ASSESSMENT OF TOOLS AND LIBRARIES FOR DIGITAL IMAGING AND COMMUNICATIONS IN MEDICINE (DICOM)

Aksyonov Sergey Vladimirovich, Associate Professor
Toro, Mohammed Lawal
Postgraduate Tomsk Polytechnic University
E-mail: molatoro@hotmail.com

Introduction

There has been a growing trend in digital image processing for the diagnosis of patients, due to its relevance to researchers and interested audiences, there has always been a need for an updated systematic analysis of a specific subject area [1]. Accurate medical image analysis is an important stage in the contouring process during the preparation of radiotherapy. In diagnosis, clinical trials and recovery planning, medical images are often used as radiographic techniques. The main purpose of the analysis is to collect and assess the tool to show users of different operating systems the kind of medical image tools to use in the analysis of different images.

Background

A BMJ Health and Safety report state that about 5 per cent of adults, or 1 out of 20 adult patients, are misdiagnosed. Recent advances in imaging have resulted in advancements and alterations in the future application of image-guided treatments. From the observation of X-ray beams by Roentgen in 1895[2,3].

These tools are categorized into Commercial, open-source and freeware. The PACS (Picture Archiving and Communication Systems) are instruments of medical imagery used to store, display, and exchange DICOM images from radiological studies. PACS can make a significant difference in terms of time and money for hospitals, clinics because a PACS system can help to optimize the time spent by doctors on each patient case, improve diagnostic efficiency and ensure that the cost of operating an institution can be significantly reduced. In today's world, technology has produced many options that can be taken advantage of by imaging centers, doctors and researchers. The system is designed to help both radiologists and scientists in producing an accurate and true ground truth with less supervisory intervention when there are multiple segmentations for a single image.

Methodology

DICOM (Digital Imaging and Communications in Medicine) is a typical format that aids medical specialists to view, store, and share medical images regardless of their geographic location or the devices they use, as long as those devices support the format. DICOM images are accessed through precise software called DICOM viewers that can read and display the format of these images, along with their matching patient data, are often stored in a large database called the Picture Archiving and Communication System (PACS). Dedicated segmentation instruments are therefore mandatory to obtain a comprehensive result. These tools also can handle Maximum and minimum intensity projection (MIP) and Multiplanar reconstruction (MPR)[3,4].

Categorization

These tools are categorized into opensource, freeware and web-based. The most popular formats used in daily practice are JPEG, JPEG 2000, TIFF, GIF, and PNG formats., images stored in these formats can be viewed on any personal computer without the need for dedicated viewers. They can be easily integrated into presentations and web pages. A major disadvantage of these file formats, compared to DICOM, is that they contain the user-defined level of the window and the width of the window that is set when the image is created**.** As a result, the contrast between the structures within the image cannot be adjusted and post-processing cannot be performed on JPEG (Joint Photographic Experts Group), TIFF (Tagged Image File Format), GIF (Graphics Interchange Format and PNG) (Portable Networks Graphics)[5,6]. DICOM viewers are often developed with a focus on one or more of the following functions: Simple viewing of medical images, Teaching, Mini-PACS servers and research.

Table 1 represents my assessment of five different tools and their corresponding features.

Table 1. Selected software tools and their features

Software	*Cost*	*Open-source*	*PACS integration/ Cloud*	*Operating system*	*MPR*	*MIP*	*Export to system*	*URL*
PostDICOM	*Free and paid*	*Yes*	*50 GB Free cloud-based, PACS*	*Windows, Mac OS X, Linux, Android, iPhones and iPads*	*Y*	*Y*	*Picture files, doc*	*https://www.postdicom.com/*
Horos	*Free*	*Yes*	*Paid for extra*	*Mac Os*	*Y*	*Y*	*NA*	*https://horosproject.org/*
RadiAnt	*paid*	*No*	*Not Available*	*Windows*	*Y*	*Y*	*Image files, doc powerpoint*	*https://www.radiantviewer.com/*
Navegatium	*Free*	*Yes*	*Can integrate to PACS no cloud storage*	*Windows 8.1 and above*	*Y*	*Y*	*NA*	*http:// www.navegatium.com*
Pro Surgical 3D	*Free*	*Yes*	*Not Available*	*Windows 8.1 and above*	*Y*	*Y*	*STL and PLY*	*https://www.stratovan.com/products/pro-surgical-3d*

These tools can show images in DICOM format from all modalities including x-ray, ultrasound, CT scanner, MRI, PET and ECG. The selected tools which fall under the category of opensource, freeware and web-based it can be seen that PostDICOM is one of the best DICOM viewers that offers almost necessary features. It is compatible with Windows, Mac OS X, and Linux and can be operated from android devices and iOS-based systems. PostDICOM comes with a cloud-based PACS, which allows you to access data from any device, anywhere, at any time. The viewer allows advanced image manipulation, such as 3D reconstruction, 3D volume rendering and MIP, and image fusion. It also offers an interface for creating reports, sharing files, and immediate uploading of all patient data to the cloud PACS. Navegatium and ProSurgical 3D can be accessed using windows 8.1 and above, while Horos and Radiant can be accessed using Mac Os and Windows respectively. The mentioned tools have different formats of export of different images to the system, however, it is not applicable in Horos.

Conclusion

From my assessment of these different tools which are either free, open-source or web-based, each tool has its power and It was concluded weaknesses. Finally, apart from accessibility which allows you to access data from any device, anywhere, at any time. The PACS is cloud-based and has many benefits, exclusive to PostDICOM. It enables researchers to upload appropriate image data to the PACS server during their clinical research for display, processing and analysis at different stages. The data is completely incorporated and the workflow is smooth.

References

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