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Designing a Free Open-Source Software based Digital Library for Medical Imaging

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This study explores the integration of the DICOM standard into DSpace, an open-source repository system, to develop a medical image repository that supports the storage, query, and retrieval of DICOM objects. The research identifies the need for a system that can handle specialized medical imaging files (dcm) and provides a solution by extending DSpace's capabilities to recognize and manage these files, ensuring access to medical professionals and radiologists. The study also addresses the customization of metadata elements to conform with DICOM standards, enhancing the quality and consistency of image appearance and facilitating the search and retrieval of medical images through developed metadata patches.

Keyword: OSS, DSpace, DICOM, Image, Repository and Viewer

Introduction

The advent of digital libraries (DLs) has revolutionized the way information is stored, accessed, and disseminated, particularly in the realm of medical imaging where the DICOM standard is pivotal for managing complex image data[6]. The necessity for an open-source DICOM Image Archive is underscored by the current limitations faced by medical professionals who rely on localized storage solutions that lack global accessibility and security. This study introduces a novel platform that leverages the DICOM standard within the DSpace repository system, aiming to provide a secure, web-enabled repository for medical images that can be accessed and analyzed by medical experts worldwide. The integration of specialized metadata elements tailored to the DICOM standard is a critical component of this platform, ensuring the accurate representation and efficient retrieval of medical images.

The DICOM standard is crucial as it provides a universal protocol for the storage, retrieval, and transfer of medical images, ensuring interoperability among different imaging devices and systems[4]. It supports a wide range of medical imaging across various specialties, including radiology, cardiology, pathology, and dentistry, by defining a set of network communications protocols and media storage services. DICOM facilitates the development and expansion of Picture Archiving and Communication Systems (PACS), enabling efficient archiving and non-proprietary communication of medical data. Moreover, the standard includes a comprehensive file format and a medical directory structure that simplifies access to images and associated information. The embedded metadata within DICOM files, organized into hierarchical levels, provides essential details for identifying and managing medical images.

Role of Dicom In Pacs Development

DICOM plays a foundational role in the development of PACS by providing a standardized framework for the storage, retrieval, management, distribution, and presentation of medical images[7]. It ensures interoperability between different imaging devices and systems, which is essential for the seamless integration of medical images into PACS. The DICOM standard supports various workflows and policies, accommodating the diverse requirements of biomedical imaging across different geographic regions and medical specialties. Furthermore, DICOM's use of TCP/IP as the lower-layer transport protocol facilitates the networked communication that is central to PACS functionality. The standard's ability to handle data supporting cultural requirements and its extensive use of Unique Identifiers are critical for the organization and tracking of medical images within PACS.

Literature Review

The literature survey of this paper encompasses a critical analysis of existing knowledge on digital libraries (DLs), highlighting their evolution and the role of open-source software (OSS) in their

development[10]. It notes the significant global advancement of DLs, with projects like the Universal Digital Library, World Digital Library, and Digital Library of India digitizing vast quantities of culturally valuable books[1]. The survey includes an evaluative study of Indian DLs, emphasizing the increasing adoption of OSS like DSpace for creating Institutional Repositories and Digital Libraries due to its superior functionality in security and other essential features. Furthermore, the survey addresses the use of metadata in library systems, transitioning from traditional card catalogues to computer databases, enhancing searchability and efficiency[3]. It also discusses the reluctance of librarians to adopt OSS despite its advantages, such as cost-effectiveness, portability, and zero maintenance features, which are beneficial for libraries of all sizes and types. The categorization of library-related OSS is also mentioned, covering a range of applications from document delivery to digital archiving.

The literature survey primarily focuses on the evolution and current state of digital libraries (DLs), the role of metadata in library systems, and the adoption of open-source software (OSS) for library management and digital archiving[5]. It highlights the progression of DLs with significant projects digitizing educational and cultural materials at global, national, and institutional levels. The survey also discusses the transition from traditional card catalogues to computerized databases, emphasizing the enhanced searchability and efficiency brought about by metadata usage[8]. Additionally, it examines the increasing utilization of OSS like DSpace in Indian digital libraries and repositories, noting its functional advantages in terms of security and other essential features.

Objective Of This Study

1. The primary objective of this study is to develop and design an architecture model for a web-based medical imaging repository application, aimed at facilitating system management and diagnostic processes.
2. The study seeks to extend the capabilities of DSpace, an institutional repository system, to recognize and manage DICOM files, which are essential for viewing and analyzing medical images, signals, and video files across various devices.
3. The overarching goal is to contribute to the healthcare industry by providing an open-source medical image library that can accommodate DICOM image files and improve the underutilization of DSpace in healthcare.

Methodology

The methodology for developing the DICOM-based medical image repository involves a critical analysis of related literature to identify existing knowledge and research gaps. The study leverages open-source software principles, aligning with the ethos of librarianship and information sharing. It utilizes the DSpace digital repository software, configuring it to manage and archive DICOM images. Metadata standards such as DICOM for medical images, LOM for learning objects, and Dublin Core for general collections are adopted to organize the repository. XML programming is employed to encode documents in a machine-readable format, ensuring the repository's compatibility with DICOM files. The study also involves the customization of input forms in DSpace to facilitate the intuitive organization of metadata elements.

Open-Source Software

Open-Source Software (OSS) is characterized by its community ownership and the provision of access to its source code, allowing users to run, study, change, and redistribute copies with or without modifications. The OSS movement, which began in the 1960s, aligns with the principles of software freedom, advocating for essential freedoms related to the use and distribution of software. OSS is not synonymous with shareware or freeware, as it specifically involves the availability of source code and the rights to modify and share the software. The term "Free/Libre or Open-Source Software" (FLOSS) is particularly used in Europe, but "Open Source Software" remains the most widely used term. OSS has gained popularity in various sectors, including library and information science, where it supports activities like library automation and the development of digital repositories.

Dspace Overview

DSpace is an open-source repository software platform widely utilized for creating digital collections within academic, nonprofit, and commercial organizations. It is designed with a three-layer architecture comprising storage, business, and application layers, each with a documented API to

facilitate future customization and enhancement. DSpace supports the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH) and uses the Dublin Core metadata format by default. The system's information model is built around the concept of "Communities," which are organizational sub-units with distinct information management needs. DSpace's flexibility is evident in its ability to integrate with various file types, including DICOM images, and its capacity for customization, such as the development of patches for viewing DICOM metadata. It also offers robust preservation features, including file type support, checksums for authenticity, and persistent identifiers.

Dicom Overview

DICOM, or Digital Imaging and Communications in Medicine, is the predominant standard for the storage, transmission, and management of medical imaging information and related data[6]. It was developed to enable interoperability of systems and to ensure a consistent presentation of images across diverse hardware and software platforms. The standard encompasses a comprehensive set of protocols for network communication, media communication, and data formats, facilitating not only the exchange of images but also the conveyance of patient information, study parameters, and workflow management details[2]. DICOM's metadata structure, which includes a wide array of attributes, is critical for the accurate and detailed description of patient data, imaging studies, and series. Unique Identifiers (UIDs) are extensively used within DICOM to ensure the unambiguous identification of information entities[9]. The standard's global adoption is a testament to its robustness and its ability to adapt to the varying requirements of medical imaging practices worldwide.

A patient IOD, for example, has attributes for patient's name, ID, date of birth, weight, sex and so on. All clinically relevant patient-related information can be described (Figure 1). The DICOM model defines four object levels: patient; study; series & equipment, image, waveform, and structured report document. Each of the levels can contain several sublevels. A patient is a person receiving health care services. One patient may have multiple studies and each study may include one or more image series with one or more images. Each level of the order has a unique ID to perform hierarchical data searches, retrievals and transactions (Figure 2) DICOM

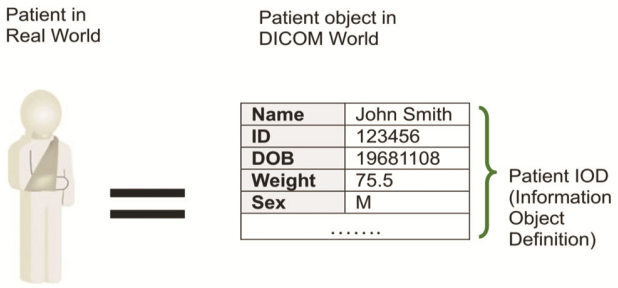

Fig. 1 — From real data to DICOM Information Object Definitions.

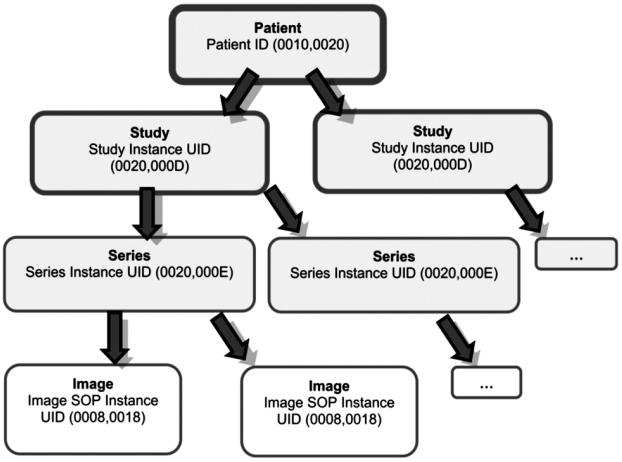

Fig. 2 — DICOM Information Hierarchy

differentiates between normalized and composite IODs. A normalized IOD represents a single real-world entity with attributes that are inherent in the real-world entity. For example, the DICOM Study IOD is normalized because it contains only the study's intrinsic properties, such as study date and time.

Implementation And Integration

The implementation and integration of the DICOM standard involve the establishment of network communications protocols and media communication facilities, ensuring devices conform to the standard for effective data transfer and interoperability. The DICOM standard is integrated to support various workflows, processes, and policies used for biomedical imaging across different geographic regions and medical specialties. Additionally, the integration of DICOM Metadata and DICOM Viewer into the medical image repository system is crucial for the efficient query and retrieval of objects with information content. The development of a medical image repository, such as the one discussed, leverages open-source software like DSpace, which is designed to be customizable and to fit the needs of any

organization. This integration ensures that the medical image repository can offer quality and consistency of image appearance, crucial for medical analysis and diagnosis.

The default metadata schema is Dublin Core, so DSpace is distributed and viewed with a default Dublin Core Metadata format. At present, the system requires that every item have a Dublin Core record. The system uses a set of Dublin Core Elements and should not be removed or moved to another schema as per the **Default Dublin Core Metadata registry**. So DICOM metadata is difficult to view on the item page. Therefore the research demand development for the DICOM standard to view DICOM metadata on the item page. In DSpace, the JSPUI interface implemented using Java Servlets that handle the business logic, and JavaServer Pages (JSPs) produce the HTML pages sent to an end-user. Since the JSPs are much closer to HTML than Java code, altering the look and feel of DSpace is relatively easy. This research developed two new patches for DICOM Repository to view DICOM Metadata in the item pages for two extensions <dspace.cfg> and <Message.Properties>. The <Message.Properties> extension file developed for metadata identification and label creation. The <dspace.cfg> developed for recognize every element when uploading any medical image file/ item to store in DICOM repository. The development patches as

Location at dspace/dspace-api/src/main/ resources/ Messages.properties

```
metadata.dicom.contributor.*                = Consulting Physician Name
metadata.dicom.contributor. physician   = Consulting Physician Name
metadata.dicom.contributor.physician     = Referring Physician Name
metadata.dicom.date.issued              = Issue Date
metadata.dicom.description              = Description
metadata.dicom.description.report       = Reports
metadata.dicom.identifier               = Other Identifiers
metadata.dicom.identifier.study         = Study Date
metadata.dicom.identifier.accession     = Accession No
metadata.dicom.identifier.id            = Study ID
metadata.dicom.identifier.patientid     = Patient ID
metadata.dicom.identifier.studyuid      = Study UID
metadata.dicom.identifier.uri           = URI
metadata.dicom.institute                = Institute/ Hospital
metadata.dicom.relation.ispartofseries = Series/Report no.
metadata.dicom.subject                  = Keywords
metadata.dicom.imagetitle               = Image Title
metadata.dicom.patient                  = Patient Name
metadata.dicom.imagetype                = Image Source
```

Location at dspace/config/dspace.cfg

```
    ###### Web Interface Settings ######
    # Customise the DICOM metadata fields to show in the default simple item view.
    #
    #The form is
    <schema prefix>.<element>[.<qualifier>|.*][(date)|(link)|(nobreakline)],
    webui.itemdisplay.default =
    dc.imagetitle, dc.title.alternative, dc.contributor.*, \
    dc.subject(nobreakline), dc.date.issued(date), dc.institute, \
    dc.identifier.patient, dc.relation.ispartofseries, \
    dc.description.report, dc.description, \
    dc.identifier.studyid, dc.identifier.uri(link), \
    dc.identifier.uid, dc.identifier.series, \
    dc.identifier.patientid, dc.identifier
    jspui.search.index.display.1 = ANY
    jspui.search.index.display.2 = physician
    jspui.search.index.display.3 = imagetitle
    jspui.search.index.display.4 = keyword
    jspui.search.index.display.5 = report
    jspui.search.index.display.6 = series
    jspui.search.index.display.7 = institute
    jspui.search.index.display.8 = identifier
    jspui.search.index.display.9 = description
```

Figure 3 shows the result after the integration of new patches in <Message. Properties> and <dspace.cfg> file under back-end area of DICOM repository. This development will help the medical professionals to view different types of DICOM metadata tags like Image Title, Patient Name, Consulting Physician, Referring Physician, Subject/ Keywords, Issue date, Institute/ Hospital, Report No, Series No, URI, Study ID, and Study UID, etc.

Figure 3 also shows the methods for linking DSpace with the DICOM server so that DICOM files uploaded to a DSpace are available via a DICOM query. In this process, data can reside in the DICOM image archive if described at the level of detail required for it to be uploaded into DSpace. By requiring DSpace to upload DICOM, Images will be discoverable via internet/ DSpace search and persist via Internet handles. Simultaneously making DICOM

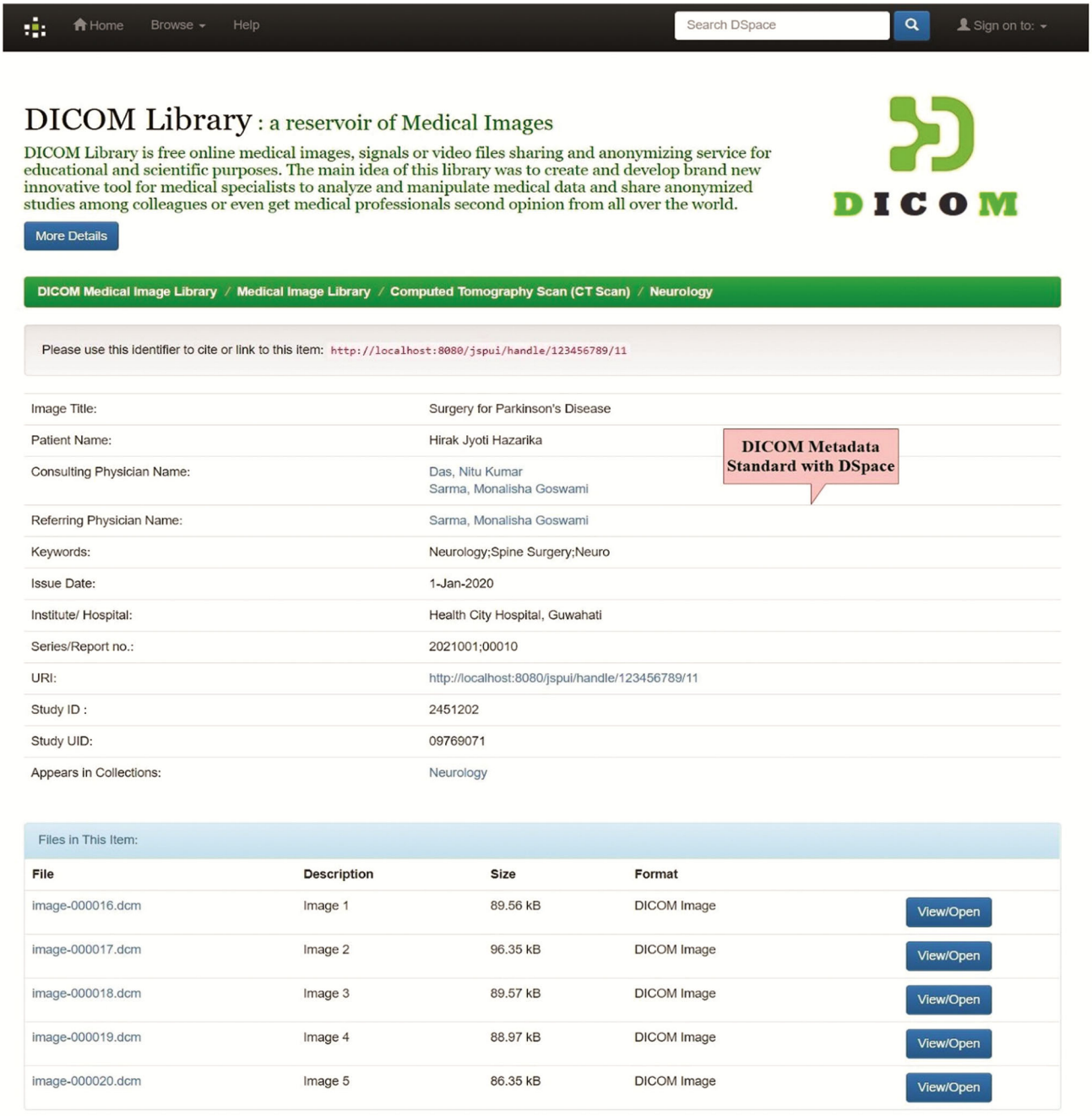

Fig. 3 — DICOM Standard in Jspui Interface

Images available from a DICOM Respositpoy and image can be read directly into an image analysis program or download as a batch.

Integration Dicom Web Viewer With Dspace

DSpace is provided two interfaces for presenting data on the web, i.e., Jspui and Xmuli. Because this research needs to create a custom look and feel for the collection, we decided to use the Jspui interface for the integration of DWV Viewer with DSpace. (Elias, 2012; Hazarika and Ravikumar, 2019) has provided an overview development of Document Viewers for digitised objects in DSpace repositories, including a local viewer developed for document collection and it is not discussed any image viewer or DICOM Viewer in their experiment. So, the major challenge in integrating the DICOM viewer into DSpace was accessing a set of *dcm* files (bitstreams) associated

with a single record; this was mainly because of how DSpace stores beat streams in its asset store file.

A workaround is to create a separate copy of the *dcm* files and saved them under the DICOM directory. Java programming takes the variable and uses it to match the corresponding folder, reads the content folder, and generates a drop-down menu that allows users to view the pages of that particular issue. When DSpace has loaded a page for a given record, a Jspui template sends a URL (/jspui/bitstream/123456789/5/1/image-000003.dcm) with the variable to call the JavaScript and embeds the viewer into DSpace. Figure 5.15 shows the interaction or integration between Jspui and JavaScript for embedding the viewer in DSpace.

Therefore, this research has developed two new patches for DSpace inside the Jspui interface back-end to integrate with DWV Software. Java programming and HTML5 programming is used for develop patches for two extension i.e., <index.html> and <utils.js>. The <index.html> is developed for DSpace to coordinate with DWV Viewer within the database. It also helps to provide a link to DSpace to access the viewer. The development patches mention below as

Location at $DSpace_Home/opt/tomcat/ webapps/ jspui/dicom/viewer

Full programming source code available in this link https://cutt.ly/9mvJAuq

```
<!DOCTYPE html>
<!-- <html manifest="cache.manifest"> -->
<html>
<head>
<title>DICOM Web Viewer</title>
<meta charset="UTF-8">
<meta name="description" content="DICOM Web Viewer (DWV) static version">
<meta name="keywords" content="DICOM, HTML5, JavaScript, medical,imaging, DWV">
<link type="text/css" rel="stylesheet" href="../../css/style.css">
<style type="text/css" >
body { background-color: #222; color: white; font-size: 80%; }
#pageHeader h1 { display: inline-block; margin: 0; color: #fff; }
#pageHeader a { color: #ddf; }
#pageHeader .toolbar { display: inline-block; float: right; }
.toolList ul { padding: 0; }
.toolList li { list-style-type: none; }
#pageMain { position: absolute; height: 92%; width: 99%; bottom: 5px; left: 5px; background-color: #333; }
.infotl { text-shadow: 0 1px 0 #000; }
.infotc { text-shadow: 0 1px 0 #000; }
.infotr { text-shadow: 0 1px 0 #000; }
.infocl { text-shadow: 0 1px 0 #000; }
.infocr { text-shadow: 0 1px 0 #000; }
.infobl { text-shadow: 0 1px 0 #000; }
.infobc { text-shadow: 0 1px 0 #000; }
.infobr { text-shadow: 0 1px 0 #000; }
.dropBox { margin: 20px; }
.ui-icon { zoom: 125%; }
.tagsTable tr:nth-child(even) { background-color: #333; }
.drawList tr:nth-child(even) { background-color: #333; }
button, input, li, table { margin-top: 0.2em; }
li button, li input { margin: 0; }
.history_list { width: 100%; }
</style>
<link type="text/css" rel="stylesheet" href="../../ext/jquery-ui/themes/ui-darkness/jquery-ui-1.12.0.min.css">
<style type="text/css" >
.ui-widget-content { background-color: #222; background-image: url();}
</style>
```

The <utils.js> is another developed patch for recognising and creating links between uploading files/items. It also helps to provide a link to DSpace. The JavaScript suppresses that the DICOM viewer is loaded as a standard site but loads it as an overlay over the image view, using JQuery Programming. Then we wrote a minor CSS (Cascading Style Sheets) file that helps us the position that overlay within the item view. The development patches mention below as

Location at $DSpace_Home/opt/tomcat/web apps/jspui

```
var flag=0
$( dicomviewer ).ready(function() {
jQuery(".standard").find("a[target='_blank']").each(function(){
  jQuery(this).attr('value',jQuery(this).attr('href'));
  jQuery(this).removeAttr('href');
  jQuery(this).css("text-decoration", "underline");
  jQuery(this).css("cursor", "pointer");
});
```

```
jQuery(".metadataFieldLabel").each(
function(index){
   if(jQuery(this).text().trim().replace(/:/g, '').replace("
","') == 'EnteredBy'){
   $(this).next().remove();
   $(this).remove();
   } });
      jQuery(".standard").find("a[target='_blank']").on
( "click", function() {
   if(flag==1){
   jQuery(                                          this
).parents('table').parents('table').eq(0).find('tr:last').re
move();
   jQuery( this ).parents('table').parents ('table').
eq(0).find('tr:last').remove();
   jQuery(                                          this
).parents('table').parents('table').eq(0).append("<tr><t
d><object style='overflow: auto;' data='"+jQuery( this
).attr('value')+"' type='application/pdf' width='100%'
height='548px'></object><td><tr>");
   }else{
   flag=1;
   jQuery(                                          this
).parents('table').parents('table').eq(0).append("<tr><t
d><object style='overflow: auto;' data='"+jQuery( this
).attr('value')+"' type='application/pdf' width='100%'
height='548px'></object><td><tr>");
   }
   });
   });
```

DICOM picture document comprises of several cuts, each put away in a different DICOM object record, and record size will be 200 MB to 3 GB. However, DWV software includes parsing and displaying of DICOM object's metadata. Through this viewer, medical professionals can view DICOM images with a different dimension. After this development, it can be run on any platform that provides a modern browser on various devices such as laptops and even current TV (Figure 4). A significant limitation during this study is that it cannot be accessible from Mobile and tablet due to the Android platform. So this research has developed another patch to accommodate and accessible through Mobile and Tablet. The <applauncher> extension file will help configure the path when DWV viewer is used in the mobile device or android platforms. The entire programming source code will be available in this link https://cutt.ly/smvJNMc

Location at $DSpace Home/ opt/tomcat/ webapps/jspui/dicom/viewer/mobile

```
   /**
    * Application launcher.
    */
   // start app function
   function startApp() {
      // translate page
      dwv.i18nPage();
      // main application
      var myapp = new dwv.App();
      // display loading time
      var listener = function (event) {
         if (event.type === "load-start") {
            console.time("load-data");
         }
         else {
            console.timeEnd("load-data");
         }
      };
      // before myapp.init since it does the url load
      myapp.addEventListener("load-start", listener);
      myapp.addEventListener("load-end", listener);
      // also available:
      //myapp.addEventListener("load-progress",
listener);
      //myapp.addEventListener("draw-create", listener);
      //myapp.addEventListener("draw-move", listener);
      //myapp.addEventListener("draw-change",
listener);
      //myapp.addEventListener("draw-delete", listener);
      //myapp.addEventListener("wl-change", listener);
      //myapp.addEventListener("colour-change",
listener);
      //myapp.addEventListener("position-change",
listener);
      //myapp.addEventListener("slice-change",
listener);
      // initialise the application
      myapp.init({
         "containerDivId": "dwv",
         "fitToWindow": true,
         "gui": ["tool", "load", "help", "undo", "version",
"tags", "drawList"],
         "loaders": ["File", "Url", "GoogleDrive",
"Dropbox"],
         "tools": ["Scroll", "WindowLevel",
"ZoomAndPan", "Draw", "Livewire", "Filter",
"Floodfill"],
         "filters": ["Threshold", "Sharpen", "Sobel"],
```

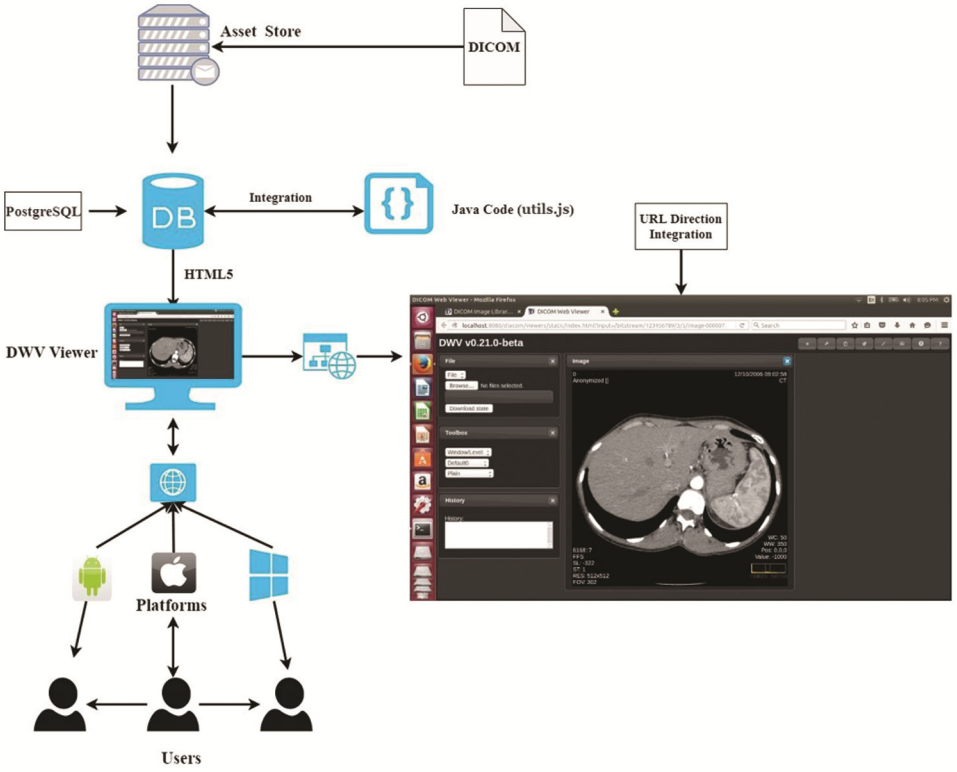

Fig. 4 — Integration Viewer with DSpace

```
        "shapes": ["Arrow", "Ruler", "Protractor", "Rectangle", "Roi", "Ellipse", "FreeHand"],
        "isMobile": true
        //"defaultCharacterSet": "chinese"
    });
    var size = dwv.gui.getWindowSize();
    $(".layerContainer").height(size.height);
}
```

After this development, it can be run on android platforms such as Mobile and Tablet (Figure 5). It can load local or remote data in DICOM format such as MRI, CT Scan and Digital X-Ray. This viewer provides standard tools for image manipulation such as contrast, zoom, drag, and the possibility of drawing regions on top of the image and imaging filters such as threshold and sharpen (Figure 5). DWV Viewer provided an opportunity to use the mobile platform and work from any place in the world where the Internet is accessible. Many people can access and view medical records at the same time. Such functionality speeds up the collaboration among the professionals. So, a doctor in the hospital and a doctor in a different location may view the medical data and discuss it simultaneously. The patients' medical history, various studies, and images are much faster than conventional paper-based methods.

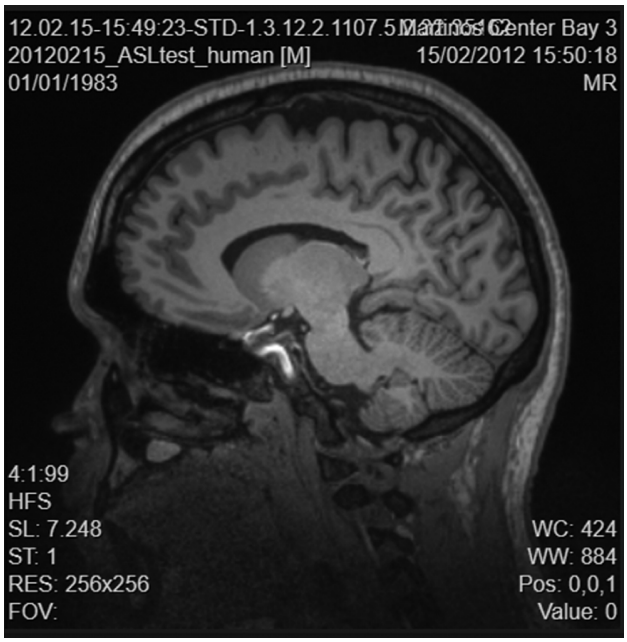

Fig. 5 — Mobile Portable DICOM Web Viewer with DSpace

Finding

The paper presents the successful creation of a DICOM-based Medical Image Repository using DSpace, which is capable of managing a substantial volume of medical images with an acceptable

response time for data loading and display. The study highlights the feasibility of using in-built metadata of DICOM files for image retrieval and suggests that custom search forms could be developed to enhance search accuracy, particularly for mammographic findings. It also points out the potential for further improvements in data transfer efficiency and loading large quantities of data, indicating that the current system can be optimized for better performance. The research underscores the adaptability of DSpace for applications beyond the academic domain, such as in the healthcare industry, where it can serve as a centralized database for medical images, thereby facilitating improved system management and diagnostic processes.

Custom search forms can enhance accuracy by allowing users to specify detailed criteria that align closely with the structured metadata fields within a repository. In the context of DSpace, the development of custom search forms, such as those for DICOM metadata, enables precise querying based on specific attributes like Physician Name, Patient ID, and Institute Hospital Name. By utilizing these tailored forms, users can filter results more effectively, reducing the retrieval of irrelevant records and improving the relevance of search outcomes. This targeted approach to searching is particularly beneficial in medical image repositories where the accuracy of search results is critical for diagnostic and research purposes.

Custom search forms in medical image repositories are beneficial as they enable the creation of search interfaces tailored to the specific needs of medical professionals, allowing for more precise and efficient retrieval of image data. These forms can incorporate complex search criteria that correspond to the structured metadata of medical images, such as patient identifiers, image acquisition descriptors, and physician names, which are crucial for accurate diagnosis and research purposes. By facilitating searches that are more aligned with the user's needs, custom search forms can significantly reduce the time spent on locating relevant images and improve the overall usability of the repository. Moreover, the ability to render searches more accurate concerning mammographic findings or other specific medical conditions can directly impact the quality of patient care and the effectiveness of medical research.

Result

The paper successfully demonstrates the development and integration of a DICOM-based Medical Image Repository using DSpace, which is traditionally underutilized in the healthcare industry. The repository is capable of handling a high volume of images and data, with an acceptable response time for loading and displaying content, although the study suggests that there is room for improvement in data loading efficiency. The research also identifies the potential for DSpace to extend beyond academic applications to other domains, such as healthcare, which could benefit from its archival and retrieval capabilities. The findings indicate that the proposed system can serve as a centralized database for digitally acquired medical images, aiming to enhance system management and diagnostic processes in a web-based medical imaging repository application.

Limitation

The paper acknowledges that DSpace does not address all issues related to the long-term preservation and access to digital material, indicating that the platform serves more as a foundation for developing solutions rather than a complete answer to these challenges. Additionally, the prototype for integrating the DICOM Web Viewer within DSpace is still in its early stages, suggesting that there are many unresolved questions and that further development is necessary. The paper also highlights the inadequacy of ad hoc descriptions for unsupported file formats, which may hinder the export and discovery of information contained within these files**.** Furthermore, the paper discusses the underutilization of DSpace in the healthcare industry, which implies that there is significant potential for growth and application that has yet to be tapped.

Discussion

The primary study, to developed and designed the DICOM Based Medical Image Repository. Presently, there is no Open Source DICOM Image Archive or Medical Image Repository software for LIS Community and Medical Community. Therefore, Medical Professionals need to store all images in one PC or Hard Disk, which is not globally access available or secure. In this study, the authors built up a new or out-of-the-box new creative platform for medical experts to store, analyse and control medical information and offer anonymised considers among associates or even get medical experts from everywhere throughout the world in the web-enabled platform. DICOM images is an extraordinary kind of

images which can be seen from different measurement (like 2D,3D) and others highlights like goals, amplifying and so on., should be possible with this document position; subsequently, a unique viewer required for the dcm file (DICOM image group). This investigation will see DICOM images through DICOM image viewer utilising DSpace. This is helpful for the community to develop an Open Source DICOM Medical Image Repository with the help of the Open Source Platform. This study helps all Medical Librarians Community, Laboratories, Radiologists, and LIS Professionals build and store opensource Digital libraries. Presently, there is no open-source Digital Library software to preserve this image and real-time viewing capacity on the web.

Most importantly, the methods in this paper encourage and are available as open-source software. They worked without modifying those libraries or standards to grow independently and yet benefit one another. They set a standard whereby related software libraries (e.g., E-Prints, Omeka & Greenstone) can also integrate using the same framework without requiring direct modifications. They also provide much needed DICOM queries and retrieve proficiencies.

Conclusion

The study concludes with the successful development and design of a web-based medical imaging repository application, addressing the critical need for accessible and shareable medical image data across different centers. The integration of the DICOM standard, metadata, and viewer within the DSpace digital repository software is a significant achievement, enabling the archiving of DICOM files, which was previously not supported. The research highlights the importance of open-source software in reducing the infrastructure costs associated with medical image archival systems. It also emphasizes the potential for improved management control, visualization, post-processing tools, backup systems, and security protocols. The study suggests that further enhancements could be made to the usability of the repository application to meet the specific needs of medical staff. Additionally, the research identifies the need for more efficient data transfer algorithms and custom search forms to yield optimal results tailored to user requirements. The conclusion underscores the significance of the study in contributing to the healthcare industry by providing a cost-effective, device-portable solution for medical image storage and analysis.

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