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Content Based Image Retrival Using Different Clustering Techniques

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ABSTRACT—

CBIR (Content based image retrieval) is the software system for retrieving the images from the database by using their features. In CBIR technique, the images are retrieved from the dataset by using the features like color, text, shape, texture and similarity. Object recognition technique is used in CBIR. Research on multimedia systems and content-based image retrieval is given tremendous importance during the last decade. The reason behind this is the fact that multimedia databases handle text, audio, video and image information, which are of prime interest in web and other high end user applications. Content-based Image retrieval deals with the extraction of knowledge, image data relationship, or other patterns not expressly keep within the pictures. It uses ways from computer vision, image processing, image retrieval, data retrieval, machine learning, database and artificial intelligence. Rule retrieval has been applied to large image databases. The proposed system gives average accuracy of 90%.

Keywords— CBIR, Color feature, Shape feature, Texture feature, Feature extraction, Clustering, Image Retrieval.

I. INTRODUCTION

Image retrieval is that the method of browsing, searching and retrieving pictures from an oversized information of digital pictures. The gathering of pictures within the internet are growing larger and changing into additional various .Retrieving pictures from such giant collections could be a difficult drawback. One of the most issues they highlighted was the problem of locating a desired image in a very large and varied collection. Whereas it has potential to identify a desired image from a small collection just by browsing, simpler techniques which are required with collections containing thousands of things to look for pictures ,a user could offer question terms like keyword ,image file/link or click on some image and also the system can come back pictures " similar " to the question .The similarity used for search criteria can be meta tags ,color distribution in pictures ,region /shape ,attributes etc.[1]

This technique has its some disadvantages:

a) first of all, considering the large collection of pictures present, it's not possible to manually annotate them b) Secondly; the rich features present in an image cannot be descried by keywords completely.

To overcome above disadvantages of text based image retrieval approach, the new efficient technique is developed namely "Content Based Image Retrieval". In CBIR, the system uses the visual content of an image such as color, shape, texture to represent and index image. To retrieve images, user provides the system with example image or sketched figure. The system then changes the example into its internal representation of feature vector .The similarity distance between query image and database image is compared and final image is retrieved.[2]

II. LITERATURE SURVEY

Manish Maheshwari, Dr. Mahesh Motwani, Dr. SanjaySilakari[3] had discussed that due to semantic gap between low level image features and also the richness of human linguistics, a challenge with image contents is to extract meaning from the data they contain .Proposed framework focuses on color and texture as feature .Color Moment and Gabor filter is used to extract feature for image dataset. K-Means and Hierarchical clustering algorithm is applied to group the image dataset into various clusters and have shown results.

B.Dinakaran, J. Annapurna, Ch.Aswani Kumar[4] had researched on a novel image retrieval approach which combines text, content and interactive based retrieval. The accuracy is higher in comparison to using the techniques separately. The experiments on the sample datasets prove the effectiveness of the system. Further it is proposed to integrate and classify the techniques and add low level features like texture, shape to the system.

Guoqiang Shen, Lanchi Jiang, Guoxaun Zhang[5]had proposed the image retrieval technology based on the color feature and shape feature , a new image retrieval algorithm based on color segment histogram and Hu moment invariants with edge information. The weights assigned to features respectively and calculate the similarity with combined features of color and shape. Compared with the traditional single method, the results indicate that the proposed algorithm in this paper has better retrieval recall and precision.

S.Nandagopalan, Dr.B. S. Adiga and N. Deepak [6]had proposed a universal model for the Content Based Retrieval System by combining the color , texture and edge density features or individually. Users were given options to select the appropriate feature extraction method for best results.

The advantages of global and local features together have been utilized for better retrieval efficiency.

Mesfin Sileshi and Bjorn Gamback,[7] had presented an evaluation of four clustering algorithms: k-mean, average linkage, complete linkage and Ward's method, with the letter three being different hierarchical methods. The quality of the clusters created by algorithms was measured in terms of cluster cohesiveness and semantic cohesiveness and both quantitative and predicate based similarity criteria were considered for better results.

Z Lei, L Fuzong, Z Bo,[14] had presented Along with the analysis of color options within the hue, saturation and value (HSV) area, a new dividing technique to quantize the color area into thirty six non-uniform bins is introduced during this paper. Supported this quantization technique we propose a color-spatial technique to incorporate many special features of the colors in a picture for retrieval. These features are space and position that mean the zero- order and also the first-order moments, severally. Experiments on a picture information of 838 pictures show that the algorithmic program performs well in exactness and flexibility.

SK Saha, AK Das, B Chanda [15] had designed and implemented an experimental CBIR system that uses a texture co-occurrence matrix. Fuzzy index of major colors also are used as color feature to enhance performance. A new live is usually recommended to search out the connection of the retrieved pictures and to judge the CBIR system. Consequently, the performance study of the planned system is applied and compared with an identical system. The study has established the effectiveness of the features.

P Hong, Q Tian, TS Huang [16] had proposed by exploitation connection feedback, content-based image retrieval (CBIR) permits the user to retrieve pictures interactively. Starting with a rough query, the user will choose the most relevant pictures and provide a weight of preference for every relevant image to refine the query. The high level idea borne by the user and perception subjectiveness of the user can be automatically captured by the system to a point. This paper proposes an approach to utilize each positive and negative feedbacks for image retrieval. Support vector machines (SVM) is applied to classifying the positive and negative pictures. The SVM learning results are accustomed update the preference weights for the relevant pictures. This approach releases the user from manually providing preference weight for every positive example. Experimental results show that the planned approach has improvement over the previous approach that uses positive examples only.

III. PROPOSED WORK

The planned work consists of the implementation of Content based Image Retrieval using hierarchical and K-Means clustering techniques as shown in fig. 1. At first the pictures are hierarchically clustered into groups having similar color content. Then the preferred cluster is clustered using K-Means algorithm. hierarchical clustering assists quicker image retrieval and also permits the look for most relevant pictures in giant image databases .K-Means could be a clustering technique supported the improvement of an overall live of clustering quality and known for its efficiency and manufacturing correct results in image retrieval.[1]

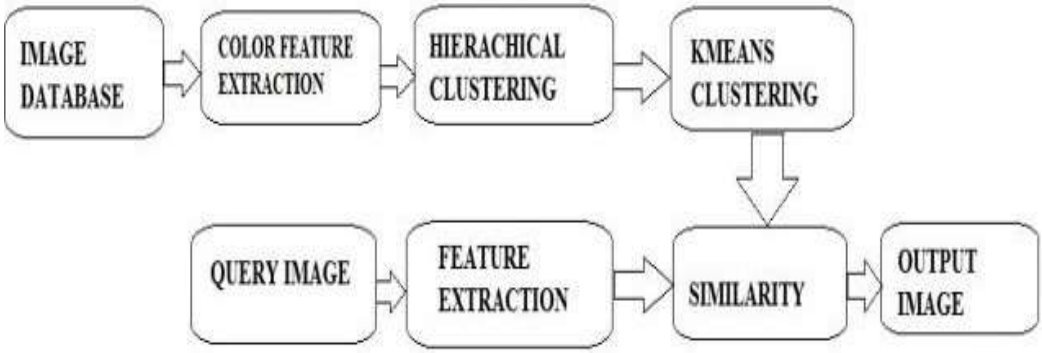


Figure 1: Block Diagram of Content Based Image Retrieval

IV. IMAGE FEATURES EXTRACTION

In proposed work, we considered color based features

RGB Images

An RGB image, generally referred to as a real color image, is keep in MATLAB as m-by-n-by-3 information that defines red, green and blue color parts for every individual picture element. RGB pictures don't use a palette. The color of every picture element is decided by the mix of the red, green and blue intensities stored in every color plane at the pixel's location. Graphics file formats store RGB pictures as 24-bit pictures, wherever the red, green and blue parts are eight bits every. This yields a possible of sixteen million colors. The exactness with that a real-life image may be replicated has junction rectifier to the commonly used term true color image. [12]

Color Space

A color space is outlined as a model representing color in terms of intensity values. Typically, a color space defines a one to four dimensional space. A color element, or a color channel, is one among the size. A color dimensional space (i.e., one dimension per pixel) represents the gray-scale space. The subsequent 2 models are normally utilized in color image retrieval system.

RGB Color Model

The RGB color model consists of the first colors Red, green and Blue. This technique defines the color model that's utilized in most color CRT monitors and color raster graphics. They are considered the "additive primaries" since the colors are another along to provide the required color. The RGB model uses the Cartesian system as shown in figure2 (a). Notice the diagonal from (0, 0, and 0) black to (1, 1, 1) white that represents the grey-scale. Figure 3.1.3(b) could be a view of the RGB color model looking down from "White" to origin.

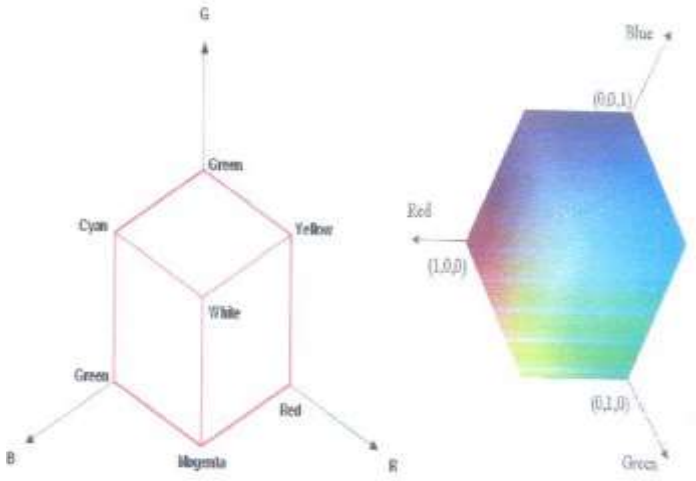


Figure 2. (a) RGB coordinate system (b) RGB color model

HSV Color Model

The HSV stands for the Hue, Saturation and value based on the artists (Tint, Shade and Tone). The coordinate system for HSV color model could be a hexa-cone as shown in Figure 2(a) and Figure (b) gives a view of the HSV color model. the value represents intensity of a color, that is decoupled from the color data in the described image. The hue and saturation parts are intimately associated with the means human eye perceives.

As hue varies from zero to one, the corresponding colors vary from red through yellow, green, cyan, blue and magenta, back to red. So that there are literally red values each at zero and one.0 as saturation varies from zero to one. The corresponding colors (hues) vary from unsaturated (shades of gray) to totally saturated (no white component). As price or brightness varies from zero to one.0, the corresponding colors become more and more bright. [12]

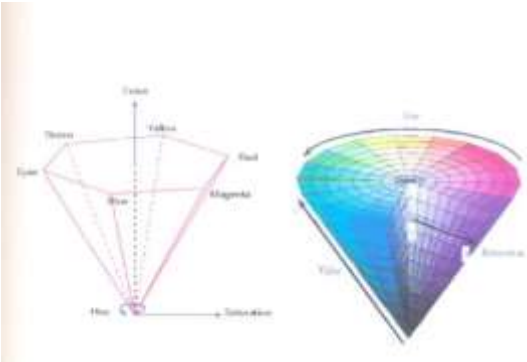


Figure 3.(a) HSV coordinate system (b) HSV color model

Main options of image retrieval:

1) Color
2) Texture
3) Shape
4) Edge

5) Text

6) Temporal details etc.

The features that were most promising were color, texture and edge.

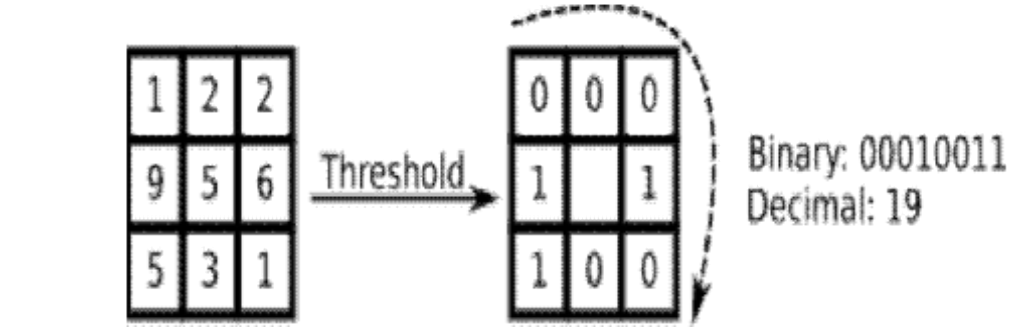
The reasons are as follows:

1. **Color:** It occurs in two colors – pink (rusty rose) and black. Hence the image parts will be compared to those spectra.
2. **Texture**: Texture is outlined as a part feature [RHC99] – as a part or a block. The variation of every element with reference to its neighboring pixels defines texture. In our case, It occurs in open water or in water at the boundary. Hence the textural details of similar regions may be compared with a texture example.
3. **Edge:** Edge is just an outsized modification in frequency. This can be particularly important here, because the distinction between the dark and therefore the lighter water bodies or land may be thought of as an edge.

Local Binary Pattern

The local binary pattern (LBP) operator is outlined as a gray-scale invariant texture live, derived from a general definition of texture in a local neighborhood. Through its recent extensions, the LBP operator has been created into a very powerful live of image texture, showing wonderful results in several empirical studies. The LBP operator may be seen as a unifying approach to the historically divergent statistical and structural models of texture analysis. Maybe the foremost necessary property of the LBP operator in real-world applications is its exchangeability against monotonic grey level changes. Another equally vital is its process simplicity that makes it possible to research pictures in difficult period of time settings. The LBP technique and its variants have already been employed in an outsized variety of applications everywhere the globe. Recently, we've got begun to check tasks that haven't been antecedent thought- about as texture analysis issues. Our facial image illustration supported local binary patterns, projected at ECCV 2004, has evolved to be a growing success. It's been adopted and any developed by several analysis teams. We've got additionally developed the primary texture-based technique for subtracting the background and detective work moving objects in real time. of these results indicate that texture and therefore the concepts behind LBP methodology may have a much wider role in computer vision and image analysis than was earlier thought.[8]

Local Binary Patterns methodology has its roots in 2nd texture analysis. The fundamental plan is to summarize the local structure in a picture by comparison every element with its neighborhood. Take a element as center and threshold its neighbors against. If the intensity of the middle element is greater-equal its neighbor, then denote it with one and zero if not. You will find yourself with a binary range for every element, a bit like 11001111. With eight close pixels you will find yourself with 2^8 possible mixtures, that are known as local Binary Patterns or typically LBP codes. The primary LBP operator truly used a set three x three neighborhoods just like this:



The LBP feature vector, in its simplest type, is made in the following manner:

1. Divide the examined window to cells (e.g. 16x16 pixels for every cell).
2. For every element in a cell, compare the element to every of its eight neighbors (on its left-top, left- middle, left-bottom, right-top, etc.). Follow the pixels on a circle, i.e. clockwise or counter-clockwise.
3. Where the middle pixel's value is bigger than the neighbor, write "1". Otherwise, write "0". This provides an 8-digit binary range (which is sometimes regenerate to decimal for convenience).
4. Compute the histogram, over the cell, of the frequency of every "number" occurring (i.e., every combination of that pixels are smaller and that are larger than the center).
5. Optionally normalize the histogram.
6. Concatenate normalized histograms of all cells. This provides the feature vector for the window.[8]

The Haar Discrete Wavelet Transform

An outstanding property of the Haar functions is that except function Haar (0, t), the ith Haar function will be generated by the restriction of the (j − 1)th function to be half the interval wherever it's completely different from zero, by multiplication with √2 and scaling over the interval [0, 1]. These properties provide appreciable interest of the Haar function, since they closely relate them to the wavelet theory. During this setting, the primary 2 Haar functions are known as the world functions, whereas all the others are denoted because the local functions. Hence, the Haar function, that is an odd rectangular pulse pair, is that the simplest and oldest wavelet.[12] The motivation for exploitation the distinct wavelet transforms is to get info that's a lot of discriminating by providing {a totally differentialspecialunique distinct resolution at different elements of the time– frequency plane. The wavelet transforms enable the partitioning of the time-frequency domain into no uniform tiles in connection with the time–spectral contents of the signal. The wavelet strategies are powerfully connected with classical basis of the Haar functions; scaling and dilation of a basic wavelet will generate the premise Haar functions.

Haar wavelet may be a function that consists of a brief positive pulse followed by a brief negative pulse that provides orthogonally decomposition of a picture signal.

$$\Psi = \begin{cases} 1 & \text{if } 0 \le t \le 1/2 \\ -1 & \text{if } 1/2 \le t \le 1 \\ 0 & \text{otherwise} \end{cases}$$

The discrete wavelet transform may be a very great tool for signal analysis and image process, particularly in multi-resolution illustration. It will decompose signal into completely different elements within the frequency domain.

In Haar wavelet transform the low frequency wavelet constant are generated by averaging {the 2|the 2} element values and high frequency coefficients are generated by taking half the distinction of an equivalent two pixels. The four bands obtained are approximate band (LL), Vertical Band (LH), Horizontal band (HL), and diagonal detail band (HH). [12]In Haar Wavelet Transform the low frequency wavelet coefficient are generated by averaging the two pixel values and high frequency coefficients are generated by taking half of the difference of the same two pixels. The four bands obtained are approximate band (LL), Vertical Band (LH), Horizontal band (HL), and diagonal detail band (HH). [12]

Gabor Transform

Its impulse response is outlined by a harmonic function increased by a mathematician function. owing to the multiplication-convolution property (Convolution theorem), the Fourier transform of a Gabor filter's impulse response is that the convolution of the Fourier transform of the harmonic function and therefore the Fourier transform of the Gaussian function. The filter features a real and an imaginary element representing orthogonal directions. The 2 parts is also formed into a complex variety or used separately [9]

V. CLASSIFICATION

If there are 2 images in database with features a, b and their distance from test feature T is d1, d2 then whichever is smaller of d1 and d2 will be selected as result image. For example here if d2 is smaller than image with feature b is selected.

Image Classification: Grouping image pixels into classes or categories to provide a thematic illustration. Classification is used in thematic maps or is additional incorporated into digital analysis. It can be performed on single or multiple image channels to separate areas in step with their totally different scattering or spectral characteristics.

Digital image classification procedures are differentiated as being either supervised or unsupervised (clustering). [13]

Supervised Classification: In supervised category objects/pixels belonging to a notable class are used for "training" of the system and drawing decision lines between completely different categories. New objects/pixels are known based on the choice lines.

Supervised classification depends on the a priori information of helpful features that are within the image. There are various aspects that have to be considered once conducting a supervised classification. The primary is developing an acceptable classification scheme. training pictures should be chosen for every of the categories, and once every element within the image (including those used as training set) are evaluated, and assigned to a land cover category, the accuracy of the classification needs to be assessed. [10]

Unsupervised Classification: Categorization of digital image information by computer process based mostly only on the image statistics while not accessibility of training samples or a-priori data of the area. Category is not known and structure is to be discovered automatically. Example: cluster and auto associative nets. This project involves comparison pictures like leaf, rose, and face pictures keep within the database that are already trained by using image statistics like mean, median, standard-deviation, momentum, variances, skewness and kurtosis.[10] Classification which has training and testing processes, wherever features extracted from training pictures are compared with those extracted from testing pictures. The image is then classified based on the matched features. Image acquisition, segmentation and have extraction comes below the training method. An easy training and testing method is shown in figure4.[10]

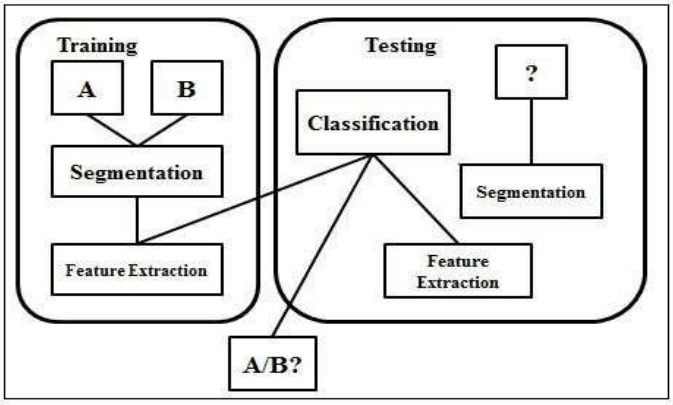


Fig.4. Classification Process

VI. EXPERIMENTATION ANDRESULTS

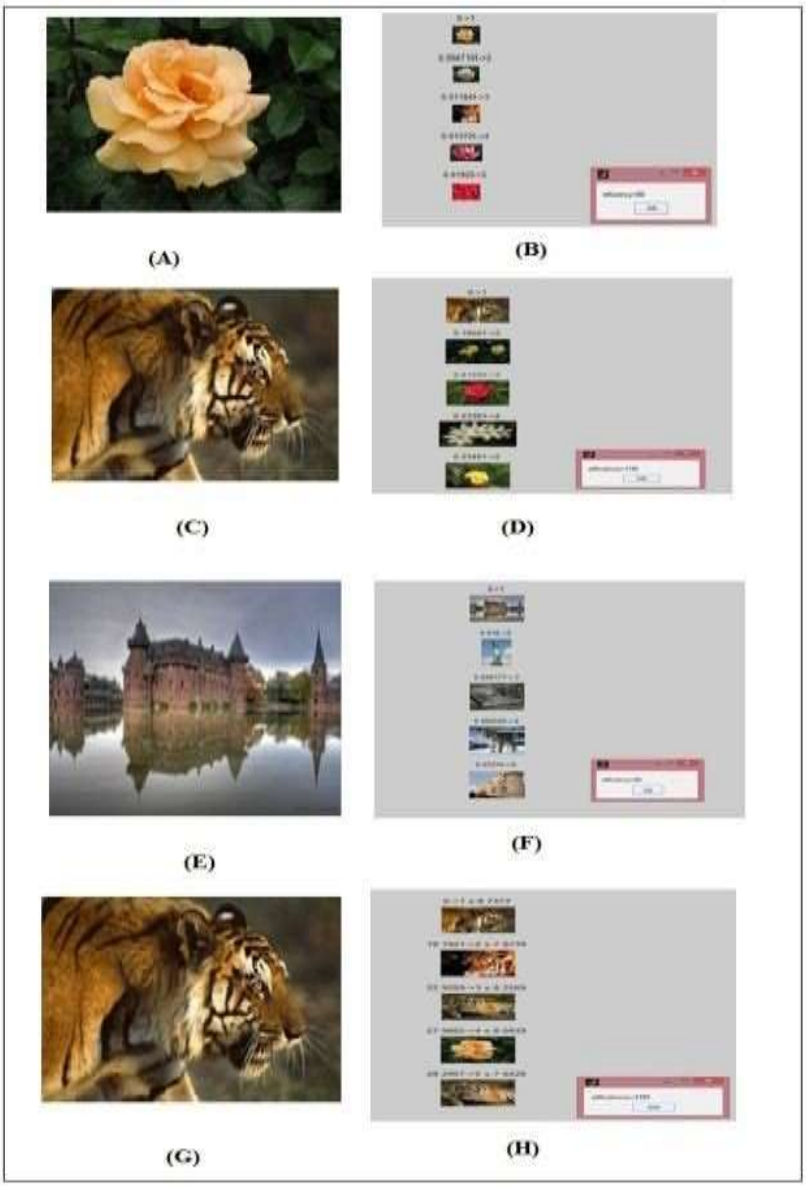


Fig. 05. A) C) E) G) Query Images) Retrieval images by shape D) Retrieval images by phase & amplitude of image F) Retrieval images by texture H) Retrieval images by color

Result comparison Table

Features	Shape Feature	Phase & magnitude feature	Texture(Pixel) feature	Color feature
	Curve let	DCT	LBP	HISTOGAM/HSV
Retrieval Score in %	80%	80%	100%	100%

CONCLUSION

In this research of implementation of content based image retrieval technique we are retrieved the images from the database by using different image retrieval technique such as query by texture. Also in classification by shape we are retrieved the images from the database by using wavelet based texture descriptor.

Using the concept of content based image retrieval and data retrieval we have developed two stream of analysis. Based on the information obtained from texture images in the database, about different of images, we have associated the features extracted from these images with their descriptions and thereby created our knowledge base.

Next we have created a decision support which extracts the feature of an input test image. Comparing these extracted features with those of our standard images in our knowledge base, our system, on the basis of the number of hits (number of features matched), helps us decide to which category the given

Input image belongs to. The proposed system gives average accuracy of 90%.

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REFERENCES

[1] V.S.V.S Murthy, Content Based Image Retrieval using Hierarchical and K –Means Clustering Techniques, International Journal of Engineering Sciences and Technology ,vol.2 (3).2010,209-212.

[2] D. Kishore Kumar et al ,Content Based Image Retrieval – Extraction by Objects of User Interest, International Journal on Computer Science and Engineering (IJCSE),ISSN : 0975-3397 ,Vol.3 ,Mar 2011

[3] Manish Maheshwari, Dr.Sanjay silakari, Dr.Mahesh Motwani, Image Clustering using color and texture ,First International Conference on computational Intelligence,Communicational Systems nd Networks ,2009.

[4] B.Dinakaran.J.Annapurna2,Ch.Asawani,Kumar, Interactive Image Retrieval Using Text and Image Content,Volume 10 ,No 3 ,2010.

[5] Guoquing Shen, Lanchi Jiang, Guoxan Zhang, An image Retrieval Algorithm Based on color segment and shape moment invariants ,Second International Symposium on Computational Intelligence and Design,2009.

[6] S.Nandagopalan ,Dr .B.S.Adiga and N.Deepak ,A Universal Model for Content –Based Image Retrieval,World Academy of Science ,Engineering and Technology,46,2008.

[7] Mesfin Sileshi, Bjorn Gamback, Evaluating Clustering Algorithms: Cluster Quality and Feature Selection in Content Based Image Clustering, World Congress on Computer Science and Information Engineering, 2009.

[8] Valtteri Takala, Timo Ahonen, and Matti Pietikainen,Machine Vision Group, Infotech Oulu, PO Box 4500 FI- 90014 University of Oulu, Finland Block-Based Methods for Image Retrieval Using Local Binary Patterns

[9] Suruchi Bapat - Malao, Prof N. M. Shahane Curvelet Based Image Indexing and Retrieval IJETTCS Volume 2, Issue 2, March – April 2013.

[10] Juli Rejito*, Retantyo Wardoyo, Sri Hartati, Agus Harjoko Optimization CBIR using K-Means Clustering for Image Database Juli Rejito et al, / (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 3 (4) , 2012.

[11] Swati V. Sakhare & Vrushali G. Nasre ,Design of Feature Extraction in Content Based Image Retrieval (CBIR) using Color and Texture Available online.

[12] P.S.Hiremath, S. Shivashankar, and Jagadeesh Pujari,wavelet based features for color texture classification with application to cbir IJCSNS International Journal of Computer Science and Network Security, VOL.6 No.9A, September 2006

[13] Mrs. Monika jain ,Dr. S.K. Singh ,A Survey on: Content Based Image Retrieval Systems Using Clustering Techniques For Large Data sets,International Journal Of Managing Information Technology (IJMIT) vol.3, No.4,November 2011.

[14] Z Lei, L Fuzong, Z Bo - TENCON 99. Proceedings of the IEEE,1999-ieeexplore.ieee.org 1999 IEEE TENCON, A CBIR method based on color-spatial feature.

[15] SK Saha, AK Das, B Chanda - Pattern Recognition, 2004.ICPR-2004-ieeexplore.**ieee**.org. IEEE A CBIR system using texture and color feature.

[16] P Hong, Q Tian, TS Huang - Image Processing, 2000 IEEE.incorporate SVM into CBIR with relevant feedback