Performance Augmentation of Video Retrieval using Even-Odd Videos with Multilevel Block Truncation Coding

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ABSTRACT

The method proposed in this paper uses Content based video retrieval(CBVR) using 7 color spaces and multilevel-Block Truncation Coding(BTC) . The results are calculated using Absolute Difference(AD) as similarity measurement criteria. The performance comparison for 500 different videos in database with various combinations are examined by using height of cross over point precision recall values.

General Terms

Content Based Video Retrieval (CBVR), Feature Extraction, Color Spaces, Multilevel-Block Truncation Coding (BTC)

Keywords

Content Based Video Retrieval (CBVR), Feature Extraction, Multi-level Block Truncation Coding (BTC)

1. INTRODUCTION

With the tremendous number of videos in the digital world, to get the relevant video for the user is difficult in system point of view as well as user perspective in the internet based retrieval domain. So, content based video retrieval is gaining popularity for video retrieval.

Basically, in most of the current scenarios of conventional text based video retrieval is very tedious to give proper results according to user's point of view. This is because video in text based retrieval are retrieved according to textual pattern matching so this provides poor performance for retrieval. So, nowadays content of videos are more closer to user point of view and hence, there is immense need of content based video retrieval technique in today's scenario.

In this novel approach for content based video retrieval, the paper is focusing on applying video retrieval techniques on videos by considering spatial properties(color) using multi block truncation coding (BTC).

Paper presents an innovative solution by extracting five frames from each video with different frame frequency criteria starting from 1st frame and in this approach every 20th frame provides better result so 20th frame frequency is considered. Now feature vector generation is carried out by using multilevel-BTC. For performance measurement of above proposed system we have used height of cross over point of precision-recall for each query fired on the database considered.

The organization of the paper is as follows. Section II elaborates about performance improvement using frequency selection criteria in content based video retrieval. Section III gives about content based video retrieval concept and multilevel block truncation coding. Section IV elaborates about implementation of proposed system. Section V describes about results and discussion of the experimentation done. Section VI describes about conclusion of proposed system.

2. PERFORMANCE IMPROVEMENT USING FRAME SELECTION FREQUENCY CRITERIA

In Content Based Video Retrieval efficiency of the extraction method mostly depends upon the frame selection criteria. The more relevance in the extracted frames can have chances to get closest result. So the performance of CBVR is mainly depending upon the frame selection criteria. For some videos first few frames may give better results and for another video variable frequency may give better results. So the challenge is to improve overall performance of the retrieval technique with improvement in retrieved videos in generic dataset. Here we have tested our generic video dataset by considering 5 video frames from each video with variable frame frequency rates. Frequency rates are 5, 8, 12, 15, 20 and better performance is observed in case of 20th frame frequency rate with maximum video length. Fig1 shows the performance comparison between various frame frequency videos.

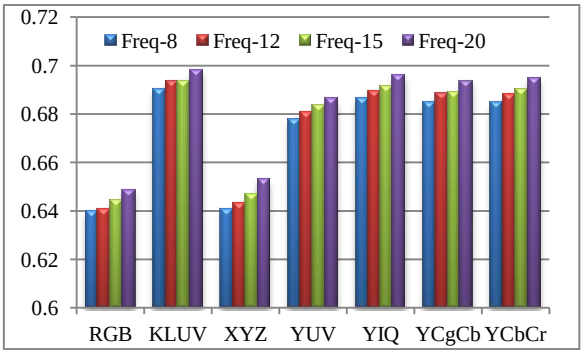

Fig1 Performance enhancement for increasing frame frequencies considered

3. CONTENT BASED VIDEO RETRIEVAL AND MULTI-LEVEL BLOCK TRUNCATION CODING

3.1 MULTI-LEVEL BLOCK TRUNCATION CODING

BTC is getting good popularity in representing color contents of videos .BTC gives good results for working on color contents. So we thought to on multiple levels in BTC.BTC vector been formed by Dividingeach component of color spaces (R, G and B), into two parts, lower region and upper region. These regions are based on average threshold for each color space intensities values. In simple words we divided each color space(R, G and B) into two parts and taken local average of each part. Now we thought to divide each color space into more local regions which given born to multilevel BTC.

R				G				B			
Lower R		Upper R		Lower G		Upper G		Lower B		Upper B	
Lower lower R	Lower upper R	Upper lower R	Upper upper R	Lower lower G	Lower upper G	Upper lower G	Upper upper G	Lower lower B	Lower upper B	Upper lower B	Upper upper B

Fig 2 Multi-level BTC feature vector format

3.1.1 BTC Level-1

In this approach, BTC is achieved by separating basic color intensities into 6 sub-clusters based on average threshold value [12].

3.1.2 BTC Level-2

For this level, clusters generated from level-1 are now used as average threshold to generate new 12 clusters [12].

3.1.3 BTC Level-3

Similarly feature vector obtained from previous level can be extended to get 24 new clusters [12].

3.1.4 BTC Level-4

Correspondingly previous result obtained can further be unmitigated to achieve 48 new clusters [12].

3.2 CONTENT BASED VIDEO RETRIEVAL

Here, we have developed a system which takes videos from database and extracts every 20th frame frequency and convert it into BTC feature vectors as described. The important point we noted is while dealing with color contents of videos every 20th frame frequency information can give better results and if we take more than 20th frame then performance detoriates which strongly inspired us to focus on every 20th frame frequency of video.

4. EVEN AND ODD VIDEOS

Hence in order to improve the performance of color content averaging techniques for video retrieval even and odd frames are generated for every video in the generic database. To generate an even or odd part of videos, firstly mirror image of frame across Y planes is considered which is termed as flip frames. The Flip Frames is shown in figure no 3. Now to obtain even part, addition of flip and original videos are taken into consideration. Similarly odd part is obtained by subtracting flip with original videos. The complete process is explained in equation 1 and 2.

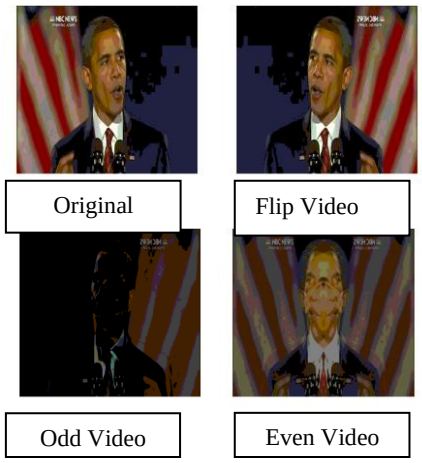

Fig 3 Formation of Even and Odd videos using original videos

$$\text{even videos} = (\text{flip video} + \text{original video})/2 \quad (1)$$

$$\text{odd videos} = |\text{flip video} - \text{original video}|/2 \quad (2)$$

5. IMPLEMENTATION

5.1 IMPLEMENATION PLATFORM

The implementation of model is done in MATLAB 2012a with basic system of Intel core 2 duo (2.93GHz) with 2GB RAM and minimum of 250GB hard disk for storage. The modules of model are run under MATLAB 2012a compiler. The operating system used is windows 7 for mat lab environment.

5.2 VIDEO DATASET

The videos are differentiated in 10 assorted categories containing 50 similar videos. So, in total there are 500 videos in data set for experimentation.

5.3 PERFORMACE IMPROVISON OF CBVR COMBINATION WITH EVEN-ODD VIDEOS

Considering only original video with BTC feature vector for retrieval purpose does not provide effective results . Hence there is need of different approach such as even odd videos with original videos are taken into consideration. Still for effective performance improvising single original video is not efficient, hence combination of original videos with these approaches are taken into consideration. So different approaches are used with various combination of even-odd videos to generate feature vector of each video. So we have workout on 4 combinations which provide better performance than original videos using BTC.

i. EVEN+ORIGINAL
ii. ODD+ORIGINAL
iii. EVEN+ODD
iv. EVEN+ODD+ORIGINAL

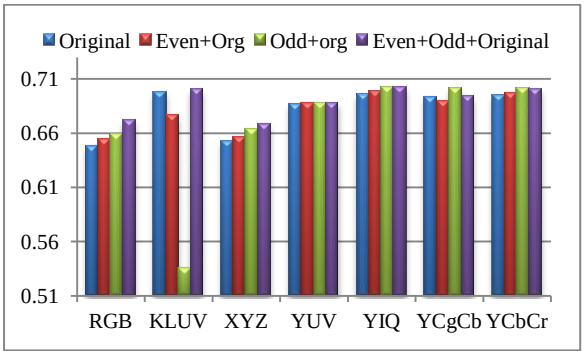

Fig 4 Performance comparison of combinatrics of original video, odd video and even video

5.4 PERFORMANCE RISE FOR INCREASING FUNDAMENTAL LEVEL OF BLOCK TRUNCATION CODING

Feature vector of original video is not providing expected results. So multilevel BTC is used for covering more details of color content in videos. Feature vector up to BTC-4 is tested with considerable rise in performance of retrieval technique up to BTC-3 for each color space. The fig 5 shows the comparison between different levels of BTC.

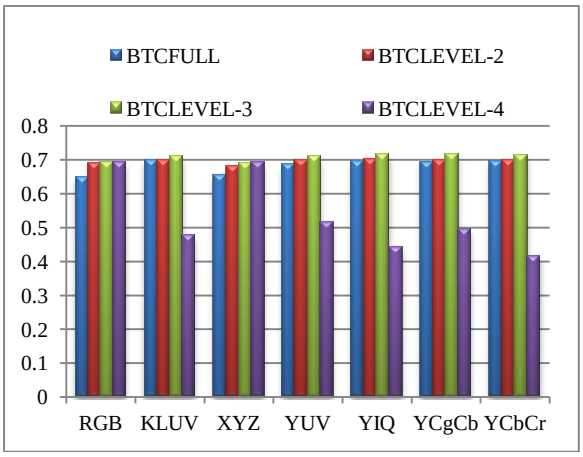

Fig 5 Performance enhancement for increasing level of BTC till level 3

5.5 MULTILEVEL BTC AUGEMENTED WITH EVEN ODD VIDEOS

As CBVR is gaining popularity there are more no of methods for retrieval purpose. Hence only one method doesn't provide expected results in spatial domain as required for best video retrieval technique .So there came a need for combination of different retrieval techniques. So to increase performance of video retrieval we are proposing a method which is based upon the combination of even odd images with multilevel BTC. Hence the two approaches which provide better results are combined to obtain better results.

6. RESULTS ANS DISCUSSION

Combinations of multilevel BTC with even -odd videos for 7 color spaces are tested. The combinations of BTC- 3 with even+odd+original have outperformed than other combinations. Fig6 shows the result of augmented multilevel BTC-3 with even-odd videos. Performances of methods are chosen on the basis of height of cross over point of precision and recall values. Higher the cross-over point higher is the performance of the retrieval technique. The better performance is observed in YIQ color space and then seconds comes YCbCr. In fact it is observed that all color luminance-chromaticity color spaces have shown better performance than conventional RGB color space.

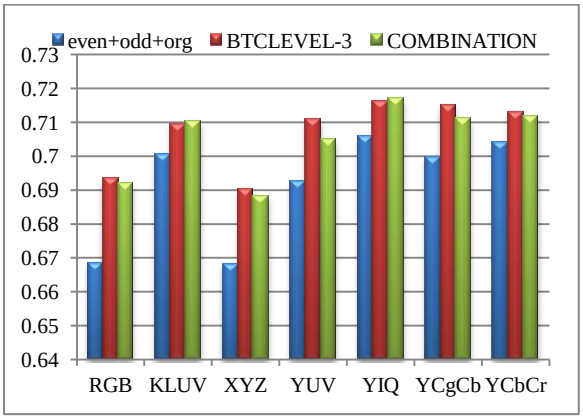

Fig 6 Multilevel BTC augmented with even odd videos

7. CONCLUSION

As content based video retrieval is gaining popularity over text based approach. Here a novel method with combination of multilevel BTC with even-odd videos is proposed. This approach has shown considerable improvement in retrieval performance. Only point of concern is the feature vector size. The performance has increased with cost of increase in feature vector size. In all different combinations of even-odd videos with multilevel BTC for 7 different color spaces are experimented for proposed CBVR method. Combination of BTC level-3 with original+even+odd has outperformed all other combinations. From all seven color spaces considered YIQ gives better result.

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