that they are generally not invariant to camera zoom.

7.5. Other features: A number of other features are used in the literature, such as the color anglogram.

7.6. Multiple features: Many algorithms extract several types of features either to use them in combination or for subsequent processing and analysis.

VIII. CONCLUSION

Disturbances caused by fast object and camera motion often mistaken a shot boundaries and its elimination is the major challenge to the shot boundaries detection algorithms. Different metrics are described and the performance of all the metric is poor due to the disturbances caused by fast camera and object motion. So there is a rigorous need to develop an effective algorithm which will detect the gradual transitions properly and distinguish these effects from object and camera motion. In future, it needs to develop an algorithm for classifying the gradual transition without threshold. The classifiers such as support vector machine, neural N/W, interactive genetic algorithm can perform well in classification of shot transitions.

REFERENCES

[1] Ba TuTruongt, Chitra Dorai, Svetha Venkatesht, "Improved fade and dissolve detection for reliable video .0369*69 segmentation,"0-7803-G297-7/00/2000 IEEE.
[2] Liang Bai, Song-Yang Lao, Hai-Tao Liu, Jiang Bu , "Video Shot Boundary Detection Using Petri-Net,"1-4244-2096-4/08 ©2008 IEEE.
[3] Yin Wang1, Xiangming Wen1, Xinqi Lin1,2, Peizhou He1, Wei Zheng1, "A Novel Video Shot Segmentation Based on Textural Features", 978-0-7695-3744-3/09 © 2009 IEEE DOI 10.1109/IAS.2009.232
[4] Xiang Fu, Jie-xian Zeng, "An Effective Video Shot Boundary Detection Method Based on the Local Color Features of Interest Points", 978-0-7695-3643-9/09 $25.00 © 2009 IEEE DOI 10.1109/ISECS.2009.140
[5] Jun Li, Youdong Ding, Yunyu Shi, Wei Li, "Efficient Shot Boundary Detection Based on Scale Invariant Features," 978-0-7695-3883-9/09 © 2009 IEEE DOI 10.1109/ICIG.2009.99
[6] Abdelati Malek Amel, Ben Abdelali Abdessalem and Mtibaa Abdellatif , "Video shot boundary detection using motion activity descriptor", Journal of Telecommunications, Volume 2, Issue 1, April 2010
[7] W.A.C. Fernando, C.N. Canagarajah, D. R. Bull, "FADE-IN AND FADE-OUT DETECTION IN VIDEO SEQUENCES USING HISTOGRAMS" ISCAS 2000 - IEEE International Symposium on Circuits and Systems, May 28-31, 2000, Geneva, Switzerland
[8] Zhang xiaona_Qi guoqing_Wang Qiang_Zhang Tao, "An Improved Approach of Scene Change Detection in Archived Films", 978-1-4244-5900-1/10/$26.00 ©2010 IEEE
[9] Costas Cotsaces, Marios A. Gavrielides, and Ioannis Pitas Costas Cotsaces, Marios A. Gavrielides, and Ioannis Pitas, "A Survey of Recent Work in Video Shot Boundary Detection", Department of Informatics, University of Thessaloniki, Thessaloniki 54124, Greece.
[10] Krishna K. Warhade, Shabbier N. Merchant and U.B.Desai, "Performance Evaluation of Shot Boundary Detection Metrics in the Presence of Object and Camera Motion", IETE Journal of Researcch, Vol 57,Issue 5, sep-oct 2011.

[11] J Yuan, H Wang, L Xiao, W Zheng, J Li, F Lin, "A Formal Study of Shot Boundary Detection" ,IEEE Transaction on circuits and Systems for Video Technology, vol. 17, NO. 2, pp. 168-86, Feb. 2007.
[12] U Gargi, R Kasturi, and S Strayer, "Performance Characterization of video-shot-change detection methods",IEEE Transaction on circuits and Systems for Video Technology,Vol. 10,NO. 1,pp 1-13, feb. 2000.
[13] Purnima S. Mittalkod, Dr.G.N. Srinivasan, " Shot Boundary Detection Algorithms and Techniques: A Review", Technical journals, vol2,Issue 02,June,2011,ISSN:2230-8563;e-ISSN-2230-8571.