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# Content Based Image Retrieval Using Multi feature fusion Extraction

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## Abstract:

The development of multimedia system technology in Content based Image Retrieval (CBIR) System is one in every of the outstanding area to retrieve the images from an oversized collection of database. The feature vectors of the query image are compared with feature vectors of the database images to get matching images.It is much observed that anyone algorithm isn't beneficial in extracting all differing kinds of natural images. Thus an intensive analysis of certain color, texture and shape extraction techniques are allotted to spot an efficient CBIR technique that suits for a selected sort of images. The Extraction of an image includes feature description and feature extraction. During this paper, we tend to projected Color Layout Descriptor (CLD), grey Level Co-Occurrences Matrix (GLCM), Marker-Controlled Watershed Segmentation feature extraction technique that extract the matching image based on the similarity of Color, Texture and shape within the database. For performance analysis, the image retrieval timing results of the projected technique is calculated and compared with every of the individual feature.

*Keywords* — **Color Layout Descriptor (CLD), Gray Level Co-Occurrences Matrix (GLCM), Marker-ControlledWatershed Segmentation,Similarity Mtching,Performance Evolation etc.**

## I.INTRODUCTION

Content primarily based Image Retrieval (CBIR) is that the methodology of retrieving images from the big image databases prioring visual contents in images. It is additionally called query By Image Content (QBIC) and Content Visual data Retrieval (CBVIR). In CBIR, looking of image takes place on the particular content of image instead of alternative helpful information. Reasons for its development are that in several giant image databases, previous old strategies of image classification have proved to be low, laborious, and very time overwhelming. These recent strategies of image classification, starting from storing an image within the information and associating it with a keyword or variety, to associating it with a categorized description, became obsolete. The Content primarily based Image Retrieval System is employed to extract the features and assign index those features exploitation acceptable structures and supply satisfactory answer to the user's question. To attain this, CBIR provides some flow of work. First off CBIR system takes the RGB or HSV image as an input, performs feature extraction, performs some similarity computations with the images keep in information and retrieves the output image on the idea of similarity computation. There are some basic CBIR fundamentals and are divided into 2 elements: feature extraction and matching.

### A.Feature Extraction

Features are divided into 2 classes severally text based and visual based. Textual features are keywords, tags, caption etc. Visual features are color, space and texture etc. Visual features are the key features of an image for pattern identification.

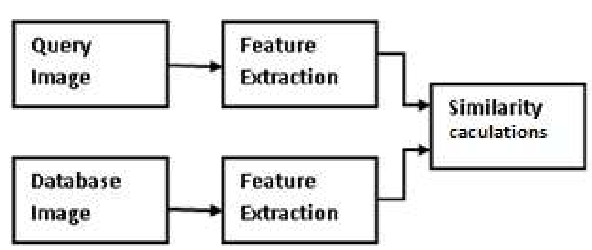


Fig 1 Block Diagram of CBIR

1) *Color*

Color represents one in all the most wide used visual features in CBIR systems. first a color space is employed to represent color images. we've got numerous ways in which to denote the color content of an image corresponding to color histograms, color correlograms, color coherence matrix, dominant color descriptors and color sets

2) *Texture*

Texture is that innate property of all surfaces that describes visual patterns, each having properties of homogeneity furthermore as cloud, trees, bricks, hair and artefact and its relationship to the peripheral atmosphere.

3) *Shape*

Shape is additionally outlined as a result of the characteristic surface configuration of associate object; a summary or contour. It permits associate object to be distinguished from its surroundings by its outline that categories in two: boundary based mostly} and region based.

***B.Matching***

Similarity matching analysis is finished between the features of the query image and also the features of the target image within the database. Similarity images ought to have smaller distance between them and totally different images ought to have giant distance.

## II.COLOR FEATURE CALCULATIONS

***A.Color Layout Descriptor (CLD)***

The CLD [6] represents the spatial distribution of colors in an image. To extract this feature, the input image array is first partitioned off into 8 × 8 blocks. Representative colors are then chosen and expressed in YCbCr color area and every of the 3 elements (Y, Cb and Cr) is remodeled by 8 × 8DCT (Discrete cosine Transform). The ensuing sets of DC coefficients are zigzag-scanned and therefore the first few coefficients (6 from the Y-DCT-matrix and 3 from every DCT matrix of the two chrominance components) are nonlinearly measure to create the descriptor. The Descriptor is saved as an array of 12 values. For more details, please check with [6].

To visualize the CLD descriptor, the on top of method ought to be reversed exploitation only the data remaining within the final descriptor. The subsequent steps were concerned in there construction process:

1) From the descriptor, the DCT coefficients of every color element were separated, repositioned into their zigzag indices within the matrix and also the remainder of every matrix was filled with zeros to interchange those values that were lost within the formation of the descriptor.

2) The 3 DCT matrices were currently remodeled back to the spatial domain exploitation the 8 × 8 IDCT (Inverse discrete cosine Transform).

3) The spatial domain matrices were regenerate from the YCbCr color space back to the RGB color area.

4) The visual image image of the reconstructed RGB 8×8 matrices is formed that has the size (blockwidth ×8) × (block height× 8).

It should be noted that the reconstructed image may besmaller than the first image if the first dimensions weren't dividable by eight.

## III.TEXTURE CALCULATION

***A.Grey Level Co-occurrences Matrix (GLCM)***

GLCM creates a matrix based on the directions and distances between pixels, and extracts the statistics from the matrix as texture features. GLCM texture features unremarkably used are shown within the following [11]:

GLCM consists of the probability value, it's defined P (i, j│d,) that specific the probability of the couple pixel at ɵ direction and d interval. Once ɵ and d is decided, P (i, j│d,) is showed by Pi,j. clearly GLCM is a symmetry matrix, components in the matrix are computed by the below equation:

$$P(i,j \mid d,\theta)= P(i,j \mid d,\theta))/(\Sigma i\Sigma jP(i,j \mid d,\theta))$$

GLCM expresses the texture feature according the correlation of the couple pixels gray level at completely different positions. It direction describes the texture features. however here primarily four things are thought of they are energy, contrast, entropy and also the inverse difference.

1) *Energy*

It is a gray scale image texture measure of the homogeneity ever-changing reflective the distribution of the image gray-scale uniformity of the image and also the texture.

$$E = \sum_x \sum_y p(x,y)^2$$

2) *Contrast*

It is a gray scale image texture measure of the homogeneity changing reflecting the distribution of the image gray-scale uniformity of the image and the texture.

$$I = \sum\sum (x-y)^2\, p(x,y)$$

3) *Entropy*

Entropy measures image texture irregular, when the space co-occurrence matrix for all values are equal, it achieved the minimum value; on the other hand, if the value of co-occurrence matrix is very uneven, its value is greater. Therefore, the maximum entropy implied by the image gray distribution is random.

$$S = -\sum_x\sum_y p(x,y) log p(x,y)$$

4) *Inverse difference*

It measures local changes in image texture number. Its value in large is illustrated that image texture between the different regions of the lack of change and partial very evenly.

Here p(x, y) is the gray level.

$$H = \sum_x\sum_y \frac{1}{1+(x-y)^2} p(x,y)$$

## IV.SHAPE CALCULATION

### *A.Marker-Controlled Watershed Segmentation*

Separating touching objects in an image is one in all the tougher image process operations. The watershed transform is commonly applied to the present drawback. The watershed transform finds “catchments basins” and “watershed ridge lines” in an image by treating it as a surface wherever lightweight pixels are high and dark pixels are low. One in all the foremost vital drawbacks associated to the watershed transform is that the over segmentation that usually results. The standard approach of predetermining the amount and approximate location of the regions provided by the watersheds technique consists within the modification of the homotopic of the function to that the algorithm is applied. This modification is administrated via a mathematical morphology operation, geodesic reconstruction [13], by that the function is changed in order that the minima are often imposed by an external function (the marker function). All the structure basins that haven't been marked are filled by the morphological reconstruction and so transformed into no minima plateaus, which cannot turn out distinct regions once the final watersheds are calculated. Segmentation using the watershed transforms works well if you'll be able to determine, or “mark,” foreground objects and background locations. Marker-controlled watershed segmentation follows this basic procedure:

1. Calculate a segmentation function. This can be an image whose dark regions are the objects you’re making an attempt to phase.
2. Calculate foreground markers. These are connected blobs of pixels with in every of the objects.
3. Calculate background markers. These are pixels that aren't a part of any object.
4. Modify the segmentation function in order that it solely has minima at the foreground and background marker locations.
5. Calculate the watershed rework of the modified Segmentation function.

## V.SIMILARITY MATCHING

Once the features vectors are created, the matching process becomes the measure of a metric distance between the features vectors. Understanding the link among distance measures will facilitate selecting an appropriate one for a specific application. We apply Euclidean Distance Metric for similarity Matching. The following equation shows Euclidean Distance calculation:

$$d = \sqrt{\sum_{i=1}^{n}(x_i - y_i)^2}$$

Euclidean distance is square root of the sum of the squares of the distance between corresponding values where ***i*** represents the image in the database, and d is the Euclidean distance between the query image feature vector ***x*** and the $\boldsymbol{i^{th}}$ database image feature vector $\boldsymbol{y_i}$.

## VI.RESULTS

### *A.WANG Database*

The database we used in our evaluation in WANG database. The WANG database is a subset of the Corel database of 1000 images.

### *B.Feature Extraction and Matching*

From the database, we have extracted and matched color, texture and shape features using extraction algorithm and matching algorithm to get 6 top results as follows:

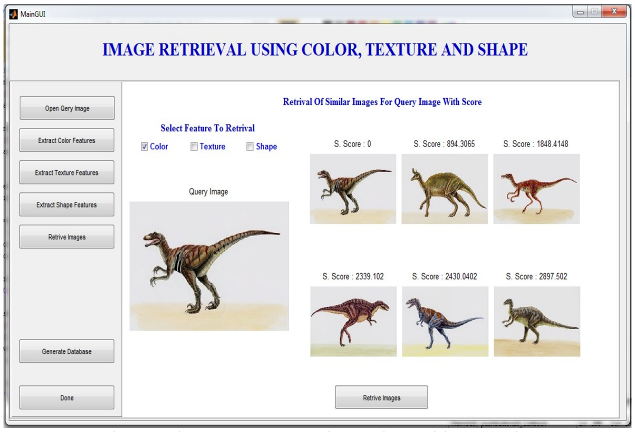


Fig. 2 Color Feature Extraction and Matching Results

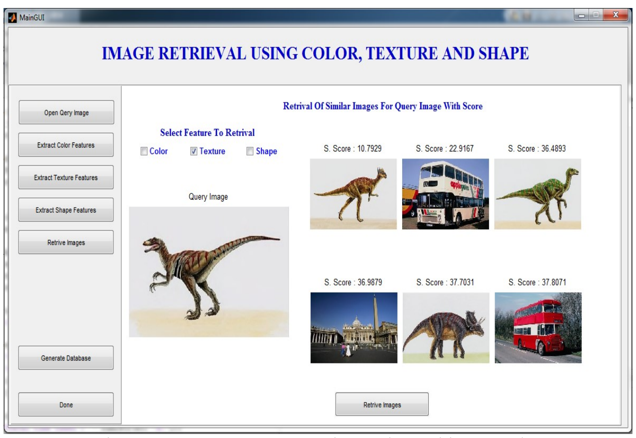


Fig.3 Texture Feature Extraction and Matching Results

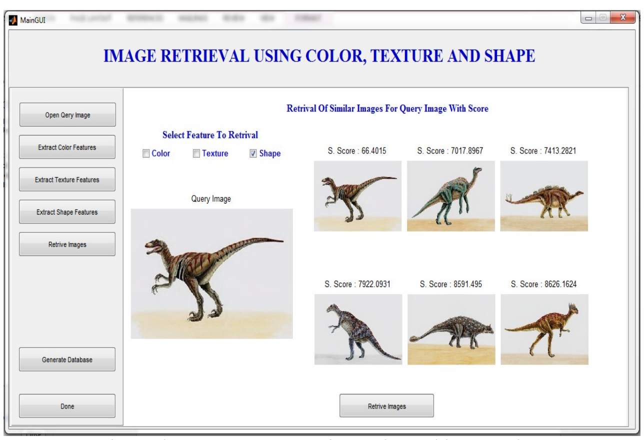


Fig. 4 Shape Feature Extraction and Matching Results

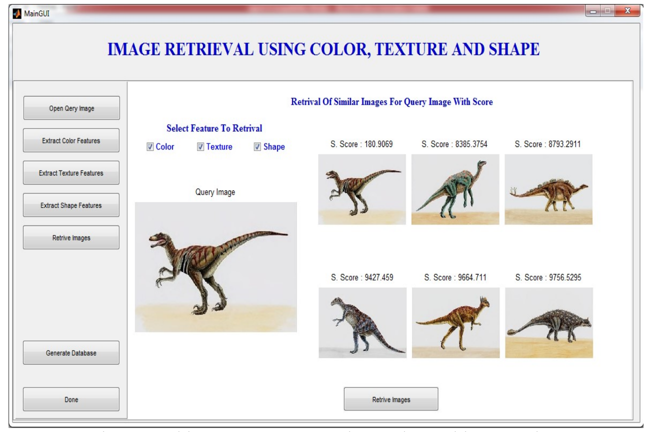


Fig 5 Combine Features Extraction and Matching Results

### *C.Performance Evaluation of CBIR*

The performance of a CBIR system can be measured in terms of time results. We have calculated time duration for each color, texture and shape features. Then, we calculated for combines features. The following table shows the performance evaluation of CBIR in terms of time:

Table I

Performance Evaluation Using Time

| Wang Images | Color | Texture | Shape | Combined |
|---|---|---|---|---|
| 400.jpg | 0.611 | 0.628 | 0.531 | 0.594 |
| 452.jpg | 0.579 | 0.568 | 0.583 | 0.695 |
| 245.jpg | 0.688 | 0.672 | 0.601 | 0.647 |
| 263.jpg | 0.589 | 0.545 | 0.59 | 0.641 |
| 319.jpg | 0.679 | 0.721 | 0.685 | 0.695 |
| 301.jpg | 0.612 | 0.648 | 0.625 | 0.677 |

## VII.CONCLUSION

The application performs color-based search in an image database for an input query image, using Color Layout Descriptor (CLD). Further going in the search, the application performs a texture-based search, using Gray Level Co-occurrences Matrix (GLCM) and its statistics calculation. A more elaborated step would further enhance these above results, using a shape-based search by using the Marker-Controlled Watershed

Segmentation and finally, these extracted features are matched by Euclidean Distance Metric to get top 6 results. Then, we tested Performance Evaluation on images of the databases and we found that the timing results for the integrated approach are going to be less and correct, this will be improved by integration alternative spatial relationship.

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