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A Survey on Different CBIR Techniques

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***Abstract*— A lot of information from older books, newspapers, journals etc. has been digitized and revealed in computer understandable formats in the past few decades. A huge amount of archives of films, images, music, books, satellite pictures, magazines and newspapers, have been made available for computer users. Human can access this enormous amount of information with the help of internet. A lot of information offered about a specified topic on the internet, so one of the utmost challenges of the WWW (World Wide Web) is to discover accurate and appropriate information from this large amount of information. Most of the users recognize what information they want, but they are unconfident where to discover it. Search engines provide the facility for users to discover such related information. With the fast expansion and huge utilization of multimedia and digital collection, content-based image retrieval (CBIR) gained a great fame from the last decade and come out as an essential area of research. CBIR is a system which employs visual contents to discover images from huge extent image databases in accordance with user concern. In this paper, we have provided a survey of different CBIR techniques.**

***Keywords*— Digital Image Processing, Image Retrieval, CBIR, Texture, Color, Shape.**

I. INTRODUCTION

From last few decades, the size of the digital image database has increases very rapidly. There are various sources of digital images like- satellite, civilian equipments, military, computer etc. which generates gigabytes of digital images daily and enormous quantity of data and knowledge are out there. Still, we can't gain or utilize this data or information, except if it is arranged, so as to permit important operations (like- browse, search, and retrieve) efficiently. Since 1970s the field of image retrieval has been too vital investigation field, through the faith from two most important investigation groups, computer visualization and database management. Both the investigation groups examine image retrieval from various viewpoints, from these one is based on text and other is based on visual [1] [2].

A well-liked image retrieval system was proposed in 1970s, which first interpret the digital images via text and after that apply text based DBMS to execute image retrieval. There are various expansion have been done towards this research like- data modelling, query assessment, and multidimensional indexing. Still, there are two main complexities, mainly when the range of image database is very huge. The first problem is the huge amount of effort desired in physical image annotation. Second and most important is to get correct outcomes according to the users demand from the huge content in the images. Specifically, for the analogous image content diverse user may view it in a different way. The user's demand and annotation indefiniteness may origins unrecoverable imbalances in ensuing retrieval methods. To defeat these troubles, content based image retrieval (CBIR) was offered in 1990s. Specifically, rather than being physically annotated by means of text based keywords; images probably indexed via visual content that they hold, for instance color, shape and texture [1] [2]. Figure-1 shows the types of image retrieval techniques.

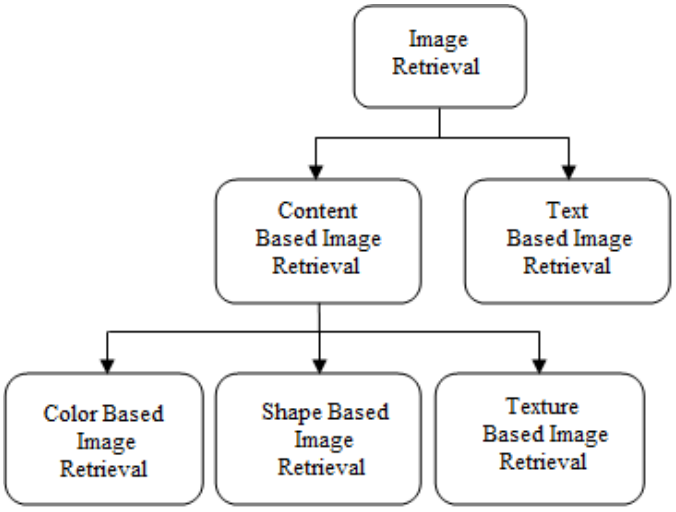

Figure-1: Image Retrieval Techniques

CBIR also famous as a content based visual information retrieval (CBVIR) and also as query by image content (QBIC) are the utility of computer visualization methods to the image recovery crisis, to be precise, the trouble of discovering for images in huge image databases. Content based indicates that the system examines the visual contents of the image that they hold in place of the metadata for instance- keywords, tags, or descriptions related with the digital image. Here, word "content" indicates- color, shape, texture, or any knowledge that can be obtained from the digital image itself. CBIR is wanted since investigations that entirely trusts on metadata are relying on the quality of annotation and comprehensiveness [3] [4].

II. LITERATURE SURVEY

Carrying out literature analysis is very major part in any research project as it obviously establishes the requirements of the work and the background improvement. It makes related queries regarding enhancements in the study previously done and permits unsolved problems to come out and thus clearly describe all boundaries concerning the development of the research plan. A lot of research effort has been done in the arena of image retrieval in digital image processing (DIP) and still a lot essential to be

complete on it. Many investigators have suggested their research work in this arena some of the most notable research works are revealed in this section is as follows.

A. Wei-Ying Ma and B. S. Manjunath [5]:

The authors of [5] have suggested a prototype (NETRA) for image retrieval which was evolved at the University of California at Santa Barbara. In this work authors extract the features of images with the help of a hybrid approach which join- shape, texture, and color information from an image by means of indexing method. The most essential characteristic of this prototype is to make use of segmented local areas for indexing of images within the image database. Hence, local and global both kinds of features are utilized. Due to the dependency of NETRA is on low level feature relationship of images and because of the semantic gap they were incapable to gather the concentration of the user, it was shortly recognized that the efficiency of NETRA was restricted. To overwhelm from this restriction, most CBIR systems usually employ mouse clicks and further traditional forms of feedback to recognize the areas or objects of attention.

B. Rong Zhao and William I. Grosky [6]:

The authors of [6] have bridged the semantic gap among the lower level features and higher level features/semantics in the interface among user and system with the help of latent semantic analysis. In this paper, latent semantic analysis discovers diverse image features co-occur by means of analogous annotation keywords and subsequently lead to upgraded methods of semantic image retrieval. Conversely, it is noticed that latent semantic analysis is not exactly and efficiently discovers the features of image. Future research direction is towards refining characteristics of Content Based Image Retrieval systems by means of efficiently discovering the latent correlation among lower level features and higher level semantics and then mixing them into an integrated vector space model.

C. Peter Stanchev, David Green Jr., and Boyan Dimitrov [7]:

The authors of [7] have suggested that a number of visual descriptors are be present for signifying the physical content/properties of images, for illustration shapes, color histograms, textures, regions etc. The authors have observed that when they perform similarity search then, some features of images are more effective than the other image features and they were also observed that this effectiveness of features is depend on the explicit characteristics of a data set, for illustration, descriptors centered on color demonstration might be effective for a data set which contains mostly black and white images. The techniques which are based on statistical study of the data set and requests are advantageous. In general, it is not probable to overwhelm the semantic gap in the image extraction by means of feature similarity, it is quite probable to enhance the retrieval effectiveness with the help of appropriate choice of the image features, amongst those in the MPEG-7 standard, relying on the characteristics of the several image data sets (noticeably, the more uniform the data set is, superior results can be attained).

D. S. Nandagopalan, Dr. B. S. Adiga, and N. Deepak [8]:

A Universal Model for Content Based Image Retrieval is presented in [8], which unites 3 feature extraction techniques to be precise- the edge histogram descriptor, color feature and texture feature. All the properties of the image are analyzed with the help of image processing algorithms and computer vision in this work. The color feature is calculated with the help of histogram of images, the texture feature is calculated with the help of co-occurrence matrix based entropy, energy etc. and the edge density is calculated with the help of Edge Histogram Descriptor (EHD). An innovative idea for efficient image retrieval is established which is based on greedy approach to diminish the computational difficulty. All these present methods requisite large storage space and more computation time to estimate the matrix of features.

E. Chih-Chin Lai and Ying-Chuan Chen [9]:

The authors of [9] have made their effort towards decrease the gap between the retrieval conclusions and the users' expectation by establishing an algorithm known as interactive genetic algorithm. In this paper authors have exploited the properties of color alike the image bitmap, standard deviation and mean value and the properties of texture for instance entropy rest on the gray level co-occurrence matrix and also the edge histogram. The algorithm (interactive genetic algorithm) suggested by authors in this research work is very complex for examination of images and also the entropy feature is utilized for texture feature calculation in which data allocations leads to absences of the constraints.

F. Sagar Soman, Mitali Ghorpade, Vrushali Sonone and Satish Chavan [10]:

The authors of [10] have employed CBIR (Content Based Image Retrieval) method on texture and color of images to retrieve requested image. In this paper, authors utilized two different methods for feature extraction. Common CBIR (Content Based Image Retrieval) system make use of shape, color, and texture as the base measure for feature mining technique to get superior search outcomes if we request images from given databases. In suggested content based image retrieval system, authors make use of texture as well as color feature of image for image feature mining. With the purpose of retrieve texture feature authors applied block wise DCT (Discrete Cosine Transforms) on whole image and to excerpt color feature authors employed moments of colors technique (deviation, skewness and mean) on the images of database. For attaining superior outcomes in image retrieval authors were compare the feature vectors of the request image and the feature vectors of the database images. Authors were computed the separate and collective vectors by employing texture and color features and in comparison with separate vectors authors exposed that collective feature vector results are superior. In this research work- texture feature have extracted by employing DCT (Discrete Cosine Transforms)

and there are some drawbacks of DCT like- it is very complex process, it not create better image features and its application area is limited to the image compression. The proposed approach by the authors makes use of the mixture of features therefore it required extra memory to store the features of images.

G. Pooja Verma and Manish Mahajan [11]:

The writers of [11] have employed canny and sobel edge finding scheme for extracting the shape characteristic of a digital image. Afterward, the grouped images are indexed to uncomplicated the procedure of applying mining method with the intention of mine the correlated images from the image database. The mining of digital images from the vast database as necessary by the user can attain rightly by means of canny edge recognition scheme, as the outcome exposed by the instigators. In this work, instigators compare the final results based on the shape attribute of digital images which is took out through canny and sobel edge recognition scheme, however the final outcome haven't any expansion as contrast to outcomes formed when we acquire the color element of a given digital image.

H. Swapnalini Pattanaik and D.G. Bhalke [12]:

The authors of [12] have exposed an uncomplicated thought for efficient mining of images from a particular database by employing universal elements of Multimedia Content Description Interface- 7. To signify a set of usual schemes for representing multimedia content is the prime objective of Mpeg-7 and additionally it authorizes fast and efficient content detection with a massive amount of application area. In this work, instigators employed color structure descriptor for color attribute mining and edge histogram descriptor is employed for texture feature retrieval. The competence of content based image retrieval scheme can also boost with the help of these two image elements. In this work, instigators employed MPEG-7 descriptors to attain better outcomes although the implementation of MPEG-7 descriptors is complicated and time consuming.

I. Devyani Soni and K. J. Mathai [13]:

The authors of [13] have offered an approach for image retrieval which reliant on text, color space approaches through color histogram technique and color correlogram technique. Color space approaches employed local color histogram and global color histogram and afterward which are applied on- RGB color space and HSV color space, and ultimately they were equated. The second order statistical scheme which is utilized for calculating spatial correlation is known as color correlogram. In this research work, primarily the image will be examined with the help of annotated text and after that the color features are discovered by utilizing color correlogram and color histogram. The color correlogram attains the good image retrieval performance amongst many others, for instance color coherence vector, color histograms, but it arises with several infeasibility difficulties for example its massive memory necessity and computational difficulty.

III. Architecture of CBIR System

In CBIR scheme the images are retrieved based on their visual features for instance shape, text, and color. There are various CBIR systems at this time are present and also are being frequently extended. Figure-2 shows the basic architecture of CBIR system.

The CBIR system works in three stages as displayed in figure-2, which are- decomposition and feature extraction of image, indexing & clustering image features and comparison of image features. The short description of these stages is as follows-

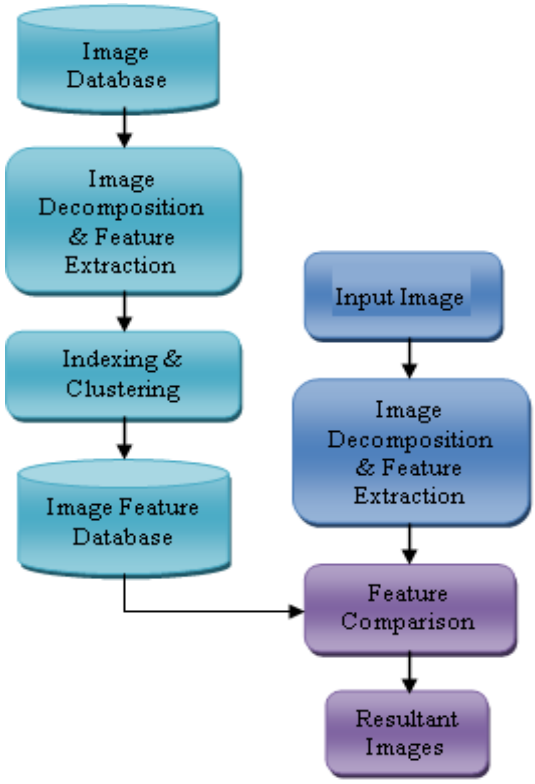

Figure- 2: Architecture of CBIR System

I. Image Decomposition & Feature Extraction:

In this stage, images of database will decomposed by utilizing any decomposition technique, for instance- Haar wavelet transform. Initially, Haar wavelet transform decompose the images in lower dimension and then the color feature (intensity) data base will be made for all the database images. In this stage, every image of database is transformed in to the matrix form, this matrix consist the intensity values (RGB values). In RGB scheme we just get the color means intensity values of the pixels generated by Haar wavelet transform.

II. Image indexing & Image clustering:

In this step, the images that are stored in database (that are already broken and then altered to color element database in earlier step) are indexed and grouped by means of any clustering technique for example- k-means clustering scheme. In this stage identical images are kept into same group/cluster. The indexing & clustering of images improve the effect of searching process and also help in handling the large database easily.

III. Image Search & Image Retrieval:

As we supply a digital image as input to the projected image retrieval system, it broken the image and mines the color attributes and constructs a matrix for color attributes, as described above (for database images in which we will search the input image). Now the color features of input image are equated with the color features of the other images (images present in database) with the help of any similarity measure technique for example- Euclidian similarity function. The search results produced by Euclidian similarity may be the final outcomes or results may be further refined by other criteria factors like- threshold or any other filtering constant. On the basis of above criteria the CBIR system returns the most appropriate images as output.

IV. CONCLUSION

Due to development of multimedia technology and increasing vogue of the computer network, the conventional information/image retrieval systems are not able to overcome the users' current needs. There are a range of arenas in which digital images are utilized like- engineering, surveillance, commerce, crime preclusion, hospitals, historical investigations, architecture, finger print identification, graphic design, academics, government institutions, fashion, etc. In this paper, we have provided a survey of different CBIR techniques. We have surveyed various CBIR schemes from that some uses color, some utilizes texture, some uses shape or some uses combination of any two or all the visual characteristic of a digital image to get requisite digital image from a huge database. Because of the widespread demand of efficient image retrieval scheme, in near future we will make a new CBIR based scheme to enhance the retrieval precision and minimized the retrieval time.

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