

A COMPARATIVE STUDY ON VARIOUS TECHNIQUES FOR IMAGE RETRIEVAL

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Abstract— In the digital world, there is a rapid increase in data that is being generated everyday. Obviously, the image data growth is also more. So from a large database containing images it is really hard to mine retrieve images that are relevant for the query. Image Retrieval is a significant research area in the domain of image processing. It contains features for extraction such as shape, texture, colour etc., for image comparison. Currently, the focus of research is in semantic gap reduction between high level image semantics and low level visual feature.. In this paper, a comparative study on various techniques for retrieval of images is studied. Multiple feature extraction can be done by combining various methods. Based on the extracted feature any of the classification techniques can be applied which will significantly reduce retrieval time and search space. Once when this is done, for the respective relevant images relevance feedback algorithm is applied which in turn provides the user intention for resultant images to the system as this increases the classification accuracy. This is done by getting the feedback from the user which in turns decreases the semantic gap.

Index Terms— Feature Extraction, Image retrieval, Segmentation, Relevance feedback, Texture

I. INTRODUCTION

An image retrieval is outlined as a way of looking, aquatics and retrieving pictures from an over sized digital image information. Image retrieval has been a awfully active and attention-grabbing analysis domain since the Nineteen Seventies [1]. Some analysis concerning image retrieval technology has begun that focuses solely on the text-based Image Retrieval that utilize some methodology of adding keywords, or descriptions to the pictures in order that retrieval may be performed over the annotation words.

A. Image Retrieval Architecture

There area unit databases in this system design in the Fig:1. The image assortment information contains the raw pictures for visual show purpose. throughout completely different stages of image retrieval, completely different image resolutions could also be required [1]. The visual feature information stores the visual options extracted from the pictures exploitation techniques. this is often the knowledge required to support content-based image retrieval. The text annotation information contains the key words and free-text descriptions of the pictures. The retrieval engine module

includes a question interface sub-module and a query-processing sub-module. The interface collects the knowledge would like from the users and displays back the retrieval results to the users in an exceedingly significant method. The question processing sub module manipulates the user query into the simplest process procedures [1].

There are 2 major characteristics of this method architecture:

- i. Multi discipline and Inter-discipline nature.
- ii. Interactive nature between human and PC

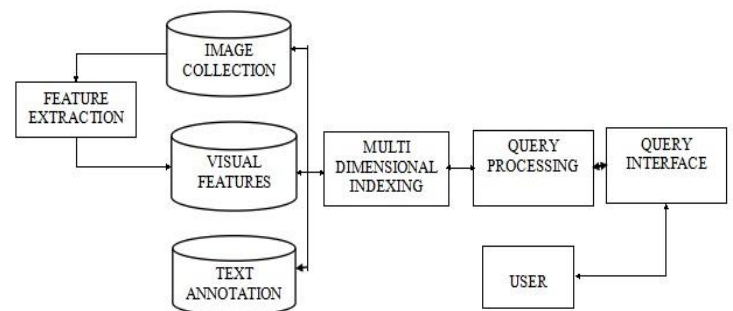


Fig.1:Image Retrieval System Architecture

II. TEXT BASED IMAGE RETRIEVAL

In text primarily based, user entered the question within the variety of text to look a picture from image information and also the system can come pictures just like the question entered by the user. it's conjointly called annotations primarily based image retrieval.

A. Merits:

- i. Simple to implement
- ii. Quick retrieval
- iii. Web image search

B. Demerits:

- I. Annotation of every image needs domain consultants
- II. It is necessary to use distinctive keyword for every image, so this is often a awfully advanced task.
- III.Annotation for every and each image in an exceedingly massive information is not possible

III. CONTENT BASED IMAGE RETRIEVAL

Content-based means the search analyses the contents of the image not the information like keywords, labels or tags related to the pictures. it's conjointly called question by image content and content-based visual data retrieval.

A. Merits:

- i. Options like color, texture, form and spacial area unit retrieved mechanically
- ii. Similarities of the pictures area unit supported distance between the options
- iii. No would like of domain consultants
- iv. Description of image in text type doesn't needed

B. Demerits:

- II. High linguistics gap between low level options and high level options

IV. FEATURE EXTRACTION

A feature is outlined as capturing a definite property of a picture. it's the most task within the CBIR systems to retrieve the similar pictures from information just like question image. In feature extraction, options like color, texture or form from image area unit extracted and creates a feature vector for every image. many necessary options that may be employed in image retrieval are going to be mentioned within the next subsections. Feature extraction is most significant step within the procedure. Options area unit classified into 3 sorts that's low, middle and high level [6]. Low level options area unit color, texture and Middle level feature is form and High level feature is linguistics gap of objects [13]. Color is out and away the foremost common visual feature employed in FBIR, primarily thanks to the simplicity of extracting color data from pictures. Texture and form are key part of human perception. Like color, this makes it a necessary feature to contemplate once querying image databases.

A. Color:

Color is that the most significant options that area unit simply recognized by humans in numerous pictures. Color options area unit the foremost wide employed in CBIR systems. To extract the colour options from a picture, a color area and color feature extraction methodology area unit needed [2] colour in digital pictures could also be drawn in an exceedingly style of color models together with RGB, HSV, YCbCr and CIE Lab etc [19]. the best thanks to represent colour in a picture is to populate color histograms within which a count of the quantity of pixels of assorted colors is accumulated [7]. Color division is mostly utilized to cut back the quantity within the image into a number of representative colors. many color descriptors [19] have conjointly been introduced that represents the importance of a dominant colorize the image.

B. Texture:

Texture is that the natural property of all surfaces, that describes visual patterns. Like colors within the image, the

textural characteristics are effective ways in which of describing visual content. Texture options have conjointly been wide employed in CBIR applications. this is often a feature that describes the distinctive physical composition of a surface [2]. Six texture options together with radial asymmetry, coarseness, contrast, line-likeness, regularity and roughness were set to be a lot of necessary than the remainder when experiments. physicist options have conjointly been used for texture analysis tasks. The intensive adaptation of assorted ways for a range of tasks involving texture analysis could be a proof of their strength [19].

C. Shape:

Shape description is a crucial task in content-based image retrieval. it's necessary as a result of it corresponds to region of interests in pictures [2]. intensive analysis is being administrated within the field of form primarily based image retrieval. This section focuses on the foremost unremarkably used form descriptors derived from the form contour or shape interior. A form descriptor has to be correct in retrieving similar shapes from the information. Region primarily based form Descriptors area unit derived from the whole set of pixels that structure Associate in nursing object. form descriptors may be classified as international or structural [19] Boundary primarily based form Retrieval Descriptors area unit derived by considering solely the boundary of the form. form recognition exploitation form contexts [19] is Associate in Nursing sweetening to the classic Hausdorff distance primarily based ways.

V. SEGMENTATION

Segmentation is extremely necessary to image retrieval. Segmentation extracts the boundaries from an over sized range of pictures while not occupying human time and energy [20]. Reliable segmentation is particularly vital for characterizing shapes among pictures, while not this form estimates area unit vacuous. The normalized cut segmentation methodology in [8] is additionally extended to rough image segmentation by exploitation cues of contour and texture variations.

Classification and agglomeration area unit necessary a part of image mining[11]. This machine learning technique is employed to cut back linguistics gap between low level image feature and high level linguistics. knowledge classification could be a two step method, consisting of a learning step and a classification step [21]. Classification algorithmic program is applied to image information within which image is best delineate to classify it in categories. Classification is difficult task in numerous application domains, together with medicine imaging, biometry, video police investigation, vehicle navigation, industrial visual examination, mechanism navigation, and remote sensing, written letter reorganization [12].

VI. IMAGE CLUSTERING:

Clustering is going to be a lot of advantage for reducing the time within the information. numerous agglomeration techniques [8] like side-information, kernel mapping,

k-means, hierarchical, metric learning area unit employed in image retrieval. Performance of K- mean algorithmic program is healthier than hierarchical agglomeration algorithmic program [3]. It takes lesser time to cluster the pictures than K-means. K-means is taken into account to be a tough agglomeration and in hard agglomeration, when some iteration most of the centers area unit converged to their final positions wherever as Fuzzy K-means is understood as soft agglomeration within which the info

points, that area unit gift within the fuzzy K-means, will belong to quite one cluster with having bound likelihood [21]. Density primarily based ways generally take into account exclusive clusters solely, and don't take into account fuzzy clusters[5]. Fuzzy C-means (FCM) is one in all the agglomeration ways, which permit one piece of knowledge to belong to 2 or a lot of clusters. FCM teams knowledge in specific range of clusters [14]. Table.1 explains pros and cons of various image retrieval techniques.

Techniques Used	Description	Advantages	Limitations
Color Histogram Wavelets and Gabor Filter	Two methods were implemented on image database. Color and Texture taken as features and chi-square and euclidean distances as matching criteria. For the performance measure, precision ratio have taken	Effective multi-scale image analysis Lower computational cost Feature vector is less uncombined approach of wavelet and color moments	Poor retrieval efficiency
HSV Color Moment Hough Transform Ranklet Texture Moment	Combination of color, texture and shape feature is used to compare and retrieve image is more accurately than using one of them only.	Higher precision than the combination of two features Dimensions of features vector are low Lower computational complexity	High computational time
Color Moment Gabor Filter GVF(Gradient Vector Flow Fields)	In this method, an image is partitioned into non-overlapping tiles. It captures the local colour and texture descriptors in a segmentation framework of grids and shape describable in terms of invariant moments	Create robust feature set High retrieval efficiency	High semantic gap
Color Moment Gabor Wavelet Co-occurrence Matrix	In this combination is done in two levels. One is the combination of color and texture features and the other is the combination of two textures extracted by two different methods.	Minimize the semantic gap using RF with SVM	Time consuming
CBIR Using Genetic K-means Algorithm (GKA)	In this GA hybridize with K-means algorithm, which define K-means operator, one of the step of K-means algorithm, and use it in GKA as a search operator instead of crossover.	Searches faster Retrieval performance is good	Not suitable for large and heterogeneous Image database
CBIR Using C-mean Clustering	It computes the distance between the centroid of the cluster and seed point.	Minimizes intra cluster variance	Consumes long time for computation
Color moment Block Truncation Coding (BTC) Algorithm	Block Truncation Coding (BTC) used to extract features of images and K-Means clustering algorithm is used to group the image data set into various clusters	Performance is superior to that of color moments	High computational time

Table.1: Various Content based Image Retrieval Techniques

VII. RELEVANCE FEEDBACK

Relevance feedback could be a powerful technique in FBIR systems, so as to enhance the performance. It permits reducing linguistics gap between low level feature and high level linguistics [24]. the thought behind relevance feedback is to require the results that area unit at first came from a given question and to use data concerning whether or not or not those results area unit relevant to perform a replacement question [21]. Here user offer this feedback to the system supported the given feedback it learn the thought. Learning in relevance feedback is split in 2 components short term learning and long run learning[4]. In long run learning past question and feedback area unit keep and supported past result it provides result wherever briefly term learning it doesn't bear in mind past question session [22]. briefly term learning every session has mutual result freelance of previous result [18]. There are question refinement methodology is there that is comparable like shot term learning .It is done by question purpose movement, update weight vector and probabilistic approach [17]. It has also

projected that relevance feedback theme by feature weight update algorithmic program. In this methodology linguistics network of image is formed by fuzzy knn methodology and relevance feedback methodology is applied by taking image feedback like relevant or unsuitable. supported that feature weight is adjusted and user gets a lot of satisfactory result.

VIII. SIMILARITY MEASURE

In this system similarity measure is vital step. Similarity live is applied between feature of question image and have vector of information pictures. Similarity between 2 pictures may be found by calculative distinction between them .It provides list of pictures that area unit just like the question image or it's least distance from question image. completely different similarity measures can have an effect on the retrieval performance of image considerably [10]. one in all the foremost widespread similarity measurements is geometer Distance [23]. geometer Distance is employed to live the similarity between 2 pictures with N-dimensional feature vector [15]. Similar pictures area unit displayed within the ranking order [9].The Mahalanobis Distance is

predicated on the correlations between variables, and is employed to analyze numerous patterns. Bar chart intersection could be a distance live for comparison histograms [16]. It calculates the common a part of the 2 histograms, and neglects the options occurring in

exceedingly single bar chart. Table.2 explains various techniques of image retrieval based on the classification of their features.

Features	Techniques	Accuracy	Dimension	Advantage	Disadvantage
Color Feature	Color Moment	Low	Low	Lower computational complexity	Precision is low
	HSV histogram	High	Medium	Simple ,Fast computation	Np spatial information
	Color Correlogram	High	High	Includes the spatial correlation of colors ,Simple to compute	Very slow computation
Texture Feature	Gabor Filter	High	High	Achieves highest retrieval results	Computationally intensive
	Gabor Moment	Low	Low	Lower Dimensionality	Low retrieval result compare to Gabor filter
	Gray level co-occurrence matrix	High	High	Include positions of pixels having similar gray level values	High Dimensionality
Shape Feature	Moment Invariant	High	Low	Invariable to translation, rotation and scale	Limited recognition power
	Zernike moments	High	Low	Invariable to translation, rotation and scale	Computational Complexity is High

Table.2: Various Feature based classification of Image Retrieval Techniques

IX. CONCLUSION

This paper provides a detailed survey on research work associated with the exciting fields of content-based image retrieval and provides a close review of the current works performed in it. This paper conjointly discusses the assorted methodologies which is being utilized for extraction of the various significant low level options and different distance measures in order to surf out the similarity between the images in the database by reducing the linguistics gap between the high and low level options and linguistics ideas. A discussion of assorted approaches and comparison of assorted techniques with reference to knowledge are created.

X. FUTURE WORK

This paper presents a comparative study of Content primarily based Image Retrieval Trends and also the various approaches towards breakdown a number of the issues encountered. One alternative is to use additional refined feature representations. rather than employing a strictly data driven evaluation mistreatment basic image options, higher-level info concerning regions might be used. Since a picture epitome provides a composite description of form and look, it is possible to realize a higher live of homogeneity/heterogeneity of the segments. One of the steps towards breakdown the linguistics info drawback, once attainable, previous data, especially application-dependent

data, ought to be incorporated into associate degree analysis methodology so that the analysis methodology is aware of the well-liked characteristics of a section. Different methods will be applied to incorporate previous data a few most well-liked options.

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