Partitioning Based Thepade's Sorted Ternary Block Truncation Coding(TSTBTC) In Content Based Video Retrieval With Various Color Spaces & Similarity Measure

Nikhil V.Soniminde
Dept of Information Technology
D.Y PatilPolytechnic ,Akurdi , Pune-33M.S.B.T.E Board , Mumbai. India

Abstract- *In This Modern ERA, Content Based Video Retrieval (CBVR) utilizes the rich and varied video contents for video Representation and Retrieval.The feature extraction methods used demonstrate varying degrees of computation, complexity and Performance.The paper attempts TSN-aryBTC(Thepade's Sorted N-ary Block Truncation Coding) Color Feature Extraction Technique and Partitioning RGB Planes into No.Of Different Partitions,Such as Partitioning Equal in Horizontal and Vertical Fashionand then TSN-aryBTC applied.In This Paper, Thepade's Sorted N-ary Block Truncation Coding (TSN-aryBTC) has been Attempted ForColor Content Based Video Retrieval. This Paper Attempts 16 Different Simmilarity Measures and 9 Various ColorSpaces,In Which YCbCrColor Space and Sorensen Distance gives Higher Accuracy.The Process of Feature Vector generation by using 20th Frequency Frame of videos.*

TSTBTC

(Thepade's Sorted Ternary Block Truncation Coding) Onto RGB Squared Partitioning gives Excellent Result as compared to remaining Combinations of Partitioning.TSTBTC based Video Retrieval experimentation is done on test bed of 500 videos of Different 10 Categories of Video Sets. Each Category Consist of 50 Videos.500 Queries Fired onto 500 Videos, and the Average Accuracy is computed For each Partitioning, Horizontally as well as Vertically For each Different Combination.

Keywords- Color Content Based Video Retrieval; Thepade's Sorted Ternary Block Truncation Coding:,Thepade's Sorted N-ary Block Truncation Coding ,Partitioning,Similarity Measures

I. INTRODUCTION

Today's advances in Digital video, Broadband Networking and data Storage have inspired people to express by sharing videos and other forms of media .Content Based Video Retrieval is Logical extension of Content Based Image Retrieval and Content Based Audio Retrieval Systems."Content" may refer to colors,shapes,textures, and other information that can Derived from Frame.

"Content-Based" means search the content of images instead of metadata such as keywords,tags or descriptions related to image.Video Retrieval returns the Retrieval of a behavior of an object from Frames of videos.It may contain the same objects but little difference inbetween them. Therefore,it is essential to encode within the indexing of video.The Target Of Content Based Video Retrieval Is Video Indexing and throw the Most relevant and Accurate Video In Fast manner[2].Video is dividing it into no.of Frames,Frames again divided it into no of Shots,Shots again divided into no.of Scenes, collection of scenes becomes a video[5].

Many Applications of CBVRsare-News Broadcasting,Advertising,Music Video Clips,Distance Learning,Medical Applications and etc[3].Textual Metadata is manual process so human need to maintain higher Accuracy of retrieval.it is time and cost consuming technique.So retrieval based on metadata does not give the accurate result.Video Indexing can be used for tagging of videos and arrange them for retrieval[7].In CBVR,Different Color,Texture,Shape, Motion, etc are used for indexing and retrieval[1].Feature Vectors calculated using VSR(Video Segment Representation)and Key Frames[2].

Color Content Based Video Retrieval means to Extracts the Color Features and retrieving the videos based on color features. For this Purpose of Video Retrieval,Block truncation Coding Technique is used[7].Video Retrieval retrieves the videos for query video from the huge collection of videos database.

In Video Retrieval,Relevant Videos are retrieved for the query Video from huge collection of video database.Video Retrieval consists into 2 phases Feature Extraction and Query execution Phase[2].Feature Extraction phase generated by using Partitioning Based TSTBTC for color Feature Extraction Technique[3].Database Videos Feature Vector from Feature Extraction Phase is matched with Query Execution in Second Phase[1].

II. LITERATURE SURVEY

Color Contents shows more Information in Frames of Videos.This paper includes Color Content of video as a feature for easily Content Based Video Retrieval.

Image Color Histograms is Collection Of colors in an Frame.It Can be represented by no. of Pixels belongs to Particular color shade.Layout and Histogram Describes the Image.

A.Thepade's Sorted Ternary Block Truncation Coding(TSTBTC)

Before TSTBTC,BTC has been Introduced. BTC(Block Truncation Coding), is good method for color feature extraction for color content of frame[5].In Beginning, BTC is used for gray-scale images after that it modifies for color images which improves retrieval performance of Video[5] .In BTC, Frame is divided into no.of blocks.BTC is divided into Binary and Ternary BTC.

In Binary BTC, Frame is divided into two non-overlapping regions based on threshold value[2].Calculation of bitmap from two means which returns feature vector for the image[8].

In The Ternary BTC,Frames of videos will contain 3 non overlapping regions .3 different pixels regions are formed of pixel intensity values[4].Color BTC works on Color Planes[3].Generation of image features done from the Red,Green and Blue planes of Image.There are different forms of BTC depending on Color Spaces[2].Thepade's Sorted Ternary Block Truncation Coding Performs Well[3].

B.TSTBTC On RGB Planes Partitioning

B.1Introduction

TSTBTC on RGB Planes Partition it into different parts In Horizontal and Vertical Fashion.Before Applying TSTBTC ,RGB Planes Partition it into Horizontal 2 equal parts, Vertical 2 equal parts, Horizontal 4 equal Parts, Vertical 4 equal parts, Squared parts, Horizontal and Vertical in 3*3 Parts,Horizontal and Vertical in 4*4 Parts, Horizontally and Vertically In 8 equal parts[2].From above combinations SquaredPartition gives good result as compared to remaining combinations.

B.2 Graphical Representation of RGB Planes Partitioning

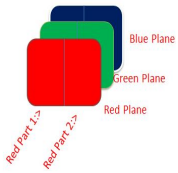

Fig 1.Vertically In 2 Parts

Fig 2.Horizontally In 2 Parts

Above Fig.1 and Fig.2 Shows that Graphical Representation of Vertical And Horizontal Partition In Equal 2 Parts.It Consist Into 2 Parts such as Part 1 & Part 2.Each Part Consist Of 9 Values such as 3 Red, 3 Green and 3 Blue Values Of Each Part.So Totally It Returns 18 Values Per Frame.

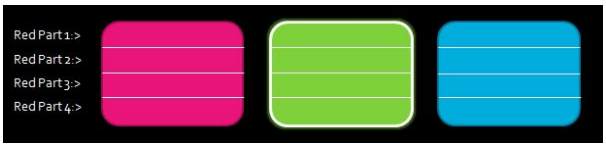

Fig 3.HorizontallyInEqual 4 Planes

Above Fig.3 Shows that Graphical Representation Of Horizontal Partition In Equal 4 Parts.It Consist Into 4 Equal Parts such as Part 1,Part 2,Part 3 & Part 4.Each Part consist of 9 Values such as 3 Red,3 Green and 3 Blue Values of each part.So It Returns totally 36 values Per Frame.

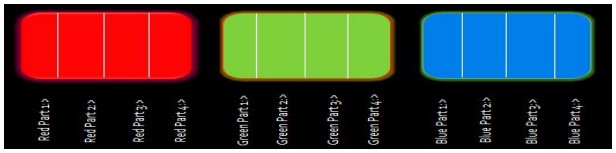

Fig 4.Vertically In Equal 4 Planes

Above Fig.4 Shows that Vertical 4 Equal Part Partitioning Into Equal 4 Parts,Which also returns 36 Values Per Frame.

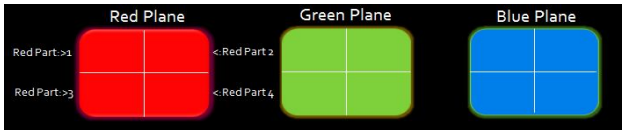

Fig.5 Squared 4 Equal Plane Partitioning

Above Fig.5 Shows that Squared 4 Equal Plane Partitioning into 4 Different Grids.Again,It Consist into 4 Different Parts such as Part 1,Part 2,Part 3 & Part 4.Each Part has 9 Different Red,Green and Blue Values.So It Returns Totally 36 Values.

1. From Fig.1, In Horizontal 2 Equal Parts On RGB Planes divide into 2 parts such as Part 1 and Part 2 .Basically TSTBTC gives 9 values per Frame Of Video.In Partitioning, Each Part has 9 Values.
Part1=3RValues+3GValues+3BValues
Part1=3RValues+3GValues+3BValues
Total Parts=Part 1+ Part 2
=9+9
=18 values/Frame.
2. It returns same parts for Vertical Fashion also.

3. In TSTBTC Horizontal 4 equal RGB Planes Partitioning Divide it into 4 parts Such as Part 1, 2, 3, and Part 4.
Part1=3RValues+3GValues+3BValues
Part2=3RValues+3GValues+3BValues
Part3=3RValues+3GValues+3BValues
Part4=3RValues+3GValues+3BValues
Total Part=Part 1+Part 2+Part 3+Part 4
=9+9+9+9
=36 values/Frame.

4.In Vertical 4 Equal RGB PlanesReturns same 36 values.

5.In Squared 4 RGB Planes divide into 4 Different Grids as shown in TSTBTC on RGB Squared Partitioning which also returns 36 values. Each Grid Consist Of 9 Values.

III. PARTITIONING BASED TSTBTC VIDEO RETRIEVAL TECHNIQUE ALGORITHM FOR REGISTRATION PHASE OF CONTENT BASED VIDEO RETRIEVAL.

In this paper, TSTBTC is applied onto RGB Planes Partitioning in Horizontal and Vertical Fashion.
There are two Part procedure for Content Based Video Retrieval.

Part 1: Algorithm for Phase of Videos Registration.

Part 2: Algorithm for Phase of Query Video Execution.

In Part 1:Algorithm for Phase of Videos Registration

1. Select a Video from Database.
2. Extract 20th Key Frame Of respected video.
3. Find Red, Green and Blue Components of each frame in sorted column Vector.
4. Partition Red, Green and Blue Components in Horizontal and Vertical Fashion.
5. Apply Thepade's Sorted Ternary Block Truncation Coding (TSTBTC).
6. Get Feature Vector of each key frame for Indivisual Red, Green and Blue Components.
7. Repeat Step 1 to 6 for Video of Database to get Feature

Vector Table.

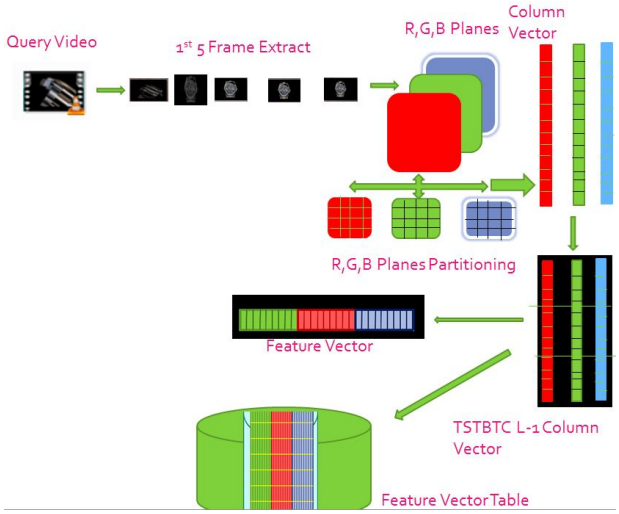

Fig 6.Video Registration Phase Of TSTBTC On RGB PlanesPartitioning Based CBVR

Partitioning Based TSTBTC Formulated given in equation 1,2,3 and 4.FVT Is Feature Vector Table. FV(kSorCVRv,kSorCVGv,kSorCVBv)be the Feature Vector of all frames k of size (m*n)/5 for Video v.

FVT=

$$\left\{ \begin{array}{l} FV\ (kSorCVRv\ ,kSorCVGv\ ,kSorCVBv\ ) \\ v = video \in videodatas\ etand \\ k = keyframeof\ v \end{array} \right\} \quad (1)$$

Where,
SorCVR(k) is Sorted Column Vector of Red Component of Frame k of selected video.
SorCVG(k) is Sorted Column Vector of Green Component of Frame k of selected video.
SorCVB(k) is Sorted Column Vector of Blue Component of Frame k of selected video.
For any video v the IndivisualkSorCVRv,kSorCVGv,kSorCVBv be the arrays

having 9 or 18 or 36 Values each; Evaluated in equations where *i* will vary from 1 to 9 or 1 to 18 or 1 to 36.

$$kSorCVRv(i)= \frac{1\sum SorCVR(k)}{(m*n)/5} \quad \frac{(mxnxi/9 \text{ or } 18 \text{ or } 36)}{k=((mxnxi-1/9 \text{ or } 18 \text{ or } 36)+1)} \quad (2)$$

$$kSorCVGv(i)= \frac{1 \sum SorCVG(k)}{(m*n)/5k=((mxnxi-1/9 \text{ or } 18 \text{ or } 36)+1)} \quad \frac{(mxnxi/9 \text{ or } 18 \text{ or } 36)}{} \quad (3)$$

$$kSorCVBv(i)= \frac{1 \sum SorCVBk)}{(m*n)/5 \quad k=((mxnxi-1/9 \text{ or } 18 \text{ or } 36)+1)} \quad \frac{(mxnxi/9 \text{ or } 18 \text{ or } 36)}{} \quad (4)$$

for i=1,2,…9 or i=1,2,…18 or i=1,2,…36

Part 2: Algorithm for Phase of Query Video Execution

1. Extract 20th Key Frame Of respected video.
2. Find Red, Green and Blue Components of each frame in sorted column vector.
3. Partition Red, Green and Blue Components in Horizontal and Vertical Fashion.
4. Apply Thepade's Sorted Ternary Block Truncation Coding (TSTBTC).
5. Get Feature Vector of each key frame for Indivisual Red, Green and Blue Components.
6. Query Video Feature Match with Feature Database which returns most relevant match for query video.

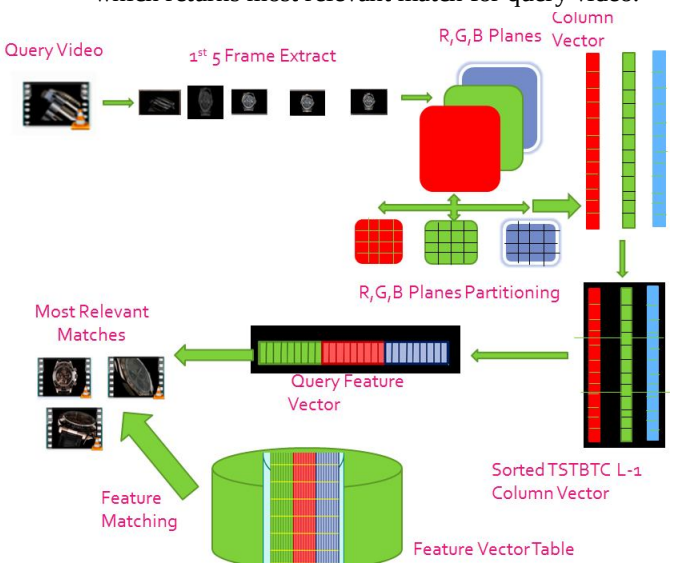

Fig.7 Query Execution Phase Of TSTBTC Partitioning On RGB Planes Based CBVR

$$\text{Accuracy}= \frac{\{\text{Number Of Relevant Videos Retrieved}\}}{\{\text{Total No.Of Videos Retrieved}\}} \quad (5)$$

IV. EXPERIMENTATION ENVIRONMENT

Here Experimentation Platform is Matlab R2012b With Processor Core i5 with 4GB RAM.

Test Bed has 500 videos .videos database has 10 Categories, each category consist of 50 videos.therefore total 500 queries fired on database.Below Diagram Shows Collection Of Videos Considered in Database.

Fig 8.Test Bed Database

V. RESULTS AND DISCUSSION

Result is On impact of RGB Planes Partition On TSTBTC and Accuracy is Computed For Different Combinations.

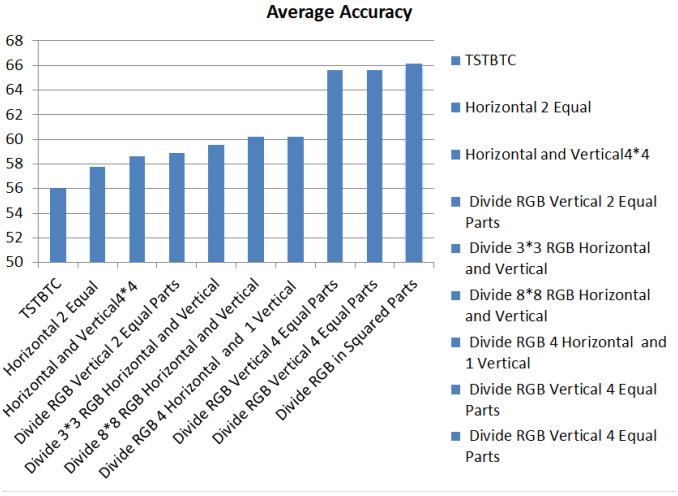

Fig.9 Performance of TSTBTC Partitioning On RGB Planes

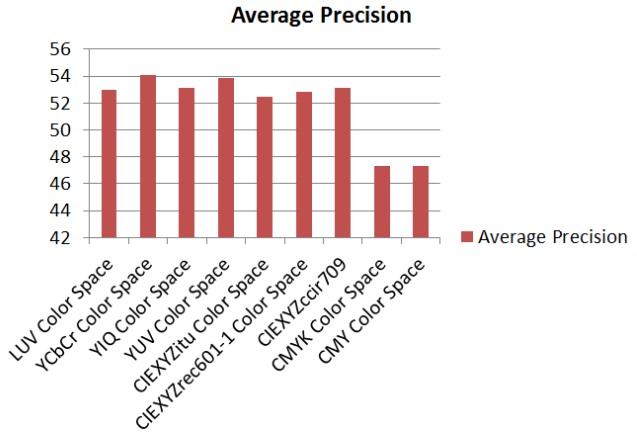

Fig.10 Performance of TSTBTC-Level 1 On Different Color Spaces

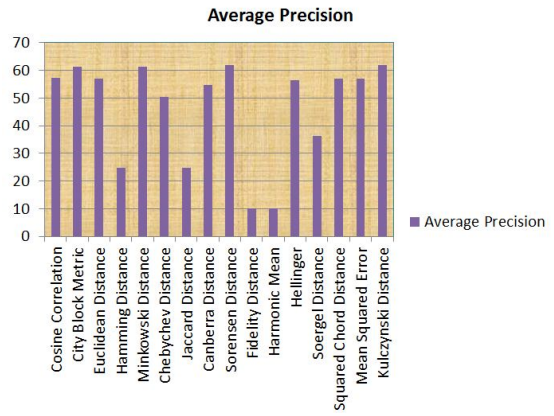

Fig.11 Performance of TSTBTC-Level 1 On Different Similarity Measures

After Applying TSTBTC On RGB Planes Partitioning Accuracy is improved for Different Combinations. TSTBTCRGB Planes Partitioning On Squared returns Highest Accuracy as compared to other Combinations.

The Experimentation Conducted on 500 Videos Database in 10 different Categories and 500 Queries fired. TSTBTC Applied on Different Combinations Of RGB Planes Partitioning and Average Accuracy is computed,in which TSTBTC Squared RGB Partitioning Gives Highest Result as compared to other Combinations.

TABLE I.Results Of TSTBTC Based RGB Planes Partitioning for CBVR

Technique	Average Precision (In %)
TSTBTC	56.02
TSTBTC On RGB Planes Partitioning In Vertical 2 Equal Parts	58.87
TSTBTC In Horizontal 2 Equal Parts	57.74
TSTBTC In Horizontal 4 Equal Parts	65.59
TSTBTC In Vertical 4 Equal Parts	65.59
TSTBTC On Squared Parts	**66.11**
TSTBTC On 3*3 Parts	59.54
TSTBTC On 4*4 Parts	58.60
TSTBTC On Vertical 8 Parts	60.18
TSTBTC On Horizontal 8 Parts	60.18
TSTBTC On 1 Vertical and 4 Horizontal	60.18

VI. CONCLUSION

Thepade's Sorted Ternary Block Truncation Coding (TSTBTC) on RGB Planes Partitioning is used for Color Content Based Video Retrieval with Different Combinations of RGB Planes Partitioning In Horizontal and Vertical Manner.

After Experimentation Environment of 500 Videos Database it identifies that TSTBTC Squared RGB Planes Partitioning returns Highest Percentage Accuracy and comfortable for Content Based Video Retrieval.Sorensen Distance and YCbCrColor Space retrieves Higher Accuracy.

REFERENCES

[1] Sudeep.D.Thepade, KrishnasagarSubhedarpage, Ankur. A. Mali,Tushar.S.Vaidya, "Color Content based Video Retrieval using BlockTruncation Coding with Different Color Spaces", International Journal of Computer Applications, USA (0975 – 8887) Volume 64, No.3, February 2013.

[2] Sudeep.D.Thepade, KrishnasagarSubhedarpage, Ankur.A.Mali, Tushar.S.Vaidya, "Performance Augmentation of Video Retrieval using Even-Odd Videos with Multilevel Block Truncation Coding", International Journal of Computer Applications, USA (0975 – 8887) Volume 64, No.9, February 2013.

[3] H.B.Kekre, Sudeep D. Thepade, "Boosting Block Truncation Coding withKekre's LUV Color Space for Image Retrieval". International Journal of Electrical, Computer, and Systems Engineering, Volume 2, No. 3, pp. 172- 180, 2008.

[4] Dr.H.B.Kekre, Ms.SwapnaBorde, "Content Based Image Retrieval,"National Conference on Applications of Digital Signal Processing, January 19-20, 2007.

[5] Zhang, Hong Jiang, Jianhua Wu, DiZhong, and Stephen W. Smoliar. "An integrated system for content-based video retrieval and browsing." Pattern recognition 30, no. 4 (1997): 643-65.

[6] Dr.H.B.Kekre,SudeepD.Thepade,ShrikantP.Sanas,"Improved CBIR using Multileveled Block Truncation Coding",(IJCSE) No. 07, 2010,2471-2476.

[7] Weiming Hu, NianhuaXie, Li Li, XianglinZeng, and Stephen Maybank, A Survey on Visual Content-Based Video Indexing and Retrieval", IEEE transactions on systems, man, and cybernetics—part c: applications and reviews, Volume 41, No. 6, pp. 797-819, November 2011.

[8] M.Petkovic "Content-based video retrieval", Centre for Telematics and Information Technology, University of Twente.

[9] Dr.H.B.Kekre, Sudeep D. Thepade, "Boosting Block Truncation Coding using Kekre's LUV Color Space for Image Retrieval", WASET International Journal of Electrical, Computer andSystem Engineering (IJECSE), Volume 2, Number 3, pp. 172-180, Summer 2008. Available online at http://www.waset.org/ijecse/v2/v2-3-23.pdf.

[10] A.K.J. Saudagar, and H.V. Mohammed, "A comparative

study of video splitting techniques," In Proc. of The 23rd Int. Conf. on Systems Engg.Las Vegas, pp. 783-788, August 19-21, 2014.