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Development of Quick Algorithm for Wipe Transition

Ms. Madhuri D. Bobade[1], Prof. Salim Chavan [2] , Prof. S.G.Akojwar[3]

[1]M-Tech scholar, Electronics Engg., S.B.Jain Institute of Technology, Management and Research, Nagpur (MS), India

[2] Professor, Deptt. of Electronics Engg., S.B.Jain Institute of Technology, Management and Research, Nagpur (MS), India

[3]Senior member IEEE, Professor, Deptt. of Electronics Engg, Rajev Gandhi college of Engg and Technolgy Chandrpur (MS) India.

ABSTRACT

Video shot boundary detection (VSBD) is the starting step for content of video management and video structural analysis. Great efforts have been taken to develop SBD algorithms for years. Due to high computational cost in the video SBD becomes a part of applications such as video indexing, browsing, retrieval, medical imaging, object recognition, surveillance, machine vision, and representation. Motivated by the requirement of day-today applications, integrated Shot boundary detection is used. Wipe transition is an very important type of gradual transition extremely used in the video production industry to use easily for the transition between two shots. Wipes involve many different types of transitions hence it becomes very difficult to detect other shot boundaries such as cut, fade, cross-fade mixed, dissolve and digital effect. Most of the developers who have worked in shot boundary detection domain have focused on fade, dissolve and cuts, because of the complication in detection of wipes due to noise, object and motion. This project proposes an efficient quick wipe detection method caused by noise as well as object motion in detection of wipes. This proposed algorithm uses mean quick different wipe detection by improving its results.

Keywords: Video shot boundary detection (VSBD), Gradual transition detection, Wipe transition effect, efficient quick wipe detection.

1. INTRODUCTION

Shot boundary detection (SBD) is fundamental of video management and video structural analysis for automatic video indexing and browsing. It can be relevant for various applications like indexing in video database, medical imaging, object recognition, surveillance, machine vision, representation and video compression etc. The fundamental unit of any video is frame. The structure of a video is shown in below Figure.No 1

The frames are sequenced in index by frame number. After breaking the video, the obtained frames have the same size. Commonly in every one second 25-30 frames are in use. A video shot is a sequence of interconnected successive frames taken by a single camera at a moment. Generally, a video produce from combined shots. Scene may be consist of a single or multiple shots which describe a story part within a video. Shot boundary detection (SBD) is based on the identification of visual deference in two frames due to change in shot scene. This mismatch between two frames generally found while shot changes. That contrast appears in different form which is categorized into two types:

Abrupt (as hard cut)

Gradual (dissolve, fade in, fade out, wipe).

An abrupt shot change can be seen in single frame. A hard cut happens when the scene suddenly changes. In this situation two successive frames are entirely different and there are usually captured in two different cameras or at different time and place .Hard cut is the simplest type of shot boundary detection.

Gradual shots are happened when the scene changes very slowly. In most of the time it is generated by adding special effects in video. The commonly used scene change methods are fade, dissolve and wipe.

Types of Gradual Transition

The different types of gradual transition are

Fades: A fade in is a slow decreasing brightness resulting in a Black colour frame and a fade out is a gradual increasing brightness starting from Black colour frame to a bright frame.

Dissolves: When one frame gets superimposed on another, the effect is called dissolve.

Wipes: A wipes is one frame replaces another with some special shape. In other word A Wipe involves movement of a line on the screen which moves from one end to another end of screen. This depends in the lead how the line

moves, wipes can be further divided into various kind of sub types such as Barn door, vertical wipe, diagonal wipe, horizontal wipe, square wipe, iris wipe, star wipe ,clock wipe, heart wipe, matrix wipe and many more.

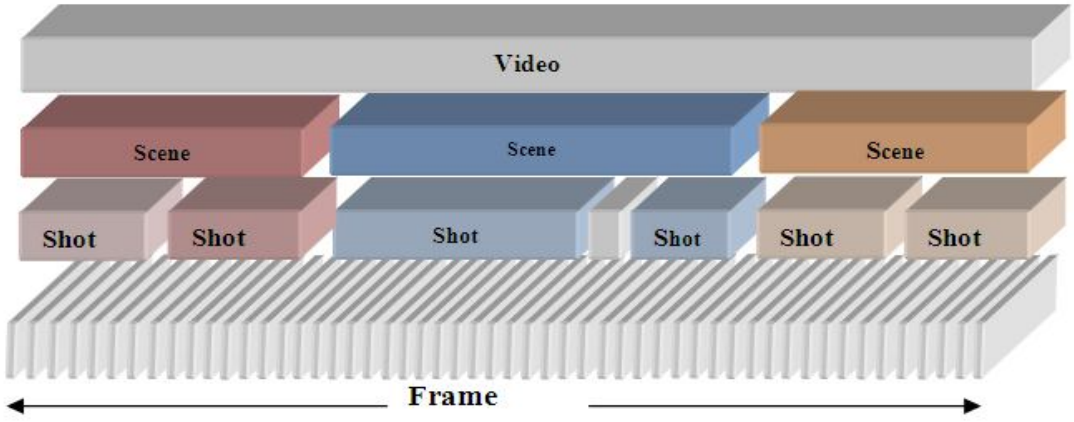

Figure.1. Structure of a Video

2. LATEST RELATED WORK

Latest research by Zhe-Ming Lu et al[1] Fast Video Shot Boundary Detection Based on SVD and Pattern Matching. Design proposes a candidate segment selection and singular value decomposition (SVD) to speed up the SBD. The positions of the video shot boundaries and Lengths of gradual transitions are predicted using adaptive thresholds and most non-boundary frames are leftover at the same time. Only the candidate segments which contain the shot boundaries are conserved for further detection process. Then, for all frames in each candidate segment, their color histograms in the hue-saturation-value space are drawn out, forming a frame-feature matrix. The SBD is then performed on the frame-feature matrices of all candidate segments to minimise the feature aspect. The refined feature vector of each frame in the candidate segments gives a new metric for boundary detection. The cut and gradual transitions are identified using pattern matching method based on a new similarity measurement. It achieves a high detection speed and batter accuracy compared with recent SBD schemes. A Quick Algorithm to Search and Detect Video Shot Changes by Ehsan Amini, Somayyeh Jafarali Jassbi et al [2].This method proposes a divide and conquer algorithm which is able to carry out fast search for shot change probability then detected. Algorithm divides the video into two parts and continues the search in each part. Worst condition, is when there are lot of shot changes in video. A weakness of this algorithm is not capable of detecting the shot boundaries located inside a long scene. An Efficient Method for Detection of Wipes in Presence of Object and Camera Motion by Salim Chavan, Sadik Fanan, Dr. Sudhir Akojwar, et al [3]. The method proposes and implemented the mean of statistical image differences method which allows dynamic threshold calculations to determine the wipe transition efficiently. An efficient wipe detection algorithm is put forward by Shan Li et al [4]. In the proposed scheme the properties of independence & completeness are introduced to distinguish an ideal wipe; frame ranges of wipes are located by finding out the sequences which are a close approximation to an ideal wipe. Dynamic threshold computation is used for extending the detection for different genres of video. A methodology for wipe detection is proposed by Adnan M. Alattar et al by developing a model for potential wipe region which derives the statistical characteristics of the frames in wipe region [5]. In the proposed literature M Alattar has stated that the means and the variances of the frames in the wipe region have either a quadratic linear or linear behavior. Min Wu et al have proposed a schematic method for detection of wipes [6]. In the proposed algorithm both structural and statistical information is exploited to detect wipe effects. The author has worked with MPEG streams and DC images. Li Yufeng et al have proposed a wipe detection methodology [7], in which each frame of color sub-image and edge sub-image are decomposed using Debaunchies-4 wavelet transform(db-4 wt). To minimize the noise influence effectively, the color sub-image is divided into 8*8 pixel blocks and a Gaussian mode is used to adjust the threshold dynamically in detecting the potential wipe transition. An remarkable method for wipe detection is the Spatio temporal slice analysis, proposed by C.W.Ngo et al [8]. A designed for various kinds of wipes, the author states that there are related patterns on the Spatio-Temporal slices. Depending on this study, Ngo et al. metamorphosed the detection of wipes to the recognition of the typical patterns on Spatio Temporal slices. The projected design uses color texture properties of the potential wipe frames to detect wipe transitions. Umut Naci and Alan Hanjalic et al [9], have proposed a schematic algorithm for potential wipe transition detection based on analysis of spatio temporal video data blocks. This algorithm is different from the previous approaches in the way that it takes volume metric data cubes in the video as the basic elementary processing unit for the algorithm. This algorithm is based on the analysis in between two different adjacent shots before and after wipes are spatially well separated at any time. R Zabih et al [10], have proposed a method for detection and

classification of scene breaks in video sequences. The proposed method can detect & classify different types of scene breaks including wipe. The proposed algorithm handles motion of object and camera by global motion computation. A potential algorithm based on histogram characteristics is proposed by Robert A Joyce et al [11]. The proposed algorithm operates in compressed domain requiring only partial decoding of the compressed video stream. The tentative results have shown that this algorithm performs well better than full frame algorithms. The planned schema carefully models the histograms during wipe region. A wipe detection model is focused on Statistical Characteristics of the frames in wipe region has been developed by Alattar A.M et al [12]. The projected wipe detector exploits the linear change in the means and the variances of the frames in the wipe region. On the other hand the proposed algorithm has a high false positive due to the influence of object and camera motion. Pei Soo chang et al[13] has developed a model which uses the Macro-Block information to detect potential wipe transition frames. The directions of B frames are analyzed, which are revealed in the MB types, the scene change region of each frame can be extracted. Just the once the accumulation of the scene change regions covers almost all of the area of the frame in which video sequence will be considered a motion less object. The new technique for wipe detection which differentiates object and camera motion is proposed by K.K Warhade et al [14]. In the proposed algorithm uses with pre-processing and without pre-processing image, first the moving strip due to wipe is detected, which reduce most of the edges due to object boundaries and maintain true wipe transition boundaries, and after that Hough transform is used on these moving lines to detect various wipe types. An algorithm for wipe detection is proposed by Hang Bin et al [15]. In this proposed design, a method for wipe detection is put forward based on three-dimensional wavelet transforms and motion vector. The Global motion compensation is used with Gaussian weighted Hausdorff distance to control the effects of camera and object motions. This innovative approach that takes advantage of the production aspect of video is proposed by Fernando W.A.C. et al [16]. In this proposed methodology each video frame is first decomposed into low resolution and high resolution mechanism which are analyzed respectively and further recombined together to form wipe transition detector. This advance approach is proposed by Mark S. Drew et al. In the proposed work a Two-Dimensional Histogram based on chromaticity is formed and after that computed histogram is intersected with that of the previous frame [17]. The result is an image in which the wipes appear as very prominent edges. K. D. Seo et al have proposed a method based on visual rhyme spectrum [18]. The authors stated that the Visual Rhythm Spectrum contains typical patterns or visual description for different kind of video effects. The proposed algorithm searches for lines in VRS for detection of potential wipe frames. A design based on Motion Activity and Dominant Colors is put forward by Sławomir Maćkowiak et al [19]. In the proposed idea motion activity which is defined as a degree of activity, in video sequence, has been integrated as a descriptor in MPEG-7 standard. The technique is based on automatic generation of motion activity descriptors. This approach for wipe detection based on pattern independent model is put forward by Kota Iwamoto et al [20]. The proposed model is based on the characteristics of image boundary lines dividing the two image regions in the transitional frames. Wipes are modelled as frame sequences where either a single boundary line moves seamlessly in a time sequence, otherwise multiple boundary lines form a quadrilateral within a frame. A novel method is proposed by Francisco Nivando Bezerra [21]. In the proposed schema the authors have used longest common subsequence (LCS) between two strings to transform the video slice into 1-dimensional signals to obtain a highly simplified representation of the video content, after this authors have proposed a string of operations leading to detection of wipe transitions.

3. METHODOLOGY

We proposed a Quick algorithm for shot boundary detection using Discrete Wavelet Transform. DWT is an efficient for multi resolution analysis of non-stationary and momentary signals. The multi resolution nature of wavelet analysis provides a solid representation of various types of signal localized in space, time or frequency domain. It is used as a powerful feature extraction tool. Wavelet analysis can be performed either in the continuous mode or in the discrete mode. The DWT requires the less computation, less complex than CWT and can be included through digital filtering methods. The DWT decomposes each frame into different frequency sub-bands.

Each frame in the video is processed with a direct wavelet transform for feature extraction. In discrete wavelet transform, a frame is analyzed by passing it through many filter bank followed by a decimator. This analysis filter bank which consists of low pass filter and high pass filter at each decomposition stage, It is very commonly used in image compression. When a signal passes through this filter, it is split into two sub bands. The low pass filter which corresponds to an averaging operation, extracts the common information of the video signal. The high pass filter which corresponds to differentiating operation, extract the detail information of the video signal. The output of the filtering operation is thus decimated by two. That means its filter that decomposes a one-D signal into a low pass and a high pass sub band and sub samples of every band by a factor of 2X2. This process is recursively applied on the low band up to the desired level of decomposition of image, leading to hierarchical pyramid tree decomposition of image. For the 2-D video signal drawn out, separate row-column processing is performed. All frames in a video sequence are decomposed by a two dimensional wavelet transform. In that case, four sub bands are created for each level of decomposition. A 4-level DWT decomposition of a video frame is shown in below fig. 2.

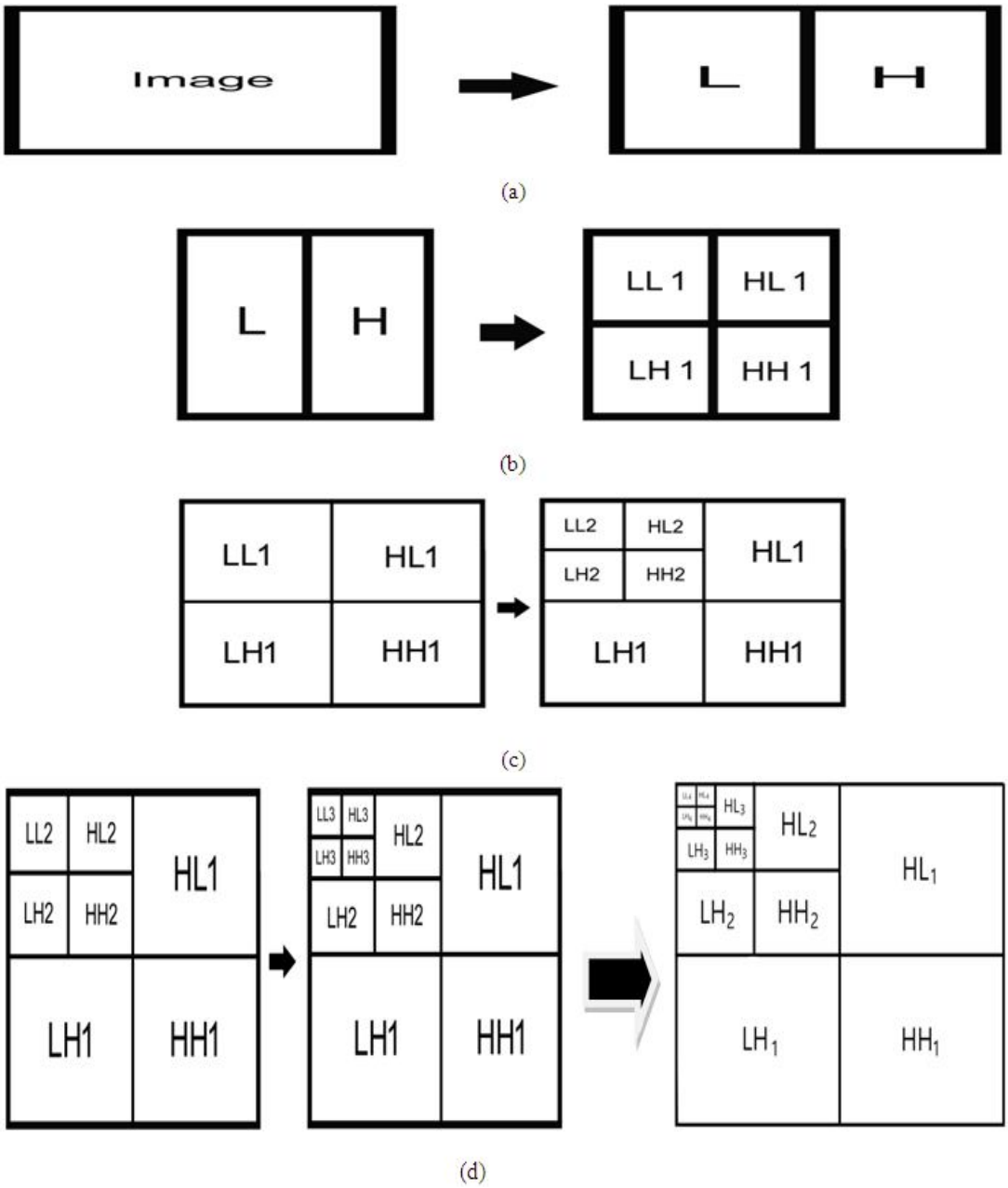

Fig.2 (a) Horizontal transform two sub bands (b) Vertical transforms four sub bands (c) Second Level Filtering (d) Second ,Third and Fourth Level Filtering

4. ALGORITHM STEPS

This proposed Algorithm for detection of various wipes is explained as follows.

1. In this proposed algorithm each frame is converted from RGB to Gray level scale.
2. Each frame is decomposed to 4 level using discrete wavelet transform.
3. The mean of approximate wavelet coefficient for each frame is calculated.
4. The mean of approximate wavelet coefficient is plotted with respected to No. of frames for video clip on test. Tested graph for different videos and for different wipe as shown in fig. 3 below

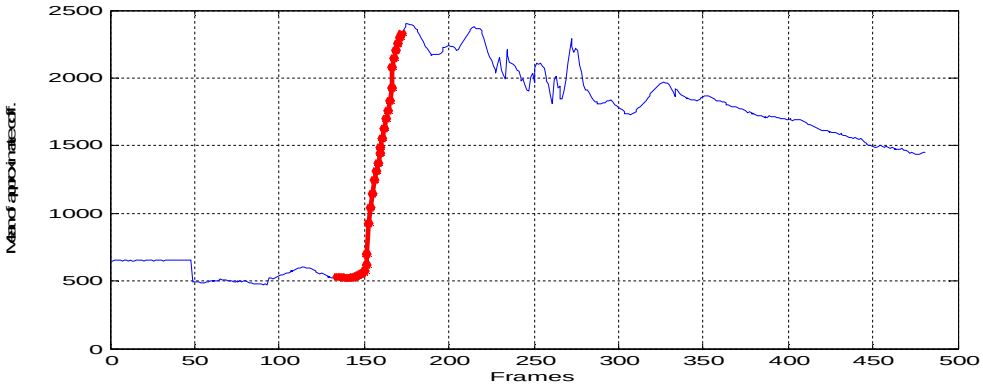

Fig.a. clock wise circular wipe present from frames 143 to173 = 30

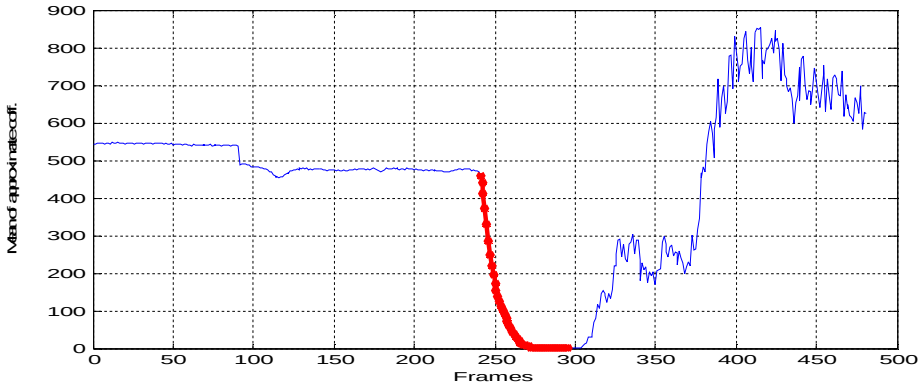

Fig.b. Squared wipe present from frames 238 to 267=31

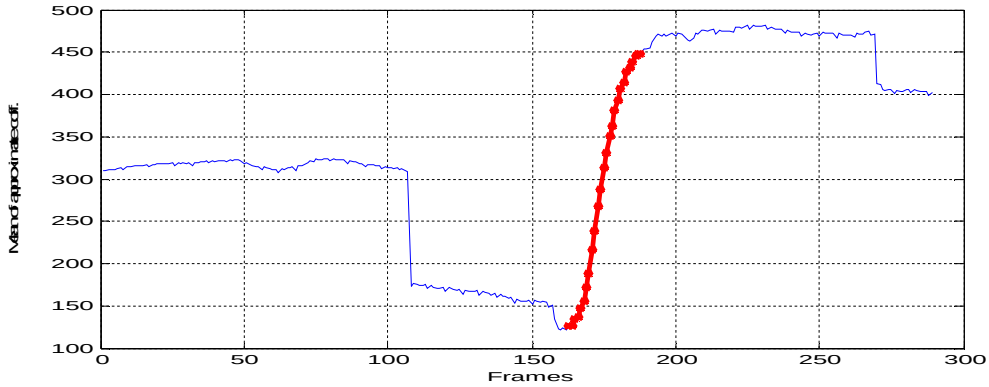

Fig.c. Horizontal wipe present from frames 156 to 187=31

Fig.3 (a), (b) and (c) variation in value of mean of approximate wavelet Coefficient Vs number of frame.

5. From the above nature of graphs, it is clear that for all patterns of wipe, there is either a gradual increase or decrease in the graph which is highlighted by red colour. This method is capable of detecting almost all types of wipes.
6. From the graph, it can be seen that for a wipe the gradual increase or decrease of values will be for more than consecutive 20-30 frames.
7. However, in case of camera motion or object motion, we may get a short gradual increase or decrease in the graph for short duration of time as shown in the graph, some time camera motion or object motion also detected as wipe but that time number of frame are more.
8. To differentiate between camera motion object movements in wipe the no of frame get increase in case of motion
9. All kinds of wipes transition are also examined in our algorithm very effectively.

5. PERFORMANCE EVALUATION

Almost all of the algorithm developer who has worked in shot boundary detection has used Recall and Precision as the performance evaluation criteria. Recall gives the performance of the algorithm which gives 'Number of wipes were observes manually in the video clip and Number of wipe were accurately detected by the algorithm'. While precision gives the accuracy of the algorithm to minimizing the false positives detected by the Algorithm. The false positives detection is those detections which actually do not present in the video clip but detected as wipes by algorithm. False positives detection is the performance affected due to object and camera motion.
Recall and Precision are mathematically defined as

$$\text{Recall} = \frac{C}{(C + M)} \quad \text{----------equation a}$$

where ,C is number of frame correctly detected from all video on test
M is number of frame missed detected from all video on test

And

$$\text{Precision} = \frac{C}{(C + F)} \quad \text{----------equation b}$$

where ,C is number of frame correctly detected from all video on test
F is number of frame False detected from all video on test

In addition to Recall and Precision many of the studies have used two more performance evaluation criteria those are F1 measure and Retrieval Success Index (RSI). F1 measure is harmonic mean value that affects Recall and Precision likewise. RSI combines correct detections, false detection and miss detections to give in a single platform for performance evaluation base.

F1 measure and RSI are defined mathematically as

$$\text{F1 measure} = 2 * \frac{(\text{Recall} * \text{Precision})}{(\text{Recall} + \text{Precision})} \quad \text{----------equation c}$$

And

$$\text{Retrieval Success Index} = \frac{\text{Correct detection}}{(\text{Correct detection} + \text{Missed detection} + \text{False detection})} \quad \text{------equation d}$$

6. RESULT AND ANALYSIS

The experimental result of wipe transition detection using proposed Quick algorithm is discussed under this paper .The developed algorithm was tested and implemented on a number of selected videos obtained from different movies. To measure the performance and accuracy of algorithm, to detecting the wipe in shots a judgment has been done by comparing the wipe transition detected manually and by using the proposed Quick wipe algorithm. The Correct, False & Missed detected transition given by the algorithm is presented in Table 1 below.

Table 1: Propose Algorithm results

Movie Name	Total No .of frame under test	Correct Detections	Miss Detections	False Detections
Star War I	13949	655	45	38
Star War III	9139	456	32	43
Jodha Akbar	4329	225	25	17

From above results Recall, Precision and the F1 measure of the algorithm can be tabulated as below

Table 2: Recall, Precision and F1 measure

Movie Name	Recall	Precision	F1 Measure	RSI
Star War I	93.57	94.51	94.03	88.75
Star War III	93.44	91.38	92.39	85.87
Jodha Akbar	87.54	92.97	90.17	84.26

The measurement of Recall and Precision is given in the table 2 to evaluate the algorithm implementation results. From this data it can be observed that recall and precision resulting high performance and it gives accuracy of wipe transition detections. In some videos, the wipe transitions recorded lower rate in their precision and recall due to pixel resolution, camera and object motion as well as the luminous which were there for more than 40 or less than 20 consecutive frames. The observed increase in the missed detections within wipe transitions could be recognized to the similarity between entering and exiting scene involving a wipe transition. Our proposed methodology efficiently avoids false detections caused due to object and camera motions.

7. CONCLUSION

This paper proposes an effective method for detecting different types of wipe effects in the video processing area. In this study we minimize computing time and also determine the occurrence of the wipe transition in a video sequence. Wipe transitions seem to be more complicated as compared to identify hard cut transition and other gradual transitions are simple and easy to detect. For this reason, we addressed the issue of wipe transition detection. In order to detect wipe transitions, this study has implemented by using db6 Discrete Wavelet Transform determine the wipe transition efficiently with less computation time. Different number of video clips has been chosen for the experimentation purpose. The result obtained from manual observation has been compared with the result obtained from automated algorithm. In order to measure the performance of this Algorithm Recall and Precision have been calculated. We got maximum recall of 93.57 %, and a maximum precision of 94.51 %. The results of this algorithm show high accuracy in detecting wipe detection. But some limitation lies in the fact that the detection process can be affected from camera and object motion which lasts for more than 40 consecutive frames which is very rare case. Overall, this algorithm can be used to enlarge targeted study aimed at shot boundary detection.

8. ACKNOWLEDGMENT

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REFERENCES

[1] Zhe-Ming Lu,"Fast video shot Boundary Detection Based on SVD and Pattern matching", image processing ,IEEE on (Volume 22,issue : 12) September 2013
[2] Ehsan Amini, Somayyeh Jafarali Jassbi , "A Quick Algorithm to Search and Detect Video Shot Changes" , "International Journal of Computer Applications ,Volume 115 - No. 3, April 2015".
[3] Salim Chavan, Sadik Fanan, Dr. Sudhir Akojwar "An Efficient Method for Detection of Wipes in Presence of Object and Camera Motion", "International Journal of Innovative Research in Advanced Engineering (IJIRAE) ISSN: 2349-2163 Volume 1 Issue 8,September 2014".
[4] Shan Li, Moon chuen Lee , "Effective Detection of Various Wipe Transitions"," IEEE transactions on circuits and systems for video technology, vol. 17, no. 6, June 2007"
[5] V.Kumthekar, Prof. J.K. Patil "Key frame extraction using color histogram method", International Journal of Scientific Research Engineering & Technology (IJSRET) Volume 2 Issue 4 pp 207-214 , ISSN 2278 – 0882, july- 2013
[6] M. Wu, W. Wolf, and B. Liu, "An algorithm for wipe detection," in Proc. ICIP, 1998, pp. 893–897.
[7] Li Yufeng, Yang Yinghua," A Novel Wipe Transition Detection Method Based on Multi-Feature"," 2010 Third International Conference on Knowledge Discovery and Data Mining".
[8] C.W. Ngo, T.-C. Pong, and R. T. Chin, "Video partitioning by temporal slice coherency," IEEE Trans. Circuits Syst. Video Technol., vol. 11, no. 8, pp. 941–953, Aug. 2001.
[9] U. Naci and A. Hanjalic, "TU Delft at TRECVID 2005: Shot boundary detection," in Proc. TRECVID 2005 Workshop, 2005
[10] R. Zabih, J. Miller, and K. Mai. A Feature-Based Algorithm for Detecting and Classifying Scene Breaks. Proc.ACM Multime- dia 95, San Francisco, CA, pp. 189-200, Nov. 1995.
[11] Robert A. Joyce, Bede Liu, "Temporal Segmentation of Video Using Frame and Histogram Space", "IEEE TRANSACTIONS ON MULTIMEDIA, VOL. 8, NO. 1, FEBRUARY 2006"
[12] Alattar A.M., "Wipe scene change detector for segmenting uncom-pressed video sequences"," Circuits and Systems, 1998. IS- CAS '98. Proceedings of the 1998 IEEE International Symposium on (Volume:4)"
[13] Pei Soo-chang,"Efficient and effective wipe detection in MPEG compressed video based on the macroblock information"," Image Processing, 2000. Proceedings. 2000 International Conference".
[14] K. Warhade , S.N. Merchant , U.B. Desai, "Effective algorithm for detecting various wipe patterns and discriminating wipe from object and camera motion"," Image Processing, IET (Volume:4 , Issue: 6) 2010"
[15] Bing Han, Hongbing Ji, Xinbo Gao, "A 3D wavelet and motion vector based method for wipe transition detection"," Signal Processing, 2004. Proceedings. ICSP '04. 2004 7th International Conference , 2004"

[16] W.A.C. Fernando, C.N. Canagarajah,D.R.Bull, "Wipe scene change detection in video sequences" ," Image Processing, 1999. ICIP 99. Proceedings. 1999 International Conference"
[17] Mark S. Drew, Ze-Nian Li, and Xiang Zhong, "Video dissolve and wipe detection via spatio-temporal images of chromatic histogram differences"
[18] Kwang-deok Seo, Seong Jun Park, and Soon-heung Jung, "Video Partitioning by Temporal Slice Coherency", "IEEE Transac- tions on Consumer Electronics, Vol. 55, No. 2, MAY 2009"
[19] Sławomir Maćkowiak, Maciej Relewicz , "Wipe Transition Detection based on Motion Activity and Dominant Colors Descrip- tors", "Institute of Electronics and Telecommunications, Poznań University of Technology, Poznań"
[20] "Kota Iwamoto", "Kyoji Hirata", Detection of wipes and digital video effects based on a pattern-independent model of image boundary line characteristics"," IEEE International Conference on Image Processing 2007"
[21] "Francisco Nivando Bezerra", "A Longest Common Subsequence Approach to Detect Cut and Wipe Video Transitions","17th Brazilian Symposium on Computer Graphics and Image Processing, 2004. Proceedings"
[22] J.S. Boreczky and L. A. Rowe, "Comparison of video shot boundary detection techniques," in Storage and Retrieval for Image and Video Databases (SPIE), 1996, pp. 170–179.
[23] U. Gargi, R. Kasturi, S. H. Strayer, Performance characterization of video-shot-change detection