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Performance Analysis For CBIR Using DTCWT and Hu Moment with GCV FeatureExtraction

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Abstract-*Content Based Image Retrieval (CBIR) has been the most important thing for searching related content on the internet in the form of images, data etc. The main work of CBIR is to get retrieve efficient, perfect and fast results. This paperis associated with color, shape and texture feature. In this research, implement a new technique for CBIR by dual tree complex wavelet transform (DTCWT), Hu moment, color moment and global correlation vector (GCV)features usingSupport vector machine (SVM) categorizing. In the feature extraction, firstly extract texture feature using DTCWT for resolving the problematic of redundant CWT. In this paper, it can integrate the advantages of histogram statistics and Color Structure Descriptor (CSD) to characterize color and consistency features respectively.After that, extract color feature using color momentin RGB color space for improving computation and efficiency. The experimental dataset contains 1100 images, including horses, elephants, food, African people,texture, etc. The match size is calculated using weighted L1 (WL1), Euclidean distance (ED), L1 (Manhattan distance) and Minkowski distance (MD). For improving effectiveness of the system, classify data using SVM. The performance analysis is based on precision, recall, time and F-measure.*

Keywords-*DTCWT; GCV; Image Pyramid; Hu moment; Color Moment.*

I. INTRODUCTION

In the recent .decay the amount of digitalinformation has been continuously increasing. This procedureenforces the accessibility of huge storage spaces to collect the data and huge databases to access it. There are two main image retrievalmethodsbased onthe type of query: CBIR and Text-Based Image Retrieval (TBIR). TBIR utilizes text keywords. The user haschoice to enter a keyword or keywords in a text field thatis used to complete the procedure of searching an image. This approach is most widespread but it is remarkable for its threedrawbacks: first, it is expensive since it requires thehuman participation to annotate the images within database.Second, entering the remarkscreates it slow. And last, the retrieved outcomebasedgenerally on the human visionthat takes part in marking images.

These problems lead to the verycapableCBIRmethod. A CBIR system executes two mainfunctions: first, image feature extraction where a feature set (image signatures, feature vectors) is produced.

This set carries image data and shows it within database takingsmall storage space. Second is similarity measurement. It calculates the space between the query image and whole database imageswith their feature vectors. The mostsimilar to the query images are displayed as a resultof the searching process. [1]

DTCWT

The Dual-tree complex wavelet transform (DTCWT) proposed by Kingsbury [2] calculates the complex transform of a signal using two separate DWT decompositions (tree a and b). It is probable for one DWT to generate the original and imaginary coefficients if the filters utilized in one are speciallydesigned dissimilar from other. This redundancy of two gives additional information for examine with cost of additional calculation power. It also givesestimated shift-invariance yet still permitsexactreform of the signal. The filter design is mainlyessential for the change to occur appropriately and the mainfeatures are: The low-pass filters within two trees must differ by half a sampl0e period, reconstruction filters are the reverse of analysis, All filters from the same orthonormal set, Tree a filters are the reverse of tree b filters, Both trees have the same frequency response.[2]

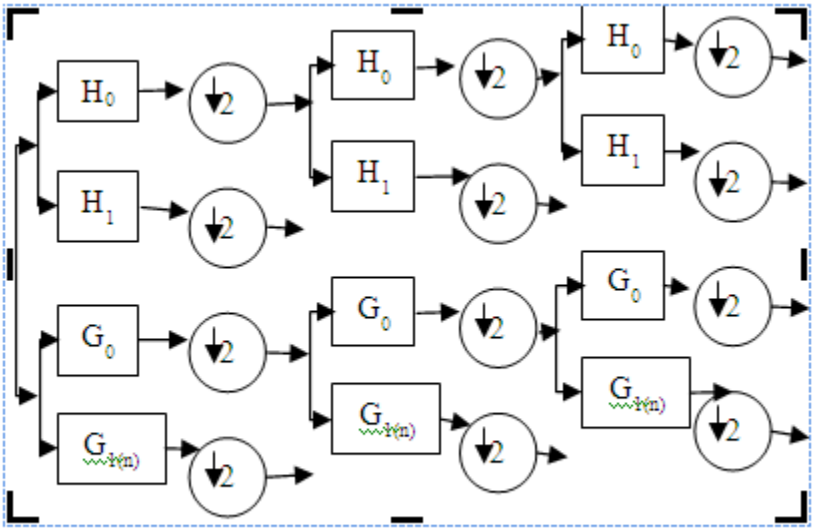

Fig. 1. Block diagram for DTCWT

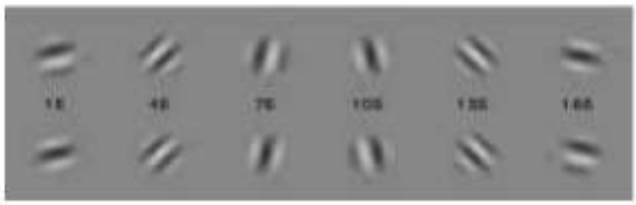

Fig. 1. Dtcwt real part and imaginary part

COLOR SPACE AND COLOR QUANTIZATION

Color space

Color is natural component and perform necessary role in CBIR systems. The Hue, Saturation and Value (HSV) give the perception representation value according to the human visual feature. The HSV mannequin defines a color area in terms of range i.e for Hue stages from zero to 360, saturation levels from 0 to a 100% with vibrancy of color and it's known as purity. Worth ranges from zero to one 100% with color brightness[3].

Color quantization

Color quantization is a procedure that decreases various distinct colors used in an image. In this a novel image much visually similar as probable to the original image. For a true color image, the different colors are upto 224=16777216, so the color feature extraction from the true color will prompt to a large computation. To reduce the computation without affecting image quality, some color is extracted to represent the image, by this processing speed, improve and reduces the storage space. Many authors stated the result of color quantization over image retrieval, with dissimilar quantization methods, like Lab (4X8X8), RGB (8X8X8), HSV (16X4X4), Lu*v* (4X8X8).[4]

Global correlation vector (GCV)

Color histogram is general method to extract color feature of an image and has great performance when applied to image recognition. With this technique is to calculate frequency of occurrence of each color [10]. GCV is proposing to extract color feature in image pyramid. The distributions of colors and the spatial correlation between pair of colors can be extracted simultaneously.[5]

Color Moment

Color moments are used to distinguish images on the basis of their color features. These moments give a Dimension for color similarity between the images. These similarity values can be matched to the values of images indexed in a catalog for content based image retrieval.[6]

Hu-Moment Shape Features

Hu-Moment in 1962 proposed seven properties related to connected region that are invariant to rotation, scaling, and translation (RTS) and are also known as Algebraic Moment Invariants. Moment invariants that are computed from each of the window are used to form feature vectors. They define simply calculated set properties of region that can be used

for class identification and also identification of shape, and this classic technique for creating invariants in conditions of arithmetical was initiallyprojected by Hu. [7]

IMAGE PYRAMID

The image pyramid is designed on data structure to support effective scaled convolution bydecrease image representation. It contains different original copies of an image in sequence with both decrease sample density and resolution in regular steps [13]. Stages of the lower resolution pyramid are achieved themselves by using the highly effective iterative algorithm. The zero or lower level of pyramid G_0 is equal to original image.

II. LITERATURE SURVEY

[8]The research is ongoing in CBIR it is getting much popular. In this retrieval of image is done using a technique that searches the necessary features of image. The main work of CBIR is to get retrieve efficient, perfect and fast results. In this algorithm, fused multi-feature for color, texture and figure features. A global and local descriptor (GLD) is proposed in this paper, called Global Correlation Descriptor (GCD) and Discrete Wavelet Transform (DWT), to excerpt color and surface feature respectively so that these features have the same effect in CBIR.

In addition, GCV and Directional Global Correlation Vector (DGCV) are proposed in this paper which can integrate the advantages of histogram statistics and Color Structure Descriptor (CSD) to characterize color and consistency features respectively. Also, this paper is implemented by Hu moment (HM) for shape feature, it extract 8 moments for image.

[9] The image descriptors depending on multi-features combination have improved performance than that depending on modest feature in CBIR. Though, these schemes still have fewboundaries: 1) the schemeswhichdescribestraightly texture within color space place more focus on color featurethan texture; 2) standard descriptors depending on histogram statistics neglect the spatial correlationamong structure elements; 3) the descriptors depending on structure element correlation (SEC) neglects the arisingpossibility of structure elements. GCV and Directional GCV (DGCV) can combine the benefits of SEC and histogram statistics to describetexture and color features individually.

[10] The DTCWT is an improvement to the DWT, with significantextrafeatures. It is closely shift invariant and directionally discriminatory in two orupper dimensions. It gets this by redundancy factor of only 2d for d-dimensional a signal that isconsiderablyless. The multidimensional (M-D) DTCWT is non-divisible but is depending on a computationally effective, divisible filter bank (FB).

[11] This method isdifferent from the existing histogram based methods. Theproposed algorithm generates feature vectors that combineboth color and edge features. This paper also uses wavelettransform to reduce the size of the feature vector andsimultaneously preserving the content details.

The robustness of the system can also be demonstrated against question image transformations reminiscent of geometric deformations and noise addition and so on. Wang's image database is used for experimental evaluation and results are proven in terms of precision and remember.

[12] Have proposed a method in whichColor moment and Gabor filter are used to extract features for image dataset. K-means and hierarchical clustering algorithm is applied to staff the picture dataset into quite a lot of clusters.

III. PROPOSED WORK

Propose methodology

In this research, implement a new technique for CBIR by dual tree complex wavelet transform (DTCWT), Hu moment, color moment and global correlation vector (GCV) features using Support vector machine (SVM) categorizing. In the feature extraction, firstly extract texture feature using DTCWT for resolving the problematic of redundant CWT. In this thesis, it can integrate the advantages of histogram statistics and Color Structure Descriptor (CSD) to characterize color and consistency features respectively. After that, extract color feature using color moment in RGB color space for improving computation and efficiency. The experimental dataset contains 1100 images, including horses, elephants, food, African people, texture, etc. The match size is calculated using weighted L1 (WL1), Euclidean distance (ED), L1 (Manhattan distance) and Minkowski distance (MD). For improving effectiveness of the system, classify data using SVM. The performance analysis is based on precision, recall, time and F-measure.

Proposed Algorithm

Step-1 browses a query image.
Step-2 Apply Image pyramid techniques.
Step-3 Now applies GCV for image color feature extraction.
Step-4 Now movement color of image.
Step-5 Now apply DCTWT wavelet
Step-6 Extraction the feature using the Global filter.

Step-7 Similarity matching using Euclidean distance, L1, etc.
Step-8 Classing image using SVM.
Step-9 Retrieved Image.
Step-10 classifies the images using SVM classifier and combine global and local features.
f_{QUERY}=(fG,fL)
Step-11Calculate precision-measure, execution time and recall of retrieved images.

$$Precision = \frac{No.\ of\ relevant\ image\ retrieved}{Total\ number\ of\ image\ retrieved}$$

$$Recall = \frac{No.\ of relevant\ image\ retrieved}{number of image\ in\ the\ datebese}$$

$$F\_measure = 2 \times \frac{Precision \times Recall}{Precision + Recall}$$

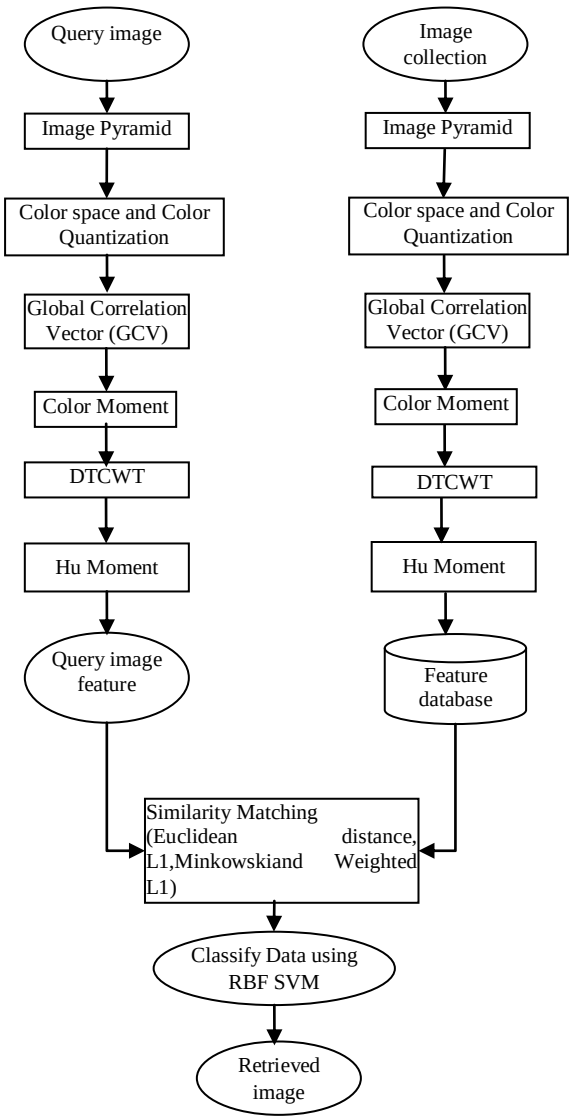

Fig. 2. Block Diagram of Proposed System

IV. Result Analysis

In this section used of Matlab2012a for performance measurement. In this work, the proposed method is performed by conducting experiments on Corel-1100 database. This database, including African, flowers, elephant, beach, horses, dinosaur, building, texture and food images. All categories contain 100 images with size of 384*256. The experimental checked by different number of returning images which varies from 10 to 50. Calculate distance between two images using weighted L1 distance, WL1, MD and ED.

Fig4. Wang-1100 Dataset

Fig5. African Category Result using Proposed System

TABLE I. PRECISION AND RECALL COMPARISON BETWEEN BASE AND PROPOSED SYSTEM

Image Name	**Base Precision (%)**	**Proposed Precision (%)**	**Base Recall (%)**	**Proposed Recall (%)**
African 1.jpg	70.73	88.89	58.00	16.00
Beach 123.jpg	78.95	90.00	60.00	18.00
Building 222.jpg	76.47	83.33	52.00	10.00
Bus 343.jpg	84.62	100.00	66.00	16.00
Elephant 511.jpg	71.43	91.67	60.00	22.00
Flower 634.jpg	74.36	90.91	58.00	20.00
Mountain 804.jpg	68.42	100.00	78.00	4.00
Food 991.jpg	74.51	100.00	76.00	2.00

In Table 1 compare the Precision and Recallof Base and Proposed work for Corel-1100 dataset. The Precision of Base has reached up to84.62where as the proposed is100%. Recall is also decreased as compared to previous algorithm.

TABLE II. F-MEASURE AND TIME COMPARISON BETWEEN BASE AND PROPOSED SYSTEM

Category	Base F-measure (%)	Proposed F-measure (%)	Base Time (%)	Proposed Time (%)
African	0.2275	0.0363	3.0187	2.2578
Beach	0.2308	0.0419	3.1069	2.3305
Building	0.2140	0.0238	2.8623	2.6149
Bus	0.2426	0.0371	3.2076	2.2757
Elephant	0.2222	0.0521	2.8354	2.4819
Flower	0.2468	0.0472	3.0808	2.2322
Mountain	0.2541	0.0047	3.2300	2.5488
Food	0.2879	0.0048	3.0133	2.3748

In Table 2 compare the F_measure and Time of Base and Proposed work for Corel-1100 dataset. The F_measure of Base has reached upto0.28where as the proposed is0.0047. Time is also decreased as compared to previous algorithm.

TABLE III. PRECISION AND TIME USING PROPOSED SYSTEM

Image Name	Proposed Time	Proposed Precision (%)
1000.jpg	2.5371	70.00
1099.jpg	2.3081	68.42

TABLE IV. PRECISION USING PROPOSED SYSTEM WITH DIFFERENT DISTANCE MEASURE

Similarity Measure	Proposed Precision (%)				
	10	*20*	*30*	*40*	*50*
L1	78.57	78.95	78.26	100.00	77.78
ED	88.89	75.00	76.92	92.31	100.00
W L1	84.21	83.33	78.57	75.00	85.71
Minkowski	81.82	55.17	72.22	83.33	70.59

TABLE V. RECALL USING PROPOSED SYSTEM WITH DIFFERENT DISTANCE MEASURE

Similarity Measure	Proposed Recall (%)				
	10	*20*	*30*	*40*	*50*
L1	22.00	30.00	36.00	8.00	28.00
ED	16.00	6.00	20.00	24.00	6.00
W L1	32.00	10.00	22.00	24.00	12.00
Minkowski	18.00	32.00	26.00	20.00	24.00

TABLE VI. PRECISION USING BASE SYSTEM WITH DIFFERENT DISTANCE MEASURE

Similarity Measure	Base Precision (%)		
	10	*20*	*30*
L1	73.91	71.11	72.50
ED	81.40	68.42	65.22
W L1	77.14	79.49	75.00

TABLE VII. RECALL USING BASE SYSTEM WITH DIFFERENT DISTANCE MEASURE

Similarity Measure	Base Recall (%)		
	10	*20*	*30*
L1	68.00	64.00	58.00
ED	70.00	52.00	90.00
W L1	54.00	62.00	60.00

Table 4 to Table 7.compare the precision and recall between Base and Proposed system, the total number of the retrieved images are fix from 10 to 50 in the experiments. It can be seen that the L1 and ED distance performs better than other similarity measures and it is much more computationally efficient. EDtypically uses similarity measures, but now

not normally the quality one considering the fact that the distances put too much emphasis on features which are generally distinctive. Weighted L1 distance can be considered as a weighted L1 distance with different weights.

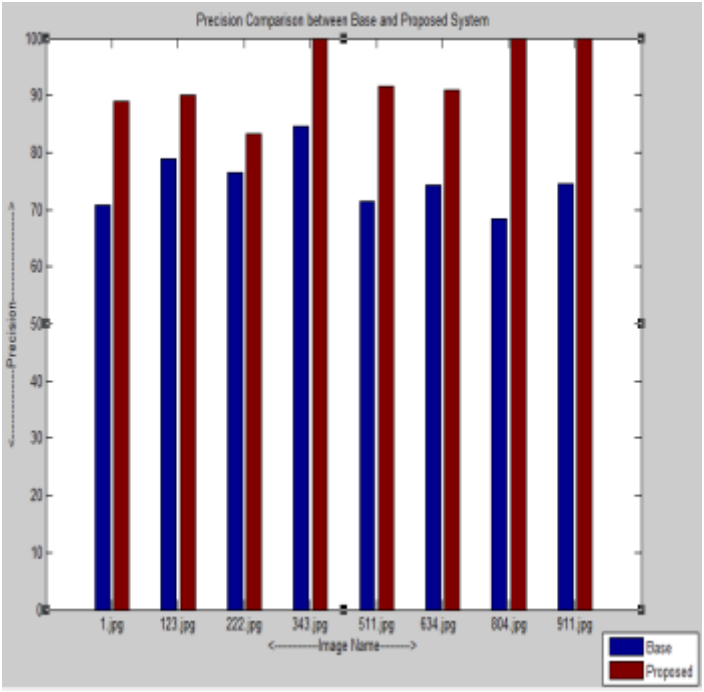

Fig.6.Precision comparison between base and proposed system

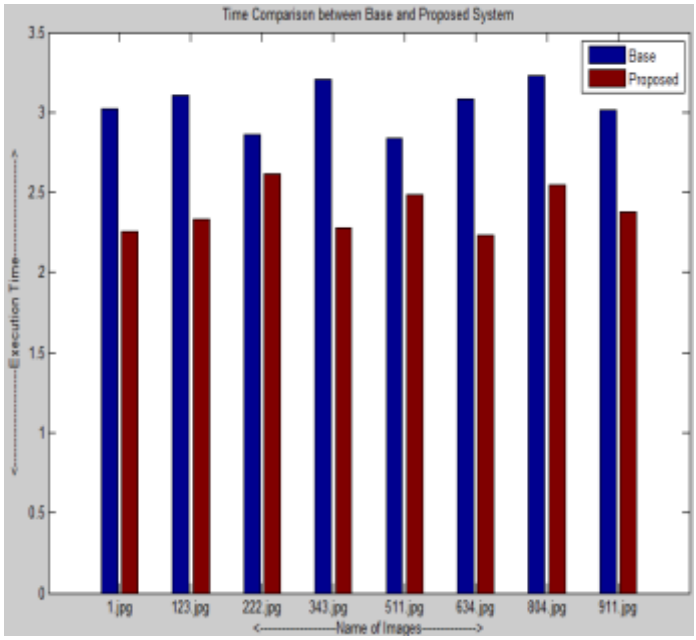

Fig.7.Time comparison between base and proposed system

In this graph, blue line shown precision of base system [5] and red line shown precision of proposed system.

Conclusion

In this research, implement a new technique for CBIR by dual tree complex wavelet transform (DTCWT), Hu moment, color moment and GCV features with SVM classification. After matching the CBIR founded on the shape, color and texture categories with that of the texture and color fused features, it is observed results of shape, color and texture fused categories are more robust than the texture and color features based image recovery. The experimental results have

demonstrated that the GCV algorithm is much more robust and discriminative than other image descriptors in CBIR.The investigational results show good precision up to100% as matched to previous techniques. Results show that our proposed CBIR schema has higher precision and F-measure in comparison with base system for different image

categories. For future works, other optimization algorithm uses for best path and reduce time execution. As future work we cantest this with other database.

References

[1] Stella vetova, ivan ivanov, "Image Features Extraction Using The Dual-Tree Complex WaveletTransform". Advances in Applied and Pure Mathematics 2015

[2] Shamira Arshad Shaikh, Roshni Padte, "Retrieving image based on contents using dual tree complex wavelet transform". IJETT. 2015

[3] Simardeep Kaur and Dr. Vijay Kumar Banga "Content Based Image Retrieval: Survey and Comparison between RGB and HSV model" International Journal of Engineering Trends and Technology (IJETT) - Volume4Issue4- April 2013.

[4] Devrat arya, Jaimala jha, "global and local descriptor for cbir and image enhancement using multi-feature fusion method". international journal of research – granthaalayah. 2016

[5] Lin Feng , Jun Wu , Shenglan Liu , Hongwei Zhang "Global Correlation Descriptor: a novel imagerepresentation for image retrieval" (2015) JVCIR.

[6] Ekta Gupta, Rajendra Singh Kushwah, "Combination of Global and Local Features usingDWT with SVM for CBIR".IEEE 2015

[7] Neelima Bagri and Punit Kumar Johari, "A Comparative Study on Feature Extraction using Texture and Shape for Content Based Image Retrieval".IJAST. 2015

[8] Jaimala jha, Devrat arya, " global and local descriptor for cbir and image enhancement using multi-feature fusion method". 2016

[9] Lin Feng, Jun Wu, Shenglan Liu, Hongwei Zhang, "Global Correlation Descriptor: a novel imagerepresentation for image retrieval".2015

[10] Shamira Arshad Shaikh, Roshni Padte, "Retrieving image based on contents using dualtree complex wavelet transform". IJETT.v2015

[11] Swati Agarwal, A. K. Verma,Nitin Dixit, "Content Based Image Retrieval using Color EdgeDetection and Discrete Wavelet Transform". 978-1-4799-2900-9/14/$31.00 ©2014 IEEE

[12] M. Maheshwari, S. Silakari, M. Motwani, "Image Clusteringusing Color and Texture", Computational Intelligence, Communication Systems and Networks.

[13] E. H. Adelson, C. H. Anderson, J. R. Bergen, P. J. Burt, J. M. Ogden "Pyramid methods in image processing" RCA Engineer • 29-6 • Nov/Dec 1984.

