Content Based Image Retrieval through Features like Color, Texture and Shape

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Abstract-**As an Internet Network and with the ongoing development of multimedia technology is desired a process, that successful retrieval to images from large-scale image collections with comprehensive result. Yet, it is a problem in the field of multimedia digital libraries. The user are not satisfied with the traditional information retrieval techniques, because the use of textual description to represent and query images may provide poor result, due to subjectivity of descriptions. In context to find an image efficiently and effectively from large image collections by using special important low-level visual features are likes color, texture and shape of an image. We know, Image has to be represented with certain important low-level visual features are likes color, texture and shape. In this paper, I propose an efficient and effective image retrieval technique, which is Content Based Image Retrieval (CBIR) that uses dynamic dominant color, texture and shape features of an image.**

I. INTRODUCTION

Content-Based Image Retrieval (CBIR) aims at developing techniques that support effective searching and browsing to digital images based on derived imagery features. In this various application domains such as entertainment, commerce, education, biomedicine, and crime privation are uses hues amount of digital image data so, CBIR has become a prominent research topic because of the proliferation of image data in digital form. Increased bandwidth availability to access the internet in the near future will allow the users to search for and browse through image databases located at remote sites.

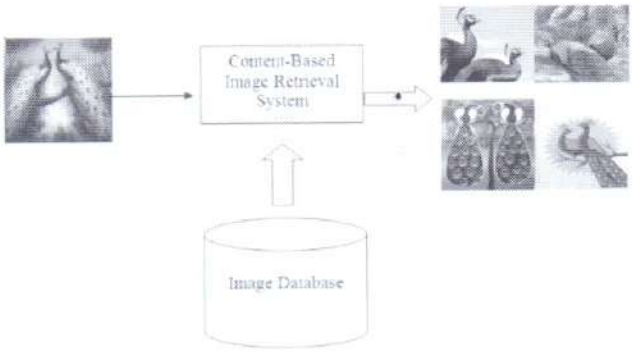

Fig. 1 Retrieval Analyzer

In typical content-based image retrieval systems, the visual contents of the images in the database are extracted and described by multi-dimensional feature vectors. The feature vectors of the images in the database form a feature database. To retrieve images, users provide the retrieval system with example images or sketched figures. The system then changes these examples into its internal representation of feature vectors. The similarities distances between the feature vectors of the query example or sketch and those of the images in the database are then calculated and retrieval is performed with the aid of an indexing scheme. Content-based image retrieval system is built using statistics, pattern recognition, computer and signal processing. The indexing scheme provides an efficient way to search for the image database. Recent retrieval systems have incorporated users' relevance feedback to modify the retrieval process in order to generate perceptually and semantically more meaningful retrieval results

To estimate the local features around significant curvature points, it is necessary to select window size and shape properly. A large window may incorporate lot of insignificant information (noise) along with significant information, whereas small ones may leave out a lot of important information. Hence, the estimation of local features on a fixed sized window will have some limitations, as the spread of significant information may be different depending on the type of curvature points (sharp, medium or weak). The characteristics of sharp curvature points will be confined within a small region, while for those of medium and weak type, the region will be larger. These facts indicate the usefulness of extracting the possible high curvature region of interest (ROI), whose shape and size vary adaptively according to the nature of curvature type.

II. SCOPE

The scope for CBIR system is to integrate with trusted techniques so as to process images of diversified characteristics and categories. Many techniques for processing of low level cues are distinguished by the characteristics of domain-images. The performance of these techniques is challenged by various factors like image resolution, intra-image illumination variations, non- homogeneity of intra-region and inter-region

textures, multiple and occluded objects etc. The other major difficulty, described as semantic-gap in the literature, is a gap between inferred understanding / semantics by pixel domain processing using low level cues and human perceptions of visual cues of given image. In other words, there exists a gap between mappings of extracted features and human perceived semantics. The dimensionality of the difficulty becomes adverse because of subjectivity in the visually perceived semantics, making image content description a subjective phenomenon of human perception, characterized by human psychology, emotions, and imaginations. The image retrieval system comprises of multiple inter-dependent tasks performed by various phases. Inter-tuning of all these phases of the retrieval system is inevitable for over all good results. The diversity in the images and semantic-gap generally enforce parameter tuning & threshold-value specification suiting to the requirements. For development of a real time CBIR system, feature processing time and query response time should be optimized. A better performance can be achieved if feature dimensionality and space complexity of the algorithms are optimized. Specific issues, pertaining to application domains are to be addressed for meeting application-specific requirements. Choice of techniques, parameters and threshold-values are many a times application domain specific e.g. a set of techniques and parameters producing good results on an image database of natural images may not produce equally good results for medical or microbiological images.

III. EXPERIMENTS AND RESULTS

We kept research with images of four COREL databases which has images of different size and of different resolution. We take the results for the both version namely (i) color-shape and (ii) color-texture of the improved CLUE algorithm on each database. We carried out our conduct experiments with a general purpose image database, which contained approximately 1,000 images. Our system used the same feature extraction technique as given in [4] and we used the Euclidean distance as the similarity measure for computing the similarity between the query and target images in the database. Our implementation provides a Random option that gives a user a random set of images from the image database to start with. Once a query image is received, the system displays a list of computed similarity measure values for the different images in the database. Then, it displays a list of images in decreasing order of their similarity with the query image. Now, we present the top 25 results due to space limitation from the proposed CBIR system and shown one result from each resolution of image database by randomly chosen query images as shown in Figures 2, Figure 3, Figure 4 and Figure 5. To compare the performance of the proposed CBIR system with the other two CBIR systems based on CLUE and UFM, we test on every images and take each image as a query image from the 1000 image database. The database, we used, is a subset of the COREL database and it contains 100 images each from the 10 image categories and hence, a total of 1000 images. In our experiments, we take each image as a query image from each of the image categories and hence, a total of 1000 query images. For each query, we select the top 100 results from the CBIR system to compute precision, i.e. precision at 100, but in this paper we show only top 25 results of some query image due to space limitation. Precision at 100 may be defined as the proportion of retrieved images that are relevant to the query in the top 100 retrieved images. We tested it with four different resolutions of images on COREL image database. Comparison shown in Figure 6 and Figure 7.

CBIR system Results of Database 1

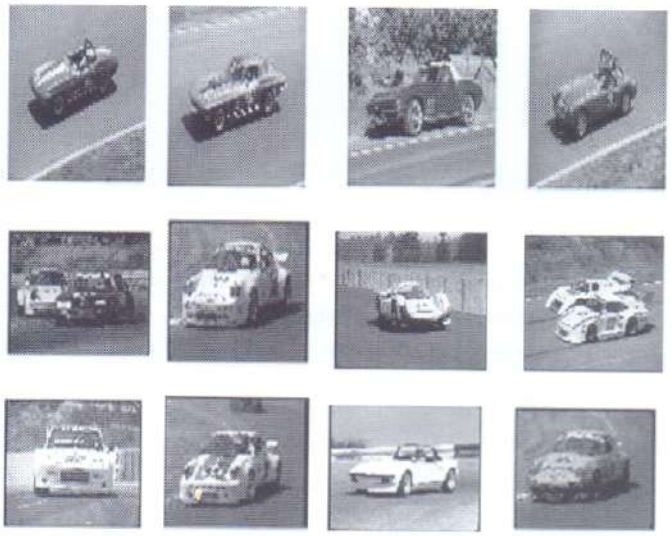

Fig.2a. Proposed CBIR system Results (Color & shape) system: 9 matches out of 12.

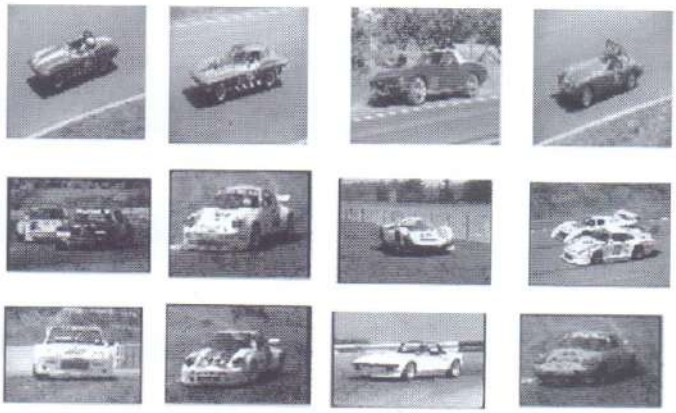

Fig. 2b. Proposed CBIR system Results (Color & texture) system: 10 matches out of 12

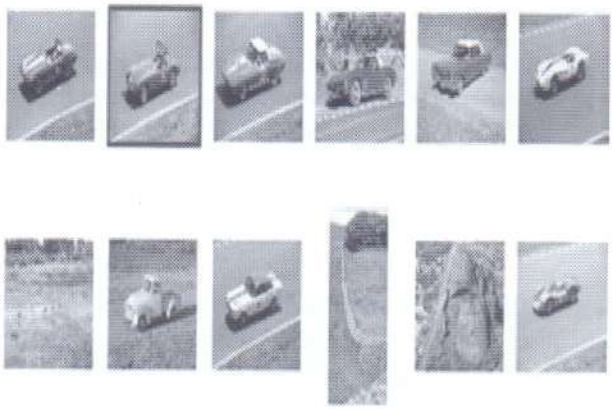

Fig. 2c. CLUE system Results: 8 matches out of 12

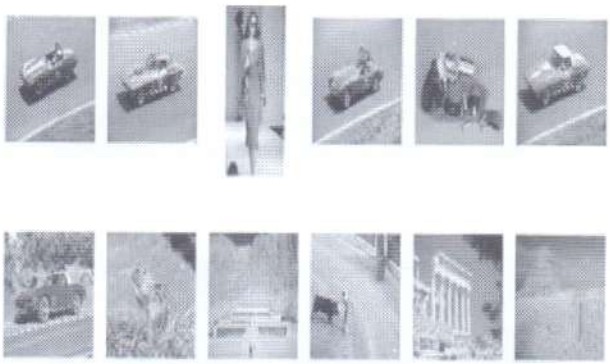

Fig. 2d. CLUE system Results: 4 matches out of 12

Fig.2: Comparison of results of the Proposed CBIR, CLUE and UFM for car category on image database1. The query image is the upper-left corner image of each block of images.

CBIR system Results of Database 2

Fig. 3a: Proposed CBIR system Results (Color & shape) system: 11 matches out of 25.

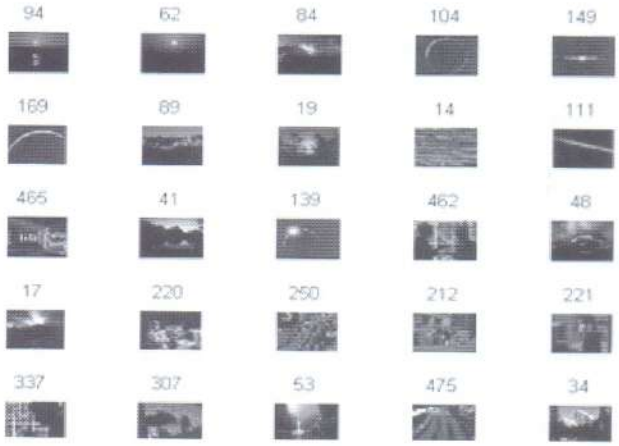

Fig. 3b: Results of the Proposed CBIR system on image database3.CLUE and UFM not shown, The query image is the upper-left corner image of each block of images.

CBIR system Results of Database 3

Fig. 4a. Proposed CBIR system Results (Color & shape) system: 10 matches out of 25

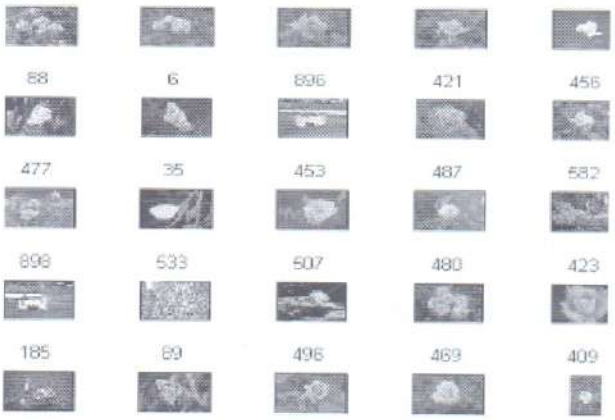

Fig. 4b. Proposed CBIR system Results (Color & Texture) system: 16matches out of 25

TABLE 1:
Semantic Descriptor of the images of COREL Database resolution 256 X 384

Category No	Category Name
1	African people and village
2	Beach
3	Building
4	Buses
5	Peacock
6	Elephants
7	Flowers
8	Horses
9	Mountains and glaciers
10	Food

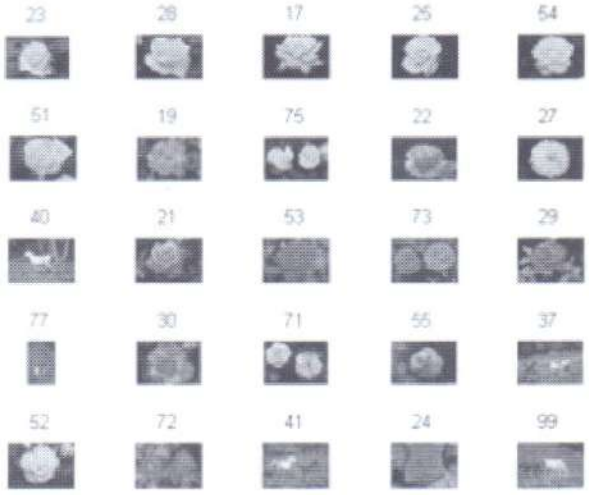

Fig. 5a. Proposed CBIR (shape-color) system Results: 21 matches' out of 25

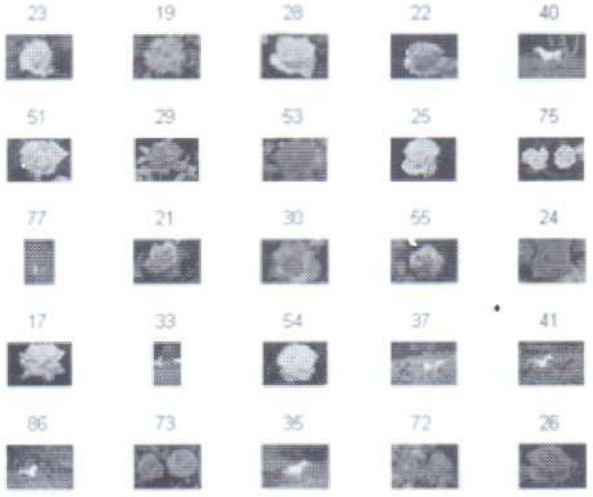

Fig. 5b: Proposed CBIR (texture & color) system Results: 19 matches out of 25

Table 1 shows that database of different categories and each category have 100 images, hence the total images it contains 1000.

TABLE 2:
Comparison of performance of Proposed CBIR, CLUE, and UFM using precision for each category of Database 4

ID	Category Name	Precision at 100(UFM)	Precision at 100(CLUE)	Precision at 100(Shape-Color)	Precision at 100(Texture-Color)
1	People	0.38	0.49	0.53	0.53
2	Beach	0.29	0.34	0.42	0.43
3	Building	0.34	0.35	0.37	0.4
4	Buses	0.61	0.63	0.62	0.65
5	Dinosaurs	0.93	0.96	0.95	0.92
6	Elephants	0.23	0.28	0.3	0.32
7	Flowers	0.63	0.75	0.74	0.77
8	Horses	0.62	0.7	0.77	0.78
9	Mountains	0.25	0.28	0.3	0.3
10	Food	0.45	0.6	0.64	0.65
Average		0.473	0.538	0.564	0.575

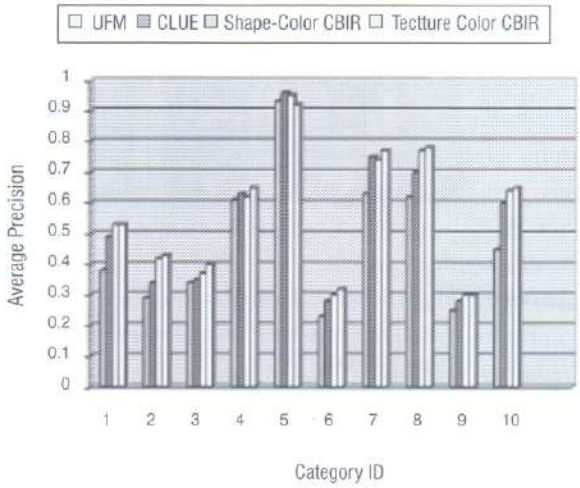

Fig. 6: Results of Comparison of proposed (Shape-Color && Texture-Color) CBIR with CLUE and UFM on the Average Precision for each category.

Table 2 shows that precision at 100 in both proposed approaches in almost all categories are better than CLUE and UFM approaches that described in [6]. Fig. 7 shows that on each resolution of image database proposed approach outperform.

IV CONCLUSION

This paper proposed a content based image retrieval system based on unsupervised learning, where in, I combine all the features values namely shape, color and texture of an image for assigning a weight on different images (as a target images) in the image database with threshold of 60%. I can take any value as a threshold means minimum value of matching individual feature as well as combined of both features value. I tested it on threshold value 60 and we got the better results in comparison to given precision value by UFM and CLUE

TABLE 3:
Average Precision on each resolution of image database

Image Database	UFM	CLUE	ICLUE (S&C)	ICLUE(T&C)
Database 1 (185X84)	0.28	0.55	0.69	0.76
Database 2 (185X96)	0.36	0.37	0.42	0.44
Database 3 (185X85)	0.39	0.41	0.49	0.52
Database 4 (384X256)	0.473	0.538	0.564	0.575

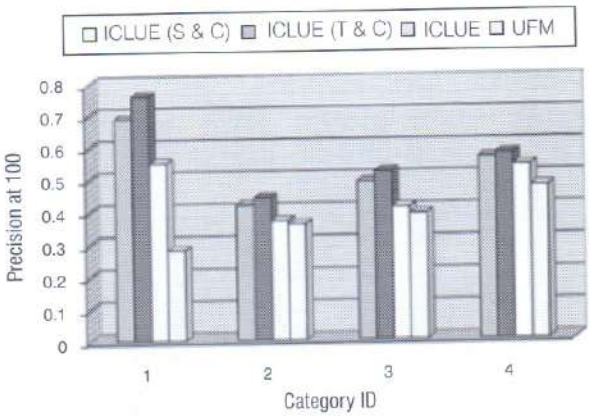

Fig. 7: Pictorial representation of Table 2 comparison shown on each resolution of image database

on [6]. I experimented with a standard image database of four different resolution of image each database consisting of approximately 1000 images to compare the performance of the proposed systems by combining both shape-color features and color-texture features with two other existing CBIR systems. In our experiments, I used Euclidean distance as the similarity measure for computing the similarity of images in the database with a query image. Experimentally, I found that the proposed CBIR systems gives better results than the CLUE and UFM based CBIR systems in almost all categories of an image databases.

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