IJCSE International Journal of Computer Sciences and Engineering Open Access
Research Paper Volume-5, Issue-5 E-ISSN: 2347-2693

Object Detection Based Image Retrieval using Edge Detection,GCV Method for YCbCr and NTSC Color Space

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Available online at: www.ijcseonline.org

Received: 15/Apr/2017, Revised: 23/Apr/2017, Accepted: 12/May/2017, Published: 30/May/2017

***Abstract*—** An Image Retrieval (IR) system is used for accessing and retrieving the pictures from big image database. Content means the image features like color ,texture and shape of the image. For color features, we implement the image pyramid for dimension reduction. It distinguish the color information of image pixels and the spatial correlation is the difference of colors, we represent a new algorithm, known as Global Correlation Vector (GCV), To remove color characteristic in picture pyramid. This system is utilized on HSV color space because it is clear to human vision eye. Dominant color Descriptor (DCD) refers to distinct small quantity of dominant color values as good as their statistical house. It provides an effective, scalable and intuitive representation of colors present in an area or picture. Discrete Wavelet Transform (DWT) is used to keep the certain contents of the pictures together with the decrease of the scale of the feature vector and it describes the texture feature of an image. Edges are the significant one as edges signify mainly the local greatness variations. The implementation result based on precision and recall. The proposed precision is reached up to 100%. For classification, Support Vector Machine (SVM) is used. It classifies the data with class labels. The distance is calculated with different similarity metrics like Chebychev, Normalised Euclidean Distance (NED), Manhattan Distance (MD), ED, Canberra, Hamming Distance(HD) and Minkowski.

***Keywords*—** CBIR, GCV, Sobel Edge Detection, Prewitt Edge Detection, NTSC, YCbCr, DCD, DWT, HSV Histogram, SVM)

I. INTRODUCTION

CBIR is a method to search and also index images in the massive set of database founded on its visual contents, for example the basis of textures, colors, Shapes or spatial layouts in its location of making use of tags or quite several descriptive metadata key phrases that would accomplice with pictures in database. In traditional CBIR systems work is done through extracting one or extra multi-dimensional vectors from all image in database, this procedure is complete in a posterior step to start retrieving. At question time, the couple of vectors are commonly extricated from inquiry picture and a similitude based capacity is utilized then to gauge the amount of fluctuation between various pictures and question picture vector in the database.Those images have a similarity vector to query vectors are the set of final retrieved result [1,2,3,4,5].

In this paper a comparatively small feature database is generated from the initial large image database. For this a feature vector corresponding to every of the pictures in the large database is formed using the visual contents of that image. This is done using the extraction of color and edge along with other finer details by DWT. Color is without doubt one of the mainly primary visual points for people. For the extraction of information related to color, we create use of 4 color models in this paper namely RGB, YCbCr, HSI and NTSC. In case of RGB color space, each color is represented as the mixture of 3 primary colors; red, green and blue. Medical researches show that human eye is more touchy to alter in brightness than change in color. So transformation from RGB to YCbCr is done for better results [3]. The change among YCbCr and RGB is that YCbCr signify color as brightness and 2 color change signals. The HSI color house is a very principal and attractive color model for photograph processing as it represents colors in the equal way because the human eye senses colors. HSI color mannequin represents each color with three add-ons; hue, saturation, and depth. For extracting the edges, Canny Edge detector (CED) and Prewitt area detectors had been used. The CED is a choicest area detector. It provides low error rate as it has a response to edges and no response to non-edges. The Prewitt edge filter is used to detect edges by applying horizontal and vertical filters in sequences. Here we combine both these filters to obtain better results [3,6,7,8,9,10].

Color Feature

In picture retrieval, the color is largely used function. Many ways are use to extract color function from graphics. To extract the color features from the content of an image, we

need to select a color space and use its properties in the extraction.

In usual, colors are defined in 3D color area. In digital picture purposes, RGB color house is the most universal option. The primary predicament of the RGB color house is that it is perceptually non-uniform and gadget elegant process [4,11,12,13,14,15]. The HSV color house is an perceptive approach, which describes a precise color via its hue, saturation, and brightness values. HSV Histogram explains the frequency of incidence of each color in the image according to its intensity; it shows the Global explanation of the color in picture. Simply by matching it with the stored histogram in database the applicable pictures can be retrieved.

The 1st -order (mean), the second (standard deviation) and the 1/3-order (skewness) CMs have been proved to be effective and mighty in representing color distributions of images. As it has lower dimension of vector but for all type of images it might not give accurate result. There are MPEG-7 regular can be there to provide a wealthy set of standardized descriptors and outline scheme to explain multimedia content like image and audio. Mpeg- 7 Stands for Multimedia content material Description Interface. It has allowed rapid and efficient content identification and addressing a massive variety of functions.

For region founded IR dominant color (DC) method is used or color FE. Due to the imprecision of the segmentation, the average color of a segmented region may be different from that of the original region. To get the DC of the picture, 1st the histogram is obtained and then the bin with the maximum size is taken as the DC of the region [4,11,12,13,14,15].

Color quantization

It [2] decreases more than a few particular colors used in a picture. In this a novel image much visually similar as probable to the original image. For a true color image, the different colors are up to 224=16777216, so the color FE from the true color will prompt to a large computation. To decrease the calculation 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 effect of color quantization over IR, with dissimilar quantization methods, like Lab (4X8X8), RGB (8X8X8), HSV (16X4X4), Lu*v* (4X8X8).

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. GCV is proposing to remove color feature in picture pyramid. The distributions of colors and the spatial correlation between pair of colors can be removed simultaneously [5] .

Median Filtering

To find out the Mean value we used the median filter. In Image processing (IP) it's customarily critical to perform excessive degree of noise discount in an image before performing better-degree processing steps. It is a non-linear digital filtering technique, mostly used to dispose of noise from pictures or different signals, primarily valuable to diminish speckle noise and SPN. This is performed utilizing a window including an ordinary quantity of samples.

1. The values within the window are sorted into numerical order.
2. The median worth, the pattern within the core of the window, is selected because the output.
3. The oldest pattern is discarded a brand new sample got, and the calculation duplicates.

The standard median filter removes noise but reduce the image's resolution to some extent, especially edge information.[6].

Dominant Color Descriptor:

DCD [7] awards a packed elucidation of the expert hues in a picture or picture territory. The essential target utility of correlation recovery in huge picture database, DCD extricates the angles from a photo through utilizing grouping the hues in a photo into a little wide assortment of hues and is clear as

The descriptor incorporates the characterize hues ci, their portions pi , The now not required shading modifications for every single DC vi, and the alternatively accessible spatial coherency s of DC The hole D2 (F1, F2) among the 2 descriptor can be processed as:

$$D^2(F1,F2) = \sum_{i=1}^{Ni} {P_{li}}^2 - \sum_{j=1}^{N2} {P_{2i}}^2 - \sum_{i=1}^{N1}\sum_{j=1}^{N2} 2a_{i,j}P_{1i},P_{2j}$$

$$a_{i,j} = \left\{ 1 - \frac{\left\|c_{1j} - c_{2j}\right\|}{\alpha T \left\|c_{1j} - c_{2j}\right\|} < T_d \left\|c_{1j} - c_{2j}\right\| > T_d 0 \right\}$$

where F1 = {{c1i, p1i}, i=1,..., N1} and F2 ={{c2i, p2i}, i=1,...,N2} are 2 DCD descriptors through N1 or N2 DC, independently.The DC and its percent value are signified by the aid of ci and pi. The addition of percentage is normalizing to 1. The match coefficient, ai,j, is used to don't forget the nearness among the 2 DC c1i and c2j. Tdis a threshold for picking out the assessment among 2 colors and α is used for adjusting the importance of color space. With this straightforward and compact design, DCD kinds it possible for strong indexing for comparison recovery while forgoing

recovery correctness for this purpose the lack of spatial capabilities of the outline.

II. LITERATURE SURVEY

The image descriptors depending on multi-features combination have improved performance than that depending on modest feature in CBIR. Though, these schemes still have few boundaries: 1) the schemes which describe straightly texture within color space place more focus on color feature than texture; 2) standard descriptors relying on histogram facts overlook the spatial correlation amongst structure elements; three) the descriptors depending on structure element correlation (SEC) neglects the arising possibility of structure elements. GCV and Directional GCV can combine the benefits of SEC and histogram statistics to describe texture and color features individually [2,6].

In [5] describes a new-fangled method in which both area and color features of the picture are regarded for iteration of characteristic vectors. DWT is used to hold the detailed contents of the images together with the reduction of the size of the function vector. An evaluation is taught on the outcome of the proposed method on YCbCr and HSI color spaces are also presented in this paper.

In [8] is ongoing in CBIR it's getting much trendy. On this retrieval of picture is done utilizing a technique that searches the vital points of picture. The foremost work of CBIR is to get retrieve effective, perfect and speedy results. In this algorithm, fused multi-characteristic for color, texture and determine features. A GLD is proposed in this paper, referred to as GCD and DWT, to excerpt color and surface feature respectively so that these aspects have the same effect in CBIR.

In [9] presents content based image retrieval from color digital pictures making use of more suitable SVM strategies .They proposed the dramatic upward push in the sizes of pictures databases has stirred the development of potent and effective retrieval systems. Programs making use of CBIR retrieve portraits established on visible aspects reminiscent of texture, color and shape, as opposed to depending on snapshot descriptions or textual indexing. The main objective of this paper is to retrieve the images from database in a fast and an efficient manner using modified SVM.

In [10] proposed an IGA to slash the gap between the retrieval outcome and the users' expectation referred to as semantic hole. They've used HSV color area that corresponds to human manner of perceiving the colors and separate the luminance element from chrominance ones. They have got also used texture elements like the entropy founded on the grey stage co-incidence matrix and the edge histogram. They compared this method with others approaches and achieved better results.

III. PROPOSED WORK

In this algorithm, we have proposed a grouping of color, shape and texture features. In this approach, the previous work is enhanced to achieve better precision and reduce recall rate of proposed system. This method includes the following steps: (i) Pre Processing (ii) Feature Extraction (iii) Classification

Pre Processing: In this process, take a query image which is resized with 384*256 sizes. We can select appropriate scales for image pyramid.

Feature Extraction: Color information is extracted in HSV color space, because it is more suitable for human eye perception. The human eye cannot distinguish enormous quantity of colors even as; color quantization is used in this procedure. Color quantization is to assign a certain group of colors to indicate the image with maximum useful information. Split the image into three components, H, S and V and assign 8, 8, 8 bins to each component, thus resulting in 8*8*8=512. And then merging the GCV of each and every scale of the HSV histogram values, we will get a more discriminative color feature vector. DCD is applied on YCbCr and NTSC color space. Edge orientation is used for shape features and it identifies the object edges and image information. change the RGB picture into YCbCr and HSI color gap. Consider the Y and H matrix and apply Prewitt edge detector to it and store the resulting matrix as Y1 and H1.Now apply Sobel edge detection on the Y and H matrix and store the resulting matrix as Y2 and H2. Now combine the edges obtained the matrix Y and H. Then combine this with the unmodified Cb and Cr to obtain Y'CbCr image. Now convert this Y'CbCr image back to RGB image. Then find the R, G, B matrices of this image and find the histogram of each of these separately. These histograms i.e.HR, HG and HB will contain 256 bins. After that extract texture features using DWT. Finally merged all features. This process is also executed for database images. Store all features into matrix file.

Classification: After the feature extraction process, read the stored database of features and query image features. The database is divided into 10 classes in Corel-1k dataset: Africa, Beach, Monuments, Elephant, Horses, Building, Food, Flower, Mountain, and Dinosaur etc. Then randomly select the training dataset and test dataset for classification. After database classification we will get the class labels (each class contains related images). The learning process is done using SVM method. Training set includes all the images from image database. Given input query image contains the caption. Then compare input query image caption with the each class label in the huge database. So that

we will with ease determine that the query input picture belongs to specific category label or now not. If the input query image belongs to any one of the class label in the database, now we can select only that matched class images in the database and perform retrieval operations on that selected particular part of the database based on the similarity matching.

Proposed Algorithm

1. Consider color query image 'I' as an N X M size of an image and extract the Red, Green, and Blue Components from an image.
2. Apply image pyramid reduction, initialize kernel center weight to 0.375 for reducing the size of an image.

$$Img_{filtered} = \sum_{i=1}^{3} Blur\_img(I, kernel)$$

Where $Img_{filtered}$ is pyramid reduced image, Blur_img is blurred image, kernel is kernel center weight

3. Apply GCV by assigning 8 levels each to hue, saturation and value provide a quantized HSV space with 8x8x8=512 histogram bins. And also find color structure descriptor.
4. Apply DCD, every color is partitioned into a set of partitions it is also known as coarse partition. DCD is applied on YCbCr and NTSC color space.
5. Apply 1DWT on input image to split into four sub-bands: LL, LH, HL, HH and apply median filter on each band of DWT and extract mean and standard deviation values of filtered image.
6. Convert the RGB image into YCbCr and HSI image.
7. Consider the Y and H matrix and apply Prewitt edge detector to it and store the resulting matrix as Y1 and H1.
8. Now apply Sobel edge detection on the Y and H matrix and store the resulting matrix as Y2 and H2.
9. Now combine the edges obtained in Step 7 and Step 8 to obtain the matrix Y and H. Then combine this with the unmodified Cb and Cr to obtain Y'CbCr image. Now convert this Y'CbCr image back to RGB image. Then find the R, G, B matrices of this image and find the histogram of each of these separately. These histograms i.e.HR, HG and HB will contain 256 bins.
10. Repeat step2 to step9 on a query image in the database.

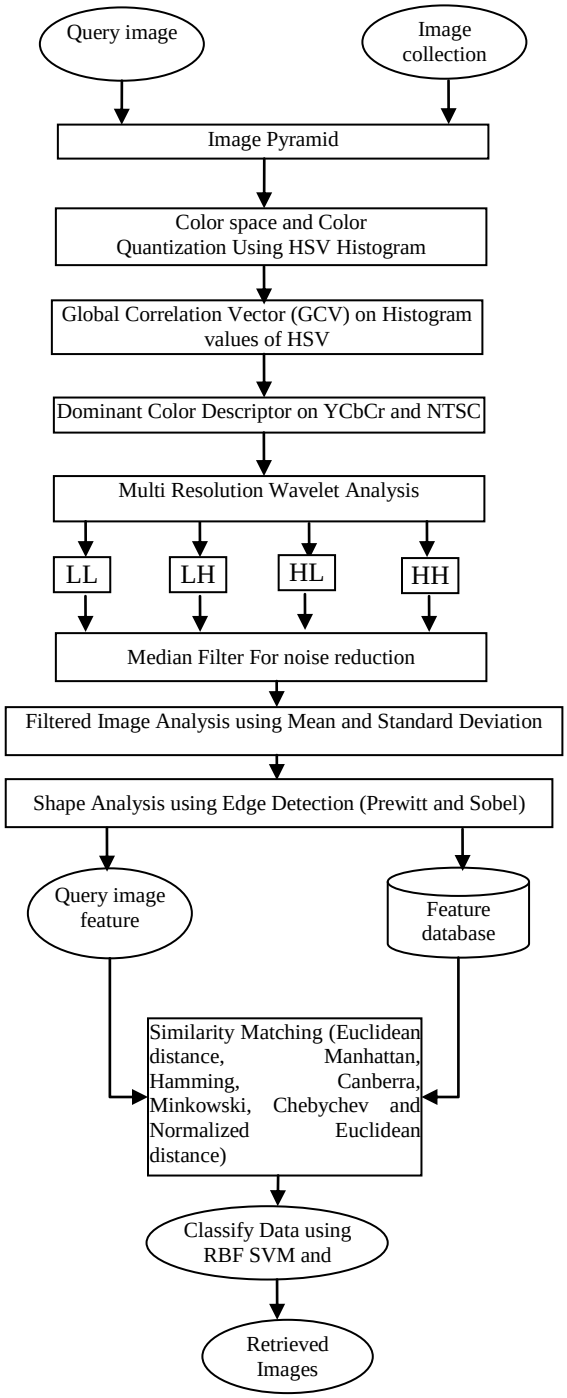

Figure 1. Block Diagram of Proposed System

IV. CONCLUSION AND FUTURE SCOPE

The experimental results performed on following datasets, Corel-1k is used. On Corel-1k dataset, each category consist 100 images of size 384×256 in JPG format. In this proposed, the number of matched images is varying from 1 to 50. Using Sobel and Prewitt combination, we find the object edges which were not identified properly in previous work.

Figure 2. Experimental Dataset

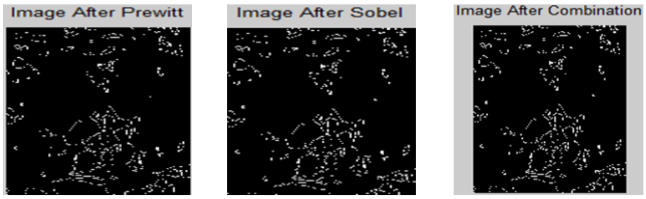

Figure 3. Edge Detection Results on Food Image

Figure 4. Results on 984.jpg Image for N=10 with MD distance

Figure 5. Results on 984.jpg Image for N=50 with MD distance

Fig4 to Fig5 show one examples of CBIR on Corel dataset by Proposed algorithm. In Fig4, the query image is food and all the top N=10 matched images whcih shows good match of color, texture and shape to the query image. In Fig 5, the query image is food category and all the top N=50 matched images. In Fig 3, it shows that edges of an object using Sobel and Prewitt edge detection method.

Figure 6. Edge Detection Results on Bus Image

Fig7 show one examples of CBIR on Corel dataset by Proposed algorithm. In Fig7, the query image is Bus and all the top N=50 matched images whcih shows good match of color, texture and shape to the query image. In Fig 6, it shows that edges of an object using Sobel and Prewitt edge detection method.

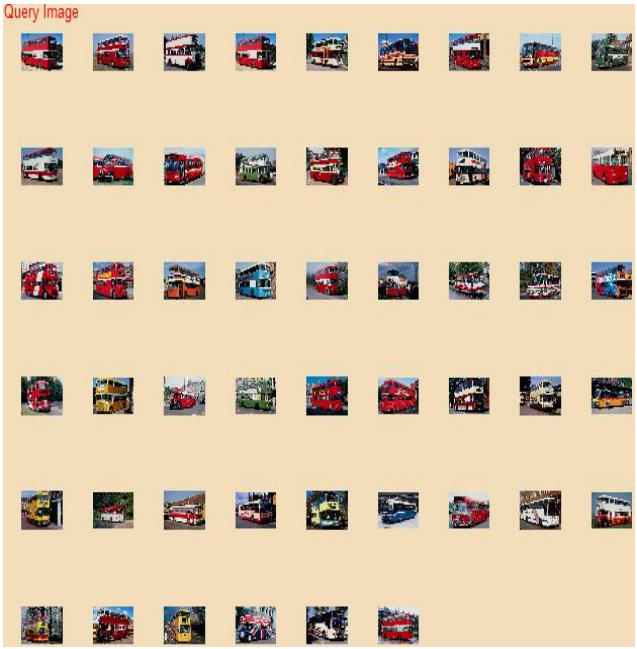

Figure 7. Results on 382.jpg Image for N=50 with MD distance

Here TABLE I and TABLE II given below shows the precision rates of proposed work and previous work respectively. These values are calculated on different number of image retrieved for the same image .

TABLE I. PROPOSED PRECISION ON NUMBER OF RETRIEVAL IMAGES

Image	Proposed Precision (%)				
	N=10	N=20	N=30	N=40	N=50
602.jpg	90.91	78.26	85.71	77.78	90.00
382.jpg	83.33	85.71	88.89	90.91	83.81
788.jpg	100.00	85.71	83.33	88.24	84.21
510.jpg	76.19	75.00	100.00	68.18	100.00
984.jpg	75.00	76.00	84.21	72.22	76.19

TABLE II. REF PRECISION ON NUMBER OF RETRIEVAL IMAGES

Image	Ref Precision (%)				
	N=10	N=20	N=30	N=40	N=50
602.jpg	44.77	44.26	51.56	55.35	50.79
382.jpg	51.42	39.34	47.54	42.85	54.54
788.jpg	43.07	51.78	46.87	44.82	57.14
510.jpg	55.76	50.84	57.89	65.30	56.52
984.jpg	60	57.14	55.17	54.54	50.81

Similarliy in TABLE III and TABLE IV we calculated the recall percentange of proposed work and previous work respectively.

TABLE III. PROPOSED RECALL ON NUMBER OF RETRIEVAL IMAGES

Image	Proposed Recall (%)				
	N=10	N=20	N=30	N=40	N=50
602.jpg	40.00	36.00	36.00	14.00	18.00
382.jpg	22.00	12.00	20.00	34.00	28.00
788.jpg	10.00	24.00	10.00	30.00	32.00
510.jpg	32.00	24.00	16.00	30.00	20.00
984.jpg	18.00	38.00	32.00	26.00	32.00

TABLE IV. REF RECALL ON NUMBER OF RETRIEVAL IMAGES

Image	Ref Recall (%)				
	N=10	N=20	N=30	N=40	N=50
602.jpg	60	54	66	62	64
382.jpg	66	66	54	60	62
788.jpg	56	58	60	52	56
510.jpg	58	60	66	64	52
984.jpg	60	64	64	60	62

In TABLE V and TABLE VI We calculate the precision rate of test image 382.jpg on multiple similarity measures for proposed work and previous respectively.

TABLE V. PROPOSED PRECISION ON DIFFERENT SIMILARITY MEASURE FOR IMAGE 382.JPG

Similarity Measure	Proposed Precision (%)				
	N=10	N=20	N=30	N=40	N=50
MD	83.33	85.71	88.89	90.91	83.81
ED	58.82	100.00	38.89	100.00	71.43
Canberra	75.00	58.82	75.00	68.00	85.71
HD	56.25	89.47	100.00	32.50	80.00
Minkowski	73.68	85.71	87.50	58.82	90.91
Chebychev	71.43	78.26	32.20	69.23	50.00
NED	68.75	85.71	90.91	77.78	80.00

TABLE VI. REF PRECISION ON DIFFERENT SIMILARITY MEASURE FOR IMAGE 382.JPG

Similarity Measure	Ref Precision (%)				
	N=10	N=20	N=30	N=40	N=50
MD	51.42	39.34	47.54	42.85	54.54
ED	45.90	57.89	47.54	52.45	52.63
Canberra	48.21	46.03	53.06	46.87	52
Minkowski	48.38	66.07	50	47.88	52.72
Chebychev	49.18	58.33	45.76	53.33	45.83
NED	52.54	48	57.14	55.10	58.62

Graphical Representation for the above two table(i.e table V and VI) is shown below:

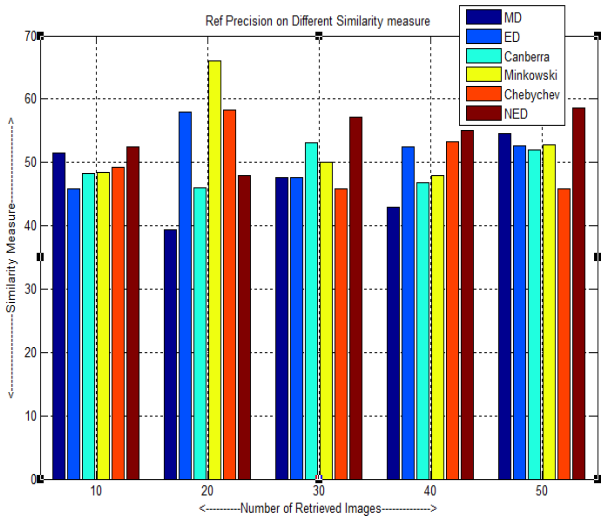

Figure 8. Ref Precision on dissimilar comparison measure

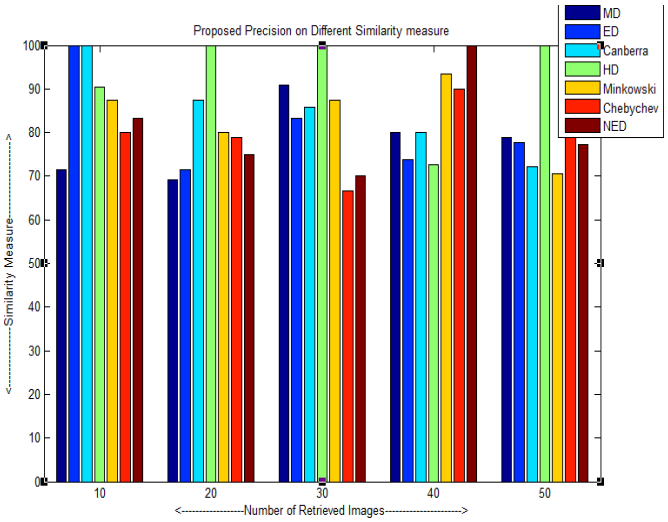

Figure 9. Proposed Precision on Different Similarity measure

V. CONCLUSION

In this paper, CBIR is presented for searching and accessing the images from huge image datasets. It retrieved images on the basis of image descriptors. We used GCV, DCD on YCbCr and NTSC color space and HSV histogram for color descriptors are presented. For texture descriptors, presented

DWT for reduction of smaller dimension. Edge detection is used for object edges and this feature proved well for object detection. The proposed algorithm is better for precision and recall as compared to previous algorithm. MD and HD are used as a similarity measure to detect the final image rank and it is better than other metrics. . In this system, the precision and recall has reached up to **100**% as well as **16%** for 510.jpg image for N=30 and **90.91%** as well as **40%** for 602.jpg Furthermore, we will work on edge detection process for improving detect object and also work on other databases like Caltech etc.

REFERENCES

[1] Pooja Devi, Mahesh Parmar, "*A Survey On Cbir Techniques And Learning Algorithm Comparision*", International Journal of Latest Trends in Engineering and Technology, Vol.8, Issue.1, pp.197-205, 2017.

[2] Devrat Arya, Jaimala Jha, " *Global And Local Descriptor For Cbir And Image Enhancement Using Multi-Feature Fusion Method*", International Journal of Research, Vol.4, Issue.6, pp.170-182, 2016.

[3] S Agarwal, AK. Verma, N. Dixit, "*Content Based Image Retrieval using Color Edge Detection and Discrete Wavelet Transform*", International Conference on Issues and Challenges in Intelligent Computing Techniques (ICICT), India, pp.368-372, 2014

[4] Vinay Lowanshi, Shweta Shrivastava, "*Two Tier Architecture for Content Based Image Retrieval Using Modified SVM and knn-GA*", International Journal of Computer Sciences and Engineering, Vol.2, Issue.10, pp.41-45, 2014.

[5] Lin Feng, Jun Wu, Shenglan Liu, Hongwei Zhang, "*Global Correlation Descriptor: a novel imagerepresentation for image retrieval* ", Journal of Visual Communication and Image Representation, Vol.33, Issue.11, pp.104-114, 2015.

[6] P. Rachana, S. Ranjitha, H.N. Suresh, "*Stride Towards Developing an CBIR System Based on Image Annotations and Extensive Multimodal Feature Set*", International Journal of Computer Sciences and Engineering, Vol.2, Issue.1, pp.18-22, 2014.

[7] Nooby Mariam, Rejiram R, "*A Modified Approach in CBIR Based on Combined Edge Detection Color and Discrete Wavelet Transform*", 2015 International Conference on Advances in Computing, Communications and Informatics, Kochi, pp. 2201-2205, 2015.

[8] Gurmeet Kaur, Arshdeep Singh, "*Content Based Image Retrieval from Colored Digital Images using Enhanced SVM Technique*" International Journal of Advanced Research in Computer Science and Software Engineering, Vol. 5, Issue.7, pp.1-7, 2015.

[9] Chih-Chin Lai, Ying-Chuan Chen, "*A User-Oriented Image Retrieval System Based on Interactive Genetic Algorithm*", IEEE Transactions on Instrumentation and Measurement, Vol. 60, Issue.10, pp.3318-3325 , 2011

[10] Ka-man wong, Lai-man Po, Kwok Waicheung "*A compact and efficient Color Descriptor for Image Retrieval*", 2007 IEEE International Conference on Multimedia and Expo, Beijing, pp. 611-614, 2007.

[11] Aasish Sipani, Phani Krishna , Sarath Chandra, "*Content Based Image Retrieval Using Extended Local Tetra Patterns*", International Journal of Computer Sciences and Engineering, Vol.2, Issue.11, pp.11-17, 2014.

[12] Yogita Mistry, D.T. Ingole, M.D. Ingole, "*Efficent Color Based Image Retreival Using Transform and Spatial Feature Level Fusion*" c 2015 IEEE,Vol.1, Issue.8, pp.1828-1836, 2015.

[13] A. Agarwal, S.S. Bhadouria, "*An Evaluation of Dominant Color descriptor and Wavelet Transform on YCbCr Color Space for CBIR*", International Journal of Scientific Research in Computer Science and Engineering, Vol.5, Issue.2, pp.56-62, 2017.

[14] Min Huanga,Huazhong Shua, Yaqiong Mab, Qiuping Gongb" Content-based image retrieval technology using multi-feature fusion" 0030-4026/© 2015 Published by Elsevier GmbH,pp.2144-2148.

[15] Bhoomika Gupta, Shilky Shrivastva, Manish Gupta "*Optimisation of Image retreival by using HSV color space Zernike moment and DWT Technique*", 2015 IEEE International Conference on Computational Intelligence and Computing Research (ICCIC), Madurai, pp. 1-5, 2015.

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