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IMPROVING GRAPH BASED MODEL FOR CONTENT BASED IMAGE RETRIEVAL

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ABSTRACT- *An effective content-based image retrieval system is essential to locate required medical images in huge databases. In this project, mainly focus on a well-known graph-based model - the Ranking on Data Manifold model, or Manifold Ranking (MR). Particularly, it has been successfully applied to content-based image retrieval, because of its outstanding ability to discover underlying geometrical structure of the given image database.*

This project proposes a novel scalable graph-based ranking model trying to address the shortcomings of MR from two main perspectives: scalable graph construction and efficient ranking computation. Specifically, build an anchor graph on the database instead of a traditional k-nearest neighbour graph, and design a new form of adjacency matrix utilized to speed up the ranking. An approximate method is adopted for efficient out-of-sample retrieval. Experimental results on some large scale image databases demonstrate that promising method is effective for real world retrieval applications.

Key Words: Manifold Ranking (MR), Content-based Image Retrieval System (CBIR), Anchor Graph, Recall Rate

1. INTRODUCTION

Medical images are essential evidences to diagnose which provide important information about the any complicated diseases. There have recently been revolutionary changes in medical technology, hence a large amount of medical images have been stored in data base. These medical images also help in Computer Aided Diagnosis Applications. To satisfy the above needs, content-based medical image retrieval (CBIR) techniques have been initiated and researched in the past few years. Feature extraction plays a major task in content based medical image retrieval. In which the content of the image is described with the help of color, texture and shape features. The content of the image can be analyzed more effectively by employing multiple features rather than single feature. They combine the advantages of individual features resulting in a better retrieval system.

Graphed-based ranking models have been deeply studied and widely applied in information retrieval area. In this project, we focus on the problem of applying a novel and efficient graph-based model for content based image retrieval (CBIR), especially for out-of-sample retrieval on large data bases.

Most traditional methods focus on the data features too much but they ignore the underlying structure information, which is of great importance for semantic discovery, especially when the label information is unknown. Many databases have underlying cluster or manifold structure. Under such circumstances, the assumption of label consistency is reasonable. It means that those nearby data points, or points belong to the same cluster or manifold, are very likely to share the same semantic label. This phenomenon is extremely important to explore the semantic relevance when the label information is unknown. In our opinion, a good CBIR system should consider images low level features as well as the intrinsic structure of the image database

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1.1 CBIR System

Content-based medical image retrieval system is consisting of off-line phase. The contents of the database images are described with a feature vector in offline phase and same process is repeated for required given query image. The user submits a query images for searching similar images and the system retrieves related images by computing the similarity matching and finally, the system display the results which are nearly relevant to the given query image.

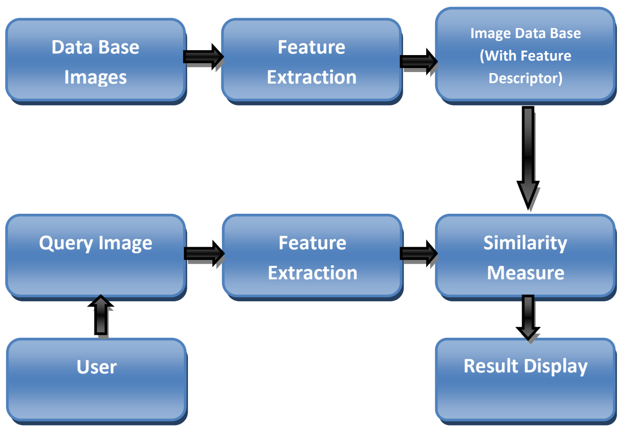

Fig.1: Basic Model Content based Image Retrieval

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2. LITERATURE REVIEW

B. Jyothi proposed Multidimensional Feature Space for an Effective Content Based Medical Image Retrieval. An effective content-based image retrieval system is essential to locate required medical images in huge databases. This paper proposes an effective approach to improve the effectiveness of retrieval system. The proposed scheme involves first, by detecting the boundary of the image, based on intensity gradient vector image model followed by exploring the content of the interior boundary with the help of multiple features using Gabor feature, Local line binary pattern and moment based features. The Euclidean distance is used for similarity measure and then these distances are sorted out and ranked. As a result, the Recall rate enormously improved and Error rate has been decreased when compared to the existing retrieval systems.[1]

Bin Xu, Jiajun Bu, Chun Chen proposed EMR: A Scalable Graph-based Ranking Model for Content-based Image Retrieval. This is based paper in which they propose a novel scalable graph-based ranking model called Efficient Manifold Ranking (EMR), trying to address the shortcomings of MR from two main perspectives: scalable graph construction and efficient ranking computation. Specifically, we build an anchor graph on the database instead of a traditional *k*-nearest neighbour graph, and design a new form of adjacency matrix utilized to speed up the ranking. An approximate method is adopted for efficient out-of-sample retrieval. Experimental results on some large scale image databases demonstrate that EMR is a promising method for real world retrieval applications.[2]

Kuldeep Yadav and Avi Srivastavapresented Texture-based medical image retrieval in compressed domain using compressive sensing In this paper, they focus on texture-based image retrieval in compressed domain using compressive sensing with the help of DC coefficients. Medical imaging is one of the fields which have been affected most; as there had been huge size of image database and getting out the concerned image had been a daunting task. Considering this, in this paper they propose a new model of image retrieval process using compressive sampling, since it allows accurate recovery of image from far fewer samples of unknowns and it does not require a close relation on matching between sampling pattern and characteristic image structure with increase acquisition speed and enhanced image quality.[3]

3. OBJECTIVES

The objectives of projects are given below:

- Reduce database load for image retrieval.
- Increase Recall Rate and reduce time delay
- By showing several experimental results and comparisons to evaluate the effectiveness and efficiency of our proposed method on many real time images

4. METHODOLOGY

The Fig.2 shows the methodology of proposed method. Here image processing carried out to extract the features of images by processing various image through various tools. The contents of the database images are described with a feature vector in offline phase and same process is repeated for required given query image. The user submits a query images for searching similar images and the system retrieves related images by computing the similarity matching and finally, the system display the results which are nearly relevant to the given query image.

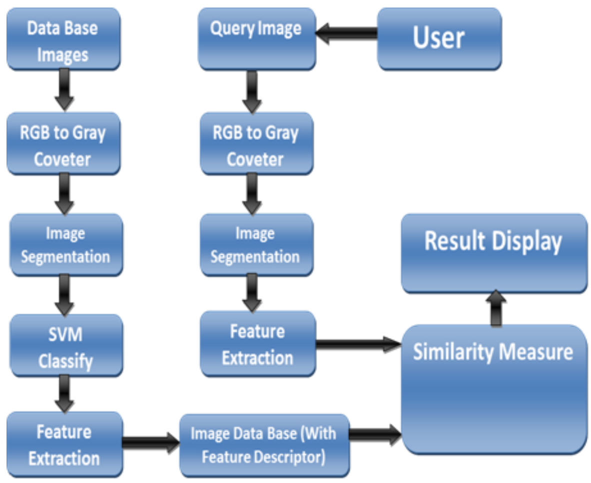


Fig.2: Block Diagram of Proposed Method

4.1 Feature Extraction Method

To handle large databases, we want the graph construction cost to be sub-linear with the graph size. That means, for each data point; we can't search the whole database, as kNN strategy dose. To achieve this requirement, we construct an anchor graph and propose a new design of adjacency matrix W.

4.2 Anchor Graph Construction

Now we introduce how to use anchor graph to model the data. Suppose we have a data set $\chi = \{X1, \ldots, Xn\} \subset Rm$ with n samples in m dimensions, and $U = \{u1, \ldots, ud\} \subset Rm$ denotes a set of anchors sharing the same space with the data set. Let $f : \chi \rightarrow R$ be a real value function which assigns each data point in χ a semantic label. We aim to find a weight matrix $Z \in Rd\times n$ that measures the potential relationships between data points in χ and anchors in U. Then we estimate f (x) for each data point as a weighted average of the labels on anchors[2].

$$f(xi) = \sum_{k=1}^{d} z_{ki}\ f(u_k), i = 1, \ldots . . n.$$

With constraints $\sum_{k=1}^{d} z_{ki}$=0 amd $z_{ki} \geq 0$ Element z_{ki} represents the weight between data point *xi* and anchor u_k. The key point of the anchor graph construction is how to compute the weight vector z_{ki} for each data point *xi*. Two issues need to be considered: (1) the quality of the weight vector and (2) the cost of the computation.

4.3 Design of Adjacency Matrix

We present a new approach to design the adjacency matrix W and make an intuitive explanation for it. The weight matrix Z ∈Rd×n can be seen as a d dimensional representation of the data X ∈ Rm×n, d is the number of anchor points. That is to say, data points can be represented in the new space, no matter what the original features are. This is a big advantage to handle some high dimensional data. Then, with the inner product as the metric to measure the adjacent weight between data points, we design the adjacency matrix to be a low-rank.[2]

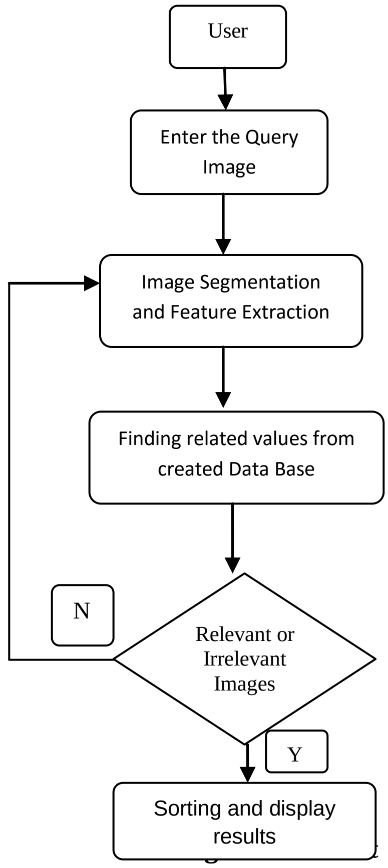
$$W = Z^T Z$$

Which means that if two data points are correlative (Wij>0), they share at least one common anchor point, otherwise Wij= 0. By sharing the same anchors, data points have similar semantic concepts in a high probability as our consideration. Thus, our design is helpful to explore the semantic relationships in the data.

5. IMPLEMENTATION

The proposed CBIR framework is given as shown in the Figure 3. The sequence of steps is given below.

- Step 1: Input A query image “I”.
- Step 2: Convert I to gray scale.
- Step 3: Compute image segmentation and then calculate features values of the image using proposed method.
- Step 4: Calculate the metrics value
- Step 5: Similarity comparisons between input images and data base.
- Step 6: Finally, relevant images are retrieved with respect to corresponding query image I.
- Step 7: Repeat step 1 to 6 for rest of the query images.
- Step 8: End.



6. EXPERIMENTAL RESULT

Experimental result output for data base. To calculate accuracy and time first we have create 100 images sample data base of various blood cell related diseases images.

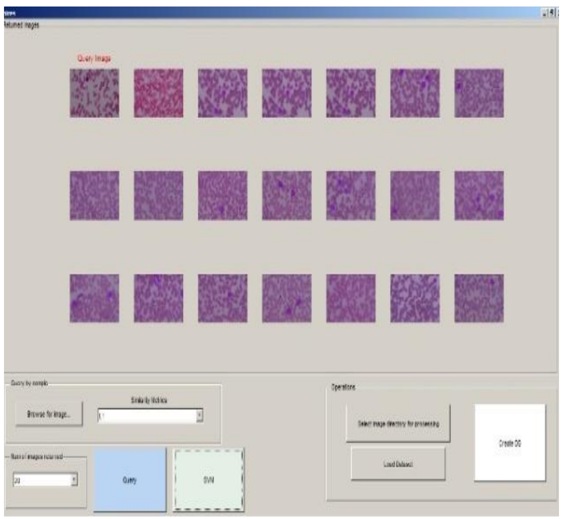


Fig.4: Blood cell image retrieval

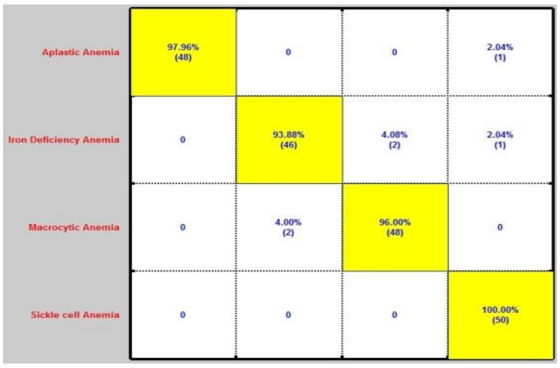


Fig.5: SVM classifier output Blood cell Images

6.1 Table for Accuracy and Time

To calculate accuracy and time first we have create 100 images sample data base of various blood cell related diseases images. All this images are taken from pathology lab which contains type of images of various diseases As shown in tables, suppose we give any query image as per the retrieval image value provided we get relevant images for that query.

Table 1- Accuracy

Sr. No.	No. of Images	No. of Images Retrieval	Accuracy %
1	5	5	100
2	10	9	90
3	15	12	80
4	20	15	75
5	25	19	76

7. CONCLUSION

We have proposed a novel approach for extracting region features from the object of an image. It can easily be implemented and is computationally more effective than the traditional methods. The results have illustrated that the projected method enhances the retrieval results when compared the existing system.

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