Published by :
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 04, April-2016

Hue Saturation Value (HSV) Color Space for Content based Image Retrieval

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***Abstract*—Nowadays, content based image retrieval system plays major role among professional groups like design engineers, journalists and art historians. In this work, it is decided to consider the low level features of images which is more preferable when compared to high level features and it also provide users with a higher level of information(image) retrieval. In this paper, it is proposed to develop an efficient CBIR system to reduce the semantic gap by using visual color with Hue Saturation Value (HSV) color space [5][17].**

Keywords—CBIR, Query Image, Low-level and High-level Features, Hue saturation Value (HSV).

I. INTRODUCTION

In the information era, as an average information consumer may make to hold and increase his/her expectations regarding the technical quality and quantity as well as the variety of the retrieved information. Luckily, plenty of research has been conducted and as a result various approaches have been introduced for CBIR systems. While considering feature and attribute abstractions, users always feel a friendly environment. So, it is decided to create such a user friendly platform for the users to design a user interface which can be easily used to select the approaches which they want to be used as per their requirements. User's requirements are different and depends on domain like medicine, publishing, crime prevention, architecture and fashion. To represent the content on an image query, the problem is how to represent a query for a particular image, like search for a green leaf in terms of low level features. It is also necessary to represent the content of an image query in a most suitable manner to search for most useful information. Searching and retrieving a matching image for a query image from a large pool of image database becomes a challenging task. Identifying the semantics of an image is a tedious task for images without textual annotations. In this work, image retrieval can be performed from the image database by means of color features with HSV color space.

II. PROBLEM STATEMENT

In this work, it is proposed to develop an efficient CBIR system to reduce the semantic gap by using combination of visual features like color, texture and shape of image [17].

III. PREVIOUS WORK

Various literature on the previous methods has been examined which are relevant to the proposed work. Some of them which are more important for the proposed CBIR System is included here.

Tang, Wei and Xiong, Hui and Zhong, Shi and Wu, Jie,et.al.[4] Proposed a content based image retrieval with the combination of gray level co-occurrence matrix and K-means clustering algorithms for texture content retrieval.

Zhang, Xu-Bo and Peng, Jin-Ye et.al.[7]Proposed a comparative evaluation of image retrieval algorithms using relevance feedback(RF) and its applications. RF is a human interactive process to incorporate and refine progressively with the retrieved results and scores (relevant or not relevant). Then repeat the search with feedback until a satisfactory result is obtained.

Fesharaki, Nooshin Jafari and Pourghassem, Hossein et.al.[3] used an effective clustering method based on multi-level features consisting of global, local and pixel levels in order to cluster medical X-ray images by using a combination of the hierarchical techniques and K-means method. This algorithm was evaluated on 150 X-ray images in 5 classes without using any dimension reduction technique, but its capability for large databases still has been remained as a challenge.

H.Pourghassem, H.Ghassemian et.al.[11] Propose a content-based medical image classification using a new hierarchical merging scheme. The merging conditions of the research realized a supervised classification method and an unsupervised clustering technique.

From the literature survey, it is concluded that a wide variety of CBIR algorithms are introduced in different papers. The appropriate feature selection reflects the accuracy of content based image retrieval system. Relevant features are not predefined in the most cases in the real world. Thus, many of the features at the beginning are irrelevant or redundant for showing the complete image. To identify the best low level features that meet the requirement of efficient and computationally simple and suitable image retrieval.

A. PROPOSED WORK

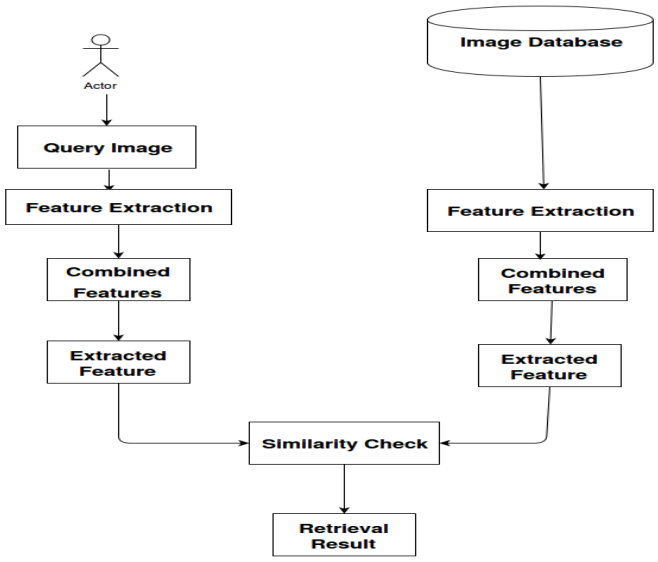
In this paper, it is proposed to develop an efficient CBIR system for retrieving images from image database on the basis of color using Hue Saturation Value (HSV). Proposed method is mentioned as steps given below:

Step 1: Loading the image database in the Matlab workspace.
Step 2: Convert the image RGB to HSV.
Step 3: Generate Histogram of RGB.

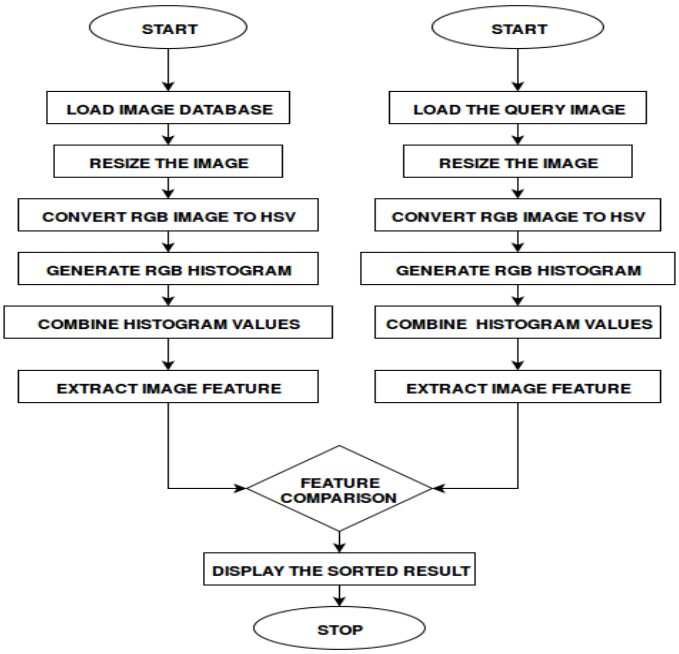
International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 04, April-2016

Step 4: Color Feature extraction(Extract H,S and V components separate).
Step 5: Combine the H, S and V color features .
Step 6: Loading the Query image.
Step 7: Repeat steps 2-5 to find combine features of Query image.
Step 8: Compare the similarity between query image feature and the features of the image database.
Step 9: Retrieves the closest distance images from the image database.
Step 10: Display the retrieval images.

B. PROPOSED SYSTEM ARCHITECTURE



C. FLOW CHART FOR PROPOSED METHOD



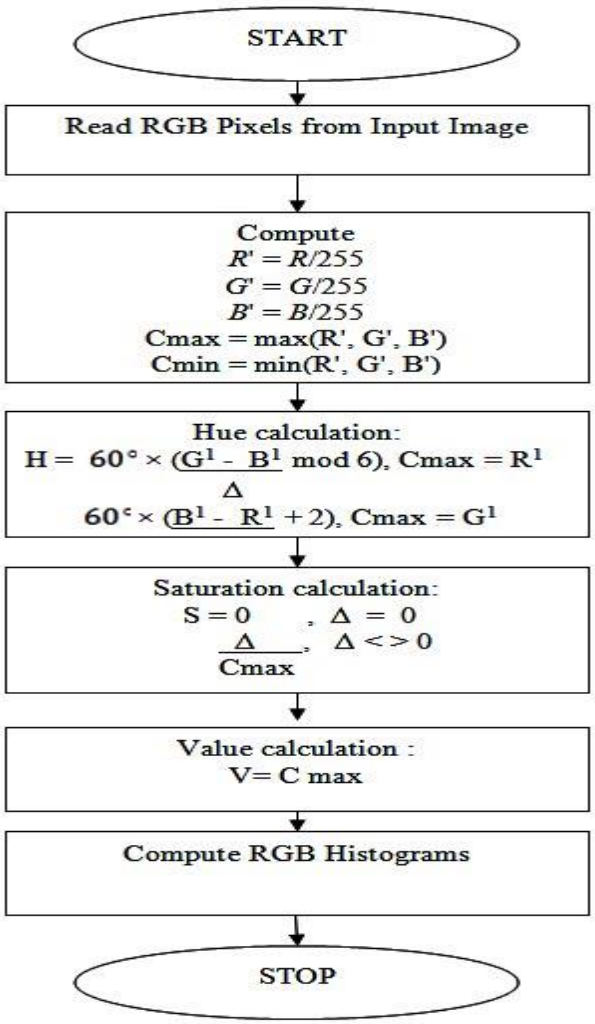
D. COLOR FEATURE BASED RETRIEVAL

Several literatures on color based retrieval methods have been studied. From the analysis, different color similarity based retrieval methods described in the most of the literatures are variants on the same basic idea. When user submit a query image, then color vector for the query image is extracted and this e vector is compared with all feature vector from the database images. The images whose color histogram values are more closer to the query image is retrieved on to the output panel. In this work, feature vectors for individual color components are retrieved and testing with combined color feature vector. From results and testing shows that it is much better to considering combination of all color components than considering individual components separately.

E. FEATURE EXTRACTION

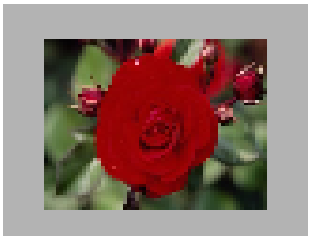
This phase identifies the unique feature vector corresponding to the image features. In this paper, hue saturation value (HSV) color space is used for color feature extraction [12]. The RGB color components in a digital images are directly related to the amount of light hitting on the objects. Therefore the object discrimination process with respect to those components are sometimes become very difficult. Because of that, HSV color space is often used in this work.

F. FLOW CHART FOR RGB TO HSV CONVERSION

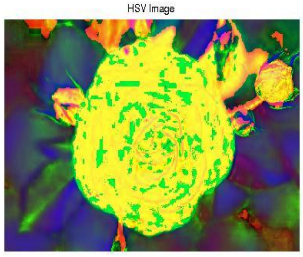


International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 04, April-2016

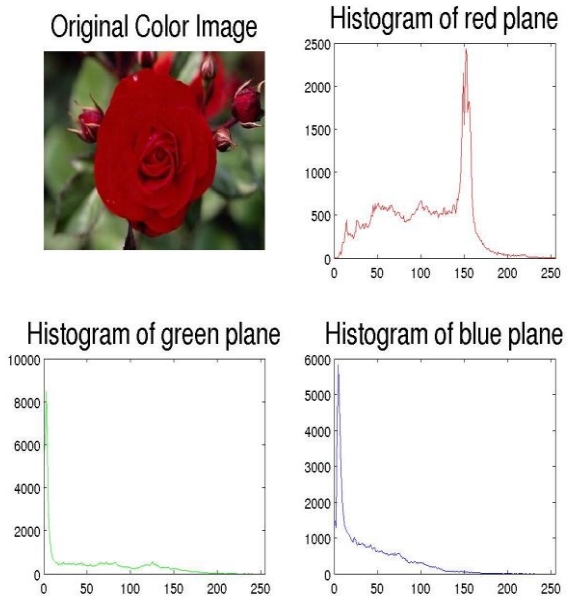
Flow chart for RGB to HSV conversion



RGB image 27.bmp



HSV image for RGB image 27.bmp



RGB histogram for image 27.bmp

G. SIMILARITY CHECK

Every image present in the database the system identifies region and extract feature vectors. Similarity measurement algorithm performs matching which compares between extracted features of images to find whether they are similar or not and up to what level they are matching. After comparing, distance of two images shows zero means two images are very similar.

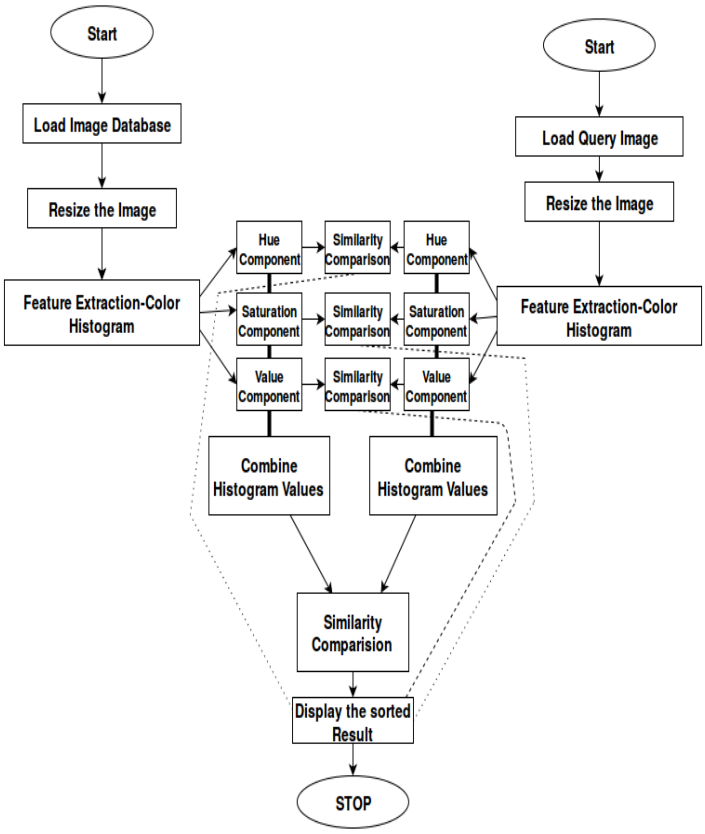


Fig. 1. Flow diagram for color based image retrieval

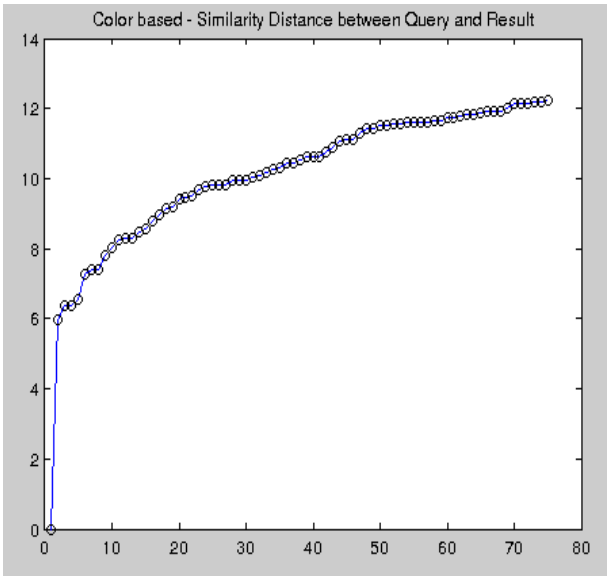


Fig. 2. Color based similarity distance between query image and result

H .IMPLEMENTATION

The actual implementation of the proposed system were performed with the help of few Matlab programs. The proposed CBIR system is composed with 1000 Wang's data set and 1360 flower data set from different sources and in each categories of images containing number of images with similar category. For loading and retrieving images to and

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 04, April-2016

from the image database, proposed system provide a user interface.

For the initial test data, database of 70 images is being used. When a user wants to search and retrieve a particular image from the image database, CBIR system performs the feature extraction of the query image and construct a feature vector corresponding to the query image. Also compute feature vectors of each an every images present in the database and then compare the feature vector of query image against the feature vector of all other images in the database. Finally,sort the feature vector based on the similarity distance and the CBIR system display the relevant image which are those feature vectors with minimum distance is displayed on the output panel.

a) Results of query image using color feature :

Query image 26.bmp

Result of query image 26.bmp using H component

Result of query image 26.bmp using S component

Result of query image 26.bmp using V component

Result of query image 26.bmp using Combined HSV

Result of query image 26.bmp using Combined HSV

Query image 2.bmp

Result of query image 2.bmp using H component

Result of query image 2.bmp using S component

Result of query image 2.bmp using V component

Result of query image 2.bmp using Combined HSV

I. RECALL AND PRECISION

Testing the effectiveness of the system, two measures used in this work :

1. Recall

$$Recall = \frac{Number\ of\ relevant\ images\ retrieved}{Number\ of\ relevant\ images\ in\ database}$$

2. Precision

$$Precision = \frac{Number\ of\ relevant\ images\ retrieved}{Total\ number\ of\ images\ retrieved\ by\ the\ system}$$

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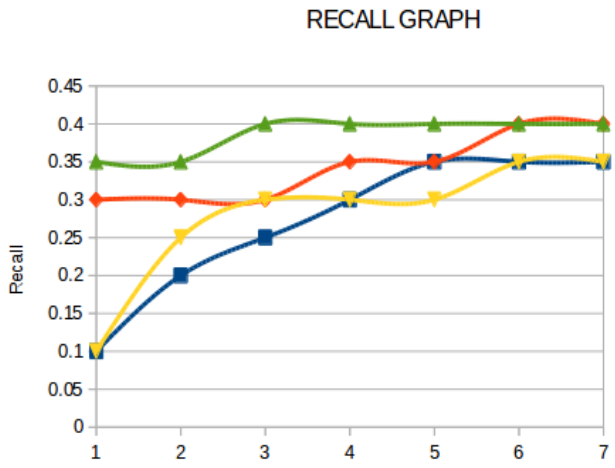
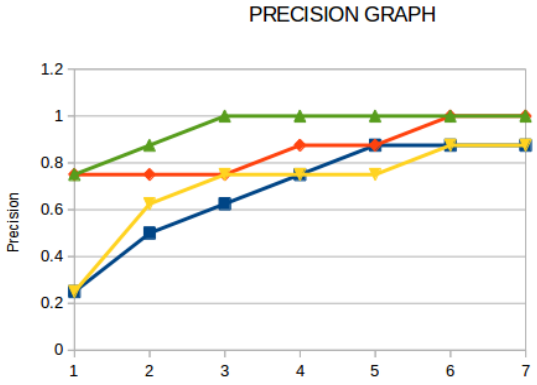
Following graph shows the recall and precision graph for color feature. The values of recall and precision can be obtained by selecting each images from the image database and this process repeated for all other images in the other category. After getting many values for the different images, these values are then plotted. From the precision and recall graph clearly shows that using all combinations of color components gives much better retrieval results than using color components individually.



Recall Graph for HSV color components



Precision Graph for HSV color components

J.FUTURE WORK

To improve the performance a stepwise refinement method is taken. Preliminary evaluation is conducted based only on color feature. In future, shape and texture features can also apply to compensate the retrieval time and result as the size of the database is increased.

K.CONCLUSION

As discussed in this work, to develop a generic content based information retrieval system. It is concluded that, now CBIR systems have been improved a lot. However, some problems are still existing which have not been effectively satisfies user's requirements. Some of the existing techniques shows good results only on small data set but doesn't give much accuracy for on large dataset. Also planning to combining two or more additional features to improve system performance.

REFERENCES

[1] Colin Campbell. *Algorithmic approaches to training support vector machines*: a survey. In ESANN, pages 27–36, 2000.

[2] Pengyu Hong, Qi Tian, and Thomas S Huang. *Incorporate support vector machines to content based image retrieval with relevance feedback. In Image Processing*, 2000. Proceedings. 2000 International Conference on, volume 3, pages 750–753. IEEE, 2000.

[3] Nooshin Jafari Fesharaki and Hossein Pourghas-sem. *Medical x-ray image hierarchical classification using a merging and splitting scheme in feature space*. Journal of medical signals and sensors, 3(3):150, 2013.

[4] Wei Tang, Hui Xiong, Shi Zhong, and Jie Wu .*Enhancing semi-supervised clustering: a feature projection perspective*. In Proceedings of the 13th ACM SIGKDD international conference on Knowledge discovery and data mining,pages 707–716. ACM, 2007.

[5] B Ramamurthy and KR Chandran. *Content based medical image retrieval with texture content using gray level co-occurrence matrix and k-means clustering algorithms*. Journal of Computer Science, 8(7):1070, 2012.

[6] Yubing Dong and Baice Li. *Combined automatic weighting and relevance feedback method in content-based image retrieval*. In Computer, Mechatronics, Control and Electronic Engineering (CMCE), 2010 International Conference on,volume 6, pages 179–182. IEEE, 2010.

[7] Xu-Bo Zhang and Jin-Ye Peng. *Re-ranking algorithm using clustering and relevance feedback for image retrieval*. In Educational and Network Technology (ICENT), 2010 International Conference on, pages 237–239. IEEE, 2010.

[8] Ja-Hwung Su, Wei-Jyun Huang, Philip S Yu, and Vincent S Tseng. *Efficient relevance feedback for content-based image retrieval by mining user navigation patterns*. Knowledge and Data Engineering, IEEE Transactions on, 23(3):360–372, 2011.

[9] Lining Zhang, Lipo Wang, and Weisi Lin. Generalized biased discriminant analysis for content based image retrieval. Systems, Man, and Cyberetics, Part B: Cybernetics, IEEE Transactions on, 42(1):282–290, 2012.

[10] T Dharani and I Laurence Aroquiaraj. *A survey on content based image retrieval. In Pattern Recognition, Informatics and Mobile Engineering (PRIME)*, 2013 International Conference on, pages 485–490. IEEE, 2013.

[11] Nguyen, Nhu-Van and Boucher, Alain and Ogier, Jean-Marc and Tabbone, Salvatore, *Cluster-based relevance feedback for CBIR: a combination of query point movement and query expansion*, Journal of ambient intelligence and humanized computing,volume 3, number 4,pages281—292,2012, Springer

[12] Hossein Pourghassem and Hassan Ghassemian. Content-based medical image classification using a new hierarchical merging scheme. Computerized Medical Imaging and Graphics, 32(8):651–661, 2008.

[13] Meenakshi Madugunki, DS Bormane, Sonali Bhadoria, and CG Dethe. Comparison of different cbir techniques. In Electronics Computer Technology (ICECT), 2011 3rd International Conference on, volume 4, pages 372–375.IEEE, 2011.

[14] Yong-mao Wang and Zheng-guang Xu. Image retrieval using the color approximation histogram based on rough set theory. In Information Engineering and Computer Science, 2009. ICIECS 2009. International Conference on, pages 1–4.IEEE, 2009.

[15] K Rajakumar and S Muttan. Texture based mri image retrieval using curvelet with statistical similarity matching. IJCSI International Journal of Computer Science Issues, 10(2), 2013.

[16] Caiming Zhong, Duoqian Miao, and Pasi Fr¨anti.Minimum spanning tree based split-and-merge: A hierarchical clustering method. Information Sciences, 181(16):3397–3410, 2011.

[17] Lijun Zhao and Jiakui Tang. Content-based image retrieval using optimal feature combination and relevance feedback. In Computer Application and System Modeling (ICCASM), 2010 International Conference on, volume 4, pages V4–436. IEEE, 2010.