

OsiriX Quick Manual

Version 0.3

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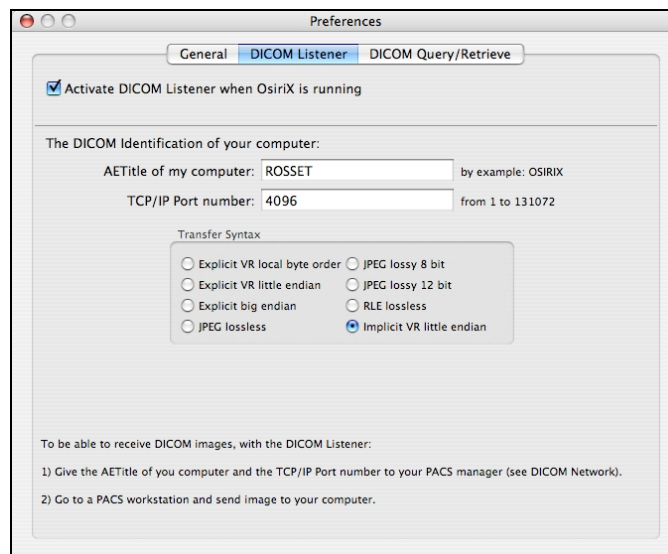
How to?

How to import DICOM images in OsiriX?

There are two ways to import DICOM images in OsiriX:

- 1) Through a network: If you are working in a PACS environment, this is the easiest way to import DICOM images in OsiriX. OsiriX is a "DICOM Listener". This means it can passively receive DICOM images. Images must be sent from a PACS workstation to a Mac computer running OsiriX. OsiriX and the PACS workstation must be first configured: Assign an AETitle and a Port number to OsiriX in the "Preferences" window. Then contact your "friendly" PACS manager to configure the PACS.

The DICOM Listener works only if OsiriX is active!

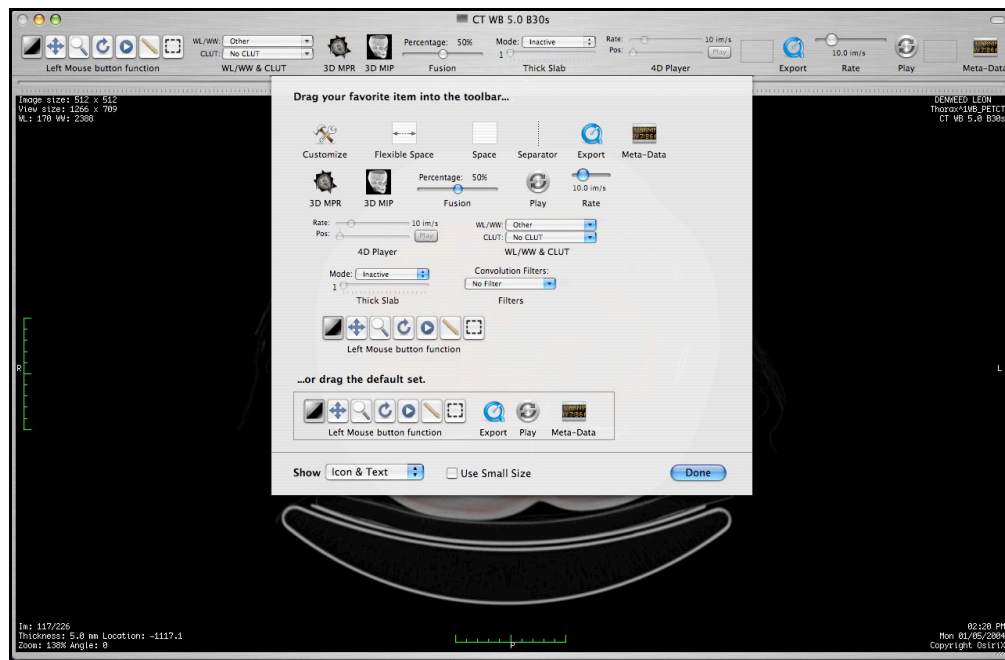


"Preferences" window to configure the "DICOM Listener"

- 2) By files: if you have DICOM files on your hard drive, or have a DICOM CD-Rom, you simply need to click on the "Import" button of the "Local database" window. You then select either files or folders containing files. Multiple files and/or folders can be selected by clicking while holding the 'shift' key. You can also "drag-and-drop" files directly from the desktop in the "Local Database" window.

How to customize your windows?

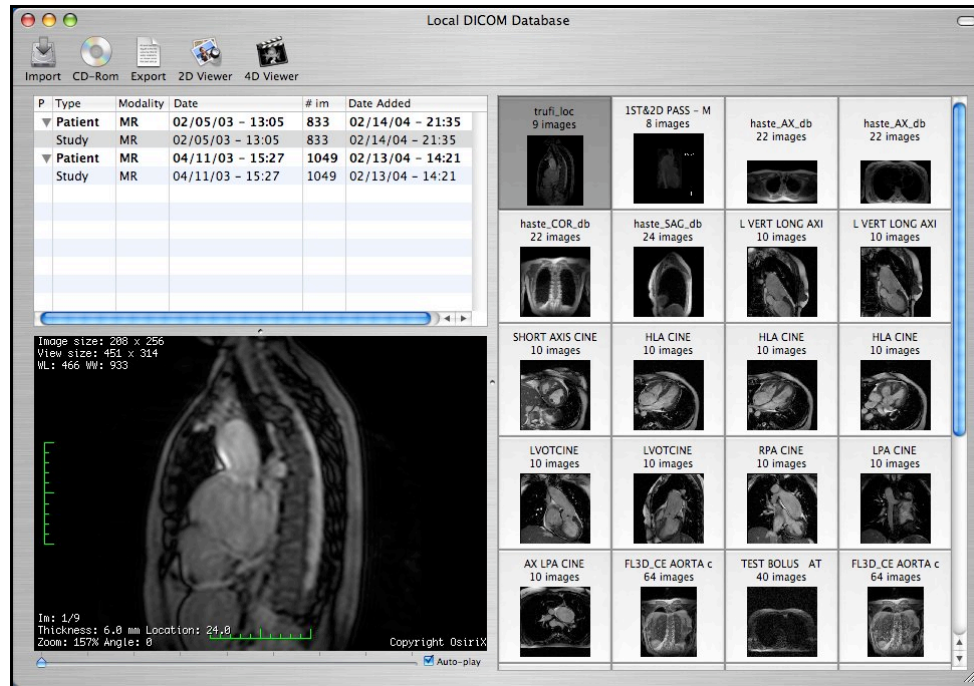
OsiriX has many functions and it is sometimes useful to modify the Graphic User Interface (GUI) for your personal needs. All windows in OsiriX are customizable. You can modify the tools displayed in the toolbar. Select "Customize Toolbar" from the "2D Viewer" or "3D Viewer" menus. You can also directly click in the toolbar by holding the 'ctrl' key. The "Customize" window will appear. Then simply "drag-and-drop" any tools from this window to the toolbar.



The "Customize" window is displayed. Simply "drag-and-drop" tools to modify your toolbar.

How to simultaneously open multiple series?

Open a patient file and select multiple series thumbnails by maintaining the 'select' key for a continuous selection or 'apple' key for a non-continuous selection. Click then on the "2D Viewer" icon from the toolbar to open all selected series.

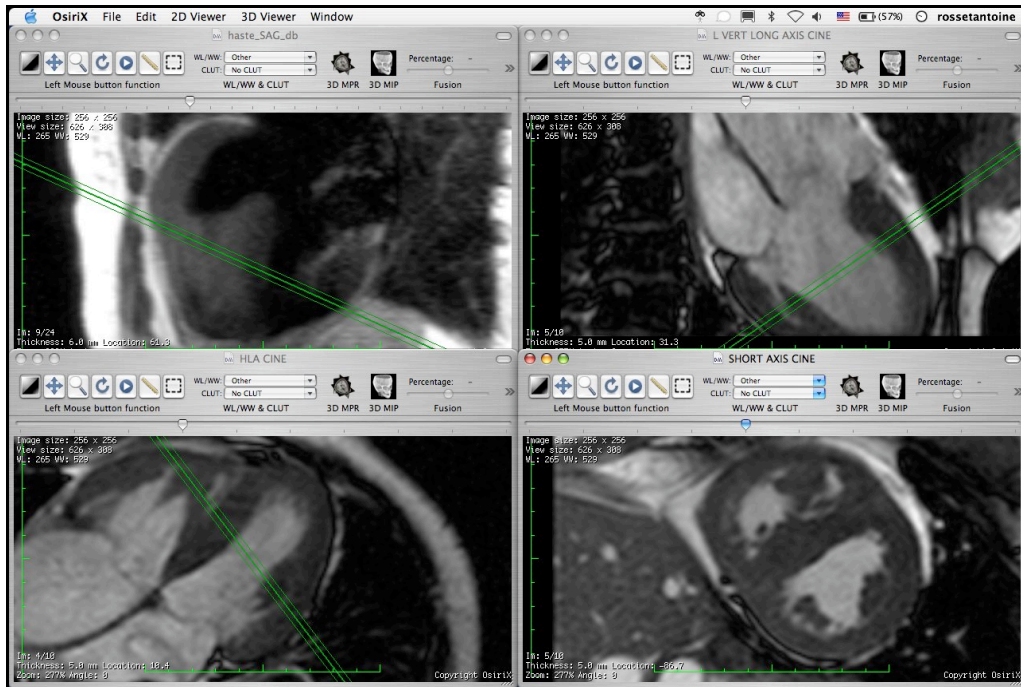


The "Local Database" window

You can open a new series at any time. Simply go to the file menu and select "Local Database" to open the database window.

How to simultaneously view multiple series?

Select the “Tile Windows” from the “2D Viewer” menu. This function will arrange all opened windows and you will be able to see all opened series at the same time.



4 series opened simultaneously. Note that if all series are from the same study, you will be able to see where the slice in the series you are navigated in is located on the other series.

How to manage your local database?

Two things are important to understand about your local database:

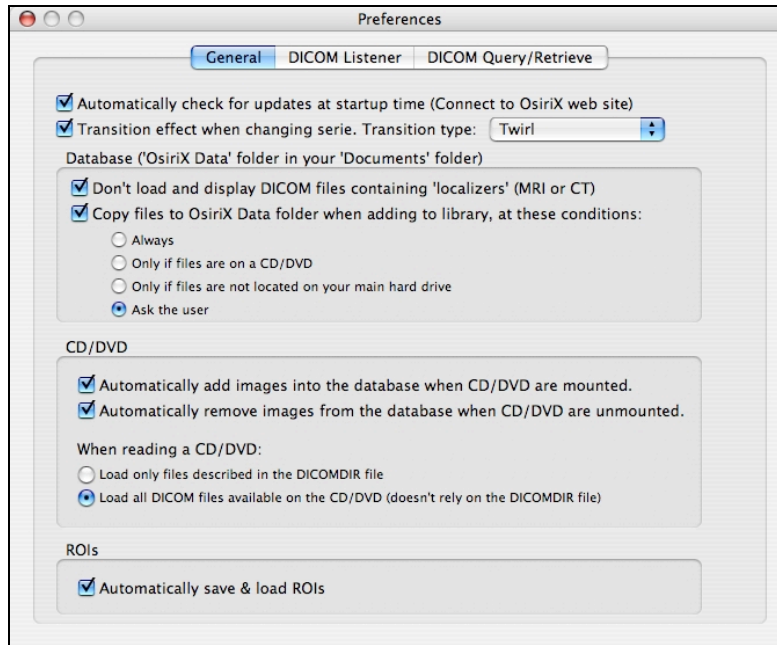
- 1) If you receive your images with the DICOM listener, they are stored in the "DATABASE" folder in the "OsiriX Data" folder, located your "Documents" folder. OsiriX will manage these files. This means that if you delete them from the "Local Database" window, Osirix will definitively delete these files.
- 2) If you import your files with the "Import" button or menu item, OsiriX can either keep a link to these files or copy them in the "DATABASE" folder. This means that if you delete them from the "Local Database" window, OsiriX will either delete the links to files or delete files located in the "DATABASE" folder.

OsiriX keeps information of all images in the "DATA.DAT" file. This file is located in the "OsiriX Data" folder.

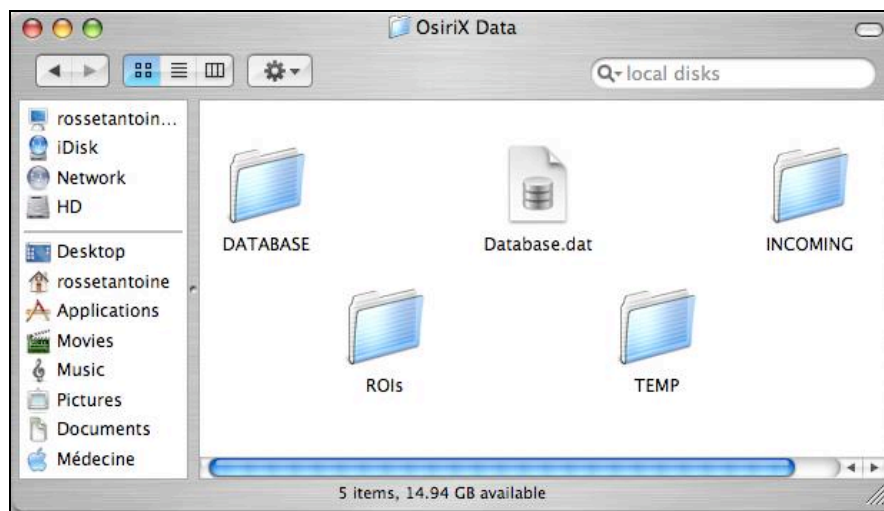
This file can be deleted. It does not contain any important data, only links to DICOM files.

You can also rebuild the database at any time. It will delete the "DATA.DAT" file and reconstruct a new one. Simply select "Rebuild Database" from the "File" menu. This function will re-scan all files displayed in the "Local Database" window, remove all unavailable files and add all files available in the "DATABASE" folder (received from the PACS network).

You can modify the database management in the Preferences window.



The Preferences window.

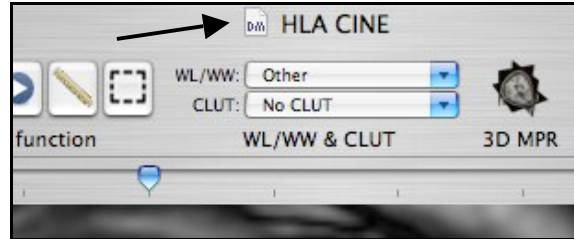


The “OsiriX Data” folder:

- “DATABASE” folder contains ‘local’ DICOM files.
- “INCOMING” folder contains temporarily files that are received by the listener.
- “TEMP” folder contains files during conversion time. This folder is deleted when you exit OsiriX.
- “ROIs” folder stores ROIs of DICOM images.

How to make image fusion?

OsiriX supports image fusion. You can mix any series with another series: simply open the two series you want to mix and then “drag-and-drop” the window icon from one on the other:



The window icon is located at the left of the window name.

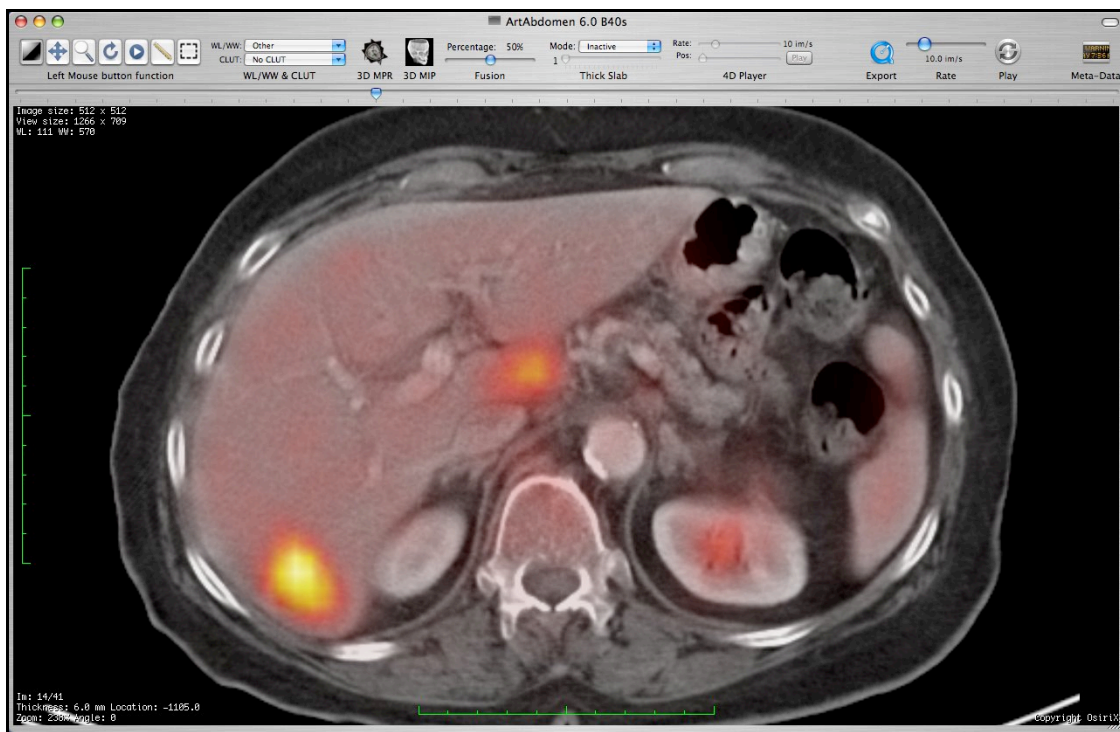


Image fusion between a CT and PET series.

You can control the fusion intensity with the “Fusion Percentage” slider from the toolbar. Note that if you close one of the two series, the fusion will be stopped. If you make a modification on the first series (CLUT, zoom, rotation, ...), these modifications will be applied to the second one.

Image fusion is also available for 2D and 3D reconstructions implying that you can use image fusion along with MPR, Volume rendering, etc...

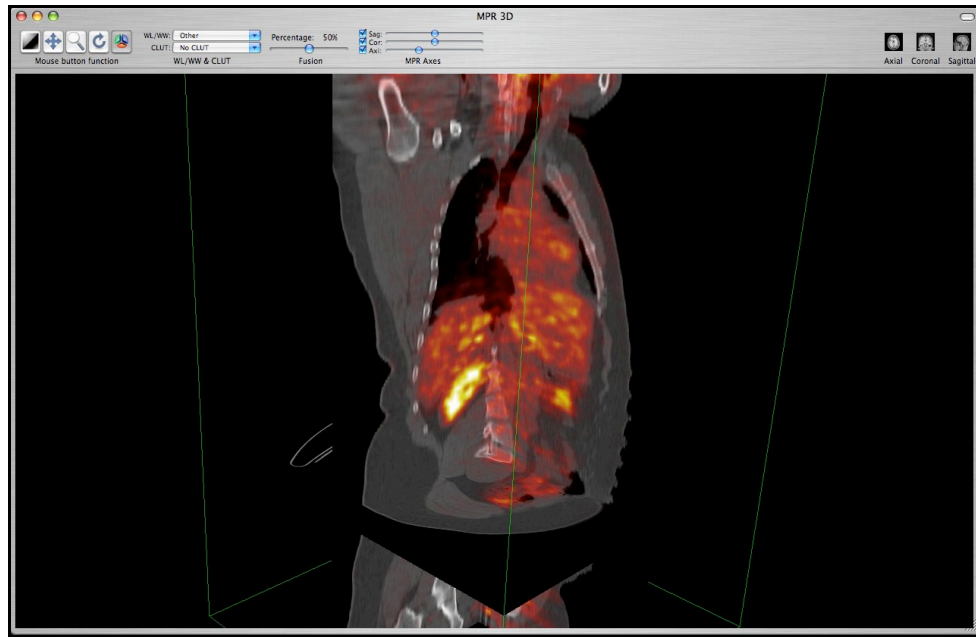


Image fusion in the 3D MPR window

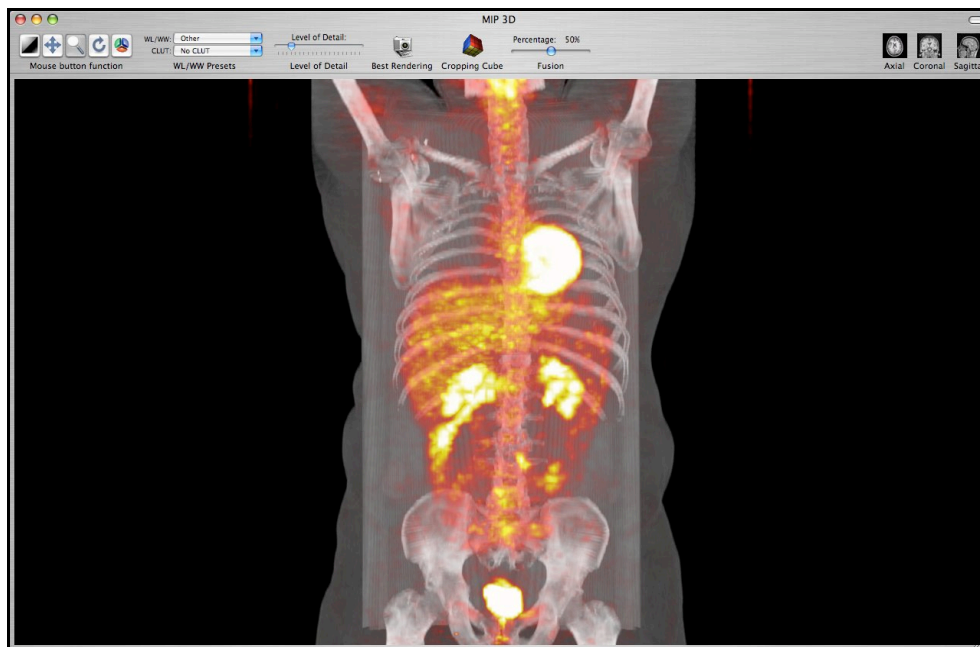
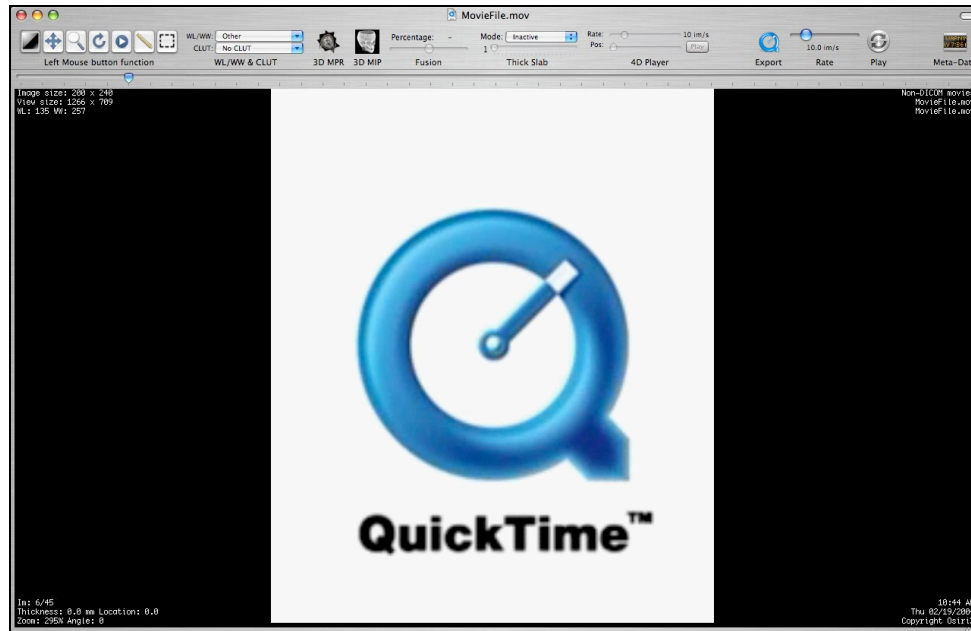


Image fusion in the 3D MIP window

How to open non-DICOM images or movies?

OsiriX supports non-DICOM images and movies. It means you can handle any images or image sequences in OsiriX as if they were DICOM images. You can re-export them as TIFF or Quicktime formats to modify the zoom, rotation, CLUT, ...

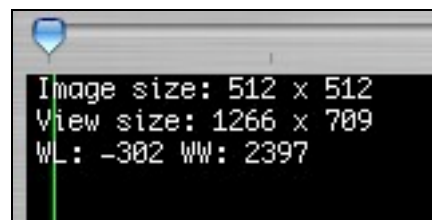


The Quicktime movie opened in OsiriX

How to export DICOM images?

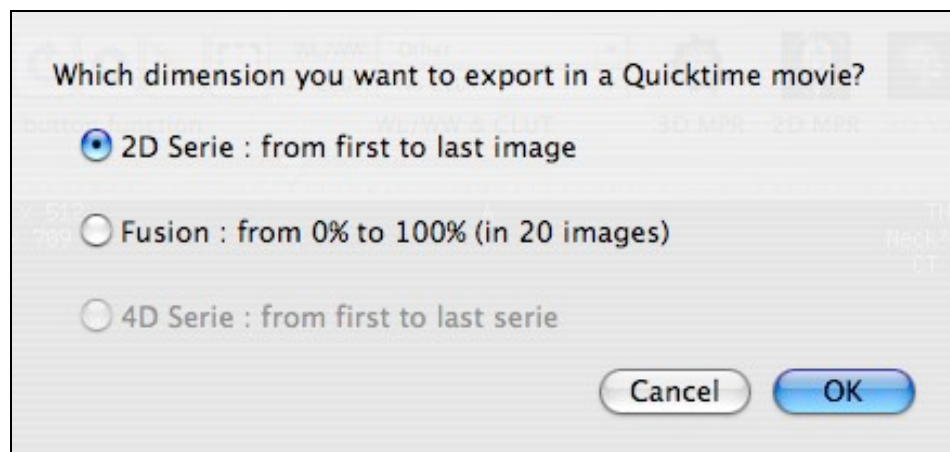
With OsiriX you can export your DICOM images in a TIFF image or a Quicktime sequence. It allows you to show your images during presentation with PowerPoint or Keynote software or import them in Microsoft Word, by example.

To export a single image, you can either press apple-copy to copy it in the clipboard or select 'Export to TIFF' from the '2D viewer' menu. OsiriX will export the image as it appears on the screen at the same size, zoom, rotation, window level, etc. You can find the exact size of the image on the upper left corner of the window:



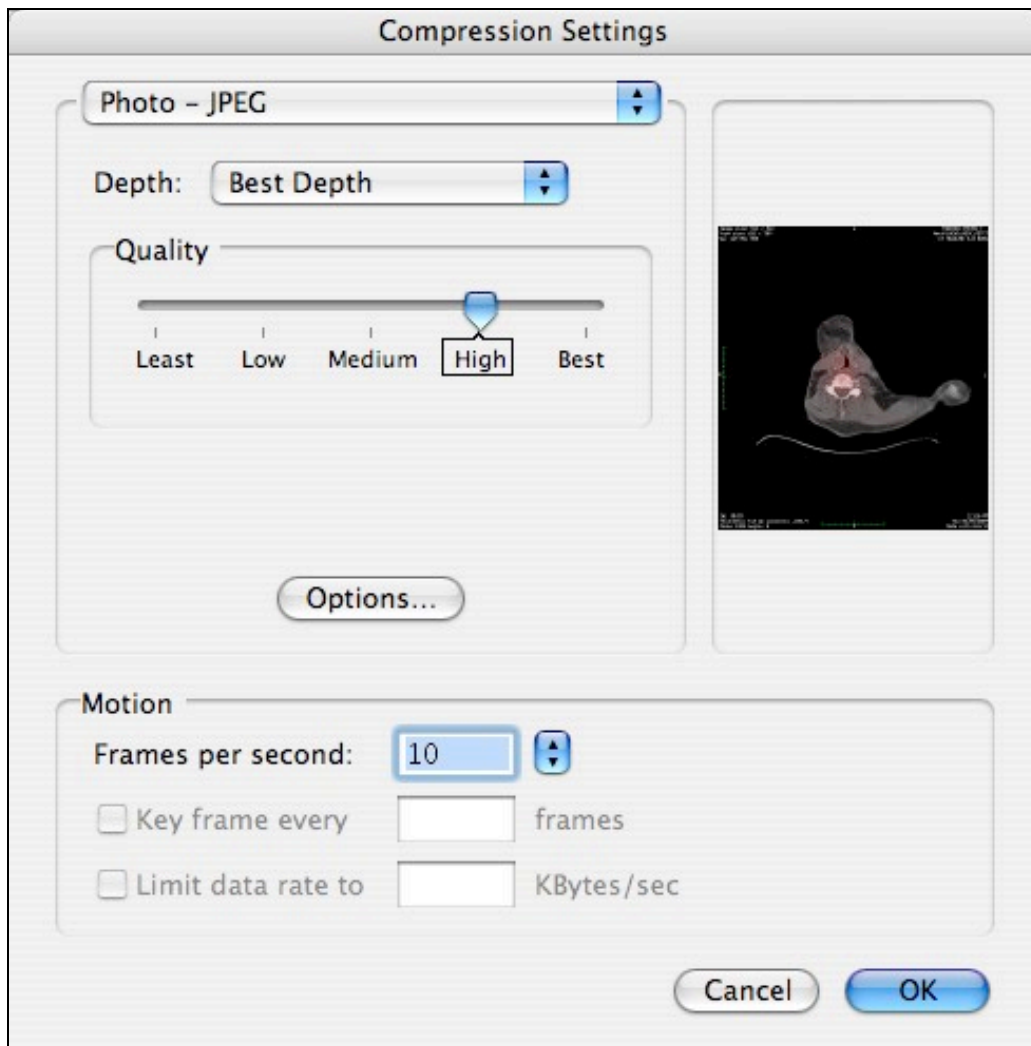
The exported image resolution will be
1266 x 709

The same principle applies for images sequence. Select 'Export to Quicktime' or click on the Quicktime button from the toolbar. With Quicktime export, you have the possibility to export the image fusion dimension of the 4D viewer dimension, if these modes are activated:



Select which 'dimension' you want to export

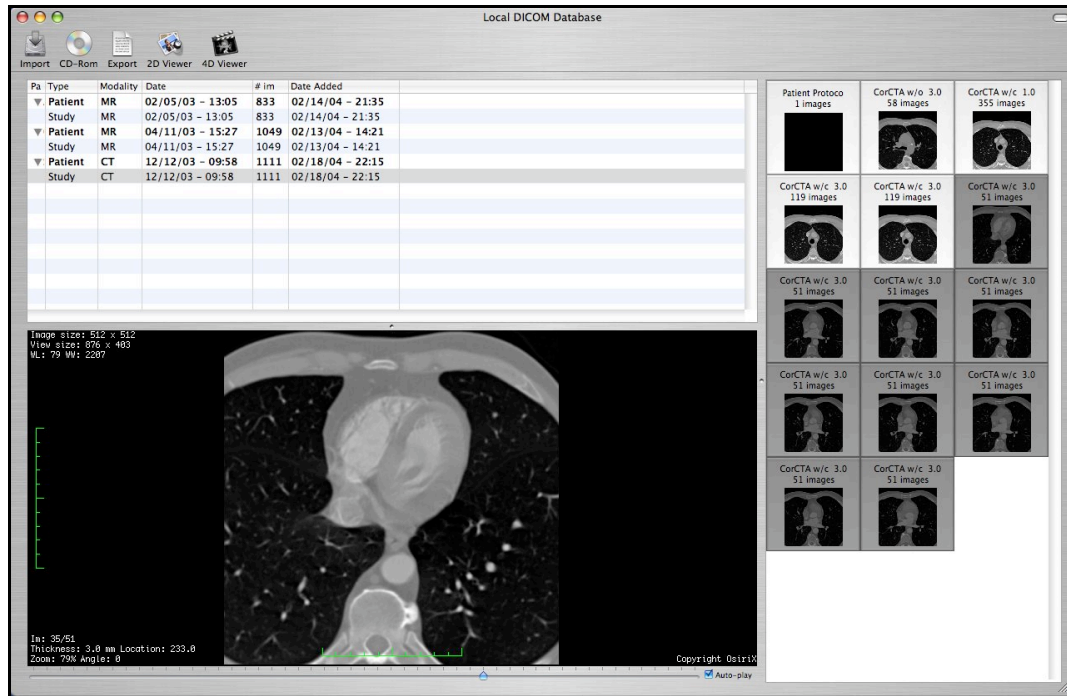
You can also change the compression mode and playing rate. We recommend the JPEG compression for best quality.



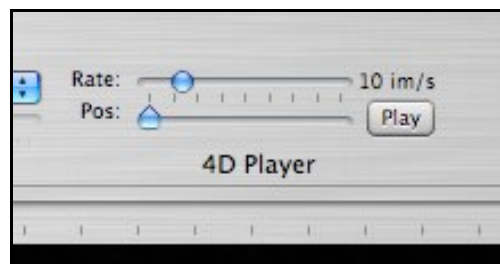
Modify compression mode and playing rate (frames per second)

How to use the 4D viewer?

OsiriX supports a 4D viewer. You can load multiple series of a study that is acquired dynamically. For example, multiphase reconstructed series from a cardiac CT can be loaded for a CINE mode review. Simply select all series in the “Local Database” window and then click “4D viewer”. All series will be loaded into the same window. You can navigate and review in a ‘dynamic’ fashion by using the “4D player” function from the toolbar.



Select multiple series and then click on the “4D viewer” icon.



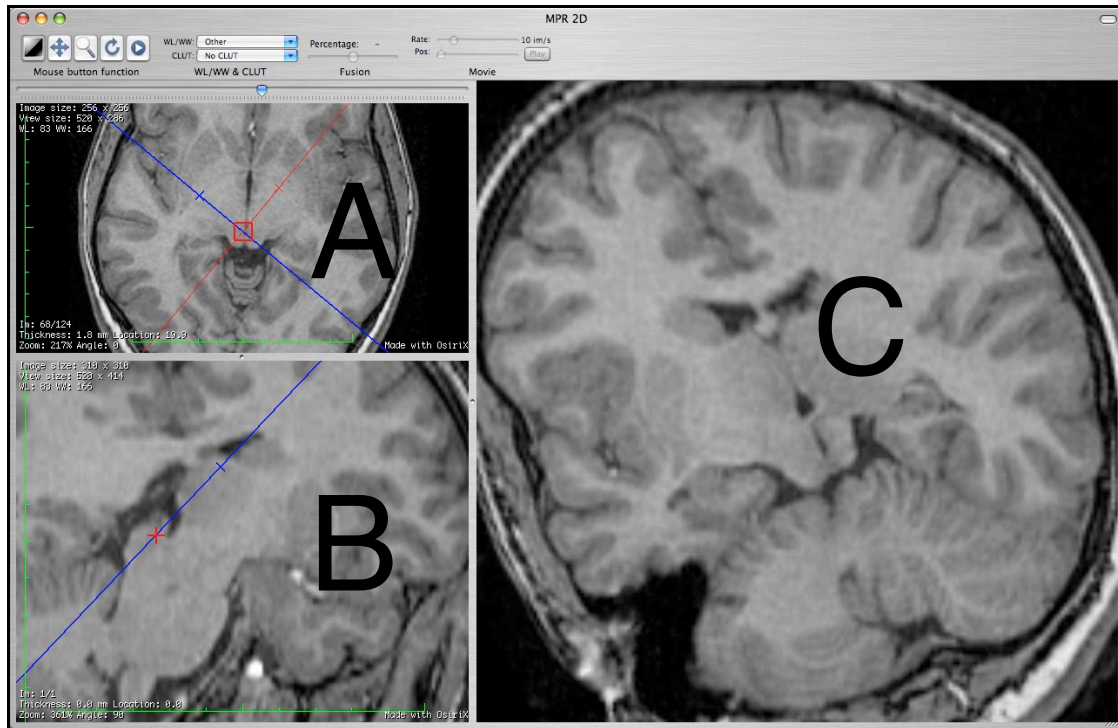
The “4D player” function from the toolbar

The “4D player” function is also available in MPR reconstructions windows.

How to use Multi-Planar Reconstruction (MPR)?

OsiriX supports two different MPR modes: a classic 2D MPR and a 3D orthogonal MPR viewer.

a) Classic 2D MPR

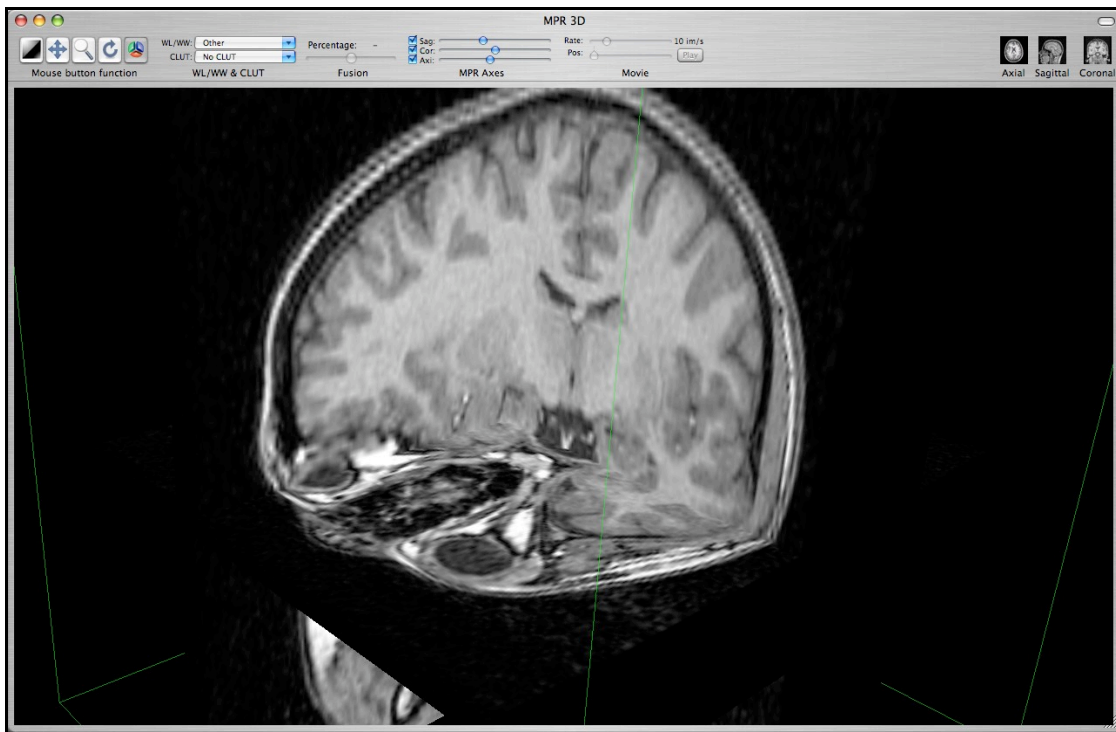


The 2D MPR window

This 2D MPR Viewer allows generating a MPR slice in any position of the 3D volume: locate your point of interest in the A view. Move the center of the lines by clicking/dragging the red square. Then change your slice rotation by clicking in the blue or red line (X and Y rotation). The blue line corresponds to the final image slice (C view) and the red line corresponds to the perpendicular view (B view) of A view. The B view allows you to modify the Z angle of the final slice (C view).

(This MPR mode is a quite computational intensive task. It cannot pre-process images and all images are displayed with cubic interpolation.)

b) 3D orthogonal MPR



3D orthogonal MPR mode

This mode allows you to display a 3D representation of the volume with 3D orthogonal MPR slices. You can change orthogonal slices positions by using 3 sliders located in the toolbar:



Positions of orthogonal slices

Hide or show slices by clicking in the check boxes.

How to use the 3D Reconstructions?

OsiriX supports three 3D reconstructions modules:

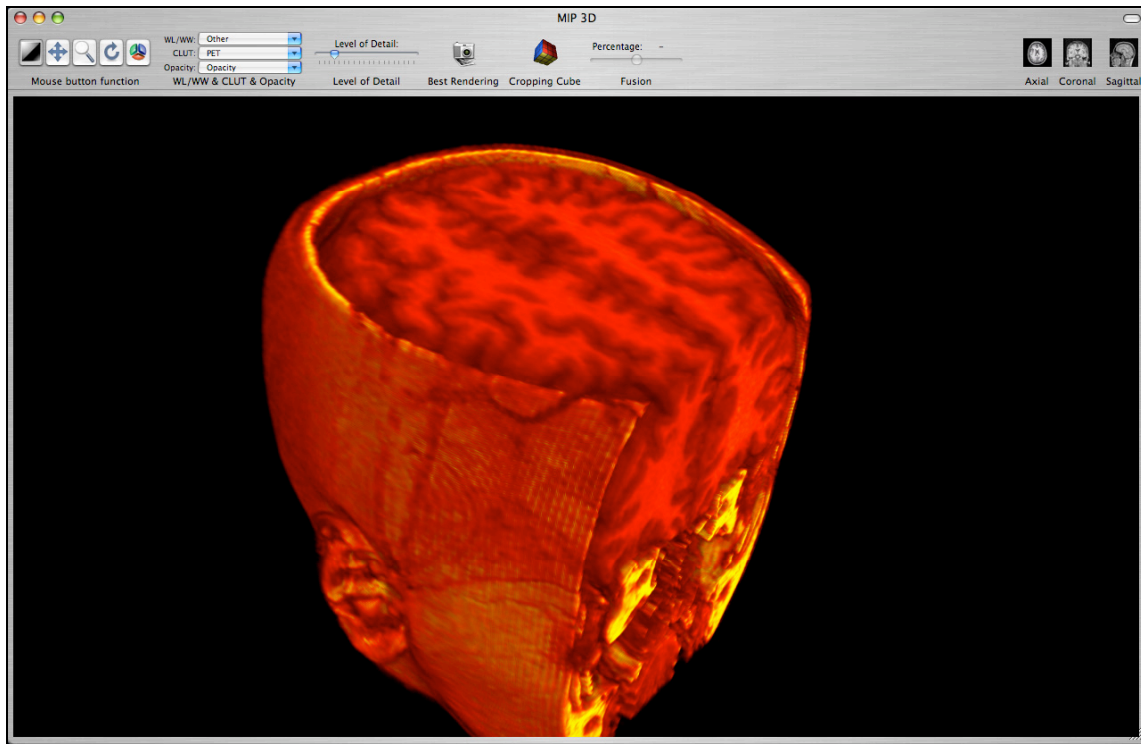
1) Maximum Intensity Projection (MIP)



3D MIP Reconstruction

This reconstruction uses a 'ray-tracing' technique to identify which pixel has the maximum intensity on each ray. This technique is useful for contrast MRIs or CTs, and bone CTs.

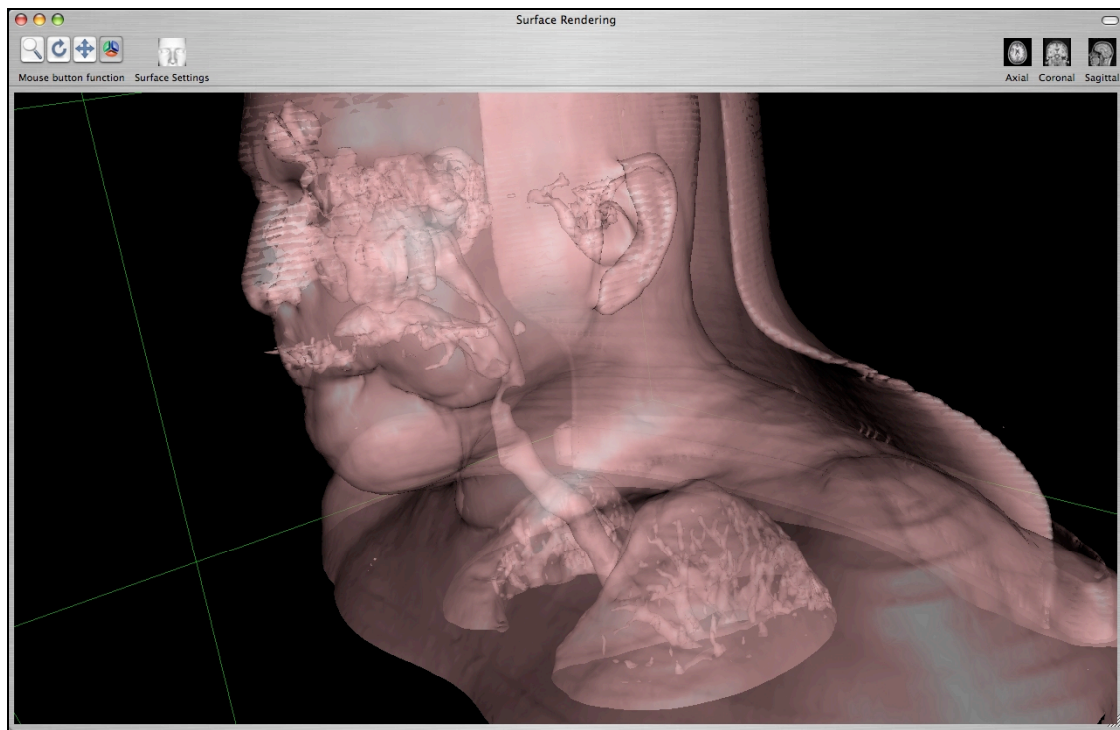
2) Volume Rendering



3D Volume Rendering

This reconstruction uses a 'ray-tracing' technique to apply a transparency/opacity to each pixels depending on their position and their intensity. This technique produces nice images of soft tissues for MRI and CT. It is actually the most used 3D technique and will produce the nicest images in many situations.

3) Surface Rendering



3D Surface Rendering

This reconstruction produces surfaces that are based on an "iso-contour" defined by the user. This technique is useful for virtual endoscopy and bone CTs. The user can define two different surfaces to render.

How to use OsiriX as a PACS workstation?

Yes, you can use OsiriX as a PACS workstation! You don't have to buy a multi-thousands \$\$ PACS workstation licenses! Save your bucks and buy Macintosh computers instead!

You only have to configure your modalities to automatically send exams to your OsiriX computer: configure the AETitle and Port number in OsiriX (see *How to import DICOM images in OsiriX?*).

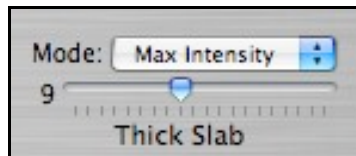


Your next PACS workstation...

How to make use 2D thick slabs?

OsiriX supports a 2D thick slab mode in the 2D viewer. This mode is particularly interesting if you are working with multi-slice CT. It will allow you to navigate more efficiently through huge series.

Thick slab mode is controlled in the tool bar:

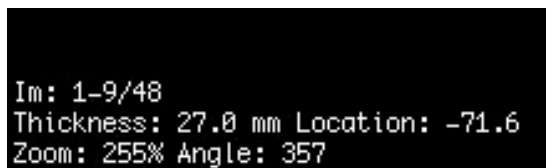


Thick Slab controller

There are actually 3 modes:

- Mean: all slices are added and the mean is computed.
- Maximum Intensity: maximum intensities of all pixels are extracted and displayed.
- Minimum Intensity: minimum intensities of all pixels are extracted and displayed.

You control the number of slices with the slider. You can view thick slabs information in the window lower left corner:



Images 1 to 9 are displayed,
and the total thickness is 27 mm.

For more information about thick slab, read the following articles:

Gruden JF, Ouanounou S, Tigges S, Norris SD, Klausner TS. Incremental benefit of maximum-intensity-projection images on observer detection of small pulmonary nodules revealed by multidetector CT. *AJR Am J Roentgenol.* 2002 Jul;179(1):149-57.

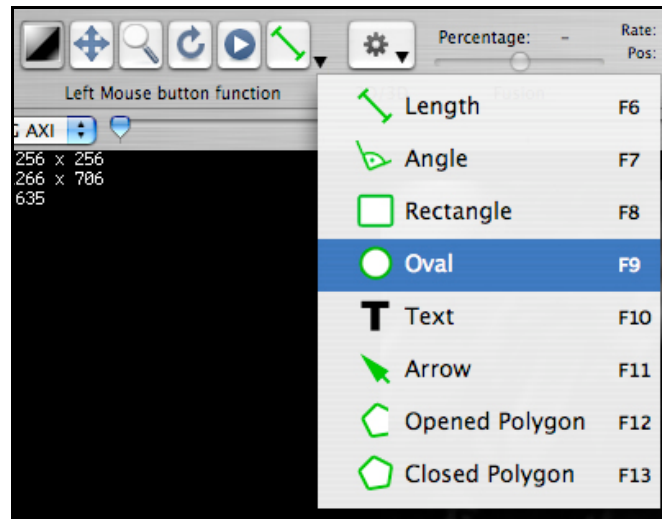
Coakley FV, Cohen MD, Johnson MS, Gonin R, Hanna MP. Maximum intensity projection images in the detection of simulated pulmonary nodules by spiral CT. *Br J Radiol.* 1998 Feb;71(842):135-40.

Remy-Jardin M, Remy J, Giraud F, Marquette C-H. Pulmonary nodules: detection with thick-section spiral CT versus conventional CT. *Radiology* 1993;187:513-520.

How to navigate quickly?

To quickly and efficiently interpret images you have to use different functions: window level adjustment, translation, zoom, rotation, serie browse, measurements, regions of interest,...

These small icons in the toolbar represent these basic functions:



Basic functions

You can simply click on them. To save time, you can also do one the following:

a) Mouse + keys

You can change your current mouse functions by using following combinations:

- Option + Click = Window level adjustment
- Apple + Click = Translation
- Ctrl + Click = Zoom
- Apple + Option + Click = Rotation

b) 3 buttons mouse + wheel

We highly recommend to use OsiriX with a multi-buttons and wheel mouse. You will be able to navigate more efficiently than by using a simple unique button mouse.

- Left button = currently selected function
- Right button = zoom
- Wheel = navigate in the serie

c) Jog-wheel

OsiriX is compatible with these new jog-wheel devices from Contour Design (<http://www.contourdesign.com/>). OsiriX is able to fully exploit these devices to quickly navigate in 5 dimensions.

How to make OsiriX run faster?

There are two limitations to OsiriX: memory and processor power.

- 1) Memory: OsiriX requires a lot of memory if you try to open large series of images! If OsiriX does not have enough memory, MacOS X will try to free memory by using the "Virtual Memory" (VM) mode: it will use your hard drive as RAM... But VM is about 1000 times slower than RAM!! You see the problem... Here is how to compute memory the amount you need: do the following simple calculation for the number of images you want to view and handle at the same time:

- Height X Width X Number of images x 4 / 1048576

For example: $512 \times 512 \times 100 \times 4 / 1048576 = 100$ MB of RAM for 100 CT images

This means that you need at least 100 MB of RAM ONLY for your 100 CT images. MacOS X requires a minimum of 256 MB to work "normally". You will need at least $256 + 100$ MB = 356 MB to avoid Virtual Memory mode.

- 2) Processor power: OsiriX needs high processing power for 3D reconstruction: MIP and Volume Rendering. OsiriX is a multi-threaded application that can use all processors available in your computer. If you want the best performance you should buy a dual-G5 computer!

Another solution is to use a computer cluster with the Apple X-Grid / MPI technology. The software package is available at <http://www.apple.com/acg/xgrid/>. Run and install the package. You then need to install the "OsiriX plugin": copy it in the "Plug-ins" folder of "Xgrid" folder located in your "Library" folder. More information about this technology in future releases.

Another solution would be to use a VolumePRO PCI graphic board from TeraRecon (<http://www.terarecon.com/>). This solution is currently under investigation to make OsiriX run faster than a Vitrea 3D workstation! All 3D reconstructions in OsiriX are based on VTK and VTK fully supports the VolumePRO graphic board...