Content Based Image Retrieval by Using Interactive Relevance Feedback Technique – A Survey

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Abstract— Due to rapid increase in storing and capturing multimedia data with the digital device, Content Based Image Retrieval play a very important role in the field of image processing. Although wide ranging studies have been done in the field of CBIR but image finding from multimedia data basis is still very complicated and open problem. If paper provide an review of CBIR based on some of the famous techniques such as Interactive Genetic Algorithm, Relevance Feedback (RS), Neural Network and so on. Relevance Feedback can be used to enhance the ability of CBIR effectively by dropping the semantic gap between low level feature and high level feature. Interactiveness on CBIR can also be done with the help of Genetic Algorithms. GA is the branch of evolutionary computation which makes the retrieval process more interactive so that user can get advanced results from database by comparing to Query Image with its evaluation. The result of traditional implicit feedback can also be improved by Neuro Fuzzy Logic based implicit feedback. This paper covers all the aspect of Relevance Feedback (RF), Interactive Genetic Algorithms, Neural Network in Content Based Image Retrieval, various RF techniques and applications of CBIR.

Keywords:- CBIR, Neuro-fuzzy logic, Relevance Feedback, Interactive Genetic Algorithm, Image Retrieval (IR).

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I. INTRODUCTION

Content Based Image Retrieval: - CBIR is one of the technique in which image retrieval is carried out according to image feature that reduce the rate of regularity difficulty in image retrieval. To construct having important effect descriptions of physical attributes from images to accelerate efficient and effective retrieval is the main challenge of the CBIR system. CBIR has become an energetic and fast- improving research area in image retrieval in the last few years. Due to this CBIR have improved in lots of way such as region-level features based, relevance feedback, semantic based etc. Content based features are chiefly divided into two main region; Common visual features and Field Specific visual features such as face recognition, task dependent applications etc. On the other hand, high level features include semantic based image retrieval computed from text description or by complex algorithms of visual features. The combination of these content based features is required for improved retrieval of image according to the application. These are the features of the image [1].

Color: color is one of the high level and visible feature of image retrieval system that is used mostly in all CBIR system.

Texture: This feature is use to identify the structure and randomness of the image. It is described the information of local shape and color feature. Structural schemes contain graphical technique which measured to be more resourceful when applied to the texture. Randomness methods symbolize Tamura features, Markov random field, wavelet transform, dual tree complex wavelet and contour lets. Texture can be represented by Grey Level Co-occurrence matrix. Texture is an essential quality for general images but its comprehensive definition does not exist still yet.

Edge: Edge detection is one of the low level feature of CBIR system. It defines the method of inspection and locating sharp and indefinite in the image. Typically Classical edge detection schemes occupy the image with an operator (2-D filter), which is constructed to be influence to large gradient in the image while inveterate values of zero in uniform regions. There are lot of edge detection operators existing, each design to be sensitive to certain types of edges. Variables involved in the selection of an edge detection operator include:

Edge orientation: The geometry of the operator determines a characteristic way in which it is most responsive to edges. Operators can be optimized to look for parallel, perpendicular, or sloping edges.

Noise environment: Edge detection is difficult in noisy images, hence both the noise and the edges having high frequency content. Attempts to reduce the noise result in blurred and distorted edges. Operators used on noisy images are typically

larger in scope, so they can average enough data to discount localized noisy pixels. This results in less accurate localization of the detected edges [2].

Relevance Feedback:- RF is the technique that covers the semantic gap between CBIR system and users. Semantic gap is the difference between the user information needed and the image representation. The limited retrieval accuracy of image nuclear retrieval systems is essentially due to the intrinsic semantic gap. In order to reduce the gap, relevance feedback is very helpful into CBIR system.

The basic idea behind relevance feedback is to integrate human perception subjectivity into the query and involve user to evaluate the retrieval results. Then depending upon user's integration the similarity measures are automatically refined. There are lots of CBIR algorithms has been proposed and most of them work on the finding effectively specific image or group of relevant image to that query image using similarity computation phase. But it is necessary to have user's interaction to get better results. Thus in order to achieve a better approximation of the user's information need for the following search in the image database, involving user's interaction is necessary for a CBIR system [3].

Interactive Genetic Algorithm:- GA within the field of image processing are proposed as a robust, computational and stochastic search procedures modeled on the mechanic of neural genetic System. Normally a GA contains a fixed-size population of potential solutions over the search space. These potential solutions of the search space are encoded as binary or floating-point strings, called chromosomes. The initial population can be created randomly or based on the problem-specific knowledge.

IGA is a branch of evolutionary computation. The construction of the fitness function is the main difference between Interactive Genetic Algorithm (IGA) and Genetic Algorithm (GA). The fitness is determined by the user's evaluation and not by the predefined mathematical formula. A user can interactively determine which members of the population will reproduce, and IGA automatically generates the next generation of content based on the user's input. Through repeated rounds of content generation and fitness assignment, IGA enables unique content to evolve that suits the user's preferences. Based on this reason, IGA can be used to solve problems that are difficult or impossible to formulate a computational fitness function, for example, evolving images, music, various artistic designs, and forms to fit a user's aesthetic preferences.

Neuro-fuzzy logic: - Neuro-fuzzy inference system is one of the latest techniques that implements fuzzy inference system in the frame work of adaptive network. Basically NFIS is a feed forward neural network, in which the parameters of the square

notes need learning. The learning of fuzzy inference system is the adjustment about the antecedent parameters and consequent parameters [4].

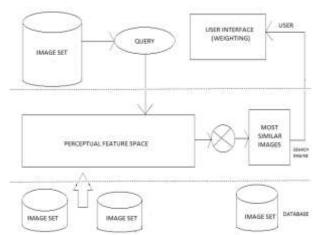## II.   CONTENT BASED IMAGE RETRIVAL: OVERVIEW

Figure. 2.1 Shows A Generic Description of A Standard Image Retrieval System.

Any CBIR system involves at least four following steps: -

- Feature extraction and indexing of image database according to the chosen visual feature color, shape, texture or any combination of the above.
- Feature extraction of query image(s).
- Matching the query image to the most similar images in the database. This forms the search part of the CBIR.
- User interface and feedback which checks the display of the outcome images [6].

III.   ADVANTAGES OF CBIR

- Easy to implement.
- Fast retrieval.
- Web image search (surrounding text).

IV.   DISADVANTAGES OF CBIR

- Manual annotation is not always available.
- Manual annotation is impossible for a large DB.
- Manual annotation is not accurate.
- A picture is worth a thousand words.
- Surrounding text may not describe the image.

V.   APPLICATIONS OF CBIR

- Crime prevention: Automatic face recognition systems, used by police forces.
- Security Check: Finger print or retina scanning for access privileges.
- Medical Diagnosis: Using CBIR in a medical database of medical images to aid diagnosis by identifying   similar past cases.

- Intellectual Property: Trademark image registration, where a new candidate mark is compared with existing marks to ensure no risk of confusing property ownership.
- Architectural and engineering design Designer needs to be aware of previous designs, particularly if these can be adapted to the problem at hand. Hence the ability to search design archives for previous examples which are in some way similar, or meet specified suitability criteria, can be valuable.

VI. RELATED WORK

Hiremath, P.S. Pujari, J. refers to the visual patterns that have properties of homogeneity or arrangement that do not result from the presence of only a single color or intensity. Various texture representations have been investigated in pattern recognition and computer vision. Two classes of texture representation methods can be distinguished: structural and statistical. Structural methods, including morphological operator and adjacency graph, describe texture by identifying structural primitives and their placement rules. They deal with the arrangement of image primitives, for instance, presence of parallel or regularly spaced objects. On the other hand, statistical methods, which include the popular co-occurrence matrix, Fourier power spectra, shift invariant principal component analysis (SPCA), Tamura feature, multi-resolution filtering techniques such as Gabor and wavelet transform, characterize texture by the statistical distribution of the image intensity. The comparison of images in the context of image retrieval using texture feature is ultimately linked to the representation employed for the texture [5].

Mianchu Chen, Ping Fu, Yuan sun, Hui zhang proposed the Color represents one of the most widely used visual features in CBIR systems. First a color space is used to represent color images. Typically, RGB (red Green Blue) space, where the grey level intensity is represented as the sum of red, green and blue grey level intensities, is widely used in practice. Next, a histogram, In RGB space, one histogram for each basic color is needed-, is employed to represent the distributions of colors in image. [7]

Chin-Chin Lai et.al. have proposed an interactive genetic algorithm (IGA) to reduce the gap between the retrieval results and the users' expectation .They have used Color attributes like the mean value, standard deviation, and image bitmap .They have also used texture features like the entropy based on the gray level co-occurrence matrix and the edge histogram.[10]

Sung-Bae Cho and Joo-Young Lee had proposed a Human - Oriented Image Retrieval System to extract the feature from images by wavelet-transform and provide a user friendly means to retrieve an image from a large database when the user cannot clearly define what the image must be [12].

Linying Jiang et.al have proposed CBIR algorithm oriented by Users Experience in order to improve the storage competence, retrieval speed and accurateness of the existing CBIR algorithm as well as to improve the quality of user experience[13].

N.Srikrishna, K.Vindhya and P.Satyanarayana propose a neuro-fuzzy technique for CBIR. The CBIR technique is based on fuzzy interpretation of natural languages neural network learning and searching algorithms. Initially, fuzzy logic is developed to interpret natural expression like most, many and few. In other hand, a neural network is calculated to learn the meaning of most reddish, many reddish and few reddish. The neural network is self determining to the database used, which avoids retraining of the neural network. Lastly, a binary search algorithm is used to competition and display neural network's output and images from database. The future techniques are very exceptional and the modernization of this research is not only based on hybrid approach to CBIR but also on the fresh idea of training neural network on queries. One of the unique aspect of that research is the neural network is design to learn query and not databases. The technique can be used for any real-world online database [14].

Ganar, A.N. Gode and C.S. Jhambulkar proposed Shape extraction, which includes edges, contours, becomes an established field in itself in image processing community and various methods have been put forward. Typically, one distinguishes two main streams in this respect: methods based on quantifying edge strength using gradient like method, then looking for its local directional maxima, and methods based on search for zero-crossing in a second order derivative expression, e.g., Laplacian-like approach [15].

Ritendra Datta, Jia Li James and Z. Wang have proposed the last decade has witnessed huge interest in research on CBIR. This has covered the method for a large number of fresh techniques, and a mounting interest in associated fields to support such systems. Correspondingly, digital imagery has expanded its prospect in many directions, resultant in an detonation in the volume of image data necessary to be organize. They discuss some of the main contributions in the current decade related to image retrieval (IR) and automated image annotation. They are also discuss few of the key challenges involved in the adaptation of existing image retrieval techniques to build useful systems that can handle real world data [16].

Reshma Chaudhari and A. M. Patil have proposed CBIR uses the visual contents of an image for example shape, color, and spatial layout to represent and index the image. Active research in CBIR- is geared towards the growth of method for analyzing, interpret classification and indexing image database. In adding to their growth, efforts are also being made to assess the act of IR systems. The quality of response is heavily reliant on the choice of the method used to produce feature vectors and parallel measure for evaluation of features. They found an algorithm which incorporates the compensation of various other

algorithms to get better exactness and performance of retrieval. The exactness of color histogram based matching can be increased by using Color Coherence Vector (CCV) for successive alteration. The speed of shape based retrieval can be enhanced by considering comparatively truthful shape rather than the exact shape. In addition to this a combination of color and shape based retrieval is also included to get better the exactness of the result[17].

Manimala Singha and K. Hemachandran have proposed Content Based Image Retrieval Technique can be found in a number of dissimilar domains such as Remote Sensing and Earth Resources Management. The CBIR, using features like shape, texture and color, called Wavelet Based Color Histogram Image Retrieval. The texture and color features are extracting through wavelet transformation and color histogram and grouping of these features is robust to scaling and translation of objects in an image. The proposed system has established a talented and faster retrieval method on a WANG image database containing 1500 general-purpose color images. The act has been evaluated by evaluating with the existing systems in the literature [18].

A. Ramesh Kumar and D. Saravanan Content-based image retrieval (CBIR) scheme searches the most-similar images of a query image that involve in evaluate the feature vectors of all the images in the database with that of the query image using some pre-selected similarity measure, and then sorting of the results. On query an image a reduced set of candidate images which have similar Grid Code as that of the query image is obtain. The color histogram for an image is constructed by quantizing the colors within the image and counting the number of pixels of each color. The feature vector of an image can be derived from the histograms of its color components and finally can set the number of bins in the color histogram to obtain the feature vector of desired size. Thus the grid code of an image is obtained through the quantization of the feature vector derived from the histogram of the desired color component of the image. In order to have similar features of the images the grid code must be same for all Images in the grid. Experimental result show confirms that the proposed method is most effective [19].

Simardeep Kaur and Dr. V.K. Banga Proposed the CBIR is an lively research field in past year. Against the conventional system where images are retrieved based on the keyword search, Content Based Image Retrieval system retrieves the images based on the visual content. The presentation of HSV color space is evaluating on the basis of exactness, accuracy and Recall. We present HSV based color space image retrieval method based on the color distribution of the images [20].

R. Priyatharshini, Surendernath S.P and Dr. S. Chitrakala have proposed computer technology and World Wide Web (WWW) there has been a detonation in the amount and complexity of multimedia data that are generated, stored, transmitted, and accessed. In systematize to extract useful information from this massive amount of data, many CBIR systems have been developed in the last past year. A typical CBIR system captures image features that represent image properties such as color, texture, or shape of objects in the uncertainty image and aim to retrieve images from the database with similar features. Retrieval efficiency and accuracy are the key issues in designing CBIR System. The Shape and Spatial features are quiet easy to derive and effective. Researchers are moving towards finding spatial features and the scope of implementing these features in to the image retrieval framework for reducing the semantic gap [21].

VII. CONCLUSIONS

Network and development of multimedia technologies are attractive more popular, users are not satisfied with the established information retrieval techniques. So now days the CBIR are becoming a source of exact and fast retrieval. There are various applications of CBIR in field of medicine like dermatology, blood cell detection etc. Thus, field of CBIR is very useful for practical reasons. The purpose of this survey is to provide an overview of the functionality of content based image retrieval systems. Most systems use color and texture features, few systems use shape feature, and still less use layout features. With the aid of genetic algorithm based similarity measure and use of feedback techniques, images that are similar to the query image are retrieving effectively and efficient. Use of genetic algorithm in CBIR system reduces the computation time. This new approach reduce "semantic gap" between the human perception and visual content and increase performance of system.

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