ABSTRACT

Diagnostic radiology demands accurate interpretation of complex signals in medical images. Content-based medical image retrieval (CBMIR) techniques are valuable to radiologists in assessing medical images by identifying similar images in large archives that could assist with decision support. In general, a Content Based Image Retrieval (CBIR) system is an extension of the traditional text-based informational retrieval system. However, the techniques and approaches used in CBIR have diverged from traditional text-based retrieval systems and CBIR has now grown into separate research discipline in its own right. Syntactically the text is one dimensional while an image is two dimensional. Most of the text based information retrieval (IR) systems such as Yahoo, Lycos and Google have achieved great success for indexing and querying web sites. In contrast, effective and precise content-based image retrieval based on low level features such as texture and shape is still remains to be an open problem because of the extreme difficulty in image understanding.

For the last two decades, content-based image retrieval has been a vital area of research. An enormous publication in this period reflects diversity among the proposed solutions. Mostly CBIR has been proved successful in non medical domains, among which some with relevance to medical domain have been taken for literature review in this work. Radiology images pose different challenges compared to images in the consumer

domain. They contain varied, rich and often subtle features that need to be recognized in assessing image similarity. Many advances in CBIR have occurred mostly in non-medical domains and adoption of these methods into radiology has been limited. Our goal in this research work is to study existing, more promising CBIR methods and system approaches developed in non-medical domain and use them or translate them for medical applications.

Considering the similarity in execution and presentation concepts used in the existing system, they can be grouped into three categories viz. single, dual and tri feature extraction. To compare the throughput of the selected schemes, similar experimental setup has been ensured by implementing all the schemes on the same machine with identical test conditions. Precision and recall were calculated from the same reference database having 560 medical images that includes real-time medical images collected from local hospital and medical images collected from "CasImage database and IRMA database" repositories. They are compared in order to assess the exact retrieval performance of these works and derive best out of them for further investigation. It is concluded that the tri feature extraction method shows the best result in terms of both precision and recall parameters, when compared to other methods such as single feature extraction method and dual feature extraction method.

Considering the best features derived from the existing methods discussed in aforementioned features a new scheme called "**Multi-Level Hybrid Approach for Content Based Medical Image Retrieval using Visual Features**" has been proposed to improve the image retrieval performance. This proposed scheme involves four levels. In the level 1, shape and texture features are extracted using Canny Edge Detection (CED) and Gray Level Co-occurrence Matrix (GLCM) methods respectively. In level 2, the extracted shape and texture features are fine tuned using Edge Histogram Descriptor (EHD) and Edge based texture feature (EBT) methods respectively. In the level 3, the above fine tuned shape and texture features are combined and hence a hybrid shape and texture feature extraction system is achieved. In level 4, Intensity features are added to the above system and finally an integrated hybrid intensity feature extraction system is achieved.

Compared to existing best system, the proposed system is able to give about 2% better precision and 5% better recall values and 15% reduced time complexity for medical image retrieval. Hence it is concluded that the proposed system outperforms all the existing methods.