*International Journal of Application or Innovation in Engineering & Management (IJAIEM)*
**Web Site: www.ijaiem.org Email: editor@ijaiem.org**
**Volume 3, Issue 8, August 2014** **ISSN 2319 - 4847**

# CONTENT BASED IMAGE RETRIEVAL SYSTEM BASED ON NEURAL NETWORKS

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## ABSTRACT

***Widespread cardinality of images and paintings has made traditional keyword based search, an inefficient method for retrieval of required input image data. When we input an image into the database, then Content-Based Image Retrieval (CBIR) system gets the similar images from a large database for that query image. Implementation of CBIR can be done using features like color, texture and shape, these features are called low level features. In this thesis, using a feed-forward back propagation neural network, classification of images in CBIR system is proposed. At first, the neural network is trained about the features of images in the database. The image features that are used in this CBIR system are color histogram, GRB Pattern and Side loop level normalized r2. There are two steps of BPNN 1. Training 2. Testing the training is carried out using BPNN. On the bases of training, resultant image comes out. So training is the best and crucial step in CBIR system for better recognition of image from database when query image is inputted. The proposed method shows the promising results in terms of precision and recall of image retrieval. The proposed method is applied on the African dataset. The whole result simulation is taken place in MATLAB environment.***

**KEYWORDS:-** CBIR, Neural Network, image

## 1. INTRODUCTION

Modern digital technologies have enabled increasing computing power and data storage capacity, permitting the creation of large digital multimedia libraries, both for personal and commercial use. Visual information retrieval has become a major research area due to increasing rate at which images are generated in many application fields ranged from entertainment to professional and scientific purposes .The central functionality of any content-based image retrieval (CBIR) system is to give top matches to a query image from large datasets. It is clear that an effective implementation of a CBIR system requires categorization, indexing and retrieval of images, which relies on effective and efficient features to characterize image content. While there are numerous implementations of CBIR systems, their performance is often not satisfactory In this paper a content-based image retrieval (CBIR) system using user's assisted neural network inference system is described. Initially, all images from database are indexed by numerals and for each image a feature vector with co-ordinates , is performed. Although the choice and/or optimization of a feature vector is of great importance, the main attention in our research was addressed to design of neural network decision stage driven by user's relevance feedback as an efficient tool for image retrieval system. The paper is organized as follows. Section 2 consists of literature Survey. Section 3 will consist of proposed work, . Section 4 consists of methodology , Section 5 will consists of results and discussions, Finally Section 6 will consist of conclusion remarks.

## 2. LITERATURE SURVEY

[1] A.W. M. Smeulders et al.(2002) presents a paper start with discussing the working condition of content image retreival: patterns of use, types of pictures, the role of semantics, and the sensory gap. Image retreival steps was discussed in computational steps. In step one images was sorted by color, texture, and local geometry. Features for retreival are discussed then sorted by accumulative and global features, salient points, object and shape features, signs, and structural combinations thereof. Similarity of pictures and object in pictures is reviewed for each of feature types to give the feedback to the user of system. This paper briefly discuss a spects of system engineering:databases,system architecture and evaluation. In the concluding section , they present their view on the driving force of the field, the heritage from computer vision, the influence on computer vision, the role of similarity and of interaction, the need for databases, the problem of evaluation, and the role of the semantic gap. [2] M.H.Pi,C.STonget. al (2006)presents a novel,effective, and efficient characterization of wavelet sub bands by bit-plane extractions. Each bit plane is associated with a probability that represents the frequency of 1-bit occurrence, and the concatenation of all the bit-plane probabilities forms our new image signature. Such a signature can be extracted directly from the code-block code-stream, rather than from the de-quantized wavelet coefficients, making our method particularly adaptable for image retrieval in the compression domain such as JPEG2000 format images. There were some drawbacks in this paper, such as computationally expensive. [3] M.Kokare et. al (2005) concentrated on finding good texture features for CBIR, they propose a novel approach for texture image retrieval by using a set of dual-tree rotated complex wavelet filter (DT-RCWF) and dual-tree-complex wavelet transform (DT-CWT) jointly, which obtains texture features in 12 different directions. The information provided by DT-RCWF

complements the information generated by DT-CWT. Features are obtained by computing the energy and standard deviation on each sub band of the decomposed image [4] R. M. Haralicket al.(1992),proposes that global image properties based CBIR using a feed-forward backpropagation neural network is proposed. At first, the neural network is trained about the features of images in the database. The image features considered here are color histogram as color descriptor, GLCM (gray level co-occurrence matrix) as texture descriptor and edge histogram as edge descriptor. The training is carried out using backpropagation algorithm. This trained when presented with a query image retrieves and displays the images which are relevant and similar to query from the database. The results show a considerable improvement in terms of precision and recall of image retrieval. An average retrieval precision of about 88% and an average recall rate of about 78% is achieved using the proposed approach over simplicity project database [5] S.Antani et.al (2002)Presents Content-based image retrieval has been keenly calculated in numerous fields. This provides more active management and retrieval of images than the keyword-based method Color attributes like the mean value, the standard deviation, and the image bitmap of a color image are used as the features for retrieval. In addition, the entropy based on the gray level co-occurrence matrix and the edge histograms of an image are too considered as the texture features.

## 3. PROPOSED WORK

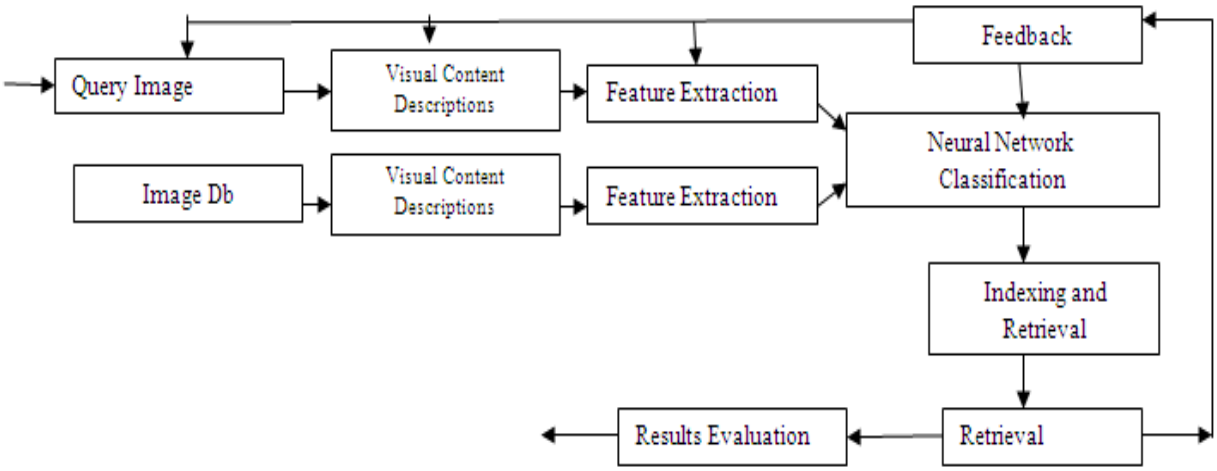


**Figure.1** Proposed Work

## 4. METHODOLOGY

**The following steps present the different stages that need to be accomplished :**

**Step-1:**

Upload African dataset Image is of size 10-12 kb and of any format like bmp, png, jpej etc and it is taken from African database

**Step-2:**

Feature extraction Color pattern is one of the important feature of an image, which depicts much of the information from the image. RGB color model do not correspond to the human way of perceiving the colors. And then histogram is being represented. RGB color pattern can be represented as:

Im = Rm * .29 + Gm * .59 + Bn*.11

**Step-3:**

Implement Neural network Neural network has been inspired from the brain that consists of network of “neuron like” units called nodes.This network can be used in many fields like classification, optimization, and control theory and for solving regression problems. Mainly NNs are helpful, or we can say that can perform effectively where classification is required on the basis of training and testing. NN are preferred over other networks because it is dynamic in nature. Dynamic in nature means weights of input can be adjusted according to the desired output. An this weight adjustment is known as learning process. Below diagram shows that there are one input layer, one hidden layer and same as one output layer , we can get the output as summation of all the inputs.

**Step-4:**

Calculate performance metrics .

## 5. RESULTS AND DISCUSSIONS

**Table 1.** Average image retrieval time

| Category | CH | WBCH (A, H) (Haar) | WBCH (A, H, V) (Haar) | WBCH (A, H, V, D) (Haar) | LWBCH (A, H) (Haar) | LWBCH (A, H) (db2) | LWBCH (A, H) (db4) | Hybrid With Neural Network |
|---|---|---|---|---|---|---|---|---|
| African people | 63.349 | 59.987 | 100.277 | 98.608 | 56.57 | 72.12 | 111.2 | 51.57 |
| Beach | 59.092 | 58.066 | 81.193 | 102.596 | 57.69 | 71.06 | 116.8 | 52.65 |
| Building | 61.591 | 60.621 | 87.071 | 100.678 | 52.74 | 69.1 | 112.05 | 47.74 |
| Buses | 63.850 | 59.669 | 72.384 | 103.938 | 58.39 | 70.13 | 113.85 | 53.35 |
| dinosaurs | 60.900 | 64.071 | 79.180 | 99.221 | 59.32 | 74.23 | 110.8 | 55.10 |
| elephants | 67.922 | 60.950 | 74.972 | 96.981 | 53.32 | 67.28 | 110.54 | 48.32 |
| Flowers | 71.105 | 59.947 | 73.326 | 92.968 | 59.09 | 69.67 | 113.65 | 54.08 |
| Horses | 60.615 | 62.075 | 79.150 | 87.093 | 55.31 | 74.67 | 11.89 | 6.85 |

The above table shows the average retrieval time using different techniques like WBCH (A, H), WBCH (A, H, V, D), LWBCH (A, H) and Hybrid with Neural Network. When we select the categories using CH technique the flowers is taking more retrieval time and the beach category is takes less time. Similarly with the comparison of other techniques, Using neural network we can see that the time taken to retrieve the image is very less in different categories as compared to other techniques because it is a fast network as the working depends on the processing speed of the neurons. So from the above table we can estimate the image retrieval time of various categories by evaluating the Mean square error rate and Peak Signal to Noise Ratio. The mean square error rate should be less so that we retrieve the image in the fewer intervals. From the above figure we can see that the horse category takes less time using neural network.

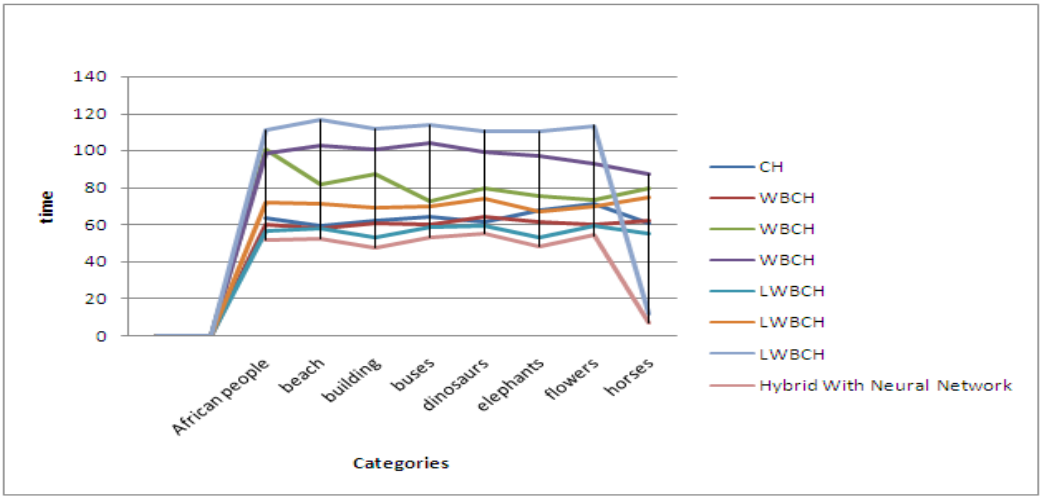


**Figure 2.** Graph Of Average image retrievel time

The above graph shows that the time taken by neural network is less as compared to another techniques.

**TABLE 2.** Average mean square error(MSE

| Ratio | MSE1 | Hybrid1 | MSE2 | Hybrid2 | MSE3 | Hybrid3 | Avg MSE | Hybrid4 |
|---|---|---|---|---|---|---|---|---|
| 0.7 | 0.15409 | 0.10321 | 0.61909 | 0.55101 | 15.5167 | 10.5123 | 5.42996 | 0.42996 |
| 0.75 | 0.1017 | 0.5012 | 0.41037 | 0.35037 | 10.9582 | 5.9582 | 3.823423 | 0.83223 |
| 0.8 | 0.051406 | 0.001809 | 0.21509 | 0.165 | 7.6985 | 2.6786 | 2.654999 | 0.00499 |
| 0.85 | 0.027704 | 0.0023705 | 0.096907 | 0.046606 | 4.7953 | 0.7283 | 1.63997 | 0.053931 |
| 0.9 | 0.009 | 0.0004 | 0.025401 | 0.020401 | 2.3136 | 0.0136 | 0.782667 | 0.282669 |

**Table 3.** Average Peak Signal To Noise Ratio(PSNR)

| Ratio | PSNR1 | Hybrid 5 | PSNR2 | Hybrid6 | PSNR3 | Hybrid7 | Avg PSNR | Hybrid PSNR8 |
|---|---|---|---|---|---|---|---|---|
| 0.7 | 56.2564 | 58.3214 | 50.2162 | 52.2161 | 36.2342 | 38.1213 | 47.56893 | 49.76871 |
| 0.75 | 58.059 | 60.09 | 52.0018 | 54.0213 | 37.743 | 39.017 | 49.26793 | 51.32413 |
| 0.8 | 61.0213 | 63.0121 | 54.8077 | 56.78 | 39.2697 | 41.028 | 51.69957 | 53.87531 |
| 0.85 | 63.7059 | 65.3121 | 58.2719 | 61.1212 | 41.3258 | 43.0123 | 54.43453 | 57.32451 |
| 0.9 | 68.2316 6 | 65.3121 | 64.0872 | 66.8061 | 44.4903 | 46.012 | 58.93637 | 61.87912 |

PSNR is the ratio between the maximum possible value (power) of a signal and the power of distorting noise that affects the quality of its representation. The Mean Square Error should be less to get the appropriate output as in the case of image processing to retrieve the image to get the desired output according to the data set. When we consider the ratio of 0.7 then the average Mans Square Error is 5.4299 and Average PSNR is 47.568 and when the ratio of DCT-DKT is 0.75 then the value of Average MSE is 3.823 and when the ratio is 0.9 then the Average MSE is having very less value and Average PSNR is having very high value as compared to all other ratios. From this we come to know that as the ratio increases the Average Mean Square Error decreases and the average PSNR increases. The MSE is defined as the difference between the estimator and what is estimated. The difference occurs because of randomness or because the estimator doesn't account for information that could produce a more accurate estimate

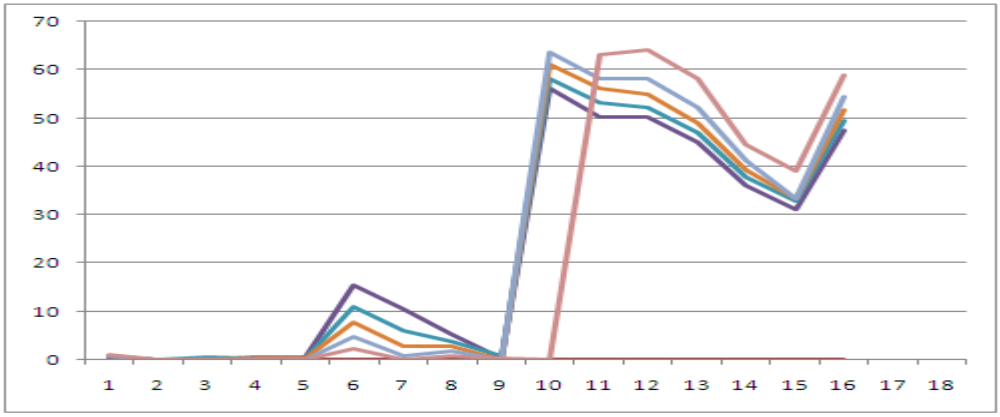


**Figure 3.**Performance comparison of Hybrid Walet Transform

## 6. CONCLUSION

This paper has presented a CBIR system using neural network. The color distribution histograms are used as color information of an image. Also, normalized r2, rgb pattern to help characterize the images. The use of neural network has considerably improved the recall rate and also retrieval time, due to its highly efficient and accurate classification capability. Also, the NN algorithm has increased the retrieval precision due to its capability of minimising the error during training process itself. This work can be extended by integrating with Fuzzy C-means clustering algorithm for better efficiency.

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