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A REVIEW APPROACH ON CONTENT BASED IMAGE RETRIEVAL TECHNIQUES FOR NATURAL IMAGE RETRIEVAL

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ABSTRACT

Content Based Image Retrieval (CBIR) is the technique for data retrieval especially images from a broad collection of database. The CBIR development requirement is increased due to growth in the images as well as the well known application in multiple fields. The common behavior to represent and index the images is color, texture, shape and spatial layout. Since the multimedia technologies development and network are very popular nowadays, the users with the standard retrieval techniques are not satisfied. Research: Based on retrieving the particular query, the content based image retrieval will arises. For retrieving the relevant images which meets the information needed by the user, an automated search is introduced for the images having the similar features. Motivation: The main motivation for developing the effective CBIR images arises due to the necessity for exploring the growing images. Several models and algorithms for image retrieval developed for past twenty years. This survey analyzed, compared and discussed about the techniques for content based image retrieval.

KEYWORDS: Content based Image Retrieval, Color based Retrieval, Texture based Retrieval, and Shape based Image Retrieval.

INTRODUCTION

Content Based Image Retrieval (CBIR) is a technique that helps to access and arrange the digital images from a large collection of databases by using the images features. Several images are uploaded every day in the social networks in this modern period. A new technique is required for uploading the images in the social networks. A new technique is developed for handling the huge data is CBIR technique. Content based image retrieval is the method which helps us to arrange and access the images from a huge collection of databases using the features of images. In this method, the images are retrieved using texture, color and shape. The methods, algorithms and tools are used for CBIR which originates from several fields such as signal processing, statistics, computer vision and pattern recognition. Many companies have large database, where there is a need for a method which have to search and retrieve the images accurately and efficiently. To meet this need, there are two processes in retrieval in general. The initial step is the feature extraction step, it will identify the unique signature which is called as feature vector based on pixel values. The image content characteristic is described by the feature extraction. The features are classified as low-level and high-level. The preceding step is the classification which matches the extracted features for image query with the image features in the database based on their similarity. The content based image retrieval includes the following systems

Color-based retrieval

Color feature is the most important image feature and generally histogram is used to describe it. Color histogram is the frequently used method for CBIR and it describes the global color distribution. Color histogram has the characteristics of speediness, low memory space and not sensitive with the size of the image.

The retrieval based on texture feature

Specific texture is identified in an image by modeling the texture into a two dimensional gray level variation. The textures are distinguished with the brightness difference which has high frequencies in the spectrum of images. Many methods are used for texture similarity measurement by comparing the query and stored images in the database.

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The retrieval based on shape feature

Shape information is extracted for using the edge detection histogram. The techniques are used for extracting shape features, fourier descriptor, elementary descriptor, canny edge detection, quantized descriptors. But the shape features are not well developed when compared to color and texture feature extraction due to the inherent complexity for shape representation.

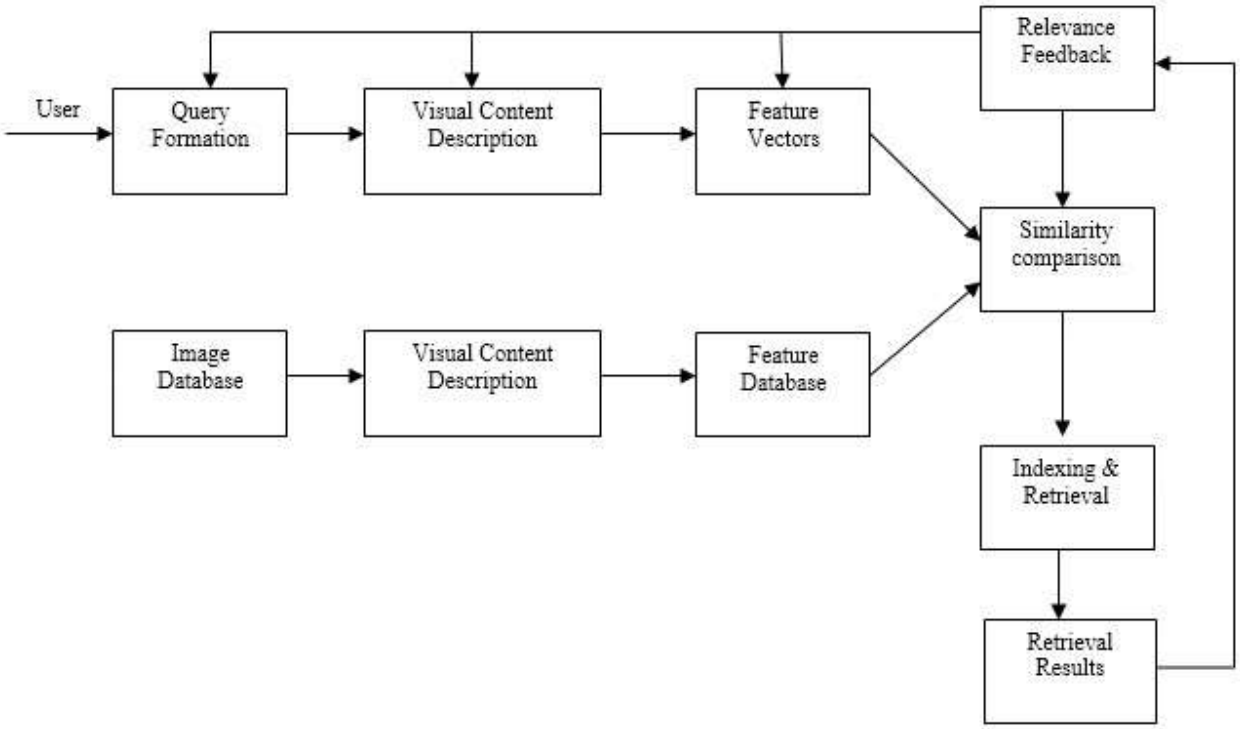

Fig. 1 Content based image retrieval

LITERATURE SURVEY

An image retrieval system is a technique for searching, browsing and retrieval the images from a large volume of digital images. Jadhav et al (2014) uses Content-Based Image Retrieval (CBIR) method for retrieving the images based on the automatically derived features such as texture, color and shape. Content Based Image Retrieval is an attractive and most growing field in the "Image Search" area, finding similar images for the given query image from the image database. KHUTWAD et al (2013) proposes a method in which combination of color and texture features of the image are used for improving the accuracy results of image retrieval. Modern image search engines retrieve the images based on their visual contents, commonly referred to as CBIR systems. Thapade (2013) focuses on efficient CBIR methods newline with help of representation of converting the visual content of newline images in feature vector. Using local tetra patterns (LTrPs) Murala et al (2012) proposed an image indexing and retrieval algorithms for CBIR. This method encodes the relationship among the neighbour and referenced pixels on the basis of directions which are calculated for the first order derivatives in horizontal and vertical directions.

Liu et al (2013) presents a novel image feature representation method, namely Color Difference Histograms (CDH) for image retrieval. This method pays more attention to color, edge orientation and perceptually uniform color differences, and encodes color, orientation and perceptually uniform color difference via feature representation, in a similar manner to the human visual system. Singha and Hemachandran (2012) introduced WBCHIR (Wavelet Based Color Histogram Image Retrieval) using the features like color and texture. Using wavelet transformation and color histogram the texture and the color features are extracted and combined these features with Robust. Iqbal et al (2012) discussed a new content-based image retrieval approach for biometric security, which is based on colour, texture and shape features and controlled by fuzzy heuristics. The proposed approach is based on the three well-known algorithms: colour histogram, texture and moment invariants. A novel algorithm called Generalized BDA (GBDA) for CBIR is

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developed by Zhang et al (2012). By adopting the differential scatter discriminant criterion (DSDC) this GBDA algorithm will rectify the singular problem. Radhedi et al (2013) employed a hybrid meta heuristic swarm intelligence based search technique known as Mixed Gravitational Search Algorithm (MGSA). To reach the maximum precision, some parameters of feature extraction are optimized. Cerra and Mihai (2012) introduced a similarity measure based on compression with dictionaries, the Fast Compression Distance (FCD), which reduces the complexity of these methods, without degradations in performance.

A fast CBIR system using the multiple support vector machine ensembles is proposed by Yildizer et al (2012). Here Daubechies wavelet transformation is used for extracting the image feature vectors. The main aim of CBIR also called as Query by Image Content (QBIC) is to help users to retrieve relevant images based on their contents. Several feature-extraction techniques viz., Average RGB, Color Moments, Co-occurrence, Local Color Histogram, Global Color Histogram and Geometric Moment have been critically compared by Chadha et al (2012). Dharani and Laurence (2013) presented a brief survey based on CBIR. The authors considered labeled and unlabelled images for image analyzing for various image retrieval processes. Akakin et al (2012) presented the development and design of multitiered CBIR system based on microscopic images which contain the images more than one diseases. This method will classify the images more efficiently because it is more difficult to discriminate the microscopic images. With respect to features which is related to low level Rehman et al (2012) analyzed the visual contents of images after extracting the images. A discussion is done for the most popular algorithms of feature extraction and relevance feedback. Arthi and Vijayaraghaven (2013) introduced the image retrieval algorithm based on CCM (Color Co-occurrence Matrix). This CCM of an image is found by HSV (Hue Saturation Value) and the compared with database images ands retrieved images.

PERFORMANCE ANALYSIS AND COMPARATIVE STUDY

AUTHOR	DESCRIPTION	PROS AND CONS
Jadhav *et al* (2014)	An image retrieval system is a technique for searching, browsing and retrieval the images from a large volume of digital images. The aim is to review the current state of the art in content-based image retrieval (CBIR), is method for the retrieving the images based on the automatically derived features such as texture, color and shape	This paper reviews the current state of the art in content-based image retrieval (CBIR), a technique for retrieving images on the basis of automatically-derived features such as color, texture and shape which is the main pros.
KHUTWAD *et al* (2013)	Content Based Image Retrieval is an attractive and most growing field in the "Image Search" area, finding similar images for the given query image from the image database. So, here proposes a method in which combination of color and texture features of the image is used for improving the accuracy results of image retrieval.	This work researched various modes of representing and retrieving the image properties of color, texture and shape. The main advantage is using the Euclidean distance equation and enhancing the search using wavelet decomposition and energy level calculation.
Thapade (2013)	Modern image search engines retrieve the images based on their visual contents, commonly referred to as Content Based Image newline Retrieval (CBIR) systems. The author focuses on efficient CBIR methods newline with help of representation of converting the visual content of newline images in feature vector	The work presented here mainly focuses on efficient CBIR methods with help of representation of converting the visual content of images in feature vector. However the impact of increasing the image database size and number of categories on the performance of proposed image retrieval methods can be one of the important works to be done further.
Murala *et al* (2012)	Using local tetra patterns (LTrPs) proposed an image indexing and retrieval algorithms for CBIR. This method encodes the relationship among the neighbour and referenced pixels on the basis of directions which are calculated for the first order derivatives in horizontal and vertical directions.	The standard local binary pattern (LBP) and local ternary pattern (LTP) encode the relationship between the referenced pixel and its surrounding neighbors by computing gray-level difference which is the benefit.
Liu *et al* (2013)	They presents a novel image feature representation method, namely color difference histograms (CDH), for image retrieval. This method pays more attention to color, edge orientation and perceptually uniform	This method is entirely different from the existing histograms; most of the existing histogram techniques merely count the number or frequency of pixels. This method pays more

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	color differences, and encodes color, orientation and perceptually uniform color difference via feature representation in a similar manner to the human visual system.	attention to color, edge orientation and perceptually uniform color differences, and encodes color, orientation and perceptually uniform color difference via feature representation in a similar manner to the human visual system.
Singha and Hemachandran (2012)	They introduced WBCHIR (Wavelet Based Color Histogram Image Retrieval) using the features like color and texture. Using wavelet transformation and color histogram the texture and the color features are extracted and combined and these combined features are robust.	The main advantage is similarity between the images is ascertained by means of a distance function and the computational steps are effectively reduced with the use of Wavelet transformation.
Iqbal *et al* (2012)	The author discuss a new content-based image retrieval approach for biometric security, which is based on colour, texture and shape features and controlled by fuzzy heuristics. The proposed approach is based on the three well-known algorithms: colour histogram, texture and moment invariants	The proposed approach is based on the three well-known algorithms: colour histogram, texture and moment invariants. These three algorithms produces results which are highly relevant to the content of an image query, by taking into account the three distinct features of the image and similarity metrics based on Euclidean measure.
Zhang *et al* (2012)	A novel algorithm called Generalized BDA (GBDA) for CBIR is developed. By adopting the differential scatter discriminant criterion (DSDC) this GBDA algorithm will rectify the singular problem	The GBDA algorithm defines the separation of different classes as a trace difference rather than a trace ratio, which can avoid the singular problem of the positive within-class scatter in the original BDA which is the main advantage.
Radhedi *et al* (2013)	They employed a hybrid meta heuristic swarm intelligence based search technique known as Mixed Gravitational Search Algorithm (MGSA). To reach the maximum precision, some parameters of feature extraction are optimized.	The pros in this work are feature extraction parameters are optimized to reach a maximum precision of the CBIR systems. Meanwhile, feature subset selection is done for the same purpose. .
Cerra and Mihai (2012)	Here, introduced a similarity measure based on compression with dictionaries, the Fast Compression Distance (FCD), which reduces the complexity of these methods, without degradations in performance.	The FCD has a reduced computational complexity with respect to the most popular compression-based similarity measure, the Normalized Compression Distance (NCD), as the latter processes iteratively the full data in order to discover similarities between the objects. At the same time, the data-driven approach typical of NCD is maintained, thus keeping a workflow with a parameter-free flavor.
Yildizer *et al* (2012)	A fast CBIR system using the multiple support vector machine ensembles is proposed. Here Daubechies wavelet transformation is used for extracting the image feature vectors.	Using data mining techniques this work not only improved the efficiency of the CBIR systems, but they also improved the accuracy of the overall process.
Chadha *et al* (2012).	The main aim of CBIR also called as Query by Image Content (QBIC) is to help users to retrieve relevant images based on their contents. Several feature-extraction techniques viz., Average RGB, Color Moments, Co-occurrence, Local Color Histogram, Global Color Histogram and Geometric Moment have been critically compared.	To enhance the adaptability of the system, this method also proposed the image cropping feature to identify the user's region of interest in a specific image which is the advantage. But the retrieval performance can be further improved by using a 'Text and Image' query system as compared to a text-only or image-only query system, which can take advantage of the keyword annotations.
Dharani and Laurence (2013)	They presented a brief survey based on CBIR. The authors considered labeled and unlabelled images for image analyzing for various image retrieval processes.	Using principles of Content Based Image Retrieval based unlabelled images will improve the performance which is the main benefit..

Akakin *et al* (2012)	They presented the development and design of multitiered CBIR system based on microscopic images which contain the images more than one diseases. This method will classify the images more efficiently because it is more difficult to discriminate the microscopic images.	This CBIR system can enable the user, e.g, a pathologist, to select multiple HPF regions from a suspected tissue and submit those images as a query to the CBIR system and retrieve the most relevant slides with their semantic annotations with higher accuracies.
Rehman *et al* (2012)	With respect to features which are related to low level they analyzed the visual contents of images after extracting the images. A discussion is done for the most popular algorithms of feature extraction and relevance feedback.	Maximum support is provided in bridging the 'semantic gap' between the level features and the perceptual knowledge present in the images with the richness of human semantics.
Arthi and Vijayaraghaven (2013)	They introduced the image retrieval algorithm based on CCM (Color Co-occurrence Matrix). This CCM of an image is found by HSV (Hue Saturation Value) and the compared with database images ands retrieved images.	This work mainly reduces the computational time and at the same time increases the user interaction. The retrieval accuracy is also increased to greater extent as the images are retrieved on the basis of both pixel information and colour feature.

PROBLEMS AND DIRECTIONS

The main problem in CBIR system is to integrate adaptable techniques for processing images for diversified categories and characteristics. Several techniques are introduced for processing the low level cues are distinguished of image characteristics. But the performance of these methods is challenged by several factors like intra image illumination variations, image resolution, non-homogeneity of inter region and intra region of textures, etc. Another major difficulty is semantic gap between inferred semantics by pixel domain processing using low level cues and human perception of given images. A real time CBIR system is developed only by optimizing than the feature processing time and query response time. If the dimensionality and space complexity of feature is optimized than the better performance can be achieved. For meeting the particular application needs, specific issues pertaining to application domain are to be addressed.

CONCLUSION

This survey discussed the major CBIR techniques which include the representation of image feature, design of system and indexing with the past and current researches achieved. Several researches issues are illustrated and future directions for solving these problems are suggested. An efficient method is required for the retrieval of images which enabling the techniques fast and scalable. In this field, the development of inexpensive, speedy and strong processors are coupled with fast memory devices are contributed a lot. So, in future immense range application can guaranteed for developing using CBIR. There are several applications in every fields using CBIR like archeology, blood cell detection, criminal investigation, satellite, etc. Hence, the CBIR is useful in every field and it is real benefit to the human life.

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