

Master

(Investigation of Novel Strategies of Content-Based Image Retrieval for Picture Archiving & Communication System)

During the last few decades, the degree of uncertainty in medical diagnosis has dramatically decreased. Medical imaging plays an essential role for improving medical diagnosis. Now, physicians have access to a large number of imaging modalities with unique diagnostic characteristics for each. These medical imaging modalities not only provide non-invasive description of organs and anatomical cross sections, but also they provide information about physiological status, measuring brain functional activities and blood flow within the heart and the vessels.

A great amount of research work has been devoted to the development of different medical imaging modalities. The research aims to increase image quality, decrease image reconstruction time, increase the safety of the imaging systems, and maintain the reliability and portability of imaging modalities. Moreover, research work is growing fast to maximize the amount of extracted diagnostic information from medical images with applications in diagnosis, clinical research, and medical education. Based on this direction of research, systems such as picture archiving and communication systems (PACS), hospital information systems (HIS), radiology information systems (RIS), and patient information systems (PIS) have been developed and matured commercially.

There are two main directions of research in PACS. In the first direction, the work is focused on the main components of PACS (display workstation, acquisition workstation, PACS network, and PACS central node) in order to increase the performance and reduce the cost of these components [1,2,3]. In the other direction, the research concerns adding new capabilities to the PACS in order to increase its benefits. Telemedicine [4], teleradiology [5,6], teleconsultance [7], home services [9], and medical digital library (integration between PACS, hospital information system, radiology information system and web capability) [9,10,11,12] are examples on the work in this direction.

The work in this thesis is within this direction. We add retrieving by content facility for medical images in the PACS and medical digital library for diagnosis, training, and educational purposes.

Thesis Objective

The objective of this thesis is to develop techniques for high performance medical content-based image retrieval (CBIR), as well as a strategy based on distributed objects to integrate medical CBIR in full scale PACS (PACS, RIS, and HIS) for more cost-effective health care delivery, medical education, and clinical research. Since PACS design is made to be a closed system that serves a few number of users, adding a new retrieving capability as CBIR or new access to the system as teleradiology, teleconsultance, and web capability will increase the load on the system dramatically and reduce the overall performance. Therefore, we propose a strategy to reduce the load on the PACS and the number of expected shucks.