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ProstateAnalyzer: GUI in Medical Domain with Management of DICOM Images of Prostate Cancer (PCa)

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Purpose of the software

Medical support analysis systems are becoming increasingly important in assisting experts to supply more accurate and well informed diagnoses [1,2]. Although there is increased interest in the management, storage and retrieval of digital images for diagnoses, most hospitals need specific and tailored software solutions to solve the management of data and its access in the network [3]. In this paper, we propose a framework that comprises visualization and analysis for MR imaging of the prostate and a new storage system of clinical diagnoses in a single package. ProstateAnalyzer is such a network-based database system allowing the management of both MRI and spectroscopy data sets, and the possibility of performing basic mathematical operation images.

Methods/Implementation/Hardware requirements

ProstateAnalyzer has been designed as a web-based application within a Zend Apache server, also used as a MySQL database server for data storage. The application links a database of DICOM images with a XML server which stores a set of clinical cases (annotation files). Figure 1 shows the proposed architecture and the hardware needed to run the ProstateAnalyzer. This tool is implemented as a Java-based applet application to facilitate the inclusion of medical findings on existing prostate studies. These studies are created by means of XML files to annotate tumors and other pathologies provided by experts.

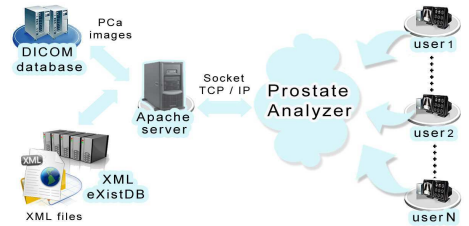


Figure 1: Network-based database system designed to implement the framework

Features illustrated at the exhibit

The main features of the software are based on the analysis of prostate images using four techniques of visualization: 3D T2-weighted anatomical imaging, Diffusion-Weighted Imaging with Apparent Diffusion Coefficient (ADC) maps, Perfusion-Weighted Imaging, and 3D MR Spectroscopy. These visualization capabilities are combined with basic post-processing tasks such as zooming, user-specific ROI, surface and volumetric measurements, ADC values, perfusion signal-time curves and individual spectrum visualization from 3D spectroscopic grid. A medical tool has been developed in order to globalize all these features in the same software and facilitate data management. Different views of the tool are shown in Figures 2 to 5.

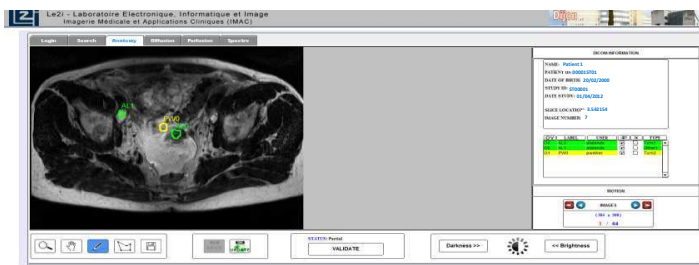


Figure 2: Multiple and user-specific ROI studies on 3D T2-weighted MR images.

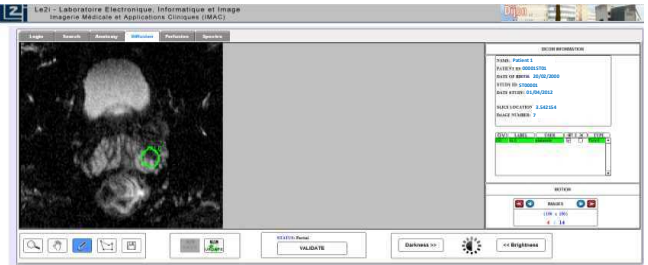


Figure 3: Example of basic operations on ADC MR images.



Figure 4: ROI analyses on perfusion MR images with the corresponding signal-time curves.

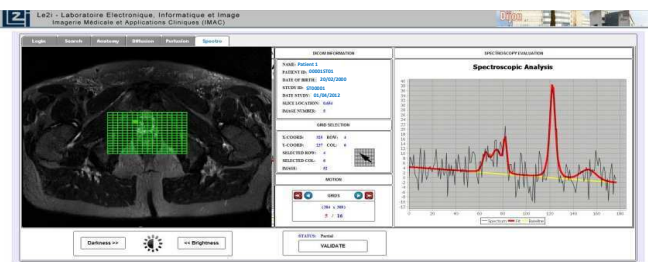


Figure 5: Example of a 3D spectroscopic imaging study with LCMoDel-processed spectrum

One of the most evident advantages provided by the tool is an improved create/recover/update prostate diagnosis provided by different experts. It is an efficient way to share information concerning the state of the diagnoses and to save them on ones own workstation. Moreover, this tool offers the possibility to work remotely via the web and represents an improvement in data management. Taking into account how rapidly clinical databases are growing, ProstateAnalyzer will be an important contribution to the management of our database of more than 1000 patient data sets in the field of MRI and spectroscopy analysis.

References

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