Medical Imaging Analysis :
Image Modalities Ultrasound, MRI and X-ray

R. Martí

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VIBOT MSc

Contents

1 Introduction

The aim of this lab is to understand the particularities of medical image modalities along with the DICOM standard. For this lab we will use various modalities such as X-ray, ultrasound and MRI, as an example within the Matlab environment. In this lab you will learn to:

- How to open DICOM images and view its contents (both the image and headers)

- Visualize the contents and histograms of a 3D volume and its information (dimensionality and pixel spacing).

- Propose an image transformation to provide a more realistic image.

2 Image information

In this section you should be able to open the DICOM files provided and observe their contents. Use `dicomread` in Matlab for the image contents and `dicominfo` for its header contents (DICOM tags). The DICOM files contains: a mammographic image and a ultrasound and MRI of the prostate.
Questions (to be included in the report)

2.1. What is the dimensionality of the data for each modality, number of pixels and pixel size?

2.2. Check the DICOM info concerning the patient information and verify the files are anonymized.

2.3. MRI: Compute and visualize the histogram of the MRI volume using Matlab.

2.4. MRI: Visualize two central slices of the MRI in axial, coronal and sagital using Matlab.

2.5. Mammography: Visualize the RAW and FOR PRESENTATION images in Matlab, what differences do you see?

2.6. Provide the Matlab code for the questions above.

3 Image transformation

As you have probably noticed, the Raw mammographic image does not show an appropiate information to be shown to the radiologists and be used for diagnosis. You are asked to transform the intensities of the RAW image in order to be similar to the For Presentation one. You can read the chapter on digital mammography attached to this hand-outs for some hints.
Questions (to be included in the report)

3.1. What is the RAW image showing?

3.2. What steps do you propose to transform the images in figure 1 (a) to the one in (b)?

3.3. Provide the Matlab code for this transformation.
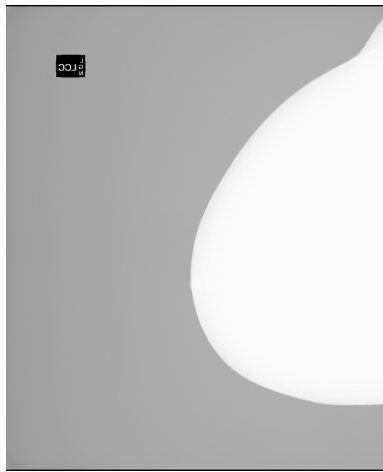
(a) Raw image   (b) Transformed Raw (For Presentation)

Figure 1: Raw and For Presentationmammographic images.