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CONTENT BASED VIDEO RETRIEVAL USING DOMINANT COLOR OF THE TRUNCATED BLOCKS OF FRAME

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ABSTRACT

We describe a system for content-based video retrieval for a large set of geographical data set consisting different categories of data like animals, birds, flowers, etc. The system retrieves similar videos using most dominant color of the non-overlapping truncated blocks of the key frame from a video. To reduce the complexity, the system converts each block of a key frame into combination of only twenty colors by using color look-up table. We can find out the most dominant color of each block by using same color-lookup table. Simple and efficient Euclidean distance metric is used to find out the most similar videos that match to our query video. The approach is reliable and flexible by consisting videos of different lengths in the dataset.

Keywords: *Content-Based Video Retrieval, Block Truncation, Color Mapping, Identification of Dominant Color, Euclidean Distance.*

1. INTRODUCTION

Now-a-days, the world is highly dependent on the videos for information rather than images. Users can extract any type of information they require from videos. This results in large databases of videos in any field. The key mechanism lies in fast retrieval of most similar videos to the query video from the database. Text annotation is the basic approach for the matching. This does not work efficiently because there are many factors that make same video to have different naming conventions.

Another approach for retrieving videos is to use different features of the video for matching. The features of the video are like color, shape and texture. We are using the color feature in our system. We have chosen this feature based upon our dataset. Our database is collection of various geographical videos like animal videos, bird videos and flowers. Every video, irrespective of size is segmented into shots. Frames are derived from each shot. Among all the frames key frames are selected which acts as key feature for entire shot. We have to find out the most dominant color of each truncated block of a Key frame.

The dominant color of all the blocks is stored in the database. This dominant color is used to retrieve the most similar videos from the database when user has given the video as query.

The rest of the paper is organized as follows: In Section 2, we briefly described about the Architecture of our system. Section 3, describes the proposed system. Experimental results are highlighted in Section 4. Finally, our paper concludes and gives the future work in Section 5.

2. ARCHITECTURE

The Architecture of the proposed system looks as in the Figure 1 below. It is organized into various blocks. Before implementing the system on the user query video, all the videos in the

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database has to be pre-processed and the dominant color of various blocks of all key frames is stored in the feature database. The user query is processed then and the dominant color of all the key frames is found, compared with dominant color of all the videos in the database.

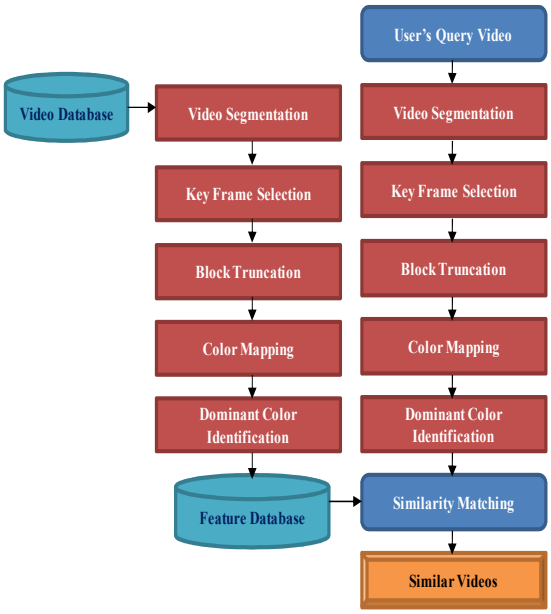

Figure 1: Architecture Diagram

The first step of our system is video segmentation in which the video has to be divided into different frames. In the next step we have to select key frames from the set of frames. Then we are performing block truncation in which each key frame is truncated into four non-overlapping blocks. By considering color-look up table all the different colors of each block should be mapped into desired color set in the color-mapping step. Next, the most dominant color should be identified and stored in the feature database.

The user video query also has to undergo all the processing steps mentioned above i.e., Video Segmentation, Block Truncation and Color Mapping, D. The most dominant color of each block is compared with the dominant color of all the videos stored in the feature database. By using similarity metric, the most similar videos are retrieved and displayed.

3. PROPOSED SYSTEM

3.1 Video Segmentation

Video sequence is a continuous and sequential combination of images. Video sequence is segmented into shots. In our system, we are implementing temporal segmentation in which each two seconds is considered as a single shot. Each shot is segmented into frames by using the technique [3]. We can have frameset of one video in the dataset as shown in the Figure 2.

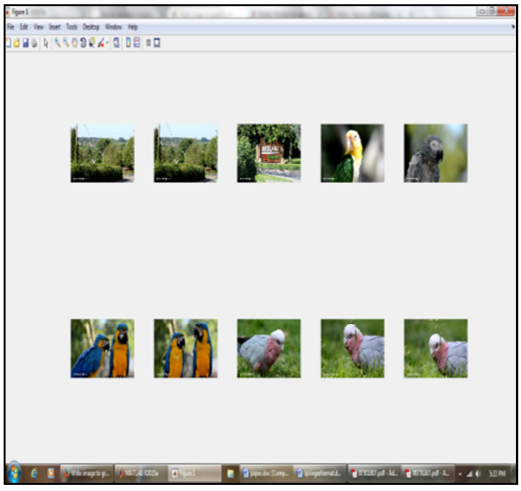

Figure 2: Frameset Of A Video After Video Segmentation

3.2 Key Frame Selection

Key Frames are the frames that characterize all the frames in a shot. As two or three frames selected from a shot could represent the salient content of the shot, it reduces the amount of information needed to be stored for a video storage, and retrieval.

In our system we are considering first, median and last frames of a shot as Key Frames. Hence for a video with N shots, we will have 3*N Key Frames. These Key Frames are only used for video processing.

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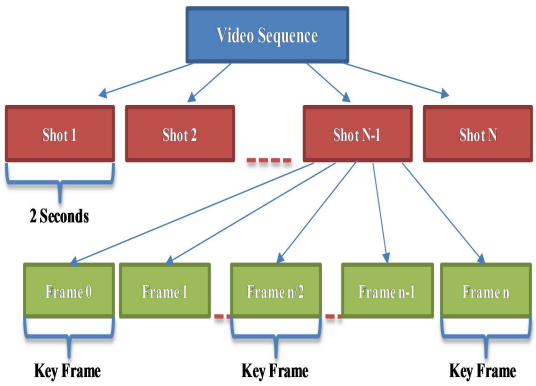

Figure 3: Key Frame Selection

3.3 Block Truncation

The given Key Frame is divided into non-overlapping rectangular regions. For the sake of simplicity, the blocks were let to be square regions of size N x N [2]. We can divide into any number of blocks. As for our dataset there is no much difference with considering more number of blocks, we are considering N value to be 2. So in our system for each Key Frame we will have 2 * 2 blocks. The non-overlapping blocks looks as in Figure 4.

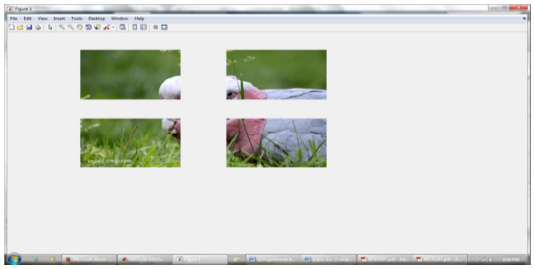

Figure 4: *Four non-overlapping blocks of the last frame in a frame set shown in Figure 2.*

3.4 Color Mapping

In general, Color space will have more than 5000 range of combinations. To reduce the complexity of our system, we are considering only 20 different combinations of colors as in the Table 1. Each block of our fame is converted into the color space of only twenty colors.

Table 1: Color Look-Up Table.

S.No	Color	R	G	B
1.	Black	0	0	0
2.	Navy	0	0	128
3.	Blue	0	0	255
4.	Green	0	255	0
5.	Red	255	0	0
6.	Olive	128	128	0
7.	Orange	255	128	0
8.	Brown	165	42	42
9.	Crimson	220	20	60
10.	Gray	128	128	128
11.	Purple	128	0	128
12.	Slate blue	113	113	198
13.	Pink	255	192	203
14.	Turquoise	64	224	208
15.	Indigo	75	0	130
16.	Violet	238	130	238
17.	Magenta	255	0	255
18	Cyan	0	255	255
19.	Yellow	255	255	0
20.	White	255	255	255

Using Euclidean distance metric - calculate distance between the RGB components of each pixel of block and the RGB components of all the colors in the look-up table. Consider r_1, g_1, b_1 as RGB values of color in color-look up table and r_2, g_2, b_2 as RGB values of color in the key frame and substitute in the Euclidean distance formula as shown in equation (1).

$$\text{Distance}=\sqrt{(r_2-r_1)^2+(g_2-g_1)^2+(b_2-b_1)^2} \quad (1)$$

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Substitute the color of the block with the color in the look-up table having minimum distance. This results in the Key Frame with only twenty color combinations.

3.5 Dominant Color Identification

Make a count of all the colors in the block. The color having with highest count will be the most dominant color of the block. Save the dominant color of each block in the database in a matrix form. As we have four blocks per each frame, the system results in four dominant colors for each frame. The matrix looks as in the Figure 5.

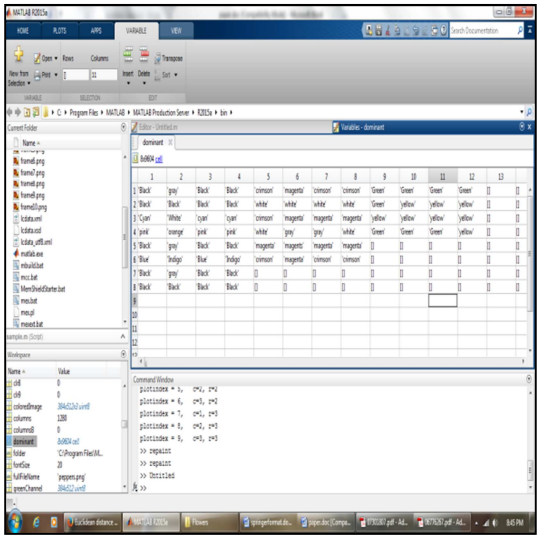

Figure 5: Matrix Having Dominant Colors Of All The Blocks Of The Video.

In the Figure 5, we can observe the dominant colors of the various frames. In the matrix, first four columns belong to the first video and so on. The rows represent the Key Frames of that video. The total number of Key Frames can be calculated by dividing total no. of rows with 4. For example if total no. of rows are 12, we will have 12/4=3 Key Frames. As the size of the video varies, the total number of key frames also varies.

3.6 Similarity Matching

After user query video has been processed as discussed above, we obtain the matrix of most dominant color. As Euclidean distance metric is the fast and simple metric, we are implementing the same in our system. The distance between the dominant colors of the query video and dominant colors in the database have been calculated by using Euclidean distance metric. The threshold value should be selected based on the dataset. The most similar videos can be retrieved by using the equation 2.

Distance < Threshold {Similar}

>Threshold {Dissimilar} (2)

In our system, we considered threshold to be 0.5. So all the images for which distance is less than 0.5 are considered as similar images and images for which distance is more than 0.5 are considered to be dissimilar images.

4 EXPERIMENTAL RESULTS

Our Dataset consists of three categories of images like animals, birds and flowers. Each category consists of 30 videos. The size of each video varies from 4 MB to 50 MB. The videos of the dataset are of the mp4 format. Based upon the size the total number of key frames varies. The size of each key frame is 720 x 1280. The size of each block of key Frame is 360 x 640. Our results of two queries are shown in the Figure 6. Our system provides a facility to search a video from the database by using a part of video also. For example the video in the databases are of 1 minute to 2 minutes. The user can retrieve similar videos even if the query video is of only 30 seconds. The key frames of query video are compared with all the key frames of the videos in the database in sequence, iteratively. For example, if total Key Frames of query video are 4 and Key Frames of a video in database are 12. Then 4 Key Frames of query video are compared with 12 Key Frames of video in database in three iterations.

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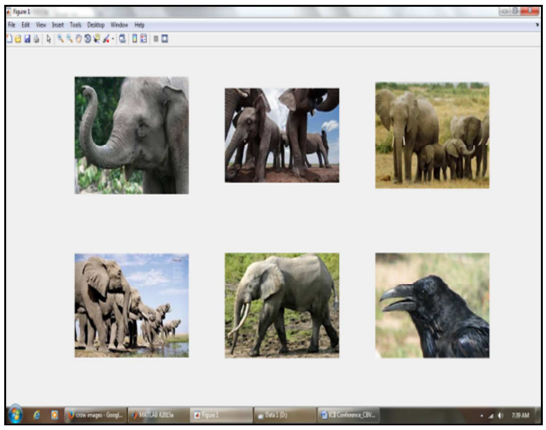

Figure 6(A): Experimental Results With Elephant Video As Query Video (The First Slot Is For Query Video)

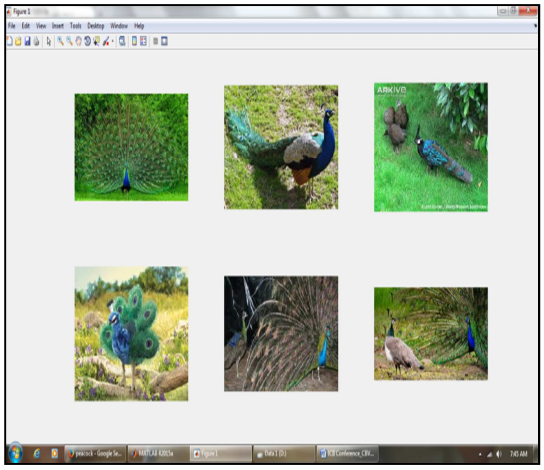

Figure 6(B): Experimental Results With Peacock Video As Query Video (The First Slot Is For Query Video)

From Figure 6 we can observe that there are some erroneous outputs. In the first result we can observe that the query video is of Elephants. We have retrieved video of crow along with the videos of elephants as similar videos. This is because the dominant color of elephant is same as dominant color of crow. In the second result, query video is of peacock and we have retrieved all videos of peacock only as similar videos. For quantitative measurement, we have used precision-recall metric. The plots in the Figure 7 show the superiority of our approach over CBVR using Colour Histograms

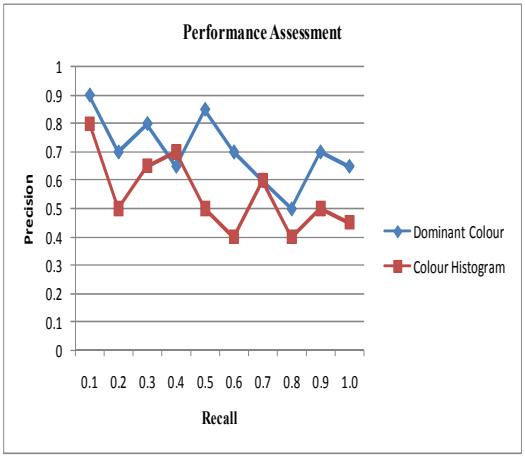

Figure 7: Precision-Recall Metric Chart

Our approach is better than CBVR using color histogram in terms of response time also. If we are using Color Histograms, we need to find distance between the all the histograms of query video and videos in the database. But in our approach we need to find distance between only dominant colors as if distance between two points which takes less computation time. The analysis of two techniques in terms of response time is as shown in the Figure 8.

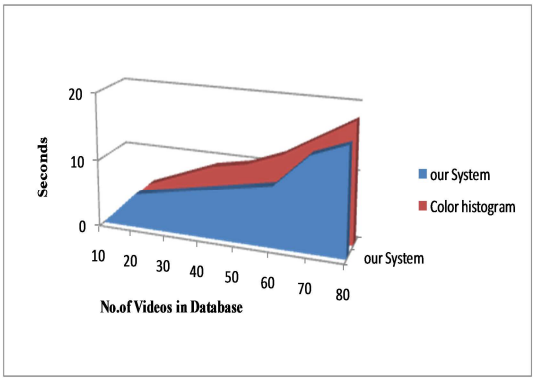

Figure 8: Response Time Comparison

5. CONCLUSION AND FUTURE WORK

We have developed an efficient Content Based Video Retrieval System by using Color feature. We have performed the Block truncation on the frames. Each block has undergone color-mapping and Dominant Color is identified for each block. Our system finds out the distance between the dominant color of query video and all the dominant colors in the database. The videos having distance less than the defined

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threshold are termed as similar videos. The results show that our approach achieved promising and effective result in video retrieval. Our system has a limitation that even dissimilar videos having similar dominant color is retrieved as similar videos as seen in the Figure 6(a). So, the future work of our system should be able to retrieve similar videos based on using some more content of video along with dominant color for retrieving similar videos. The limitation of our system is that it is not suitable for medical video data sets and human datasets.

REFERENCES

[1] Krishnan, N. ; M.S Univ., Washington ; Banu, M.S. ; Callins Christiyana, C..: Content Based Image Retrieval Using Dominant Color Identification Based on Foreground Objects. In: Conference on Computational Intelligence and Multimedia Applications, 2007. International Conference on (Volume: 3)

[2] Doaa Mohammed, Fatma Abou-Chadi (Senior Member, IEEE.): Image Compression using Block Truncation Coding. In: Cyber Journals: Multi Disciplinary journals in science and Technology, Journal of Selected Areas in Telecommunications (JSAT), February Edition, 2011

[3] Matthias Grundmann, Vivek Kwatra, Mei Han, Irfan Essa: Efficient Hierarchical Graph-Based Video Segmentation

[4] Charu C. Aggarwal, Alexander Hinnerburg, and Daniel A Keim.: On the Surprising behavior of Distance Metrics in High Dimensional Space.

[5] Fundamentals of Digital image and video processing by North Western University, https://www.coursera.org/course/digital

[6] Madhav Gitte, Harshal Bawaska, Sourabh Sethi, Ajinkya Shinde.: Content Based Video Retrieval System.In: IJRET: International Journal of Research in Engineering and Technology eISSN: 2319 - 1163 | pISSN: 2321 – 7308

[7] Dr.Sudeep.D.Thepade, rishnasagar.S.Subhedarpage, Ankur.A.Mali and Tushar.S.Vaidya.: Performance Gain of Content Based Video Retrieval Technique using Intermediate Block Truncation Coding on Different Color Spaces. In: International conference on Communication and Signal Processing, April 3-5, 2013, India

[8] 9. S.Padmakala, Dr.G.S.AnandhaMala, M.Shalini.:' An Effective Content Based Video Retrieval Utilizing Texture, Color and Optimal Key Frame Features' In: 2011 International Conference on Image Information Processing (ICIIP 2011)

[9] 10. Aasif Ansar, Muzammil H Mohammed: 'Content

[10] based Video Retrieval Systems -Methods, Techniques, Trends and Challenges' In: nternational Journal of Computer Applications (0975 – 8887) Volume 112 – No. 7, February 2015

[11] 11. S. Mangijao Singh, K. Hemachandran : Content- Based Image Retrieval using Color Moment and Gabor Texture Feature', In: IJCSI International Journal of Computer Science Issues, Vol. 9, Issue 5, No 1, September 2012 ISSN (Online): 1694-0814

[12] 12. B. V. Patel, B. B. Meshram : 'Content Based Video Retrieval' In: The International Journal of Multimedia & Its Applications (IJMA) Vol.4, No.5, October 2012

[13] 13. Hatim G. Zaini and T. Frag :' Multi feature content based Video Retrieval Using High Level Semantic Concepts' In: IPASJ International Journal of Computer Science (IIJCS) Volume 2, Issue 9, September 2014

[14] 14. P. Geetha and V.Narayanan,:'A Survey on Content based video retrieval,' In:journal of Computer Science, Vol. 4, Issue 6,PP 474-486, 2008.

[15] 15. Zhuang, Y., Rui, Y., Huang, T., &Mehrotra, S.: 'Adaptive key frame extraction using unsupervised clustering'.In: Proceedings of IEEE International Conference Image Processing,866-870,1998

[16] 16. Tan , Y., Kulkarni, S., &Ramadge, P.:' A framework for measuring video similarity and its application to video query by example 'In: Proceedings of IEEE International Conference Image Processing, 106-110, 1999

[17] 17. Davis, M. Media streams: An iconic visual language for video annotation. Proceedings of IEEE Workshop on Visual Languages, 196-201, 1993

[18] 18. R.S.Dubey, R. Choubey, J. Bhattacharga, " Multi Feature Content Based Image Retrieval", (IJCSE) International Journal on Computer Science and Engineering, vol. 02, No.06, 2010 , pp. 2145-2149.

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

[19] 19. M.Z. Swain, and D.H. Ballard, "Color Indexing", Intl. J. of Computer Vision 7(1): 1991, pp. 11-32
[20] 20. M. Stricker, and M. Orengo, "Similarity of color images", In SPIE Conference on Storage and Retrieval for Image and Video Databases , volume 2420, 1995, pp. 381-392, SanJose, USA
[21] 21. D.Saravanan, Dr.S.Srinivasan,: "Data Mining Framework for video Data ",RSTCC 2010,Pages 167-170,Nov 2010
[22] 22. T.MLiu, H.-J. Zhang, and F. H. Qi, "A novel video key-frame-extraction algorithm based on perceived motion energy model," IEEE Trans. Circuits Syst. Video Technol., vol. 13, no. 10, pp. 1006–1013, Oct. 2003
[23] 23. A. Divakaran, R. Radhakrishnan, and K. A Peker,: "Motion activitybased extraction of key-frames from video shots," in Proc. IEEE Int. Conf. Image Process., vol. 1, Rochester, NY, pp. 932–935, 2002
[24] 24. Liang-Hua Chen, Kuo-Hao Chin, Hong-Yuan Liao, "An integrated approach to video retrieval", Proceedings of the nineteenth conference on Australasian database-Volume 75, 49–55, 2008
[25] 25. Weiming Hu, Nianhua Xie, Li Li, Xianglin Zeng, Maybank S., "A Survey on Visual Content-Based Video Indexing and Retrieval", IEEE Transactions on Systems, Man, and Cybernetics, Part C (Applications and Reviews), 41-6,797-819, 11/2011
[26] 26. Delp, E. J., Saenz, M., and Salama, P., 2000, Block Truncation Coding (BTC), Handbook of Image and Video Processing, edited by Bovik A. C., Academic Press, pp. 176-181.
[27] 27. H. Baird, D. Lopresti, B. Davison, W. Pottenger (2004), "Robust document image understanding technologies", HDP, ACM.
[28] 28. Egon L. van den Broek, Peter M. F. Kisters, and Louis G. Vuurpijl (2004)," Design Guidelines for a Content-Based Image Retrieval Color-Selection Interface"ACM Dutch Directions in HCI, Amsterdam.
[29] 29. Beecks, C.; Uysal, M.S.; Seidl, T., "A comparative study of similarity measures for content-based multimedia retrieval", IEEE International Conference on Multimedia and Expo (ICME), 2010
[30] 30.Girgensohn, A. &Boreczky, J. Time-constrained key frame selection technique. Proceedings of IEEE International Conference Multimedia Computing and Systems, 756-761, 1999.