# A Inventive Method for Retrieving Momentous Images by Displaying the Top Ranked Images by means of Interactive Genetic Algorithm

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**Abstract - The principal purpose of the CBIR system is to construct meaningful descriptions of physical attributes from images. Physical features and mathematical features are two such typical descriptions. Many research efforts have been made to extract physical features such as color, texture, edge, structure or a combination of two or more. The best part of the proposed solutions are variations of the color histogram initially proposed for object recognition. Since color histogram lacked spatial information these methods were liable to produce false positives especially when the database was large. We proposed a method called image retrieval using interactive genetic algorithm (IRIGA) for computing a very large number of highly selective features and comparing these features for some relevant images and using only those selected features which incarcerate similarity in the given relevant images for image retrieval. Experiments on a collection of 10000 general-purpose images reveal the effectiveness of the proposed framework**.

***Keywords* - CBIR; Texture, Wavelet Transform, Genetic Algorithm, Interacrive.**

## 1. Introduction

In the text-based system, the images are manually annotated by text descriptors and then used by a database management system to perform image retrieval [3]. However, there are two limitations of using keywords to achieve image retrieval: the vast amount of labor required in manual image annotation and the task of describing image content is highly subjective [1, 5, 6]. That is, the perspective of textual descriptions given by an annotator could be different from the perspective of a user. In other words, there are inconsistencies between user textual queries [11, 14, 17] and image annotations or descriptions. To alleviate the inconsistency problem, the image retrieval is carried out according to the image contents. Such strategy is the so-called content-based image retrieval (CBIR). They are easy to implement and perform well for images that are either uncomplicated or contain few semantic contents.

Images are being generated today at an ever mounting rate by a variety of sources. A content based image retrieval (CBIR) system is required to retrieve these images successfully and efficiently. Such a system helps the user to retrieve relevant images based on visual properties such as color, texture and pictorial entities such as the shape of an object in the picture [4]. The prime goal of the CBIR system is to construct meaningful descriptions of physical attributes from images. Physical features and mathematical features are two such typical descriptions. Many research efforts have been made to extract physical features such as color, texture, edge, structure or a amalgamation of two or more. The majority of the proposed solutions are variations of the color histogram initially proposed for object recognition.

Most current content-based image retrieval systems are still incapable of providing users with their desired results. The major difficulty lies in the gap between low-level image features [9,13] and high-level image semantics. In target search the user already knows that there exists a certain image in the image database. The user's recollection of the image may be more or less exact. Moreover, depending on the system's litheness, the user is able to transfer varying proportion of her information about the image to the system so that it can be used as a specification in a database search [7]. In this paper, a user-oriented mechanism for CBIR method based on an image retrieval using interactive genetic algorithm (IRIGA) is proposed. To reduce the gap between the reclamation results and the users' expectation, the IRIGA is employed to help the users identify the images that are most satisfied to the users' need.

The rest of the paper is organized as follows: In section 2, a brief review of the Discrete Wavelet Transformation is presented. The proposed method (IRIGA) is given in section 3. Section 4 describes experimental results and the performance evaluation of the proposed method. Finally, conclusion is presented in section 5 respectively.

## 2. Discrete Wavelet Transformation

Discrete Wavelet Transformation (DWT) [14] is used to transform an image from spatial domain into frequency domain. Wavelet transforms exact information from signal at different scales by passing the signal through low pass and high pass filters. Wavelets provide multi-resolution capability and good energy compaction. Wavelets are robust with respect to color intensity shifts and can capture both texture and shape information efficiently.

It can be computed linearly with time and thus allowing for very fast algorithms. This paper uses Haar wavelets to compute feature signatures, because they are the fastest to compute and also have been found to perform well in practice [16]. Haar wavelets enable us to speed up the wavelet computation phase for thousands of sliding windows of varying sizes in an image. The proposed method finds effort to extract the primitive features of the query image and compare them to those of database images. The image features under consideration are texture by using the DWT concept. The block diagram for the proposed method is shown in Figure 2.

## 3. Proposed Method

The wavelet transform provides a multi-resolution approach to texture analysis and categorization. Studies of human visual system support a multi-scale texture analysis approach, since researchers have found that the visual cortex can be modeled as a set of independent channels, each tuned to a particular orientation and spatial frequency band. That is why wavelet transforms are found to be useful for texture feature extraction.

The following steps are followed.

- Extract red, green and blue components from an image.
- Decompose red, green and blue component using Haar Wavelet transformation at 3rd level to get approximate coefficient and vertical, horizontal and diagonal coefficients.
- Combine approximate coefficient of red, green and blue component
- In the same way combine the vertical, horizontal and diagonal coefficients of red, green and blue component
- Covert the approximate, vertical, horizontal and diagonal coefficients into HSV plane
- Quantize each pixel in HSV space to 48 histogram bins.
- The normalized histogram is obtained by dividing with the total number of pixels.
- Calculate mean, variance and skewness for the Normalized histogram.
- Store the values as Texture feature vector (T).
- Repeat Steps 1 to 6 for the image present in the database.
- Calculate the similarity measure of query image and the image present in the database
- Repeat the steps from 7 to 8 for all the images in the database
- Retrieve the images.

After obtaining some relevant images from database using above method, the system provides an interactive mechanism which lets the user evaluates the retrieved images those are more or less relevant to the query one and the system then updates the relevance information to include as many user-desired images as possible in the next repossession result. We design a graphical user interface image retrieval system based on IRIGA, as shown in Fig1.

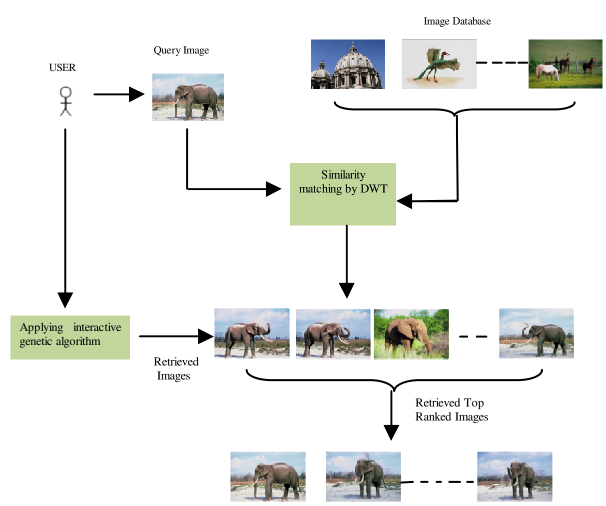



Fig1.Block Diagram for Proposed Method

Our technique of operations is explained as:

- Take the query image and the images in database divide it in to NxN blocks.
- Similarity assessment by using the Wavelet based color histogram.
- Retrieval of related images to the query image from the database.
- To gauge the most relevant images to the query image an interactive genetic algorithm (IRIGA) is used.
- The proposed method IRIGA retrieves images those are more or less relevant to the query one.
- The user-desired image is retrieved based on the top ranking.

## 4. Image Retrieval Using Interactive Genetic Algorithm ( IRIGA)

We propose to consider the subset of images close to the boundary, and then to use a criterion related to the Average Precision in order to select the winner image of the selective sampling strategy. In order to compute a score related to Average Precision, we propose to consider the sub-database of the labeled pictures. We have the ground truth for this sub-database, since we have the labels of all its images. Thus, it becomes feasible to compute the Average Precision on this sub-database, without any estimation. We still need a ranking of this sub-database in order to compute the Average Precision. We have used nearest neighborhood algorithm for calculating rank for the sub image database.

The principle in image scaling is to have a reference image and using this image as the base to construct a new scaled image. The constructed image will be smaller, larger, or equal in size depending on the scaling ratio. When enlarging an image, we are actually introducing empty spaces in the original base picture. From the image below, an image with dimension (w1 = 4, h1 = 4) is to be enlarged to (w2 = 8, h2 = 8). The black pixels symbolize empty spaces where interpolation is needed, and the complete picture is the result of nearest neighbor interpolation.

The numerical accuracy and computational cost of interpolation algorithms are directly tied to the interpolation kernel. As a result, interpolation kernels are the target of design and analysis. Here, analysis is applied to the 1-D case. Interpolation in 2-D is a simple extension of the 1-D case. In addition, data samples are assumed to be equally spaced along each dimension. This restraint causes no serious problem because images are usually defined on regular grids.

### 4.1 Nearest Neighborhood Algorithm

The simplest interpolation from a computational standpoint is the nearest neighbor, where each interpolated output pixel is assigned the value of the nearest sample point in the input image. This technique is also known as point shift algorithm and pixel replication. The interpolation kernel for the nearest neighbor algorithm is defined as

The frequency response of the nearest neighbor kernel is

$$h(r) = \begin{cases} 1 & 0 \le |r| < 0.5 \\ 0 & 0.5 \le |r| \end{cases}$$

**Steps involved in the algorithm**

- Choose k nearest neighbors of query image as seeds.
- The sub images of nearest neighbors for each are found.
- The neighboring objective images are selected to be all the distinct target image.
- By comparing the seeds and the nearest neighbors.we can get the top ranked images.

## 5. Experimental Results

The proposed IRIGA is tested with WANG Database contains 1000 images. The images can be divided into 10 categories based on their content namely Buses, Dinosaurs, Flowers, Building, Elephants, Mountains, Food, African people, Beaches and Horses with JPEG format which used in a general purpose image database for experimentation. These images are stored with size 256×256 and each image is represented with RGB color space. Sample of WANG image database is shown in Figure 2.

To measure retrieval effectiveness for an image retrieval system, precision and recall values are calculated. Precision measures the ability of the system to retrieve only models that are relevant and this used the ratio of relevant retrieved images to the total number of relevant retrieved images.

$$\text{Precision} = \frac{\text{Number of relevant image retrieved}}{\text{Total number of images retrieved}}$$

Recall measures the ability of the system to retrieve all models that are relevant and the ratio of retrieved relevant images to the total number of pertinent images to the total number of relevant images in the database.

$$\text{Recall} = \frac{\text{Number of pertinent image retrieved}}{\text{Total number of relevant images}}$$

The experiment is carried out with the number of retrieved images set as 10 to compute the average precision and recall of each query image. The proposed IRIGA method experiments based on Sum-of-Absolute Differences (SAD) Similarity measures is shown in Equation (1).

$$SAD(f_q, f_t) = \sum_{i=0}^{n-1} 1 f_q[i] - f_t[i] \qquad (1)$$

Where $f_q$, $f_t$ symbolize query feature vector and database feature vectors and n is the number of features in each vector.

Table 1: Summarize the Precision and Recall results of the proposed IRIGA

| Category of Images | Average Precision | Average Recall |
|---|---|---|
| Buses | 0.892 | 0.783 |
| Building | 0.632 | 0.758 |
| Flowers | 0.851 | 0.647 |
| Elephants | 0.727 | 0.633 |
| Mountains | 0.836 | 0.732 |
| Dinosaurs | 0.828 | 0.706 |
| Food | 0.871 | 0.601 |
| Beaches | 0.842 | 0.884 |
| African people | 0.828 | 0.806 |
| Horses | 0.851 | 0.837 |
| Average | 8.158 | 7.387 |

Figure 3.shows the query image Bus and retrieved images based on the query images from WANG database are shown in Figure 2. Table 1 summarizes the experiment results of proposed IRIGA method with ten different categories of images. Proposed IRIGA method retrieved Dinosaurs Buses, and Horses categories of images accurately. Building, Flower, Elephant, Food, African people categories of images are retrieved on and above average of 74%. Remaining categories of images are retrieved on an average of 52%. The overall performance of proposed IRIGA obtained more than 83% of retrieval images with more accurate, efficient and well- organized. The following chart represents the values of average precision and average recall for our proposed method IRIGA.

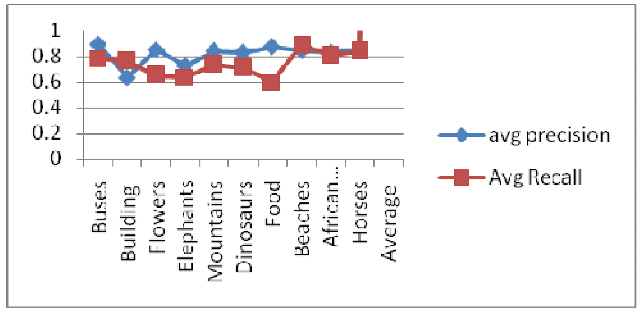



**Chart with precision and recall values**

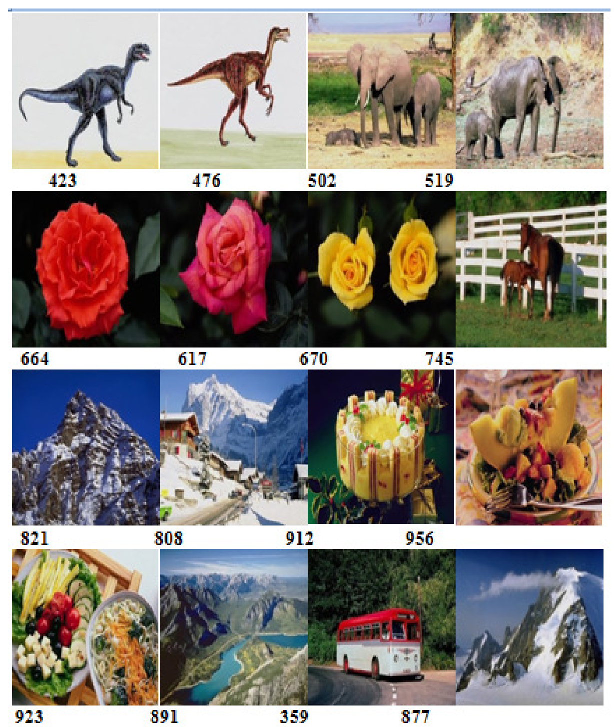
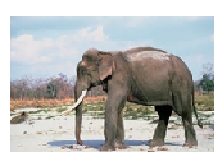



Fig.2 Sample of WANG Image database



**Query Image: Elephant**

Fig 3. Retrieved images before applying proposed method IRIGA

Fig 4. Retrieved images after proposed method IRIGA

## 6. Conclusion

This paper has presented top ranked images to be retrieved in interactive CBIR system. In contrast to conventional approaches that are based on visual features, our method (IRIGA) provides an interactive mechanism to bridge the gap between the visual features and the human perception. In addition, the entropy based on the DWT method is considered as texture descriptors to help characterize the images. Experimental results of the projected approach have shown the noteworthy development in retrieval recital. Further work considering more low-level image descriptors or high-level semantics in the future approach is in progress.

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