Chapter 1

Image Viewer Module

Contents

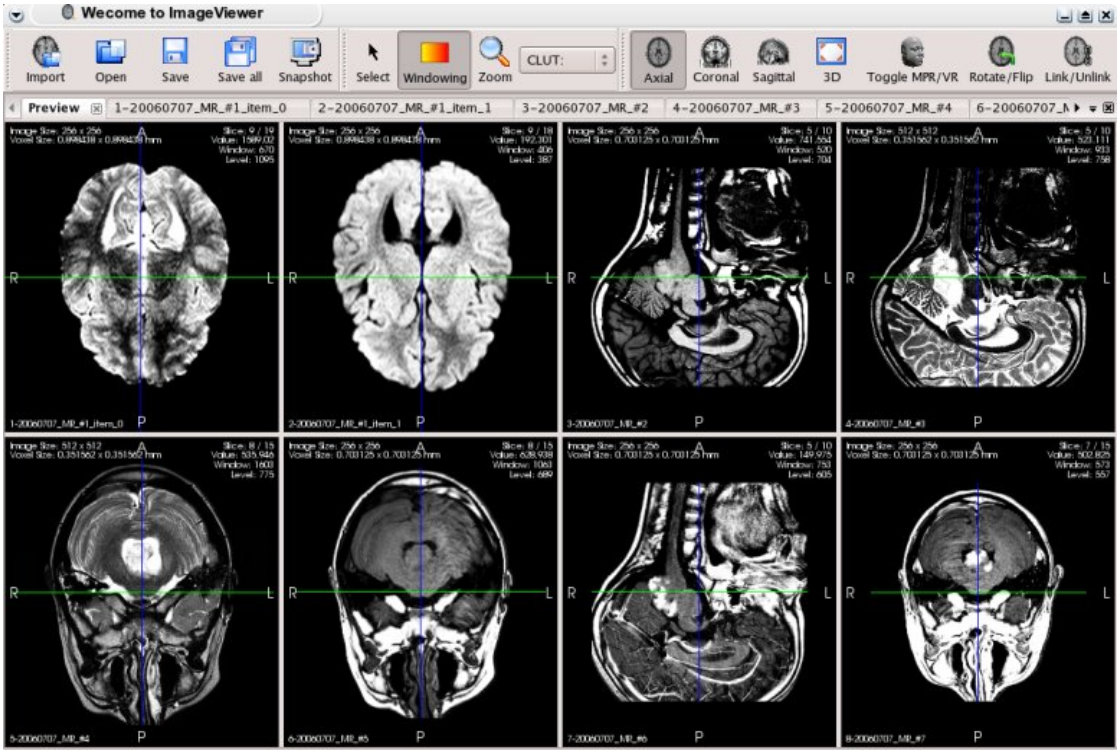

Figure 1.1: **The Image Viewer window, shown here in the preview screen where some volumes have been imported from a DICOM exam.**

This module is a simple but yet powerfull medical image browser. No data processing can be performed from here, for that please refer to the other modules.

From this module you can quickly open several images in a "web browser style". It also provide an easy-to-use DICOM importer and a "radiologic convention reorientation tool".

1.1 File Formats

The image file formats supported include those of ITK (Insight ToolKit): Analyze 7.5 (.hdr, .img), Metafile (.mha, .mhd), Gipl (.gipl), VTK image data (.vtk), Dicom (.dcm), Ge4x, GDCM, Nrrd, Siemens Vision, PNG, BMP, TIFF, JPEG, ... For dicom images without extensions, please use "All" filter.

1.2 DICOM import

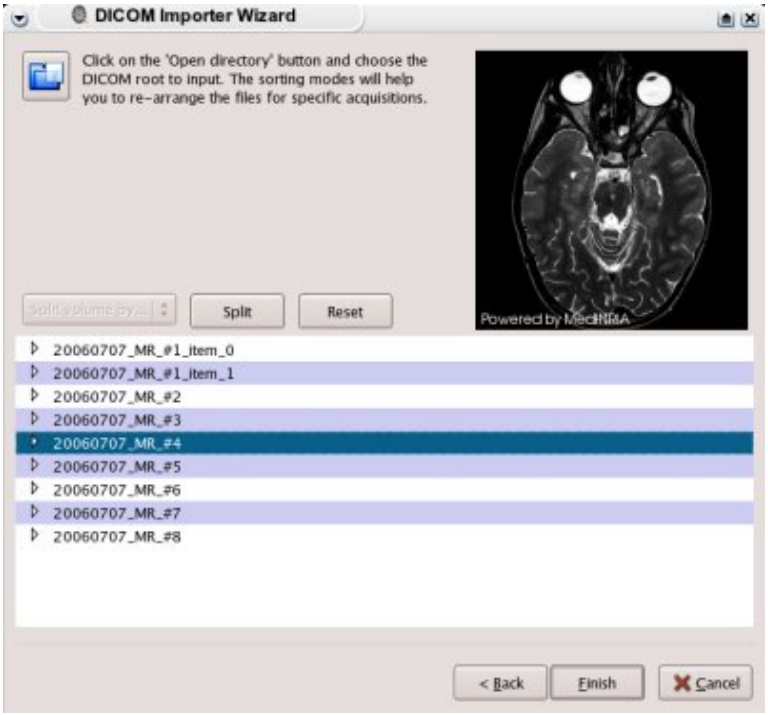

Figure 1.2: **The DICOM importer main window, shown with brain exam loaded. Click "Open" button to set the directory to scan.**

The DICOM importer is a simple wizard that allow the user to import images directly from a DICOM exam. It can reconstruct 3D volumes from 2D DICOM files.

IMPORTANT : This tool does not import 3D DICOM files ! You can open them directly from the open button.

First click on the "Open" button to choose the DICOM root directory that contains the exam. Carefull : the importer will scan recursively into this directory, don't choose a directory that contain several exams to prevent from memory overloads.

The volumes should now appear in the main table window. Each line with an arrow represents a volume. Double click on it to see what files this volume is made from. Clicking on one file will popup the corresponding image on the view window in the upper right corner. The files should be shown in correct order, following a consistent strategy : files are first splited in series and ordered by the image position DICOM flag. If for some reason the user ends up with a mixed up volume, it might be because of image position conflicts (It often happen in T2/proton density protocols). Then the user can click on "split" button that provides a consistent split process among the image positions given in the DICOM files. Clicking on reset button will go back to the original configuration.

Last step (click "finish") will reconstruct 3D volumes from the last given fileset configuration.

IMPORTANT : The DICOM importer in its current state doesn't take care of the orientation acquisiton of the the image. That might results in "radiologic convention" issues.

All the DICOM exam volumes are now visible in the preview window. For the user convinience, a "save all" button has been added in order to quickly save all the loaded images in a given directory. They will be saved in ITK Analyze format (.hdr - .img).

1.3 Image browsing

The preview window shows every volume loaded in the Image Viewer. you can quickly access to one of the images by clicking on the down arrow icon in the upper right corner. it will pop up a list of the images. In the preview window, you can choose to link (default) or unlink the views for the current chosen interaction (see Sect. 1.4). The user can click in one tabulation to switch to the corresponding image. When one of the image is shown, you can easily delete it by clicking in its corresponding cross.

1.4 2D-3D view interactions

1.4.1 2D Views

Three 2D views are shown in the main window, corresponding to the axial, coronal and sagittal views of the volume. On each view some information is shown, such as the resolution of the slice (in pixels), the size of a voxel (in mm), the index of the slice being shown, and the value of the pixel at the current selection). By default, a trilinear interpolation is made between pixels. Press **"i"** to disable this interpolation.


Several mouse interactions are available. With the selection interaction (black arrow), you will navigate in the volume (i.e. select a slice) by moving the mouse up or down while left-clicking on a view. Press **"r"** to reset the position to default.

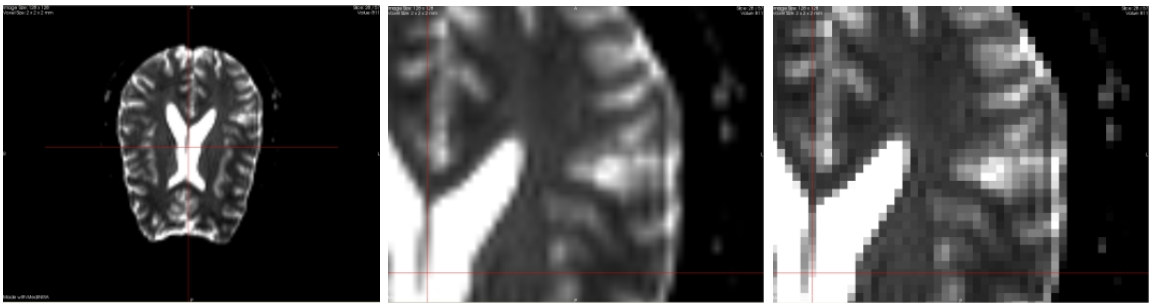

Figure 1.3: 2D view navigation. On the left you see a 2D view (axial) centered on the screen. When the zoom interaction is selected, you can zoom in the view by moving the mouse up while left-clicking on the view and translate the view by middle-clicking (middle figure). You can disable the interpolation between pixel by pressing **"i"** (right figure). Reset the image position by pressing **"r"**.

 The second interaction (windowing) controls the brightness/contrast of the image by moving the mouse while left-clicking on the view. A left-right movement controls contrast while up-down controls brightness. Note that with these two interactions, the 4 different views are synchronized. Press **"r"** to reset the contrast to default value.

 With the zoom interaction, you can zoom in or out the 2D view by left-clicking and moving the mouse up or down. A middle click in the view will translate the image. Press **"r"** to reset the zooming.

Keyboard and mouse on 2D screen :

- Press **"i"** to activate or disactivate interpolation between pixels.
- When selection interaction is ON (black arrow), move the mouse up or down while left clicking to change slice. This action can also be done using keys ↑ and ↓.
- When windowing interaction is ON, move the mouse left/right to change the contrast, move the mouse up/down to change brightness.
- When zoom interaction is ON, move the mouse up/down while left clicking to zoom. Move the mouse while middle clicking to translate the view.
- For any interaction, press **"r"** to reset the interaction.

1.4.2 3D View

On the lower-right part of the main window is shown a 3-dimentional representation of the volume. You can manipulate the volume in different ways:

- Rotate the volume by moving the mouse while left clicking in the 3D view.
- Translate the volume by moving the mouse while middle-clicking in the 3D view.
- Zoom into the volume by moving the mouse up or down while right-clicking in the 3D view.

 You also can display the 3D view in full screen by pressing the “full screen” button. When the 3D view is in full screen, you can use the “snap shot” button to easily save a .jpg picture of the current screen.

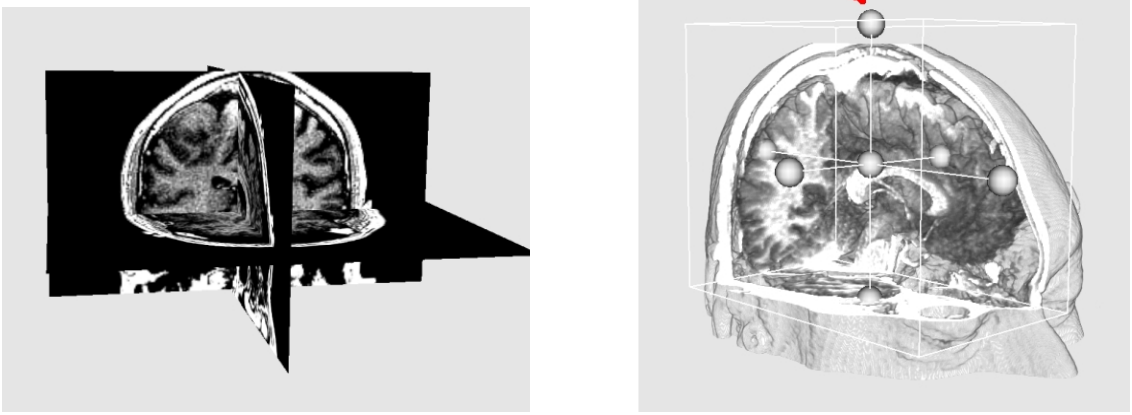

Figure 1.4: 3D view. You can see on the left a Multi-Planar Reconstruction (MPR) of the image. On the right you see a Volume Rendering (VR) of the image, cropped by the cropping box to visualize inside the volume. The cropping box can be manipulated by control points (red arrow).

 You can choose between displaying an image with Multi-Planar Reconstruction (MPR) (Fig. 1.4, right) or with Volume Rendering (VR) (Fig. 1.4, right). When VR mode is chosen, you have the possibility to take out a part of the volume in order to visualize inside it. This can be done with the “cropping box”. Use the control points around the box (red arrow in Fig. 1.4, right) to resize it and crop the volume (left-click on them). The control point in the center of the box allows you to translate it. When you have finished cropping the volume, you can make the box disappear by typing “b” on your keyboard. The orientation cube and the 3D axes help to recognize the current orientation of the image, and can be switched on or off with “i” keyboard key.

Keyboard and mouse on 3D screen:

In the 3D view, several optional features are available :
- Shift+left-click translates the volume.
- Ctrl+left-click rotates the volume around the axis perpendicular to the screen.
- Press **“j”** activates “joystick” mode (continuous movement mode).
- Press **“t”** disables the “joystick” mode.
- Shift+left-click on the cropping box translates it.
- Right-click on the cropping box makes it grow or shrink.
- Press **“r”** to center the image.
- If you cannot access the cropping box : Press “b” to switch it on, then press the “center view” button. If you still don’t see it, it may be inside the volume. Then translate it outside

the volume.
- If the cropping box doesn't seem to work properly, it might be because it has been flipped over. Use successively the control points of the box to flip it back to normal.

1.5 Image reorientation tool

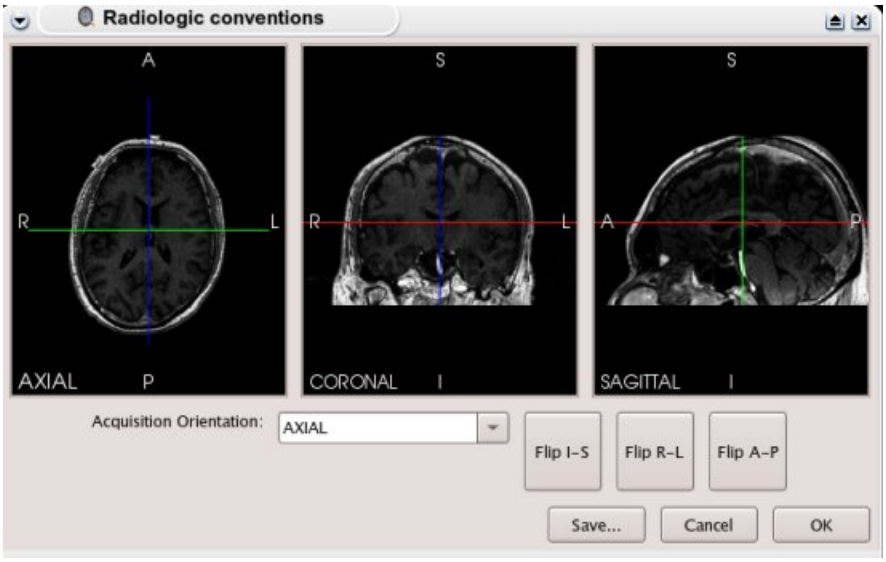

Figure 1.5: **The Reorientation Tool main window.**

This tool helps the user to manually re-orientate the image if this one doesn't match the radiologoc conventions correctly. The 3 views correspond respectively to the axial view, the coronal view and the sagittal view of the image.

If the image has been acquired in another direction than axial, you can switch the acquisition orientation flag in the check box. If the image is still flipped over an axis, you can use switch the flipping flags for the three directions. I-S corresponds to Inferior-Superior direction, R-L to Right-Left, and A-P to Anterior-Posterior.

Once the image meets correctly the conventions, you may want to save it in this orientation by clicking "save".The image will be saved in ITK analyze format (.hdr - .img) if no extention is given.