STM JOURNALS

Journal of Artificial Intelligence Research & Advances
ISSN: 2395-6720(online)
Volume 2, Issue 3
www.stmjournals.com

A Review on Image Retrieval with Its Application and Techniques

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Abstract

In the field of image processing, image retrieval is one of the most dynamic exploration field in the previous few years. In the image retrieval three main categories there are text-based, content-based and semantic-based. In content based image retrieval (CBIR) images are retrieved from their visual content such as color, texture and shapes. CBIR is used to effectively retrieve required images from a large collection of images. In this paper, the methods of CBIR are discussed, analyzed and compared. There are some different techniques for extracting color, texture and shape features. CBIR is a very important research area in the field of image processing, and comprises of low level feature extraction, such as color, texture and shape and similarity measures for the comparison of images. CBIR is the retrieving the images task from the huge database collection on the basis of the own visual content. Content ased Image Retrieval is used for image retrieval and automatic indexing depending upon the contents of images known as features. Various content-based image retrieval techniques are available for retrieving the required and classify images we are reviewing them.

Keywords: *Content based image retrieval (CBIR), image retrieval , text based image retrieval [TBIR]*

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INTRODUCTION

The term content based image *(CBIR)* retrieval can be characterized as to the retrieve image form of low level components like color, texture, shape or spatial information [1–3]. In the early era of this developing image recorded was retrieved through text description known as a TBIR [Text Based Image Retrieval]. Complete studies of this procedure can be seen [2].

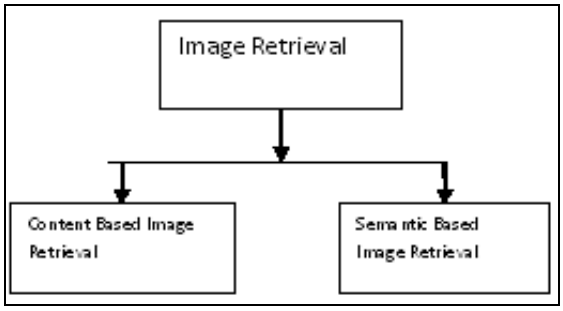

Fig. 1: *Image Based Retrival.*

Each TBIR method require the text description with images in huge scale data bases and manually this is not feasible task. As an outcome, TBIR methods were not applicable for the task dependent queries [4–10]. The process of image retrieval can be visualized as in Figure 1.

The tricky component of CBIR as shown in Figures 2 and 3 is to minimize the difference of semantic based features and content based features [4].

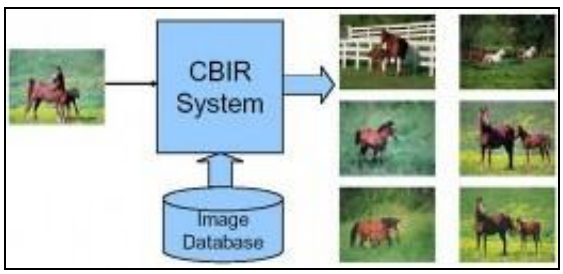

Fig. 2: *CBIR System.*

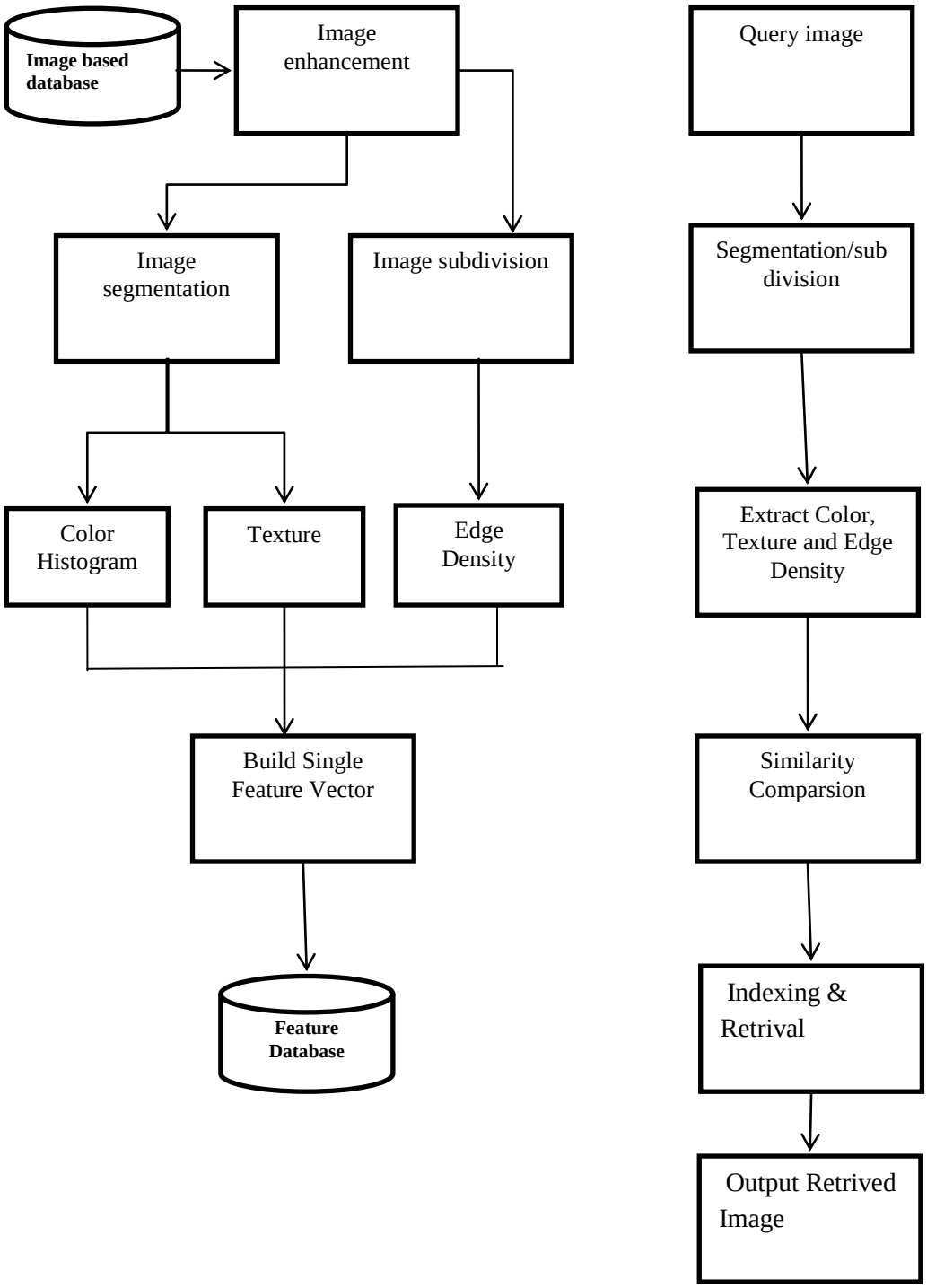

Fig. 3: *Flow Chart of Image Retrieval.*

Content Based Image Retrieval

Visual features content based are characterized into mainly two domains; field Specific visual contents like task dependent applications, face recognition etc. and common visual contents [5]. On the other different hand, high level features which include SBIR computed from text description or through visual contents complex algorithms [6]. These content based feature mixtures are required for improved retrieval of image according to application [7].

The most significant task of CBIR system is to define the exact or may be approximate matching to the query image of database image. Relevance feedback methods have been presented to create effective query outcomes through decreasing the comparative difference of semantic and content visual features [8].

Several CBIR systems used texture features and global color, whereas various used texture features and local color for improved retrieval effectiveness [9]. Later the image segmentation idea on the region basis has been suggested known as RBIR (Region Based Image Retrieval) and displays performance of better outcome [10].

Color: Color is a distinguishable and a dominant property for image retrieval. Typically CBIR systems use the dominant color descriptor, color space, histogram, moments and color coherence vector to represent color [4]. The invariant property of color has been proposed for CBIR system presently. Invariant color features are commuting on the Schafer basis model and create the outcomes like geometry view and brightness when used for the image retrieval procedure [11]. However, in parallel they also reduction the discrimination power of images [12].

Color Space: Color space contains mostly 3D color and spaces is used as a vector in it. Required color spaces for CBIR description [13]. Typically YCrCb, RGB, LAB, LUV, HSV and opponent color space are used. The color space selection is done from uniformity characteristics and consistency means to the have color points having color space same distance as perceived through the human eye.

APPLICATION OF CBIR

CBIR has numerous applications in almost each field of life.

- Few software manufactures are applying CBIR based applications into the law enforcement and internet medium fields for criminals identifying and to censor the images with the help of skin-color.
- Zoomy Images, a stock photo improved its facility through using CBIR in its visually same images and reverse image search functions, permitting customers to show more accurate search outcomes.
- Collections of Art Example:- San Francisco Fine Arts Museum
- Medical Image Databases Example:- Ultrasound, CT, MRI
- Scientific Databases Example:-Earth Sciences
- General Image Collections for Licensing
- Engineering design and Architectural
- Publishing and Fashion

CBIR TECHNIQUE

Numerous CBIR methods have been developed, but the retrieving images problem which is on the pixel content basis remains mainly unexplained.

Query Techniques

Different CBIR implementations make use of the various kinds of user queries. Query through example is a query method that includes providing the CBIR method with an example of the image that it will be then base its search upon. Underlying search algorithms may differ which is depending on the application, but outcome images should each share general element with the provided example. Providing example images options to the method contains:

- A pre-existing image may be supplied through the user or selected from a random set.
- The user draws a rough estimate of the image they are observing for example, with common shapes and blobs of color. This query method eliminates the problems that can arise when trying to define images with words.

Semantic Retrieval

The ideal CBIR system from the user perspective would include what is referred to as the semantic retrieval, where the user creates an appeal like *Find Pictures of the Abraham Lincoln*. This kind of the task of open-ended is most challenging for computers to achieve - pictures of chihuahuas and great danes seen very dissimilar, and Lincoln may not always be facing the camera or in the similar pose. Present CBIR systems therefore commonly make use features of lower-level like shape, texture, and color, although few methods take benefit of most general higher-level features like faces. Not each CBIR system is generic. Few systems are designed for the particular domain, e.g. matching of shape can be used for finding the parts inside a CADCAM database.

Other Query Methods

Other different query approaches contain browsing, for example multimodal queries (example voice, combining touch, etc.), images, navigating categories of hierarchical/customized, querying through image area (rather than the complete image), querying through multiple example images, querying with the help of visual sketch, and querying by direct specification of image features CBIR methods can also create use of relevance feedback, where the user increasingly refines the search outcomes through images marking in the outcomes as "relevant", "not relevant", or "neutral" to search query, then the repeating search with the novel data.

Content Comparison by Image Distance Measures

The most common technique for comparing two images in CBIR (classically an example image and an image from the database) is an image distance measure applying. An image distance measure compares similarity of the two images in numerous dimensions such as shape, color, texture, and others different. For example a distance of 0 indicates a particular match with query. As one may be intuitively gather, a value is greater than 0 specifies numerous degrees of similarities between the images. Search outcomes then can be sorted based on the their distance to query image [10]. A long set of distance measures can be established in.

Color

Computing distance measures based on the color similarity are attained through a color histogram computing for the every image that proportion of pixels identifies within an image holding particular values (that humans definite as colors). Present research is attempting to the segment color proportion through the area and through spatial relationship among numerous color regions. Examining images based on colors they hold is one of the most extensively used methods because it does not depend on orientation or image size. Color searches will generally include comparing color histograms, by this is not the only method in practice.

Texture

Texture measures appearance of the visual patterns in the images and also how they are spatially described. Represented Textures through texels which are then placed into a various sets, which is depending on how many textures are image detected. These sets not only describe texture, but also where in the image texture is located. Texture is a challenging theory for representing purpose. The particular textures identification in an image is achieved primarily through modeling texture as a 2D gray level alteration. The relative brightness of pairs of pixels are computed such that regularity, degree of contrast, directionality and coarseness may be probable. However, the issue is in patterns identifying of the co-pixel variation and also associating them with specific texture classes such as rough or silky.

Shape

The shape does not refer to the image shape, but to the specific region shape that is being sought out. Shapes will be often determined first segmentation applying or an image based edge detection. Other different approaches like to identify given shapes of an image use shape filters [14]. In few case accurate detection of shape will require human intervention because approaches like segmentation are most difficult to totally automate.

LITERATURE SURVEY

Jain 2013 *et al.* present CBIR is the retrieve task the images from the huge database collection on the basis of their own visual content [15]. CBIR is used for retrieval of images and automatic indexing depending upon images contents known as features. This paper provides the survey in the research area of image retrieval technical achievements. In this paper, a survey is complete on the various approaches of CBIR for the classification of color and texture. For the extracted features of classification we have used support vector machine. Classification applying cascaded support vector machine is also used here for solving large-scale pattern classification issue. The cascaded support vector machine has benefits over conventional support vector machine.

Rajam 2013 *et al.* present that CBIR is a very important research area in the field of image processing, and comprises of low level feature extraction such as color, texture and shape and similarity measures for the comparison of images [16]. Recently, the research focus in CBIR has been in reducing the semantic gap, between the high level image semantics the low level visual features. This paper provides a comprehensive survey of all these aspects. This survey covers approaches used for extracting low level features; various distance measures for measuring the similarity of images, the mechanisms for reducing the semantic gap and about invariant image retrieval. In addition to these, various data sets used in CBIR and the performance measures, are also addressed. Finally, future research directions are also suggested.

Yasmin 2013 *et al.* present that Review paper analyses the fundamental CBIR theories algorithms and also development in this field [17]. These algorithms from large image database retrieve the digital images. The image is retrieved from low level visual content based property of the query image that is spatial location, color, texture and shape. First we analysis the visual content description of the image and then the fundamental systems for CBIR are discussed. We also address the query image comparison and large data base target image with the indexing system to image retrieve. Relevance feedback in CBIR method is a dominant method for the image retrieval which is the from user's feedback derived iteration procedure. Lastly, we discuss the semantic gap and evaluation. In the concluding section we indication our opinions on the role of similarity function with the interaction and learning, the semantic gap and evaluation issue as well as future research directions.

Panchal 2014 *et al.* present that In the field of Image Processing, Image Retrieval has become one of the most dynamic research areas in the previous few years [18]. In the image retrieval three main categories , there are text-based, content-based and semantic-based. In CBIR, images are retrieved from their visual content such as color, texture and shapes. CBIR is used to effectively retrieve required images from a large collection of images. In this paper the methods of CBIR are discussed, analyzed and compared. There are some different techniques for extracting color, texture and shape features.

Yadav 2014 *et al.* present that Various content-based image retrieval techniques are available for retrieving the require and classify images, we are reviewing them [19]. In our first section, we are tending towards some basics of a particular CBIR system with that we have shown some basic features of any image, these are like shape, texture, color and shown different techniques to calculate them. In the next section, we have shown different distance measuring techniques used for similarity measurement of any image and also discussed indexing techniques. Finally a conclusion and future scope are discussed.

Velmurugan 2014 *et al.* present that CBIR is a technique for discovering similar images from large image databases [20]. Development of multimedia and the network skills are becoming more common, users are not satisfied with the classical knowledge retrieval techniques. In recent years, local descriptors are used as image features to improve the performance of CBIR. The SIFT is one of the most local feature detector and descriptors used in many computer vision applications. This paper provides the surveys of CBIR systems that using SIFT algorithm to extract the local features of the images.

Mistry 2013 *et al.* presented that as image set is rising at a fast rate, the demand for effective and efficient tools for query images retrieval from database has been improved meaningfully. Among them, CBIR systems have become more famous for browsing, retrieving and searching images from a big database of digital images as it requires relatively less human intervention. This paper is an attempt to explore the CBIR systems and their usage in numerous application domains.

Gunjal 2012 *et al.* present that the CBIR is one of the more famous, digital image processing is the increasing research areas [21, 22]. Available image search tools, such as Yahoo! Image and google image search,

which are based on images textual annotation. In these tools, images are manually annotated with the keywords and then retrieved applying text-based search approaches. These systems performances are not satisfactory. The aim of CBIR is to the visual content of an image automatically to extract, like shape, color, or texture. The CBIR technology can be used in various applications such as photo sharing sites, digital libraries, and crime prevention. Such a system has high value in apprehencing suspects and also recognizing victims in forensics and also law enforcement. A possible application is a forensic sketch matching to the gallery of mug shot images. The retrieve image area based on the query picture visual content intensified currently, which demands on the quite extensive procedure spectrum of the image processing area. In this paper, we will suggest a more comprehensive survey on CBIR techniques.

COMPARISON OF AVERAGE PRECISION FOR VARIOUS RETRIEVAL SYSTEM

On the basis of query image results of retrieved image (Figures 4 and 5):

Query Image

Fig. 4: *Query Image Class of Flower (Top) and Top 12 Retrieved Images [23].*

Query Image

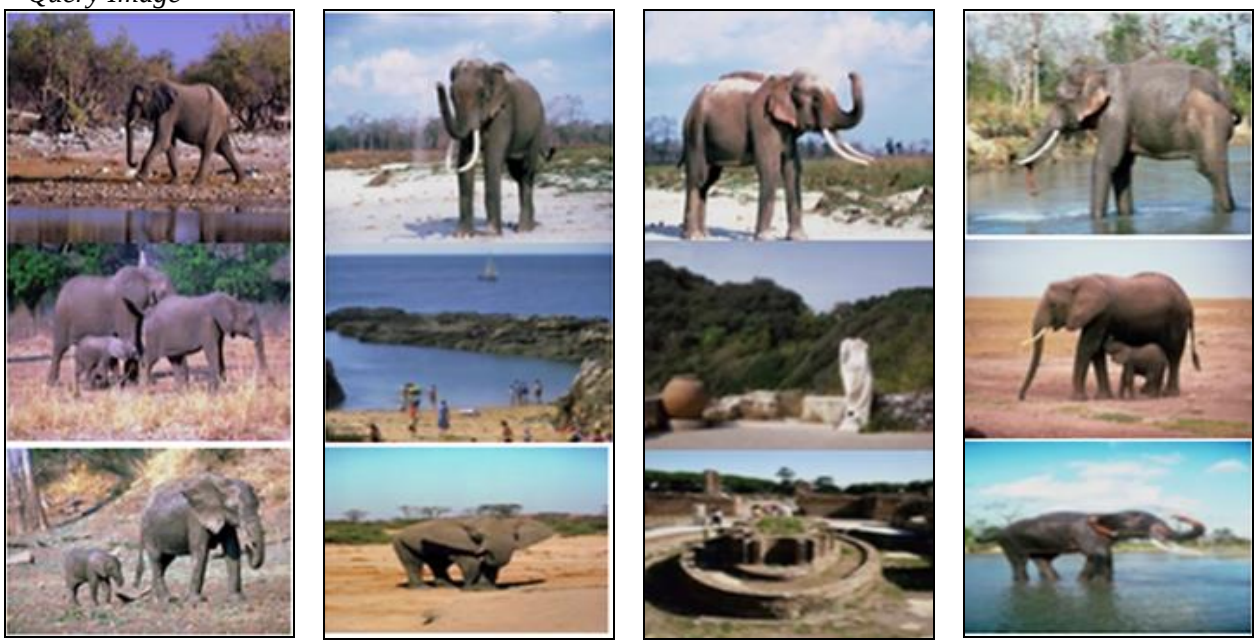

Fig. 5: *Query Image from Class of Sea (Top)and Top 12 Retrieved Image [23].*

Table 1: *Shows the Comparison of Methods used for Color, Texture and Shape of Previous Work.*

Reference Papers	**Methods Used**		
	Color	**Texture**	**Shape**
Savita Gandhani *et al.* [3]	HSV color Histograms	Block Difference of Inverse Probabilities (BDIP) and Block Basede Local Correlations (BBLC) moment.	Canny Edge Detections
PS Hiremath [10]	Conditional co-ocurrence Histograms	Local Descriptors	Gradient Vector Flow Fields.

Table 2: *Shows the Comparison of Average Precision of Previous Work.*

Class	**Average Precision**	
	Savita Gandhani *et al.* [3]	PS Hiremath [10]
Africa	0.84	0.54
Bus	0.92	0.64
Building	0.65	0.40
Beaches	0.67	0.38
Dinosaur	0.97	0.96
Elephant	0.72	0.62
Flower	0.95	0.68
Horses	0.87	0.75
Mountain	0.75	0.45
Food	0.80	0.53

Precision= No. of relevant image retrieved / Total no. of images retrieved (Tables 1 and 2)

CONCLUSION

This paper presents a survey of some modern CBIR techniques. The technology of Content-based image retrieval can be used in the various applications such as photo sharing sites, digital libraries, and crime prevention. Such a system has high value in the apprehending suspects and victims identifying in Forensics and law enforcement. The Purpose of this survey is to provide a summary of the functionality of CBIR. Most of the system use texture and color features. Some systems use shape feature and still less use layout features. CBIR methods have been used broadly in several areas for performance of the system and achieve better results in different applications. To obtain an efficient CBIR framework, one must choose the components of the CBIR in a balanced manner, and this paper helps in analyzing all the components of the CBIR framework.

This paper has surveyed the essential concepts of CBIR systems. This survey attempts to introduce the theory and practical applications of CBIR techniques. Use of the hybrid feature including color, texture and shape as a feature vector of the regions to match images can give better results. Classification and content-based retrieval methods based on the features they use such as color, texture, and shape are discussed along with their subclasses and algorithms used for constructing the feature vector.

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Cite this Article
Gupta B, Shrivastava S. A Review on Image Retrieval with its Application and Techniques. *Journal of Artificial Intelligence Research and Advances.* 2015; 2(3): 27–35p.