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Content Based Medical Image Retrieval-A Survey

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***Abstract*—** In today's world medical images play a vital role. Retrieving the correct information from medical images is the very difficult and time consuming. This paper presents the overview of content based image retrieval processing such as how medical images are processed and what are the techniques used for processing. This paper also discusses the difficulties in processing of the medical images and how to overcome difficulties. This paper overall gives an innovative idea of how content based image retrieval is employed in the medical images.

***Keywords*—** CBIR, Image Retrieval, Annotation, CBIRMI

I. INTRODUCTION

In today's world data is produced from many sources. The processed raw data is called information. The information can be image or the text. Accessing the text information is easy when compare to the images. There are many methods used to store the images. The First method to access the images is use text tags for the images while storing it. With the help of tags images can be retrieved. This method is also called annotation method. Using annotation method, misunderstanding of the images may occur and may end up with false image. In the annotation method the image retrieval has more subjectivity. This concept may bring heavy workload on the system. In Second method, features of the images are considered as the factor to access the images from the database [1]. The features can be high level feature or low level features. Retrieving the images using the information present in the images or getting the information present in the image is called ***Content Based Image Processing (CBIR).*** If the system is developed to retrieve the medical images contents then it is called Content ***Based Image Processing for medical Images (CBIRMI).***

The content based image retrieval can be done by using the feature extraction. The feature extraction can be low level feature extraction or high level feature extraction. The low level feature extraction involves colour, texture and inflections. The high level feature extraction involves shape discretion and object features. Using both the methods, sometimes it is very difficult to access images; this is because the difference in the visual perception and the actual image model representation [2].

The rest of paper is organized as follows. Section 2 reviews the architecture of the content based retrieval systems. Section 3 discusses CBIR and its connection with Medical images. This section also discusses the problems and approaches CBIRMI. Conclusion is represented in section 4.

II. ARCHITECTURE OF CBIR

The content based image retrieval can be divided into 4 sub parts. They are:

- Data Collection
- Building a database: This is done using the feature extractions.
- Searching Stage: Developing the search engine or searching in a database depending upon the features which is extracted from the new image. If the image is present extract it and show the results; else go the next stage
- Feedback Stage or restoring the new images Stage: The extracted features from the new images are stored in the database, so that it can be used for next time.

The entire CBIR system is shown below in Figure 1.1

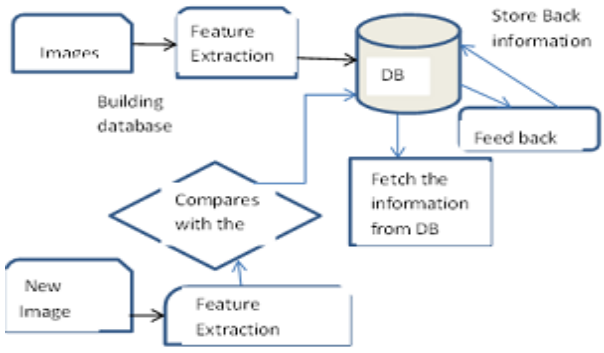

Figure 1.1 CBIR System

Data Collection contains all the different types of images storage. It can be medical images, photography images; it is

the like of the user, on which kind of database, is required for the search.

Next stage is the feature extraction where low level or high level features can be extracted and can be used as the index to store images in the database.

In third stage, when new images are given to the system, first features are extracted. These features are considered as index to search in the data base. If the features are matched, then image is retrieved from the database. Otherwise it goes to the next stage.

In last stage, all the extracted features are stored as index in the database.

III. MEDICAL IMAGES AND CBIR

As the medical science is improved, images with respect to the medical field will be in thousands and more. To retrieve the information from these medical images, and diagnose or understanding the images will take lots of time. Sometimes getting a proper diagnosis of the image is crucial.

In the case of medical images the storage of the images are usually done with respect to the high level feature extraction. Medical images can be classified according to the shape orientation, modality and region. Annotation classification method, for storing the medical images, is very difficult. So CBIR method is very much useful in the medical field to store the images and retrieve the images [3].

A. *THE DIFFICULTIES IN MEDICAL IMAGE STORAGE RETRIEVAL AND PROCESSING*

Medical images are digitally represented; there may be difference in the modality. The differences in image capturing devices are used. Some time because of the difference in the intensity the actual image is not seen properly. Most of the medical images are grey scale images, so there may be difference in the representation of monochrome images. These images are recorded as dicom images, which will be very big in size, converting the images may lose data or its features and also storing the images is difficult. In medical images person's age, gender, region matters, so storing the images and classifying the images are difficult. Identifying the proper region, i.e., segmentation is sometimes difficult.

Source files and uncertainty in representing the patient's images will be there in Medical image processing. Uncertainty may occur during the acquisition of the images. Be uncertainty can be related with respect to the biological variability, normal variability, pathological variability, intrinsic data variability. Images may have problems with limited spatial resolutions and geometric distortion. Image analysis and extracting high-level description from images should be done carefully [4].

Validation for medical image processing will be difficult. It contains clinically relevant validation. Mathematical and statistical tools are required for quantitative estimating the performances in the absence of a reference standard. Comparison of the performance of different methods requires common standard validation process.

B. *DIFFICULTIES IN THE MEDICAL IMAGES STORAGE*

During the last years, the amount of medical image data grew from Kilo- to Terabyte. This is mainly due to improvements in medical image acquisition systems with increasing pixel resolution and faster reconstruction processing. Large medical images data occur due to thousands of pictures from PACS (Picture Archiving and Communication Systems) and large amount of the images from a single datasets [5].

Due to the steadily increasing amount of medical image data, fast feature extracting and indexing techniques are needed that simultaneously narrow the gap between the numerical nature of features and the semantic meaning of images. The main disadvantage of Kilo- to Terabyte storage is increase in the processing time. The users have to wait longer duration to accept the results.

C. *CBIR METHODS ARE STILL UNAVAILABLE IN REDIOGRAPHICAL MEDICAL IMAGES*

Possible obstacles to the use of CBIR in medicine include the lack of translational cooperation between biomedical and engineering experts, effective representation of medical content by low-level mathematical features, comprehensive representation of the medical images.

Accessing the content of the medical images with the use of natural languages is difficult. But if it is implemented will give the better diagnostics and treatments to the patients. Interfacing to the image processing with automated text analysis is the challenge.

Motion estimation is very difficult in the medical images, because it requires the prior knowledge of the typically expected properties if the motion field [6].

VR technologies are useful to represent the large data, and helpful in stereoscopic displays, direct user interaction enables better understanding in less time. The representation of the medical images in the VR technologies

require preparation of the raw data, which will be done in the pre-processing stage and it, is very costly [7].

D. *SOME APPROACHES TO THE MEDICAL IMAGE PROBLEM*

To overcome the Giga- to Terabyte data, parallelization techniques are used to accept real- time response. Scalable algorithms can be developed using parallel techniques to increase memory efficiency and processing time speed. The memory efficiency can be increased by compressed or packed representation of data, decomposition techniques, out-of-core or multi-resolution techniques [8].In decomposition techniques the large volume of data is subdivided into smaller bricks. Each brick is decomposes the data into a hierarchical multi resolution techniques. To represent a bricks, the data structures like binary space partitioning (BSP) tree, octree or kd-trees are used. Here the leaves represent the original data and inner nodes hold the filtered, coarse-to-fine representation of the original volume data and are saved out-of-core [8].

To develop parallel architecture hardware and the programming languages support is very important. Hardware support can be done using one or more CPUs and GPUs [9]. With a shared memory, and programming in a single nodes using the threaded programming techniques like OpenMP or Otthreaded parallel architecture can be achieved. Different languages, high speed GPU, grid computing [10], special interface and new algorithms have been developed to achieve the parallel architecture [11,12] and efficiency.

Validation is very helpful in medical image processing, which is useful in development of new therapies and drug discovery process. Different validation algorithms are developed with respect to context of the problem constraints.

IV. CONCLUSION

In this paper, the technique employed in retrieving medical images is conferred in CBIR architecture [13]. The toil that transpire while retrieving medical images along different solutions so that future research coterie can get ease out of it.

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