UC-423 Developing Support for DICOM Medical Images

Abstract

DICOM (Digital Imaging and Communications in Medicine) is the standard for storing and sharing medical image information. GIMP (GNU Image Manipulation Program) is the leading open-source program for processing professional and scientific images; however, it is currently unable to open many modern DICOM images. The project goal is to update GIMP's DICOM import plugin with code to support all types of DICOM images. After creating a C++ wrapper to incorporate the GDCM (Grassroots DICOM) library into the existing software, GIMP could import images that previously caused errors. The updated plugin has been submitted as a merge request and is currently being reviewed by the developers for the next software release. The next step would be to expand GIMP's DICOM metadata and display multi-frame images to continue to better support medical professionals and researchers.

Introduction

The ability to show and display medical images is one of the most important advances in medical field practice. Medical imaging allows for anyone in the biomedical industry to safely view the inside of the human body to receive data, conduct research, diagnose issues, and more. GIMP is a widely used image manipulation software with medical image display capabilities, but it could not accurately display all DICOM images. To display the images there needed to be a way to use the information from external libraries, develop a way to utilize the libraries to create support for the images, and incorporate it into the existing code. The first phases of the project would be to locate the information, develop a way for the information to be readable to GIMP, and test out the images to see if the experiment was successful.

Research Question(s)

Using the Grassroots DICOM library, can support be created to expand GIMP's medical imaging capabilities?

Materials and Methods

GNOME was where the problem was presented as an open-source project. MYSY2 was the development environment used to create the alterable GIMP software. Once GIMP was functional images provided by the reports made in GitLab were used for testing. The next step was to create a wrapper that could be used to retrieve the information from the GDCM library and allow it to be read in by the existing plug-in. Once the plug-in was ready, and working DICOM files were tested, the medical images from GNOME were re-uploaded and displayed by the support created from the project.

Results

Every previously unsupported image was able to be displayed following the experiment. There were multiple images used to test the support provided by the GDCM library to observe the wider variety of images available for display. The results showed that the GDCM Library was able to offer support to all DICOM images. Once the images were able to be displayed, observations about the images gave insight into how further support would need to be added. Once further support was provided for planar configuration, and expanding on support for greyscale images, the images were able to be displayed correctly. Overall, by adding support for the GDCM library, and optimizing the support by updating GIMP's code, all DICOM images were able to be displayed correctly on GIMP's software.
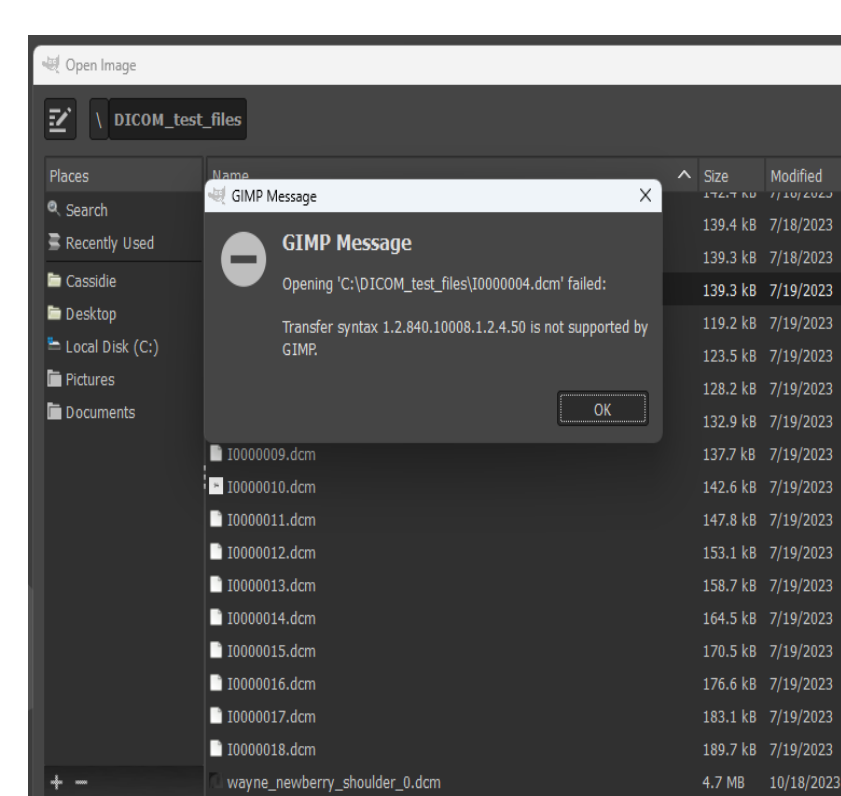

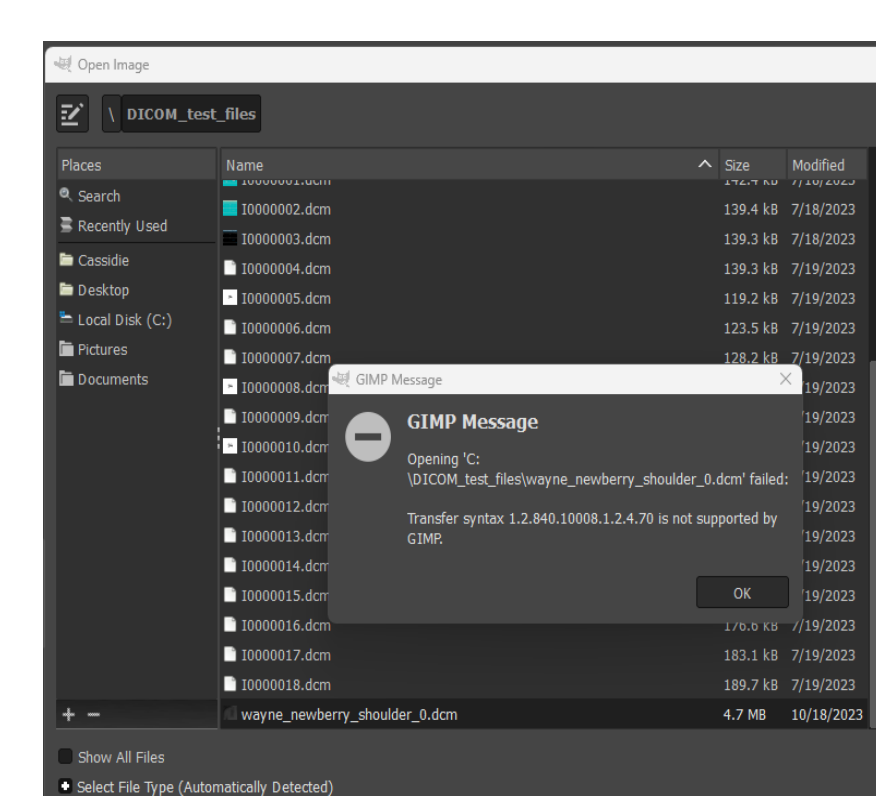Fig.1A. Error shown when loading the DICOM image in the software

Fig.2A. The initial error displaying the scan of the shoulder in the software

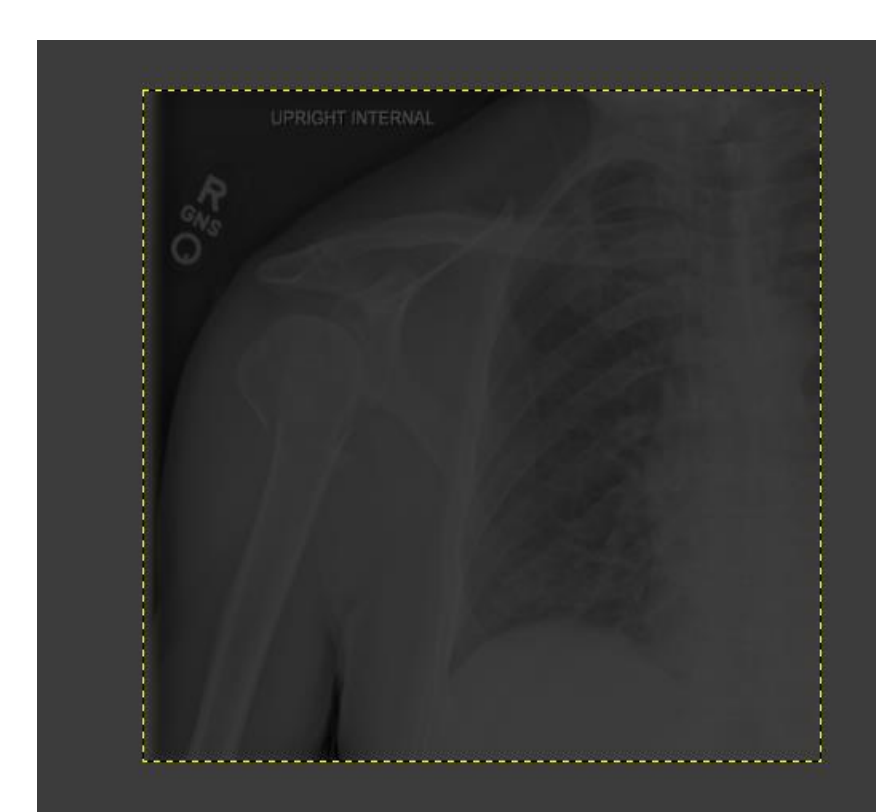Fig.1B. A color model error causing the image to appear blue

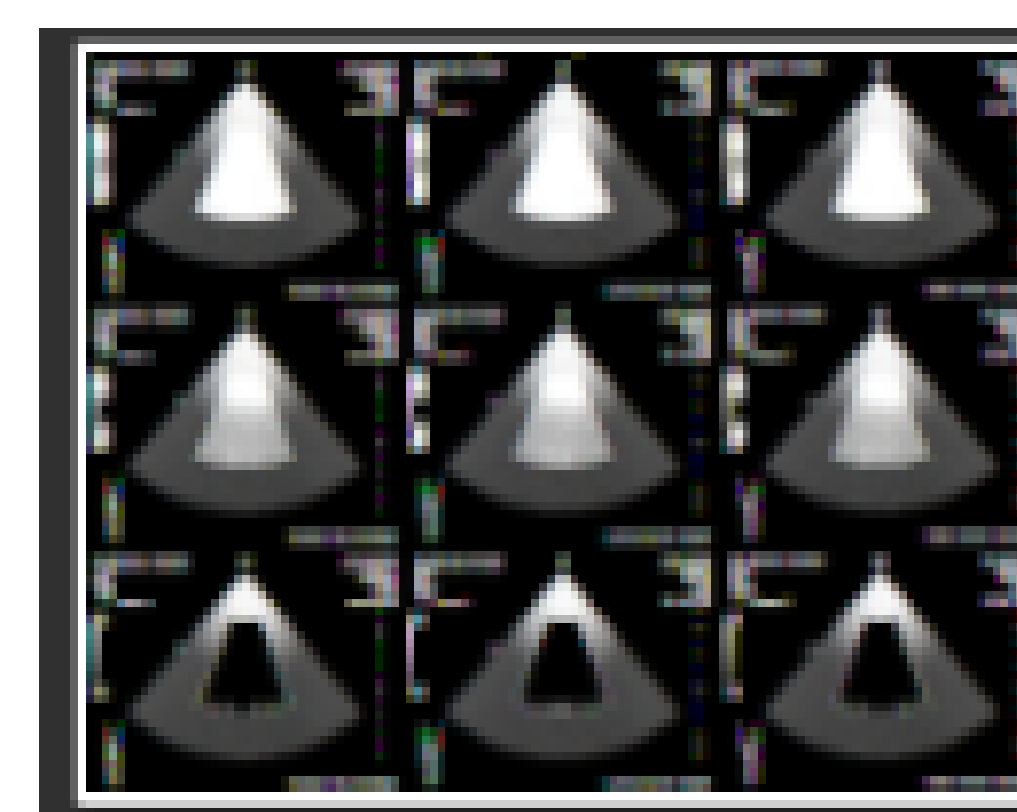Fig.2B. A rendering issue with the shoulder scan

Fig.3A. An error displaying the image due to incorrect planar configuration

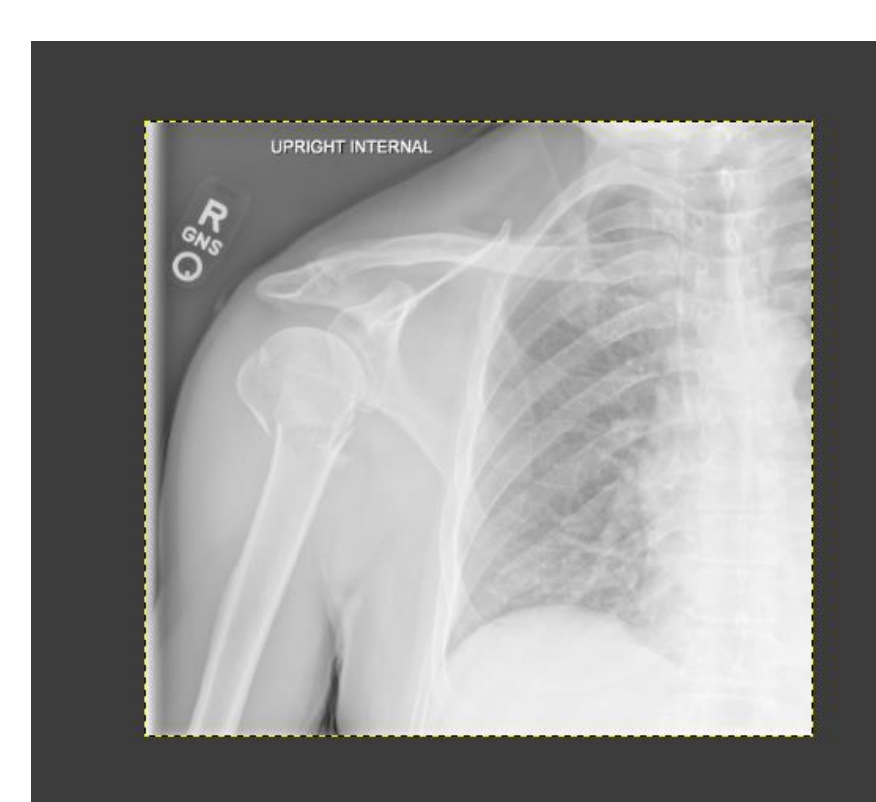Fig.1C. The result of using the correct color model to display the desired DICOM image

Fig.2C. The shoulder scan displayed correctly

Fig.3B. The correct image being displayed after support was added for planar configuration

Conclusions

The GDCM library provides the information necessary for GIMP to expand its DICOM image display capabilities. DICOM images are important for the biomedical industry and with the support needed renowned image software GIMP can make greater contributions as a tool for biomedical imaging. The next steps would be to expand on the image metadata and multi-frame imaging. Developing support for the metadata information stored with the image, and better support for multi-frame image displays would allow GIMP to be a useful tool for higher-level medical research.
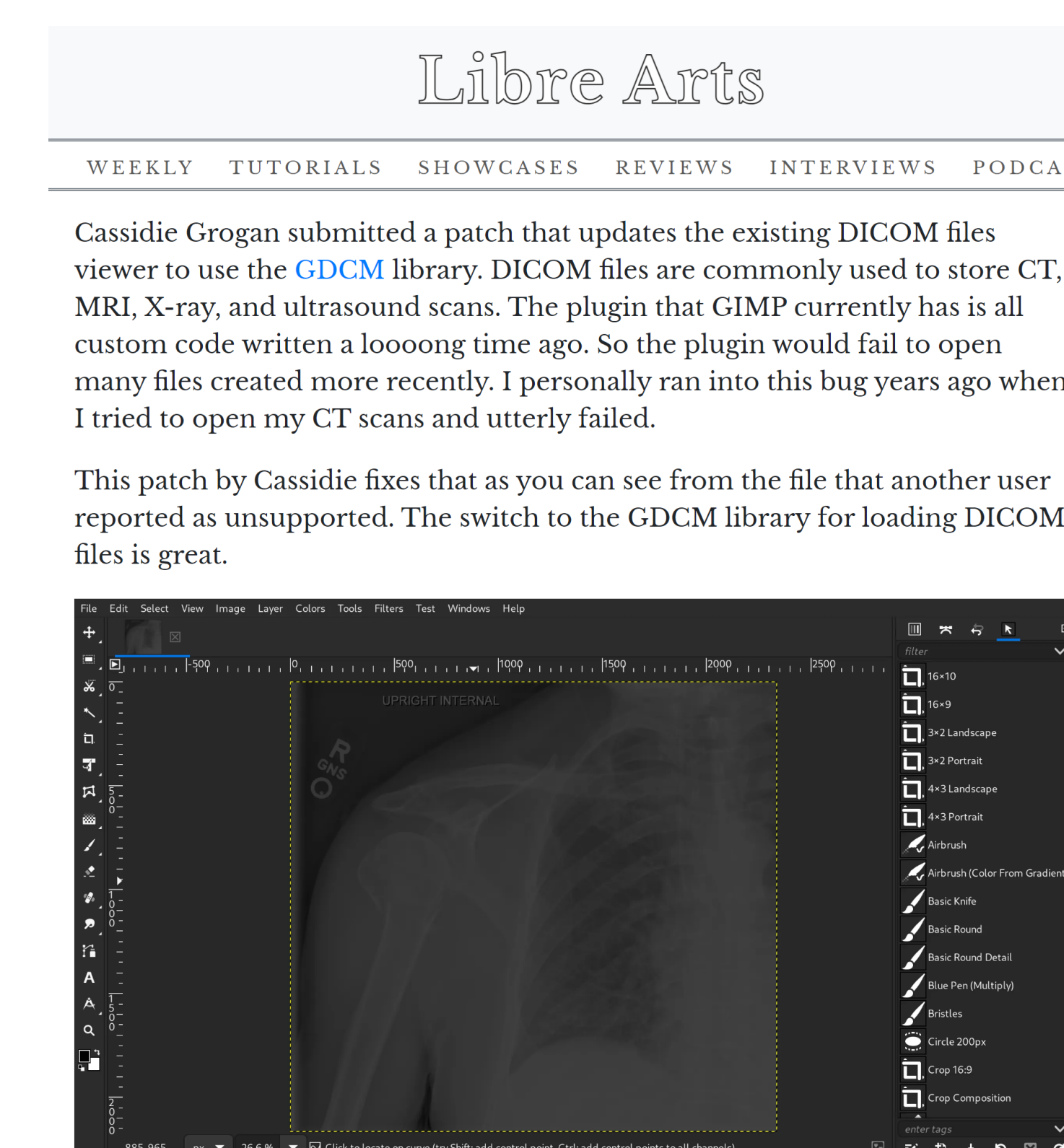

Figure 4. Review of this project in a Libre Arts online article

Acknowledgments

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