Archimedes, an Archive of Medical Images

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Abstract
We present a medical image and medical record database for the storage, research, transmission, and evaluation of medical images. Medical images from any source that supports the DICOM standard can be stored and accessed, as well as associated analysis and annotations. Retrieval is based on patient info, date, doctor's annotations, features in the images, or a spatial combination. This database supports the secure transmission of sensitive data for tele-medicine and follows all HIPPA regulations.

Introduction
Most retrievals in medical image database systems are based on the patient identifcation information or image modality [1] as it is defined in the DICOM standard [2], and it is hoped that inclusion of other features can improve the effectiveness of this type of system.

Archimedes is an image analysis and patient records management tool intended for the use of the medical community. It allows doctors to search for common features in a database of images via innovative combinations of search techniques and algorithms. This system allows the rapid retrieval of images and patient records, and can also find patients with similar images, conditions, or annotations to compare treatment successes. Searchable images types include common medical images such as x-rays, mammograms, CAT scans and MRIs. Doctors can quickly and easily retrieve patient records with the use of Archimedes' electronic image searching capabilities. They can also use it to perform electronic comparisons of images easier than traditional hard-copy comparison. In addition to software improvements, the software archives the addition of markups and notations to images, and supports auditing and reviewing of doctors' decisions. This satisfies strict legal constraints of patient information for hospitals and other medical institutions.

Search and Retrieval of Data
The doctor is allowed to enter information about the patient (i.e. First name, Last name, date of birth, etc.) Once this information is entered, they can use filters to further refine their search results. Searching by feature allows the doctors to specify feature parameters they wish to see in the results. This allows medical professionals to quickly find similar cases. The next type of search is an extension to searching by feature, specifying multiple features with defined spatial relationships between them. The most useful of these types of search would specify a distance between features, for example to find areas that have the features of both spiculations and the bright central cores indicative of spiculated lesions in a mammogram. The database also allows search over comments other doctors previously made about patients or images.

System Security
The program and database must maintain a high level of security due to privacy issues associated with maintaining patient sensitive medical information. The application is web-based for simplified deployment and tele-medicine uses. Information transmitted to the front-end is encrypted via the AES encryption scheme. All modifications during program use are monitored and logged by the system.

Annotation and Manipulation of Images
Images and image sets can be viewed directly on the system or downloaded. Image annotations can be entered directly into the system, and features can be marked as well, or uploaded from another program in an XML schema. Images can be resized, and image zooming is supported.

Conclusions
We have created a secure database for the storage, retrieval, manipulation, and annotation of medical images and medical records.

Bibliography
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