Efficient Image Recovery Using Data Mining and Image Processing Techniques

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Abstract - With **the advancement and popularity of multimedia technologies and internet mediums, user cannot satisfy with the conventional methods of information retrieval. Because of this, the content based image retrieval is becoming a new and fast method of information retrieval. Content based image retrieval is the method of retrieving the data particularly images from a wide collection of databases. The retrieval is done by using features. Content Based Image Retrieval (CBIR) is a method to organize the wide variety of images by their visual features. In modern days with the development of social networking mediums, so many digital images are uploaded day by day. In order to access this huge data collection new techniques are very essential. These techniques will ease the data handling and the user can easily access the data. Content Based Image Retrieval is such a technique which uses features for searching a particular image from a database. It represents visual features like edges, spatial information, texture, shape. Here, in this paper the content based image retrieval techniques are discussed.**

Index Terms - Content Based Image retrieval, Fuzzy logic, Shape and texture retrieval.

1. 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. In modern era with the development of social networks many digital images are uploaded every day. In order to handle this huge data new techniques are very essential. CBIR is such a technique that will ease the data handling and the user can easily access the data.

The increasing amount of digitally produced images requires new methods to archive and access. The images can be retrieved using color, texture and shape. The most important feature in retrieving an image is color. There are so many methods to retrieve the color. They include color histogram, color moments, autocorrelogram etc. Color histogram is the widely used method for color feature extraction. Color histogram method doesn‟t store the spatial information and also it is not invariant to scaling. Color moments provide a measurement for color similarity between images. Moments are invariant to scaling and rotation. The first four moments are usually calculated. Color correlogram provides the probability of finding color pairs at a particular pixel distance. Color correlogram gives better output than color histogram because the color correlogram provides the spatial information. Texture is retrieved using GLCM, entropy etc. shape is the next used image feature for retrieval

1.1 Color Based Retrieval

The most important feature in retrieving a digital image is color. There are so many methods used to retrieve the color feature. They include color histogram, autocorrelogram, color moments etc. Color is not dependent of the size of the digital image and orientation of the digital image. Color Histogram is the commonly used method for color feature extraction in digital images. Color histograms are widely used for CBIR systems in the image retrieval area.

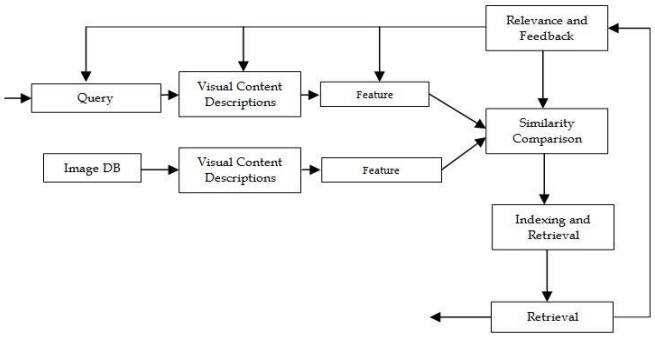

Fig: Image Retrieval System

It is one of the most common methods for predicting the features of an image. The image histogram shows the variations of gray levels from 0 to 255, these all values cannot be used as a feature vector as the dimension is too big to be stored or compared. The image histogram must be sampled into the number of bins to reduce the size of feature vector. Color histograms have the advantages of speed and low memory space. Color histogram method is invariant to rotation but it is not invariant to scaling. It also varies with the angle of view. The color moments widely used are mean, standard deviation, and kurtosis. Color moments are mainly used for color indexing .The other advantages of color moments are: - they are good under lighting conditions, the requirement for their storage are very less. Because of this less storage requirement, the image retrieval speed increases. In color moments there is no need to store the complete distribution, so only low memory is used. 1.2 Texture Based Retrieval Texture is the regular repetition or pattern on the surface of any object. The texture of an image can be extracted using GLCM (Grey level co-occurrence matrix), Wavelets, Fourier transform, entropy, correlation methods. GLCM feature extraction technique is more commonly used, because it is more similar to the human visual system features. The features extracted using GLCM are energy, entropy, correlation etc. Wavelets are the complex form for texture feature extraction. In wavelets, the wavelets are discretely sampled and decompose in to different sub bands. 1.3 Shape Based Retrieval There are many methods for the extraction of shapes from digital images. Some methods include contour based shape extraction, Region based shape extraction, Boundary based methods and generalized Hough transform(GHT) etc.GHT is the most commonly used shape extraction technique.GHT gives the complete information of the object shape and can detect multiple occurrences of object shape in a single pass. GHT is tolerant to noise and robust to the deformalities of shape. Figure 1 represents the architectural diagram of CBIR

2. LITURATURE SURVEY

In [1], Navigation-Pattern-based Relevance Feedback (NPRF) Approach is used. This Approach has high efficiency and effectiveness of CBIR in coping with the large-scale image data. In terms of efficiency, the iterations of feedback are reduced substantially by using the navigation patterns discovered from the user query log. It supports a large set of downloaded images. This paper cannot handle three issues:- First, in view of very large data sets, it have to scale the proposed method by utilizing parallel and distributed computing techniques. Second, to integrate user‟s profile into NPRF to further increase the retrieval quality. Third, to apply the NPRF approach to more kinds of applications on multimedia retrieval. It supports the minimum number of logs, and most relevant seeds. In [2], learning to combine ad-hoc Ranking Functions for Image Retrieval, the approach used is ad-hoc Ranking Functions with Support vector machines (SVM). The proposed method brings little computational burden to the system and the efficiency analysis proves its scalability. This method cannot construct the ranking features by investigating the various image visual features. The Approach gives a performance of 95.6%.The future enhancement is that by considering the image visual features, ranking features can be constructed. In [3], latent semantic indexing (LSI) method is used to support the downloaded natural images. This method is especially suitable for mass image databases such as web environment. The Future work remains to include structural information in order to see whether this improves performance or not. In [4], Recursive orthogonal least squares (ROLS) algorithm is used. The advantages of this approach are less computer memory, Network reduction to achieve smaller architectures with acceptable accuracy and without retraining. Online adaptation cannot be done in this method. So the future work can lead to an approach for on-line adaptation of both the structure and weights of an RBF network, which is useful for application to timevarying problems. In [5], “Learning from Negative Example in Relevance Feedback for Content-Based Image Retrieval”, a method which is a combination of Relevance Feedback with discriminators are used. Here negative examples are combined with positive example to identify important features to be used in retrieval process. The Approach is implemented in a set of natural images particularly in Trees. This Approach denies the Partial Information needs of the user and can be extended as a future work. In [6], random walker algorithm is used. Each unlabeled image is ranked according to the probability that a random walker starting from that image will reach a relevant seed before encountering a non-relevant one. This method is easy to implement, it has no parameters to tune and scales well to large datasets. It can give a performance of 95% and can extend to other visual features too. In [7], Geometric Optimum Experimental Design for Collaborative Image Retrieval, the algorithm used is GOED algorithm (geometric optimum experimental design. Collaborative image retrieval in this approach aims to reduce the labeling efforts of the user by resorting to the auxiliary information. Enhance the performance of image retrieval. By minimizing the expected average prediction variance on the test data, GOED has a clear geometric interpretation to select a set of the most representative samples in the database iteratively with the global optimum. This approach retrieved only shape and texture from synthetic datasets and real world image database. The retrieval performance is good .In [8], Combining positive and negative examples in relevance feedback for content-based image retrieval minimize the intra dispersion between positive examples. Here the partial information needs of the user are totally denied. This method is implemented in a set of downloaded natural images. Euclidean distance is used as the similarity measure here. It gives a better accuracy compared

to existing approaches. In [9], Radial basis functions are used for implementation. Neuro-Fuzzy control (NFC) exhibits greater robustness with large changes in plant dynamic. And moreover no tuning is needed. By using Tuning Parameters, good classification accuracy can be used. In [10], Radial basis functions are used to implement Satellite images of land region. This approach is very useful for queries involving texture patterns that represent a region of interest, nonlinear kernel for the evaluation of image similarity. Here both positive and negative feedbacks are taken for effectiveness of learning capability. The Parameters used here are RBF centres and widths, the tuning parameters and the adjustable centres. RBF networks possess an excellent nonlinear approximation capability. Nonlinear kernel for the evaluation of image similarity.RBF networks possesses an excellent nonlinear approximation capability

3. IMAGE RETRIEVAL SYSTEMS

A. Bag-based ranking:

The proposed methodology used text query to get relevant images and then performed reranking using visual features.

The process is done as follows:

a) Combining of both visual and textual features, they form cluster of relevant images. Each cluster can be considering as a "bag" and the images present in bag are treating as "instances," then apply multi-instance (MI) learning problem.

b) They use mi-SVM as MI learning method so that can be readily incorporated into bag-based reranking framework. While observing we know that a positive bag contains certain portion of positive instances and negative bag may also consist of positive instances. c) Finally use the generalized MI learning method.

c) GMI-SVM was developed to enhance retrieval performance observing the ambiguities of instances present in positive and negative bags. A bag ranking method was proposed to acquire bag annotations for GMI learning so that they performed ranking to all the bags according to the defined bag ranking score.

Advantages:

1) The automatic bag annotation process achieves best performances as compared with existing methods of image reranking.

2) GMI-SVM can achieve better performances.

Disadvantages

1) Labels of relevant training images are quite noisy so the constraints on positive bags may not always be satisfied in this application.

B. Manifold- Ranking Algorithm:

In this paper, J. He, M. Li, H. Zhang, H. Tong, and C. Zhang proposes a novel methodology Manifold- Ranking Based Image Retrieval [2]. The proposed methodology is based on the following steps:

a) They propose a novel transductive learning framework for image retrieval based on a manifold ranking algorithm here first weighted graph is formed using kNN approach and assign a positive ranking score to each query and zero to remaining points.

b) Then design and investigate different schemes for utilizing the positive and combination of positive, negative relevance feedback to improve the retrieval result

c) Finally use active learning methods to speed up the convergence to the query concepts.

Advantages:

1) Processing time can be greatly reduced.

2) It reduced scale of weighted graph to form a small graph.

C. Cross-domain Algorithm:

The process can be done as:

a) They introduce how to retrieve consumer photo considering millions of web images with their rich textual

Descriptions.

b) They perform integration of large database and Wordnet to get relevant and irrelevant images based on textual query. After that apply classification techniques such as kNN, SVM, Decision stumps.

c) To refine the retrieval result of personal photos consisting of feature distribution may differ in web images and personal photos. So to better results they consider a new approach as cross-domain regularized regression.

Advantages:

1) Images can be retrieved without using image annotation process.

2) Framework is efficiently used for large scale consumer photo retrieval.

D. Tag based Image Retrieval:

Tag-based Image Retrieval Improved by Augmented Features and Group-based Refinement [4] In this paper, they propose a new tag-based image retrieval framework to improve the retrieval performance of a group of related personal images captured by the same user within a short period of an event by considering millions of training web images and their associated rich textual descriptions.

a) For any given query tag the inverted file method is employed to automatically determine the relevant and irrelevant training web images that are associated with the query tag.

b) Using these relevant and irrelevant web images as positive and negative training data respectively, they propose a new classification method called SVM with Augmented Features (AFSVM) to learn an adapted classifier by leveraging the pre-learned SVM classifiers of popular tags that are associated with a large number of relevant training web images.

c) For refinement process, they propose to use the Laplacian Regularized Least Squares (LapRLS) method to further refine the relevance scores of test photos by utilizing the visual similarity of the images within the group.

Advantages:

1) The technique captures the geometry of the data points in the high-dimensional space. It degrades the performance of Relevance feedback

E. Tag based Image Retrieval:

In this paper Wei Bian and Dacheng Tao presents Biased Discriminate Euclidean Embedding for Content-Based Image Retrieval has represented images by low-level visual features. Now a day's very popular image retrieval technique is the Content-based image retrieval (CBIR) which used visual information. In this they must have to give query as an example instead of text query. It is also known as query by image content [12]. The retrieval process consist of the contents of the image such as textures, shapes,colors and other information of image itself.[3].They have designed a mapping to select the effective subspace from for separating positive samples from negative samples based on a number of observations. They have proposed the Biased Discriminative Euclidean Embedding (BDEE) which parameterizes samples in the original high-dimensional ambient space to discover the intrinsic coordinate of image low-level visual features.

Advantages:

1) It preserves both the intraclass geometry and interclass discrimination

2) It is superior to the popular relevance feedback dimensionality reduction algorithms.

3) Its extension considers the unlabelled samples.

F. Active Learning Support Vector Machine:

In this paper S. Tong and E. Chang presents Support Vector Machine Active Learning for Image Retrieval Mostly CBIR systems returns semantically relevant images to the user's query image. So depending upon the application the number of techniques present in CBIR varies. But result images should all share common elements with the provided example. However as person's point of view, it is more convenient and natural for a user to retrieve images using a query as text. The early relevance feedback method directly adjusts weights of various features. SVM-based relevance feedback methods were proposed [3][6]. Relevance feedback can be proposed in CBIR systems to recover the semantic gap. In RF search results will be improved or refine the results based on whether the results are related not related or neutral to search query then repeating the search with the new information.SVM-based relevance feedback methods were proposed [3][6].

Disadvantages:

1) It degrades the retrieval performance of the techniques considering limited number of feedback images

4. RECENT WORKS

The more recent works in the area of content based image retrieval consists of Relevance feedback, Radial basis function networks and fuzzy approaches. These three help to add more human interaction with the CBIR systems, thus significantly reduces the time for retrieving the output. Relevance feedback is a technique to overcome the semantic gap, where users provide feedback on the relevance of the retrieved images by the system, and this information is given back to the system for learning the user information needs. Important relevance feedback algorithms includes query refinement,re-weighting, Bayesian learning, optimal learning over heuristic-based feature weighting, artificial neural networks , discriminant-EM algorithm, and kernelbased learning etc., these have been adopted in CBIR systems and demonstrated considerable performance improvement. Fuzzy logic is a logic that deals with reasoning which is approximate rather than fixed and exact. Compared to traditional binary sets fuzzy logic variables may have a truth value that ranges in degree between 0 and

1. Fuzzy logic has been expected to handle the partial truth information concept, where the truth value may range between true and false that is partial information needs. Fuzzy deals with concepts that cannot be expressed as relevant or irrelevant but rather as partially relevant. The other approaches such as genetic algorithms and neural networks can perform as equal to fuzzy logic in many cases, fuzzy logic has the advantage that the problem solution can be cast in terms that human users can understand. Therefore fuzzy logic can be able to include more human interaction in the retrieval process. Fuzzy Radial Basis function networks are neural networks which perform the process in sessions. If the CBIR system is in real time, then RBF networks are the best. Moreover they have fast learning speed, simple network structure and global generalization power. Fuzzy logic for the

interpretation of the texture queries for contentbased image retrieval is latest and effective technique.

5. APPLICATIONS

Content Based Image Retrieval has many applications in almost all fields of life. Some software manufactures are using CBIR based applications into the internet medium and law enforcement fields for identifying the criminals and to censor the images with skin-color. Zoomy Images, a stock photo enhanced its service by utilizing CBIR in its Visually Similar Images and Reverse Image Search functions, allowing clients to view more accurate search results Art Collection Example: - Fine Arts Museum of San Francisco Medical Image Databases

Example:-CT, MRI, Ultrasound, Scientific Databases Example:-Earth Sciences General Image Collections for Licensing Architectural and engineering design Fashion and publishing

6. CONCLUSIONS

The goal of this survey is to provide an overview of the functionality of content based image retrieval systems. Most CBIR systems uses color, texture, edge features etc. Few systems use spatial information and shape for feature extraction. Fuzzy logic is one of the new technique introduced into CBIR field. As fuzzy method is mainly used for user oriented applications and is more similar to human visual features. It is the correct technique that can be used in CBIR field. There are various applications of CBIR in every fields of life like blood cell detection, archeology, criminal investigation, satellite etc. Thus, field of CBIR is very useful and it‟s a real boon to the human life.

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