

LocalEye Viewer, version 5

User Manual

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1 Abbreviations

Abbreviation	Description
DICOM	Digital Imaging and COmmunications in Medicine
DLL	Dynamic Link Library
DPI	Dots Per Inch
GUI	Graphical User Interface
HTML	Hyper Text Markup Language
HTTP	Hyper Text Transfer Protocol
JAI	Java Advanced Imaging
JRE	Java Runtime Environment
JWS	Java Web Start
LAN	Local Area Network
LUT	Look-Up Table
PACS	Picture Archiving and Communication System
PC	Personal Computer
RAM	Random Access Memory
SR	Structured Report
TCP	Transfer Control Protocol
URL	Uniform Resource Locator

2 Indications for use

The LocalEye Viewer software is intended to be used as a medical image viewer to visualize and review medical multi-modality image data stored on an optical medium (CD or DVD) in DICOM format, as well as eventual related reports.

LocalEye Viewer is NOT intended for diagnostic reading and reporting of medical exams.

LocalEye Viewer does not perform any lossy compression or lossy manipulation on the images it displays.

Typical users of LocalEye Viewer are trained professionals, including but not limited to radiologists, physicians, nurses and technicians.

3 Introduction

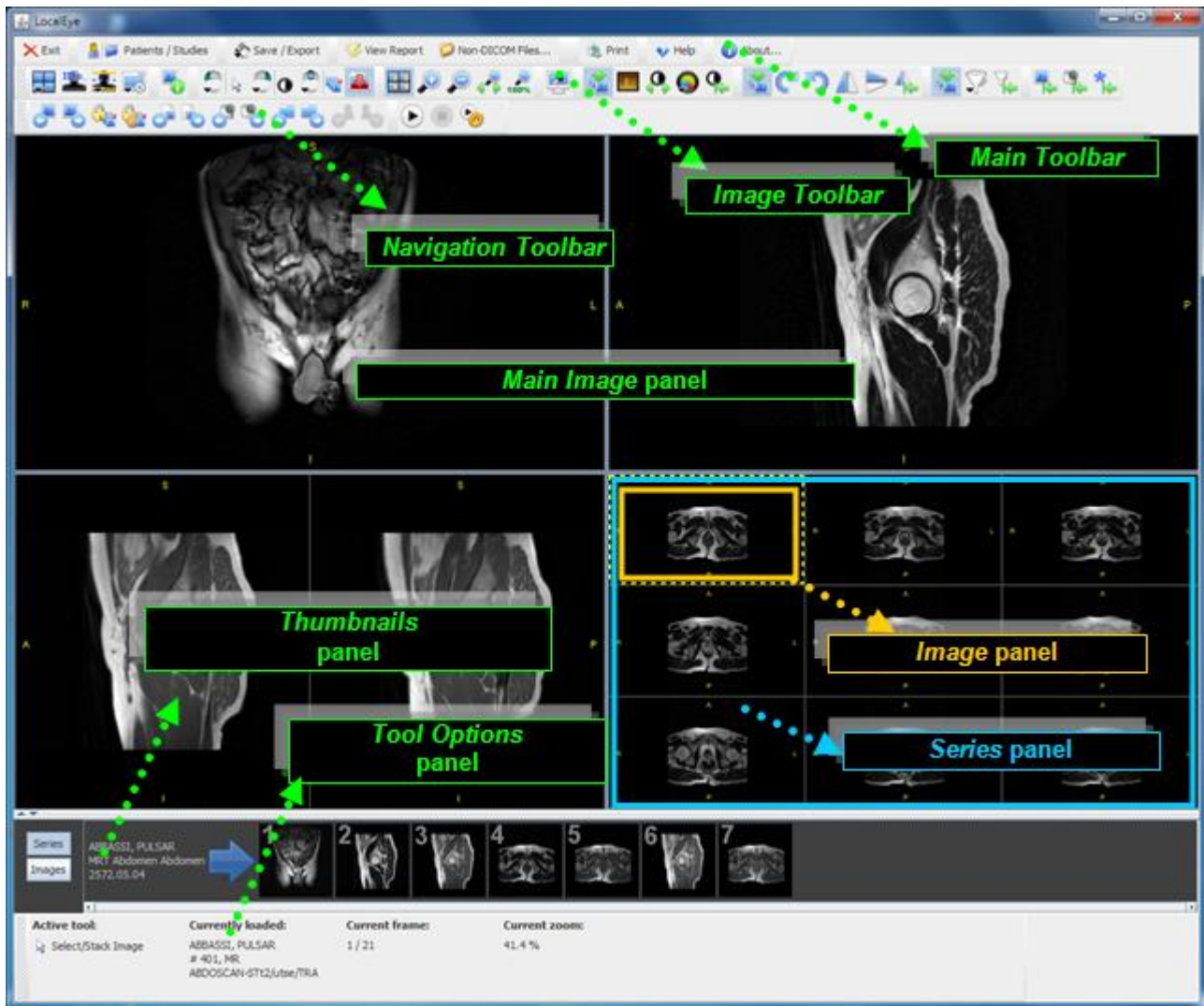
The following chapters explain the user features available from the LocalEye Viewer Graphical User Interface (GUI) and how to exploit the capabilities of this system.

The LocalEye Viewer GUI is composed of 6 main panels or toolbars:

- *Main Toolbar*: this toolbar contains buttons which allow performing the most common operations in LocalEye Viewer, such as loading and saving DICOM files, exporting and printing medical images, displaying the list of available patients or studies. Basically, this is the main menu of LocalEye Viewer.
- *Image Toolbar*: this rich toolbar contains buttons representing all operations which can be performed on medical images, and all settings which can be applied to the display of those images.
- *Navigation Toolbar*: this toolbar contains buttons allowing to navigate through the available images, series, studies and patients. Also, buttons controlling the cine-playback of multi-frame sequences are available in this toolbar.
- *Thumbnails* panel: this panel displays thumbnail images. The thumbnails may represent the available series or all available images, depending on the user's choice.
- *Tool Options* panel: this panel contains the options and information related to the currently active tool. Starting from LocalEye Viewer v4, a different image manipulation or analysis tool can be associated to each mouse button; when a given tool is in use, its specific options and data will be displayed in this panel.
- *Main Image* panel: this is the panel where the medical images are actually displayed. It can contain one or several *Series* panels, depending on the Series Tiling setting (i.e., the number of Series

columns and Series rows). In turn, each Series panel can contain one or several *Image* panels, depending on the Image Tiling setting (i.e., the number of Image columns and Image rows, for each Series panel). Hence, the Main Image panel can show several series at once, and several images for each series.

The following figure shows a screenshot of the LocalEye Viewer GUI, with the main panels clearly shown.



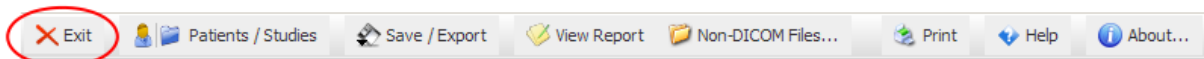
The following sections will provide a detailed description of each element of the GUI, as well as of the related features.

4 Main Toolbar

The *Main Toolbar* of LocalEye Viewer acts as its main menu, since it's the access point to all main operations and features supported by the viewer.

4.1 Exit from application

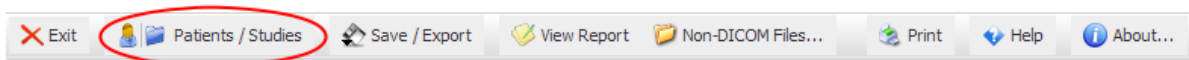
The *Exit* toolbar button is shown in the following picture:



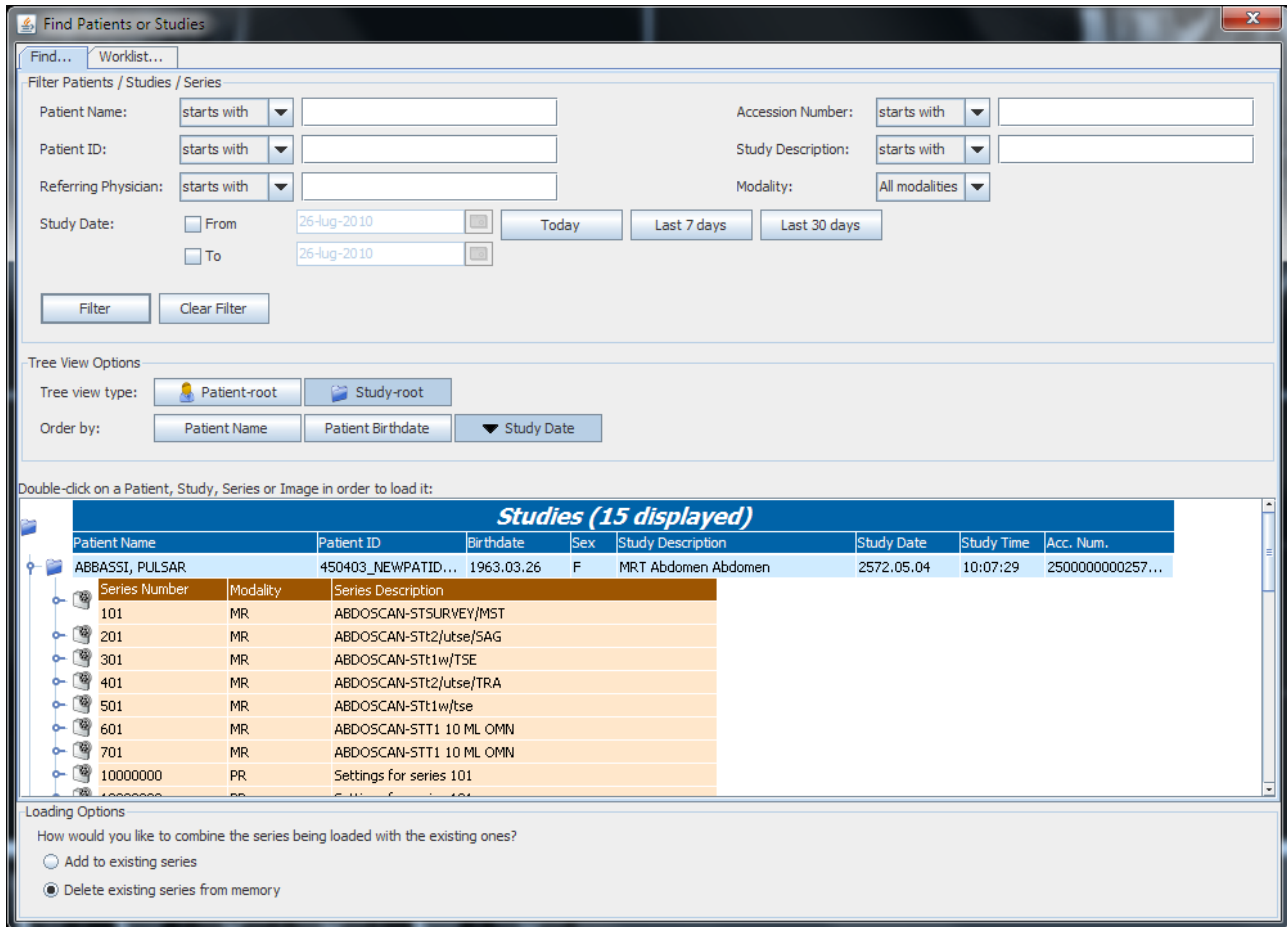
This button may be used to close the LocalEye Viewer applet or application.

4.2 Patients / Studies

The *Patients / Studies* toolbar button is shown in the following picture:



If you press the *Patients / Studies* button, the *Find Patients or Studies* frame will appear, as shown in the following picture:



This frame contains all available studies, series and images. Depending on the current LocalEye Viewer configuration, the tree view may display a “Patient / Study / Series / Image” hierarchy (*Patient-root* view) or a “Study / Series / Image” hierarchy (*Study-root* view). You can double-click on a patient, a study, a series or an image:

- Double-clicking on a patient node (only possible with *Patient-root* view) will cause loading all series belonging to that patient. A confirmation for such operation is asked by LocalEye Viewer;
- Double-clicking on a study node will cause loading all series belonging to that study;
- Double-clicking on a series node will cause loading all images belonging to that series;
- Double-clicking on an image node will cause loading just that image.

A powerful search filter is also provided, to facilitate the search of a particular Patient or Study or Series. The user may specify a value for a given search parameter, then press the *Filter* button: the “Patient / Study / Series / Image” hierarchy will be filtered and only those nodes matching the search parameter(s) will be displayed. In particular, the following search parameters are supported:

- Patient Name
- Patient ID

- Study Description
- Accession Number
- Study Date
- Modality

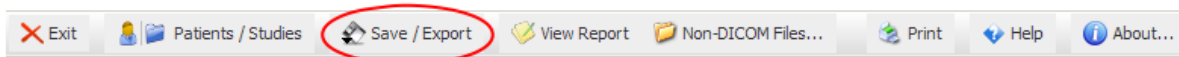
You can restore the original complete list of Patients / Studies / Series / Images by pressing the *Clear Filter* button.

The *Tree View Options* sub-frame contains options controlling how the content tree is displayed, including the *Patient-root* or *Study-root* display modes and the tree sorting.

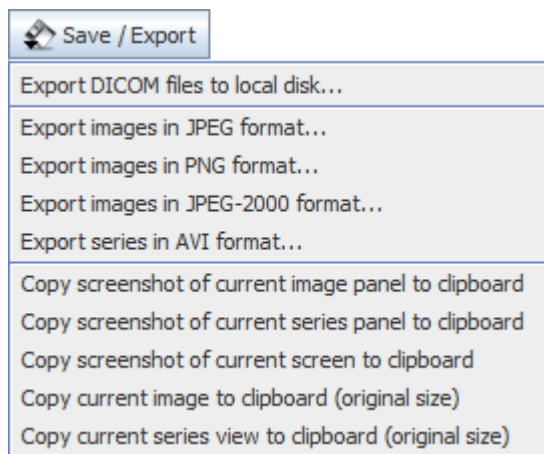
The *Find Patient / Study / Series / Image* frame also includes the *Loading Options* section, where the user can choose whether the series which are being loaded must be added to the currently loaded ones (*Add to existing series* option) or the existing series must be removed from memory (*Delete existing series from memory* option).

4.3 Save / Export

The *Save / Export* toolbar button is shown in the following picture:



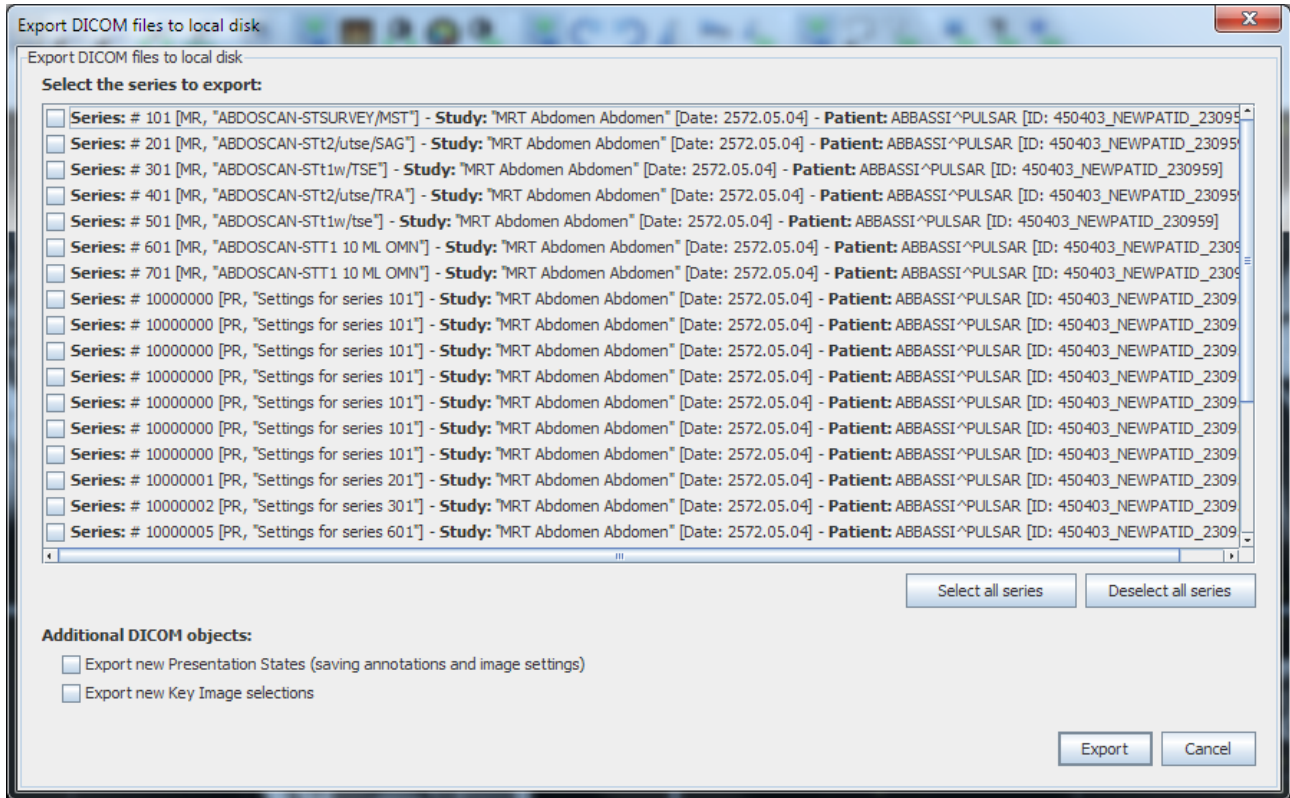
If you press the *Save / Export* button, the *Save / Export* drop-down menu will appear, as show in the following picture (some menu items may be hidden depending on your configuration):



4.3.1 Export DICOM files to local disk

The *Export DICOM files to local disk...* menu item can be used to export currently-loaded DICOM images to the local file system, or to save to the local file system modifications and settings made on images,

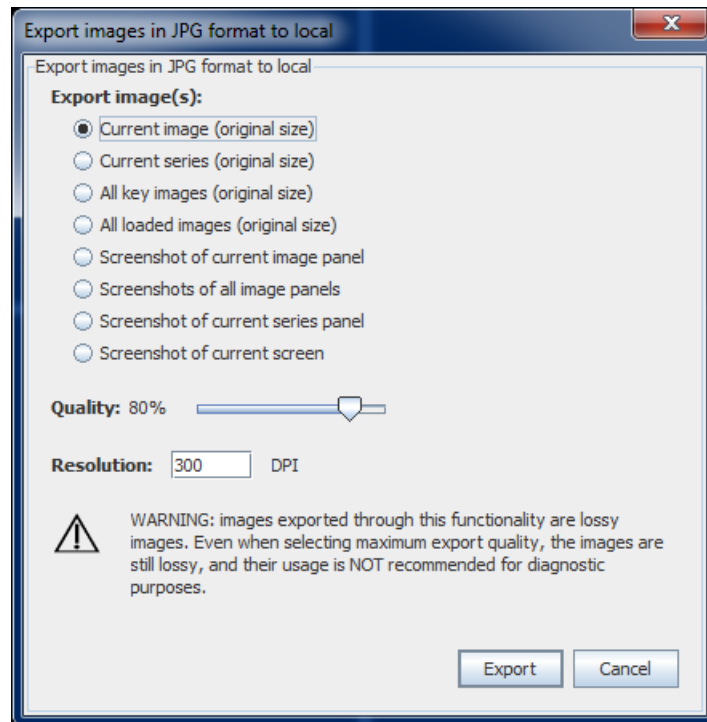
through the Presentation State or Key Object Selection DICOM objects. If you select the *Export DICOM files to local disk...* menu item, the *Export DICOM files to local disk* dialog will appear, as show in the following picture:



Through this dialog, you can select which series (among the loaded ones) need to be exported to server. Also, you can choose to create and export new Presentation States for the currently loaded images. Presentation State objects are able to save and store all settings performed by the user on the medical images, including contrast settings, rotation, flipping, annotations, etc. They don't contain the image, but only the transformations to be applied to images. They are the preferred way to save all modifications and annotations performed on the displayed DICOM images. Usually, the Presentation State files are quite small in size, so the store operation is efficient even when it requires a transfer to a remote server. In addition, you can choose whether to export the selections of Key Images for the currently loaded images: this option allows supporting persistence of the Key Image information, which can be maintained the next time the study will be loaded.

4.3.2 Export images in JPEG format

The *Export images in JPEG format...* menu item can be used to export currently-loaded medical images to the local file system in JPEG format. If you select the *Export images in JPEG format...* menu item, the *Export images in JPEG format* dialog will appear, as show in the following picture:



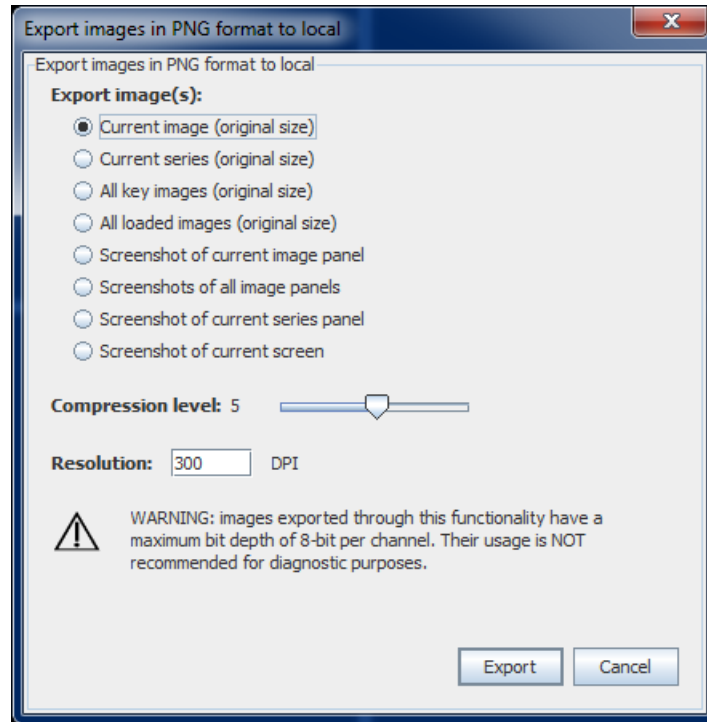
This dialog allows selecting which images need to be exported in JPEG format, as well as the quality and resolution of the JPEG images to be created.



Warning: the supported JPEG export format is a *lossy* compression format. Even if a “100 %” quality is specified, the output image is still *lossy*.

4.3.3 Export images in PNG format

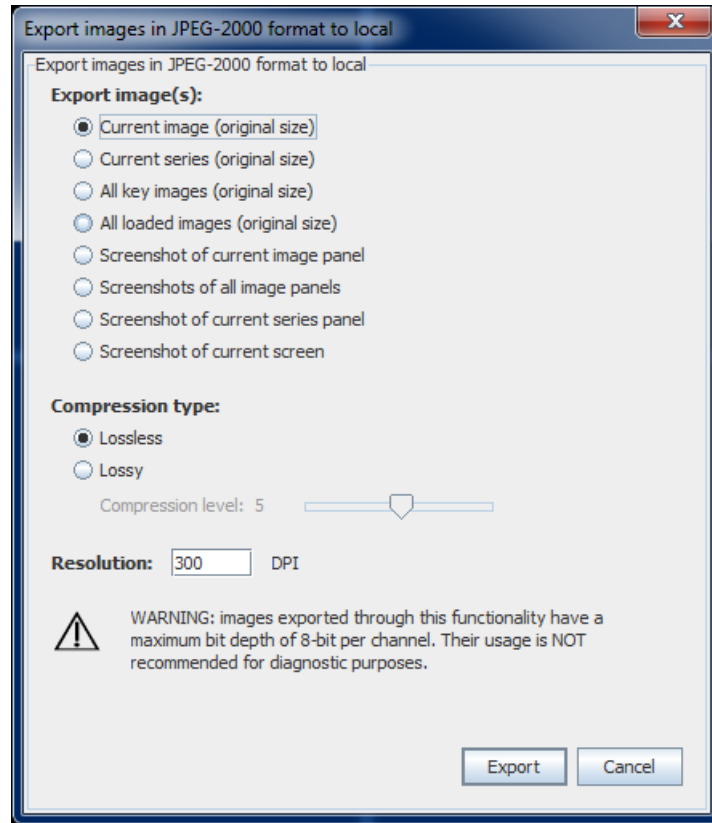
The *Export images in PNG format...* menu item can be used to export currently-loaded medical images to the local file system in PNG format. If you select the *Export images in PNG format...* menu item, the *Export images in PNG format* dialog will appear, as show in the following picture:



This dialog allows selecting which images needs to be exported in PNG format, as well as the compression level and resolution of the PNG images to be created.

4.3.4 Export images in JPEG-2000 format

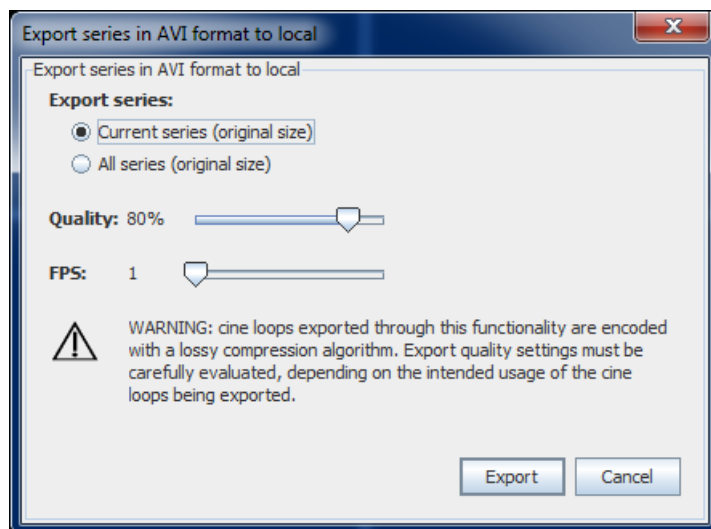
The *Export images in JPEG-2000 format...* menu item can be used to export currently-loaded medical images to the local file system in JPEG-2000 format. If you select the *Export images in JPEG-2000 format...* menu item, the *Export images in JPEG format* dialog will appear, as show in the following picture:



This dialog allows selecting which images needs to be exported in JPEG-2000 format, as well as the compression type (*Lossless* or *Lossy*) and resolution of the JPEG-2000 images to be created. In case the *Lossy* compression type is selected, it is possible to specify the compression level to be used.

4.3.5 Export series in AVI format

The *Export series in AVI format to local disk...* menu item can be used to export currently-loaded series to the local file system in AVI format, as movies. If you select the *Export series in AVI format...* menu item, the *Export series in AVI format to local* dialog will appear, as show in the following picture:



This dialog allows selecting which series need to be exported in AVI format, as well as quality and frame rate of the AVI movie to be created.

4.3.6 Copy images to clipboard

LocalEye Viewer supports a set of *Copy to clipboard* functions, which allow copying medical images to the system clipboard.

The "*Copy screenshot...*" set of functions perform a real snapshot of the content of the on-screen display panels, and copy it to the system clipboard. This implies that in this case the images copied to the system clipboard have the same size of the related on-screen display panels, hence they are influenced by the current screen resolution and display mode.

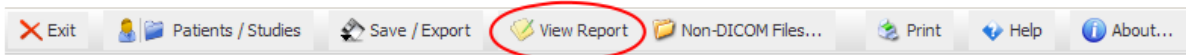
On the other side, the remaining "*Copy ... to clipboard*" functions copy the medical images to clipboard at their original size.

The CTRL+C keyboard shortcut may be used to copy a screenshot of the current image panel to the system clipboard.

4.4 View Report

LocalEye Viewer is able to display reports associated with the current study. If a DICOM Structured Report exists on the CD/DVD for the currently selected study, it will be displayed upon pressing the *View Report* button on the main toolbar. Also, if there are non-DICOM reports in TXT, PDF, DOC or RTF format properly stored on the CD/DVD, they will be displayed through an external viewer application upon pressing the *View Report* button on the main toolbar.

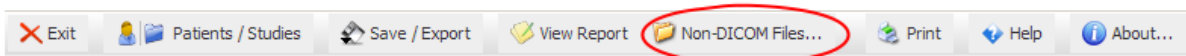
The *View Report* toolbar button is shown in the following picture.



4.5 Non-DICOM Files

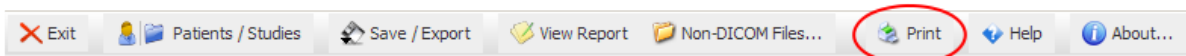
LocalEye Viewer is able to display non-DICOM files stored on CD/DVD in the appropriate “NONDICOM” folder. Pressing the *Non-DICOM Files* button (may be hidden depending on the current configuration) on the main toolbar will open a window which will allow you to browse and eventually open those non-DICOM files.

The *Non-DICOM Files* toolbar button is shown in the following picture.

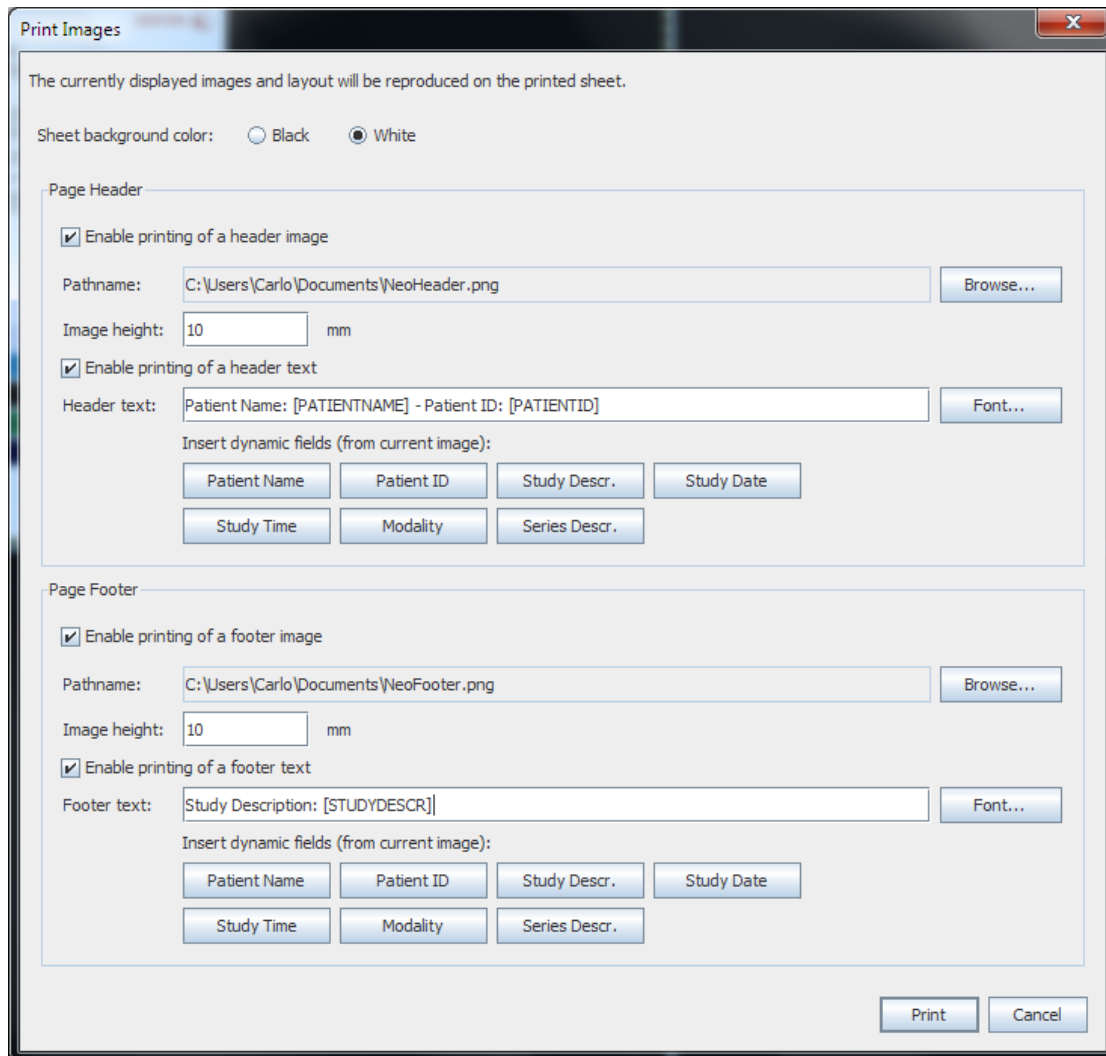


4.6 Print Images

The *Print* toolbar button is shown in the following picture.



Pressing the *Print* button opens the *Print Images* dialog, which is shown in the following picture:

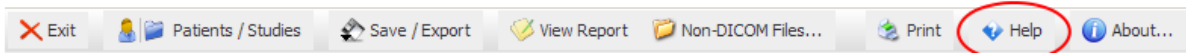


The *Print Image* dialog allows specifying several preferences related to the print operation. In particular, it is possible to select the background colour of the printed sheet (*Black* or *White*), to specify a header and footer image with configurable height, a header and footer text with configurable font, colour and size (press the *Font...* button in order to change the properties of the header and footer texts). The header and footer texts may also contain dynamic fields (*Patient Name*, *Patient ID*, *Study Description*, *Study Date*, *Study Time*, *Modality*, *Series Description*), which will be automatically substituted by LocalEye Viewer with appropriate values before the actual printing takes place.

LocalEye Viewer will reproduce on the printed sheet the layout and images currently used for the display, i.e., the same series tiling, image tiling and images as in the main display matrix.

4.7 Online Help

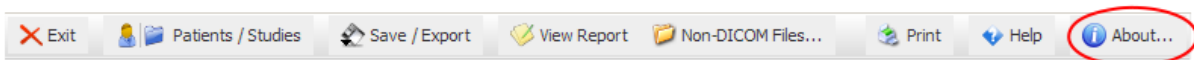
The *Help* toolbar button can be used to open the LocalEye Viewer Online Help system. This button is shown in the following picture:



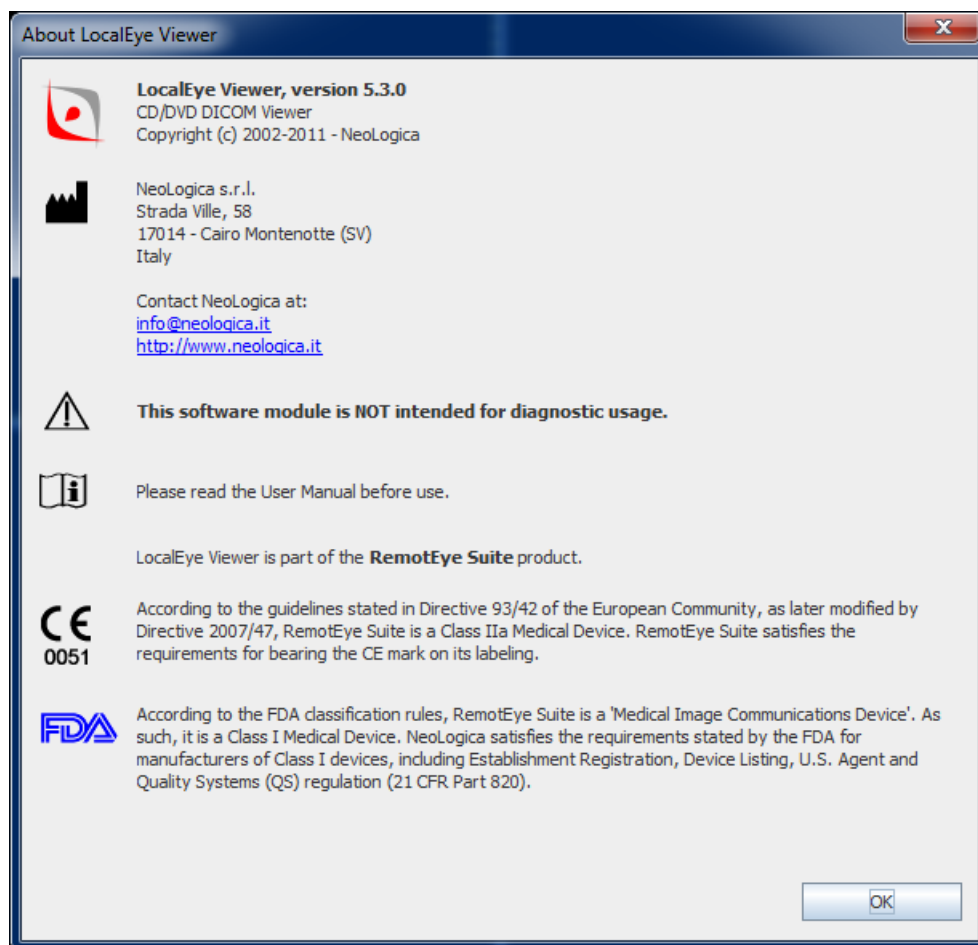
The Online Help will be displayed in a separate window. Please consider that some pop-up blocking software may prevent the Help window from appearing correctly, hence we recommend disabling the pop-up blocking software when using the LocalEye Viewer Help functionality.

4.8 About LocalEye Viewer

The *About LocalEye Viewer* toolbar button is shown in the following picture.



Pressing the *About LocalEye Viewer* button opens the *About LocalEye Viewer* frame, which is shown in the following picture:



This frame provides general information about the current version of the NeoLogica LocalEye Viewer system.

5 Image Toolbar

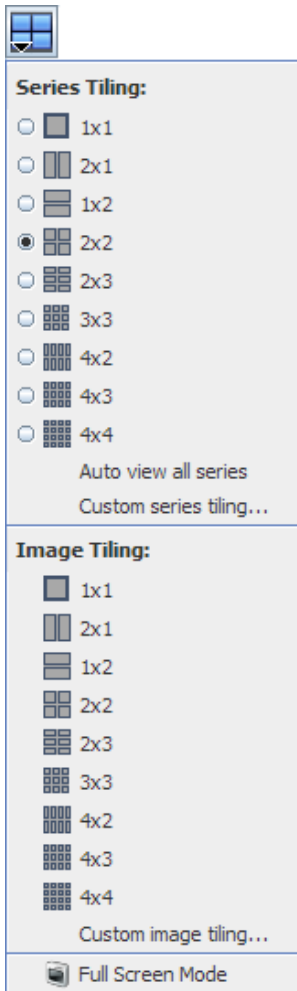
The *Image Toolbar* contains buttons representing all operations which can be performed on medical images, and all settings which can be applied to the display of those images.



When moving the mouse pointer over each single *Image Toolbar*'s button, a tooltip text will appear, providing additional information about the function of the buttons themselves.

5.1 Display layout

The *Display layout...* button () of the *Image Toolbar* allows setting the current screen layout, for an optimal visualization of medical images. If you press this toolbar button, the following drop-down menu will appear:



The display layout in the Main Image Panel is now completely flexible, and it is based on the concepts of *Series Tiling* and of *Image Tiling*.

Series Tiling allows specifying how many different series are viewable in the Main Image Panel. You can specify a given number of “series columns” and of “series rows”. Several pre-set Series Tiling are available; in case a particular Series Tiling must be used, which is not present in the list of pre-set Series Tiling, the *Custom series tiling...* menu item can be selected. The *Auto view all series* button can be used to automatically set the optimal Series Tiling, in such a way all available series (for instance, an entire study) will be visible inside the display matrix.

Image Tiling allows specifying how many different images are viewable for each Series Panel. You can specify a given number of “image columns” and of “image rows” for each Series Panel. Even in this case, several pre-set Image Tiling are available, and you can also use a custom Image Tiling by selecting the *Custom image tiling...* menu item.

Finally, the *Full Screen Mode* menu item allows switching to the Full-Screen display mode. In this mode, the display area is maximized, and all non-essential panels are hidden, in such a way to dedicate the maximum display space to the image panels. Once the Full-Screen display mode is active, you can return to the normal “windowed” display mode by pressing the ESC button on the keyboard. As an alternative, you may select the *Normal Screen Mode* menu item from the

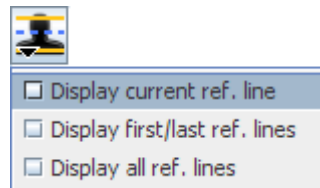
pop-up menu which appears by CTRL+right-clicking on a non-empty image panel.

5.2 Text overlays

The *Display text overlays* toggle button () of the *Image Toolbar* allows enabling and disabling the display of textual overlays on the medical images shown on screen. These text overlays contain fundamental information about each image, such as Patient ID, Patient Name, Patient Sex, Patient Birth Date, Study Date, Study Description, Modality used for acquisition, and other acquisition parameters. These acquisition parameters may sometimes be modality-specific.

5.3 Reference lines

The *Display reference lines...* button () of the *Image Toolbar* allows setting preferences about the display of reference lines (also known as “scout lines”) on CT or MR images. This toolbar button is only enabled with CT or MR images. If you press it, the following drop-down menu will appear:

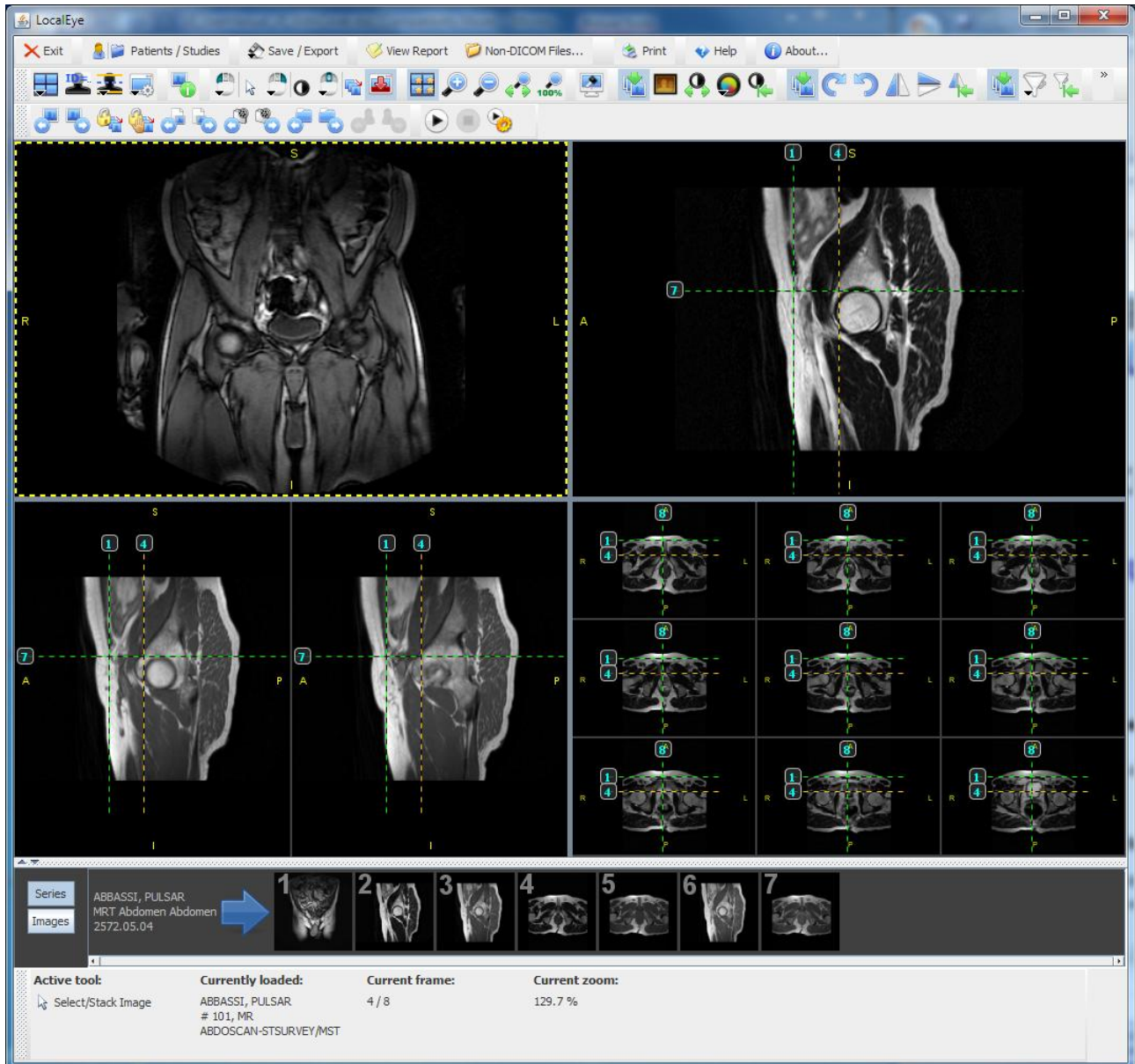


The *Display current ref. line* menu item allows enabling and disabling the display of reference lines related to the currently selected image on all other displayed and intersecting series. A reference line indicates the location of an image slice (the currently selected image) on another image of an intersecting plane.

The *Display first/last ref. lines* menu item allows enabling and disabling the display of reference lines related to the first and last image of the currently selected series.

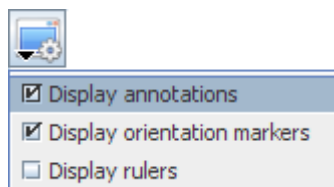
The *Display all ref. lines* menu item allows enabling and disabling the display of reference lines related to all images of the currently selected series.

The following picture shows an example of how reference lines look like on a MR study:



5.4 Display options

The *Display options...* button () of the *Image Toolbar* allows setting additional display preferences, related to annotations, orientation markers and rulers. If you press this toolbar button, the following drop-down menu will appear:



The *Display annotations* menu item allows enabling and disabling the display of measurement and graphical annotations over all the displayed images.

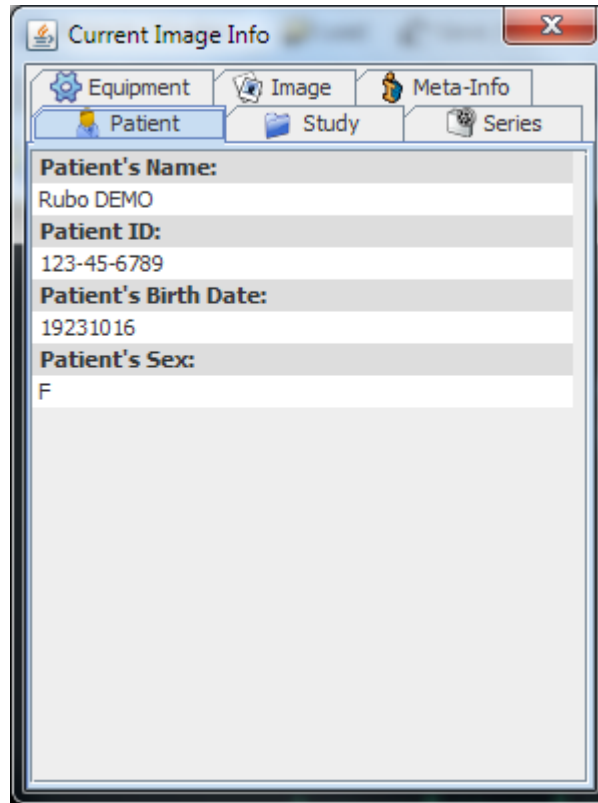
The *Display orientation markers* menu item allows enabling and disabling the display of orientation markers, normally available on CT and MR images, and sometimes on other kinds of images. If the image orientation information is present inside the related DICOM image file, the orientation markers will be displayed at the four edges of each DICOM image. The orientation will be indicated as:

- A: Anterior
- P: Posterior
- I: Inferior
- S: Superior
- L: Left
- R: Right

Finally, the *Display rulers* menu item allows enabling and disabling the display of on-screen rulers showing actual distances over the displayed images. The rulers show a short tick every 1 cm on the image, and a longer tick every 5 cm on the image. Rulers will only be displayed on images having the appropriate calibration information inside the related DICOM image file.

5.5 Information on current image

The *View info on current image* button () of the *Image Toolbar* allows viewing information about the currently selected image. If you press this toolbar button, the *Current Image Info* dialog box will appear:



This dialog box is composed of several tabs:

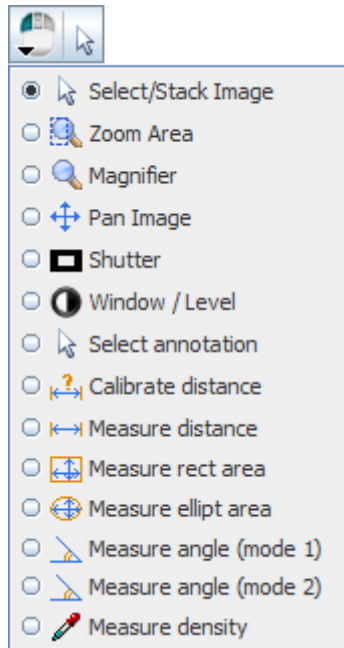
- Meta-Info tab
- Patient tab
- Study tab
- Series tab
- Equipment tab
- Image tab
- Clinical Trial tab (if enabled)

These tabs display information extracted from the current DICOM file, i.e., the DICOM file related to the currently selected image.

5.6 Image tools and mouse buttons

LocalEye Viewer now supports a completely flexible association between mouse buttons and image manipulation tools. Each available image tool can be independently associated to the left mouse button and to the right mouse button. All combinations of left / right mouse button tools are supported.

The *Associate tool with LEFT mouse button* toolbar button () can be used to associate an image tool with the left mouse button. If you press this toolbar button, the following drop-down menu will appear:



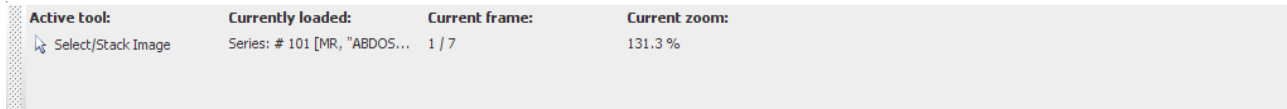
The *Associate tool with RIGHT mouse button* toolbar button () can be used to associate an image tool with the right mouse button. If you press this toolbar button, the same drop-down menu as above will appear. This flexible functionality implies that each single image tool is always usable with a single mouse button. The icon of the tool currently associated with the left and right mouse buttons will appear in the *Image Toolbar*, next to the left and right mouse button icons.

Each image tool has its own associated *Tool Options* panel, which by default will be displayed in the bottom region of the main window, but may be dragged by the user to different edges of the main window. When the user starts using an image tool on a medical image, the *Tool Options* panel related to that tool will be displayed and become active. The following paragraphs will describe each image tool, as well as the options and information available in the *Tool Options* panel associated to each tool.

5.6.1 *Select/Stack Image tool*

The *Select/Stack Image* tool allows selecting an image on the *Main Image* panel, by a single click on the image. To unselect the image you have to click on the image while holding the CTRL key pressed. Also, it is possible to scroll through the images of the series by dragging with the associated mouse button over the image (“stack” operation).

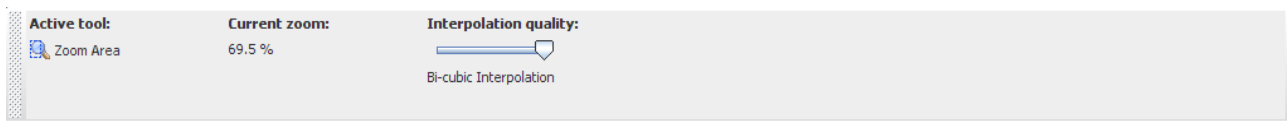
The *Tool Options* panel associated with this tool, shown in the picture below, displays basic information about the currently selected image.



5.6.2 Zoom Area tool

The *Zoom Area* tool allows zooming a specific rectangular portion of the currently selected image. The rectangular region to be zoomed can be selected by dragging with the associated mouse button over the medical image. If the SHIFT key of the keyboard is kept pressed, then the zoom area will be forced to a square shape.

The *Tool Options* panel associated with this tool is shown in the picture below:

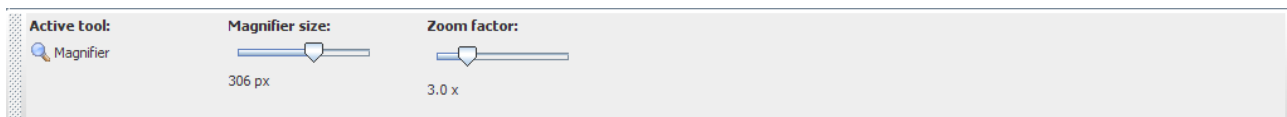


The interpolation algorithm used to zoom images can be chosen by dragging the *Interpolation quality* slider on the *Tool Options* panel associated with this tool. Three different interpolation types are supported, providing a speed vs quality trade-off.

5.6.3 Magnifier tool

The *Magnifier* tool allows magnifying a moving portion of the image, by dragging with the associated mouse button over the image.

The *Tool Options* panel associated with this tool is shown in the picture below:

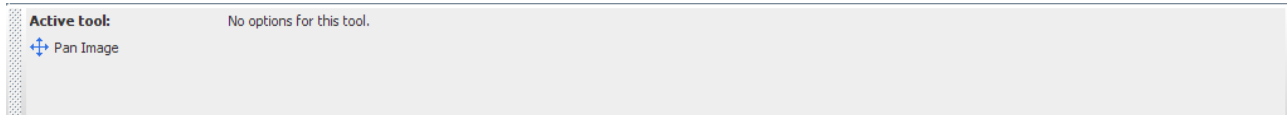


The magnification factor used by the magnifier, as well as the size of the magnifier itself, can be modified by dragging the *Zoom factor* and the *Magnifier size* sliders on the *Tool Options* panel associated with this tool.

5.6.4 Pan Image tool

The *Pan* tool allows panning over the currently selected image, by dragging with the associated mouse button over the image.

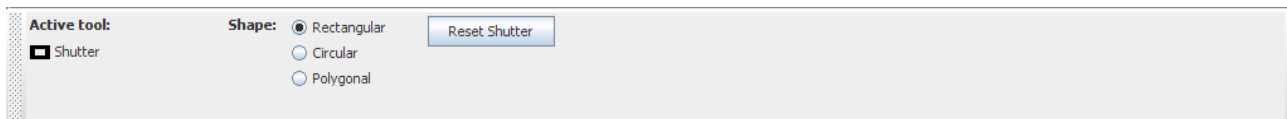
The *Tool Options* panel associated with this tool is shown in the picture below:



5.6.5 Shutter tool

The *Shutter* tool allows applying a shutter over the image, i.e., hiding a sub-region of the image, which is not interesting for medical purposes. The shutter is always applied to the entire series.

The *Tool Options* panel associated with this tool is shown in the picture below:

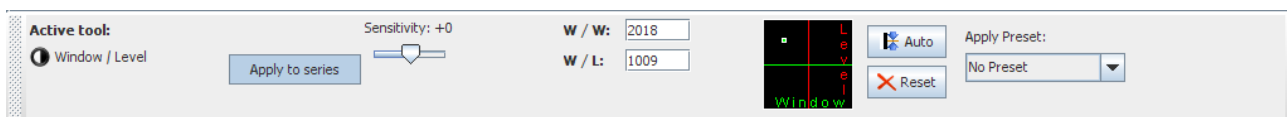


You can select the shape of the shutter to apply on the series by selecting the appropriate *Shape* option in this panel. In order to draw a Rectangular or Circular shutter, it is sufficient to select the *Shutter* tool, to drag with the associated mouse button over the image, and then to release the mouse button when you are satisfied with the size of the shutter. On the other side, if you want to draw a Polygonal shutter, then you need to click the associated mouse button on every point of the polygon contour that you want to define. When you want to define the last point of the contour, double-click the associated mouse button, and the polygonal shutter will be complete.

5.6.6 Window / Level tool

The *Window / Level* tool allows modifying the Window Width and Window Level values for the gray levels (or colors) of the current image. The Window,Level values are given in Hounsfield Units if the selected image panel contains a CT image. You may change the Window,Level values by dragging with the associated mouse button over the image.

The *Tool Options* panel associated with this tool is shown in the picture below:



If the *Apply to series* toggle button is pressed (i.e., selected) then the Window / Level changes will be applied to the entire series.

It is also possible to change the sensitivity of mouse dragging movements for contrast changes, by dragging the *Sensitivity* slider in this panel.

Window Width and Window Level values can also be changed by dragging the mouse pointer on the Window / Level widget (the square with a black background). Right-clicking on the Window / Level widget

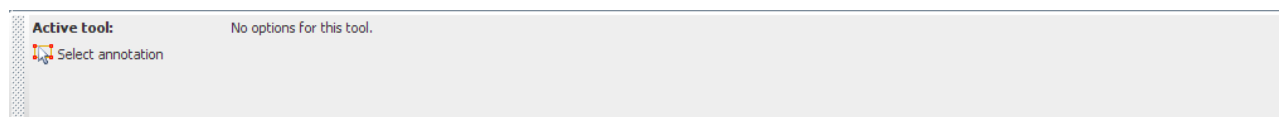
causes restoring the Window,Level values contained in the DICOM file (if they are present). You may also change the Window,Level values by selecting one of the available contrast Presets (from the *Presets* drop-down list). Finally, you can manually enter Window,Level values in the *W / W* and *W / L* text fields, and press ENTER on your keyboard to confirm and apply them.

Press the *Auto* button in order to apply an automatic “optimal” windowing for the currently selected image. The *Reset* button may be used to restore the original Window,Level setting suggested in the DICOM data set (if present).

5.6.7 *Select annotation tool*

The *Select annotation* tool allows selecting a measurement or graphical annotation which already exists on the current medical image. Selection of the annotation shape is done by clicking with the associated mouse button over the annotation shape itself. Once the annotation is selected, it is possible to move and modify the shape itself, by dragging with the associated mouse button over specific points of the selected annotation shape. If dragging is started over one of the displayed selection handles (the small red squares), then the shape will be modified, by moving the relevant selection handle point. On the other side, if dragging is started over a generic point of the shape (i.e., not over a selection handle), then the entire annotation is moved, with no modifications to its geometric shape.

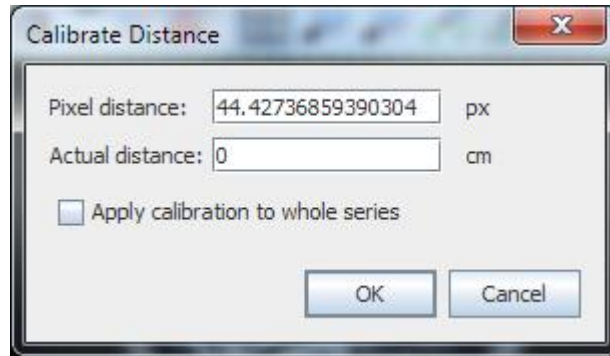
The generic *Tool Options* panel associated with this tool is shown in the picture below:



Once a measurement or graphical annotation shape is selected, the Tool Options panel will reflect the properties of the specific selected shape, and will offer more options. Also, when an annotation is selected, you can delete it by pressing the DELETE key on your keyboard, or the *Delete* button in the *Tool Options* panel. Finally, once an annotation is selected, you can select the previous or next annotation of the current image by pressing the ‘-’ or ‘+’ keys on the numeric keypad of your keyboard.

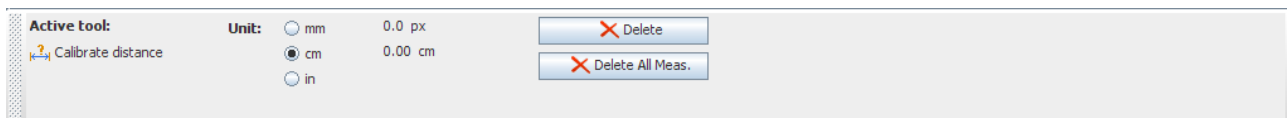
5.6.8 *Calibrate distance tool*

The *Calibrate distance* tool allows calibrating distances, that is, assigning an actual known distance (in mm, cm or inches) to a given distance measured on-screen, over the image. In order to perform calibration, select the *Calibrate distance* tool and drag with the associated mouse button over the image, on the distance that you want to calibrate / set. As soon as the drag operation has finished, the *Calibrate Distance* dialog will appear:



Enter the *Actual distance* corresponding to the measured pixel distance. You also have the option of specifying that the following calibration must be applied to the whole series, that is, to all images belonging to the current series. If this option is not checked, then the calibration will only be applied to the DICOM file containing the current image.

The *Tool Options* panel associated with this tool is shown in the picture below:

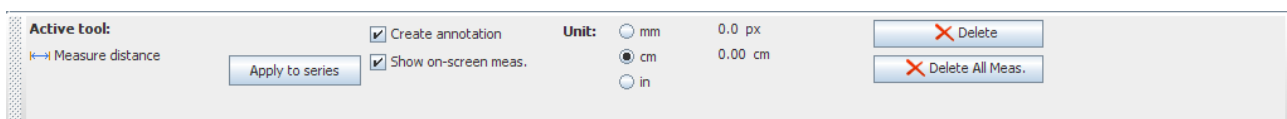


This panel basically allows you to modify the measurement unit used for calibration.

5.6.9 Measure distance tool

The *Measure distance* tool allows measuring linear distances on the selected medical image. The measurement is performed by dragging with the associated mouse button over the image, and releasing the mouse button once you traced the distance that you want to measure.

The *Tool Options* panel associated with this tool is shown in the picture below:



The user may choose to create an *annotation* of each measurement, thus leaving a persistent graphic object over the image, by enabling the *Create annotation* checkbox. In addition, the user may choose to add the drawn measurement annotations to all images of the current series, by pressing the *Apply to series* toggle button. If the *Create annotation* option is disabled, the graphic object representing the current measurement over the image will immediately disappear when the measurement is complete (i.e., the mouse button is released).

The user may also choose whether to display an on-screen label of each performed measurement, by checking or unchecking the *Show on-screen meas.* option.

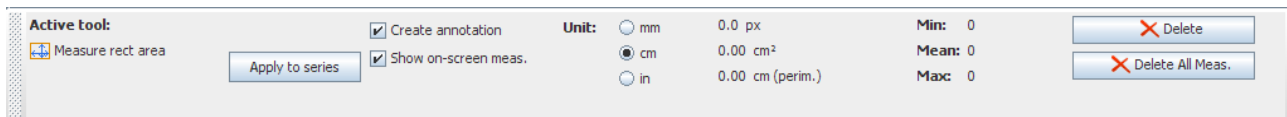
The measurement unit used for measurements may be chosen by selecting the corresponding option (*mm*, *cm*, or *in*) in this *Tool Options* panel.

Finally, it is possible to delete the currently selected annotation by pressing the *Delete* button, or to delete all measurement annotations by pressing the *Delete All Meas.*

5.6.10 Measure rect area tool

The *Measure rect area* tool allows measuring rectangular areas on the selected medical image. Information about the surface, the perimeter and the minimum, maximum and mean density of the rectangular area is provided. The measurement is performed by dragging with the associated mouse button over the image, and releasing the mouse button once you traced the rectangular area that you want to measure. Keeping the SHIFT key of the keyboard pressed will force the area to be exactly square.

The *Tool Options* panel associated with this tool is shown in the picture below:

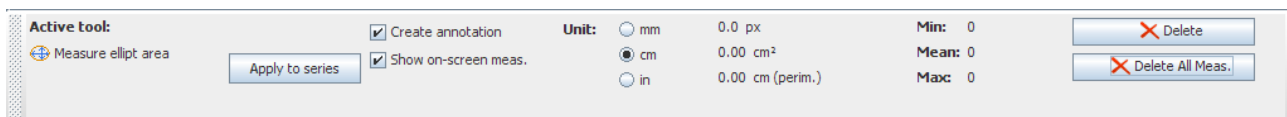


Please refer to the paragraph of the *Measure distance* tool for an explanation of the options available in this panel.

5.6.11 Measure ellipt area tool

The *Measure ellipt area* tool allows measuring elliptical areas on the selected medical image. Information about the surface, the perimeter and the minimum, maximum and mean density of the rectangular area is provided. The measurement is performed by dragging with the associated mouse button over the image, and releasing the mouse button once you traced the elliptical area that you want to measure. Keeping the SHIFT key of the keyboard pressed will force the area to be exactly circular.

The *Tool Options* panel associated with this tool is shown in the picture below:

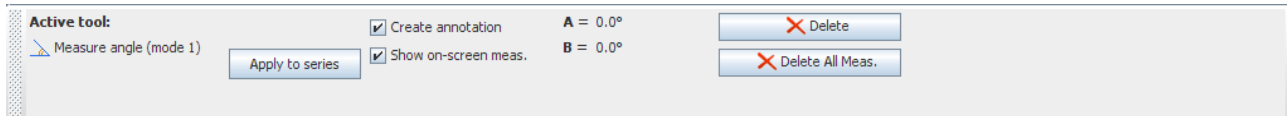


Please refer to the paragraph of the *Measure distance* tool for an explanation of the options available in this panel.

5.6.12 Measure angle (mode 1) tool

The *Measure angle (mode 1)* tool allows measuring angles on the selected medical image. The measurement is performed by clicking three times with the associated mouse button over the image; each click identifies one of the three points defining the angle to be measured.

The *Tool Options* panel associated with this tool is shown in the picture below:



Please refer to the paragraph of the *Measure distance* tool for an explanation of the options available in this panel.

5.6.13 Measure angle (mode 2) tool

The *Measure angle (mode 2)* tool allows measuring angles on the selected medical image. The measurement is performed by drawing two segments over the image; each segment can be drawn by dragging with the associated mouse button over the image, and releasing it when each segment has the desired properties.

The *Tool Options* panel associated with this tool is shown in the picture below:

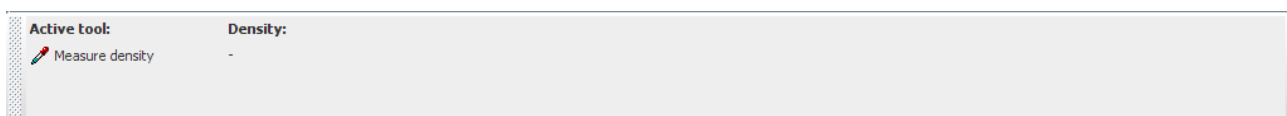


Please refer to the paragraph of the *Measure distance* tool for an explanation of the options available in this panel.

5.6.14 Measure density tool

The *Measure density* tool allows measuring densities on the selected medical image. The measurement is performed by dragging with the associated mouse button over the image. Once the mouse button is released, the density measurement is eliminated.

The *Tool Options* panel associated with this tool is shown in the picture below:



5.7 Image tools and mouse wheel

LocalEye Viewer now supports a flexible association between the mouse wheel and some image manipulation tools.

The *Associate tool with mouse wheel* toolbar button () can be used to associate an image tool with the mouse wheel. If you press this toolbar button, the following drop-down menu will appear:



5.7.1 Stack/Scroll Images

If the *Stack/Scroll Images* tool is associated to the mouse wheel, scrolling the mouse wheel will cause scrolling the images of the current series (equivalent to *Previous Frame* and *Next Frame* navigation buttons). If the ALT key on the keyboard is kept pressed while scrolling the mouse wheel, a scrolling of the current scene (i.e., page of images) will happen (equivalent to *Previous Scene* and *Next Scene* navigation buttons).

5.7.2 Zoom In/Out

If the *Zoom In/Out* tool is associated to the mouse wheel, scrolling the mouse wheel will cause a zoom in or zoom out operation (depending on the direction of wheel rotation) on the current image.

5.8 Tool Options panel

The *Show Tool Options panel* button () of the *Image Toolbar* allows showing and hiding the *Tool Options* panel. When this toggle button is pressed the *Tool Options* panel will be visible, while when it is released the *Tool Options* panel will be hidden, thus leaving more room for the *Main Image* panel.

5.9 Zoom operations

Several zoom-related operations are available through the *Image Toolbar*. The group of toolbar buttons dedicated to zoom-related operations is shown in the following picture:



This group contains the following buttons (identified by the tooltip text which appears when you move your mouse pointer over each button):

- *Apply Zoom to all panels*: if this toggle button is pressed (i.e., selected), then the zoom operations accessible through the other buttons of this group will be applied to all image panels. If this toggle button is released (i.e., not selected), then the zoom operations accessible through the other buttons of this group will only be applied to the currently selected image panel.
- *Zoom In*: the image displayed in the current panel (or in all panels, depending on the state of the *Apply Zoom to all panels* button) will be zoomed in.
- *Zoom Out*: the image displayed in the current panel (or in all panels, depending on the state of the *Apply Zoom to all panels* button) will be zoomed in.
- *Zoom To Fit*: the image displayed in the current panel (or in all panels, depending on the state of the *Apply Zoom to all panels* button) will be zoomed to fit the size of the panel itself.
- *Zoom Reset*: the image displayed in the current panel (or in all panels, depending on the state of the *Apply Zoom to all panels* button) will be set at zoom 100%, i.e., at its original size.

5.10 Key images operations

Functionalities related to flagging certain medical images as “Key Images” are available through the *Image Toolbar*. The group of toolbar buttons dedicated to Key Images operations is shown in the following picture:



This group contains the *View Key Images* button that, if selected, will display all images previously marked as “Key Images” in the *Main Image* panel, each key image in a dedicated image panel.

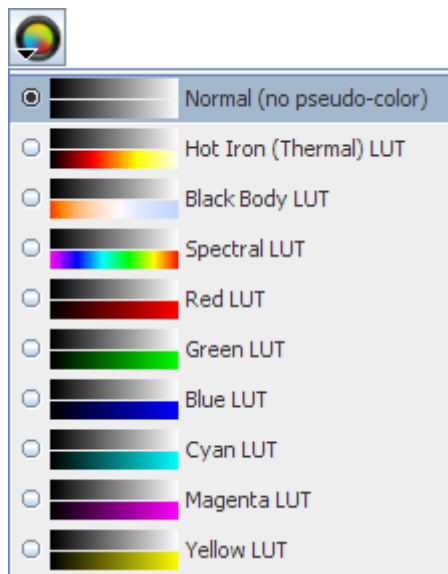
5.11 Contrast management operations

Contrast management operations are available through the *Image Toolbar*. The group of toolbar buttons dedicated to contrast management operations is shown in the following picture:



This group contains the following buttons (identified by the tooltip text which appears when you move your mouse pointer over each button):

- *Apply contrast management operations to whole series*: if this toggle button is pressed (i.e., selected), then the contrast management operations accessible through the other buttons of this group will be applied to all images of the current series. If this toggle button is released (i.e., not selected), then the contrast management operations accessible through the other buttons of this group will only be applied to the currently selected image.
- *Invert*: the selected image (or all images of the current series, depending on the state of the *Apply contrast management operations to whole series* toggle button) will be contrast-inverted. In other words, the image(s) is transformed into its “negative” image.
- *Auto Window*: the selected image (or all images of the current series, depending on the state of the *Apply contrast management operations to whole series* toggle button) will be auto-windowed. In other words, an automatic “optimal” contrast windowing will be applied to image(s).
- *Pseudo-Coloring...*: a pseudo-coloring scheme will be applied to the selected image (or to all images of the current series, depending on the state of the *Apply contrast management operations to whole series* toggle button). Pseudo-coloring may only be applied to greyscale images. The particular pseudo-coloring lookup table to be applied may be chosen from the drop-down menu which appears when the *Pseudo Coloring...* toolbar button is pressed, as shown in the following picture:



- *Reset Contrast*: all contrast operations performed on the selected image (or on all images of the current series, depending on the state of the *Apply contrast management operations to whole series* toggle button) will be reset. Also, window / level will be reset to default settings, as indicated in the DICOM dataset(s) related to image(s).

5.12 Geometric transformation operations

Geometric transformation operations (i.e., rotation and flipping) are available through the *Image Toolbar*. The group of toolbar buttons dedicated to geometric transformation operations is shown in the following picture:

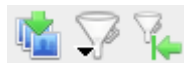


This group contains the following buttons (identified by the tooltip text which appears when you move your mouse pointer over each button):

- *Apply rotations / flips to whole series*: if this toggle button is pressed (i.e., selected), then the rotation and flipping operations accessible through the other buttons of this group will be applied to all images of the current series. If this toggle button is released (i.e., not selected), then the rotation and flipping operations accessible through the other buttons of this group will only be applied to the currently selected image.
- *Rotate +90*: the selected image (or all images of the current series, depending on the state of the *Apply rotations / flips to whole series* toggle button) will be rotated clockwise of 90 degrees.
- *Rotate -90*: the selected image (or all images of the current series, depending on the state of the *Apply rotations / flips to whole series* toggle button) will be rotated counter-clockwise of 90 degrees.
- *Flip Horizontal*: the selected image (or all images of the current series, depending on the state of the *Apply rotations / flips to whole series* toggle button) will be flipped horizontally.
- *Flip Vertical*: the selected image (or all images of the current series, depending on the state of the *Apply rotations / flips to whole series* toggle button) will be flipped vertically.
- *Reset rotations / flips*: all rotations and flips performed on the selected image (or on all images of the current series, depending on the state of the *Apply filters to whole series* toggle button) will be reset.

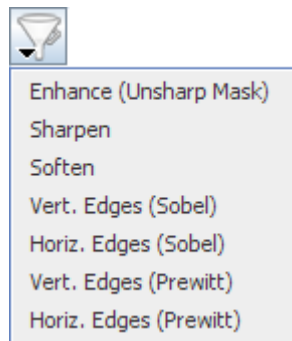
5.13 Image enhancement operations

Image enhancement operations (i.e., image filters) are available through the *Image Toolbar*. The group of toolbar buttons dedicated to image enhancement operations is shown in the following picture:



This group contains the following buttons (identified by the tooltip text which appears when you move your mouse pointer over each button):

- *Apply filters to whole series*: if this toggle button is pressed (i.e., selected), then the image enhancement operations accessible through the other buttons of this group will be applied to all images of the current series. If this toggle button is released (i.e., not selected), then the image enhancement operations accessible through the other buttons of this group will only be applied to the currently selected image.
- *Apply Filter...*: an image enhancement filter will be applied to the selected image (or to all images of the current series, depending on the state of the *Apply contrast management operations to whole series* toggle button). The particular filter to be applied may be chosen from the drop-down menu which appears when the *Apply Filter...* toolbar button is pressed, as shown in the following picture:



Here is a short description of each supported filter:

- *Enhance (Unsharp Mask)*: enhance details and edges in the image, by applying the “Unsharp Mask” image processing operation.
 - *Sharpen*: enhance little details in the image. Warning: on noisy images, this filter may amplify noise.
 - *Soften*: blurs the image. On noisy images, this filter may help in removing high-frequency noise.
 - *Vert. Edges (Sobel)*: highlights vertical edges in the image, by applying the Sobel filter.
 - *Horiz. Edges (Sobel)*: highlights horizontal edges in the image, by applying the Sobel filter.
 - *Vert. Edges (Prewitt)*: highlights vertical edges in the image, by applying the Prewitt filter.
 - *Horiz. Edges (Prewitt)*: highlights horizontal edges in the image, by applying the Prewitt filter.
- *Reset Enhancements*: all enhancement operations performed on the selected image (or on all images of the current series, depending on the state of the *Apply filters to whole series* toggle button) will be reset.

5.14 Reset operations

The *Image Toolbar* contains some buttons which allow resetting all changes performed on the current image, on all images of the current series, or on all loaded images.

The group of toolbar buttons dedicated to reset operations is shown in the following picture:



This group contains the following buttons (identified by the tooltip text which appears when you move your mouse pointer over each button):

- *Reset Image*: all changes and operations performed on the currently selected image will be reset.
- *Reset Series*: all changes and operations performed on the current series will be reset.
- *Reset All*: all changes and operations performed on all loaded images will be reset.

6 Navigation Toolbar

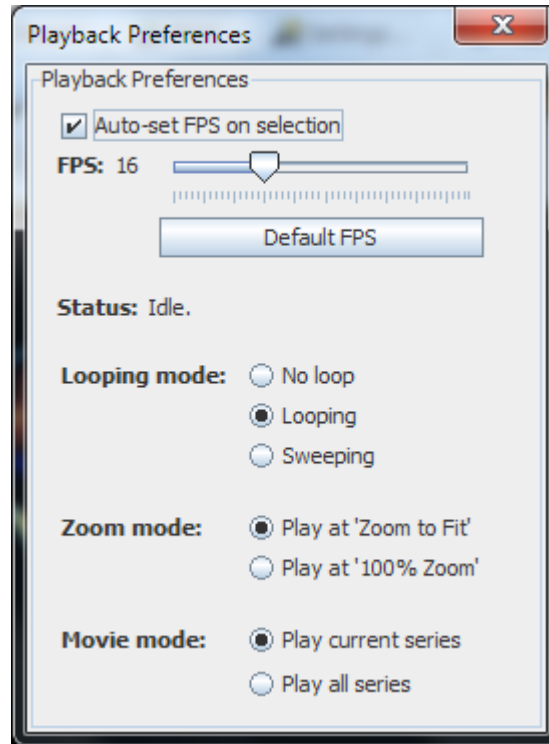
The *Navigation Toolbar* contains several buttons which allow navigating through available images, scenes, series, studies and patients. Here is a picture of the *Navigation Toolbar*:



This toolbar contains the following buttons (identified by the tooltip text which appears when you move your mouse pointer over each button):

- *Previous Frame* and *Next Frame*: these buttons are used to scroll through the frames or images belonging to the current series.
- *Automatic Series Synchronization*: this button allows synchronizing different CT or MR series whose images (slices) were acquired moving in the same direction (acquisition planes with the same orientation). The synchronization causes a scrolling through the images of these series, in such a way all panels show images related to the same patient coordinates (where available). The reference coordinates, at which all other panels are synchronized, are the ones of the currently selected image panel / series. In order to support synchronization of all series, the Image Tiling of all Series Panels is automatically set to 1x1. Once the *Automatic Series Synchronization* function is enabled, all scrolling operations will be synchronized across the displayed series. In order to disable the *Automatic Series Synchronization* function and the related locked scrolling among series, it is sufficient to click once again on the same toolbar button.

- *Manual Series Synchronization*: this button allows manually synchronizing different CT or MR series whose images (slices) were acquired moving in the same direction (acquisition planes with the same orientation). This manual function is useful when it is necessary to synchronize scrolling among series belonging to different studies, even acquired by different modalities: under these conditions, the *Automatic Series Synchronization* function won't work. In order to use the manual series synchronization, the user must scroll all relevant series in such a way they all show images related to the same patient coordinates. Once this condition is met, it is possible to press the *Manual Series Synchronization* button in order to lock scrolling of all relevant series in a synchronized way. The scrolling position of each series in the moment when the *Manual Series Synchronization* button is pressed is considered to be the initial reference point. In order to disable the *Manual Series Synchronization* function and the related locked scrolling among series, it is sufficient to click once again on the same toolbar button.
- *Previous Scene* and *Next Scene*: these buttons are used to scroll to the next or previous scene (i.e., page of images) in the current Series panel.
- *Previous Series* and *Next Series*: these buttons are used to scroll to the next or previous series, if multiple series are currently loaded into LocalEye Viewer.
- *Load Previous Study* and *Load Next Study*: these buttons are used to load the previous or next Study. The “previous” and “next” terms refer to the order of studies as shown by the *Find Patients or Studies* window.
- *Load Previous Study in Worklist* and *Load Next Study in Worklist*: these buttons are used to load the previous or next Study present in the Worklist window. The “previous” and “next” terms refer to the order of studies as shown by the *Worklist* window.
- *Load Previous Patient* and *Load Next Patient*: these buttons are used to load the previous or next Patient. The “previous” and “next” terms refer to the order of patients as shown by the *Find Patients or Studies* window. Please notice that the *Load Previous Patient* and *Load Next Patient* buttons are only enabled when the “Patient-Root” view type is selected in the *Find Patients or Studies* window, since in case of “Study-Root” view the concept of “previous” and “next” Patient is undefined.
- *Play, Stop, Pause*: these buttons allow obtaining a cine-playback of all images / frames belonging to the current series or multi-frame sequence. You can start (*Play* button or CTRL+P) or stop (*Stop* button or CTRL+S) the playback of the movie. While the movie is playing, you can also pause playback by pressing the *Pause* button (or again CTRL+P).
- *Playback preferences...*: if you press this button, the *Playback Preferences* dialog box will appear which allows setting several parameters related to playback of cine sequences.



You can modify the speed of the playback by dragging the dedicated slider. The *Default FPS* button located just under the slider allows setting the predefined playback speed for a given multi-frame DICOM file (if this information is available in the DICOM dataset). If the *Auto-set FPS on selection* option is enabled, the default FPS for the DICOM file is automatically set each time a given image or series is selected by the user.

Three different *looping modes* are supported:

- *No loop*: the frames 1 to N (where N is the total number of frames in the current series) are displayed in rapid sequence, then the playback is stopped.
- *Looping*: the frames 1 to N are displayed in rapid sequence, then the playback begins again from frame 1 and so on (frame sequence: 1,2,...,N,1,2,...,N,1,2,...).
- *Sweeping*: the playback sequence is as follows: 1,2,...,N,N-1,N-2,...,2,1,2,...,N... (forward and backward).

In addition, a couple of *Zoom mode* options are provided, controlling the zoom on images while playing the cine-movie:

- *Play at 'Zoom to fit'*: each frame of the movie is zoomed in such a way to exactly fit into the dedicated image panel.
- *Play at '100% Zoom'*: each frame is displayed at its original size.

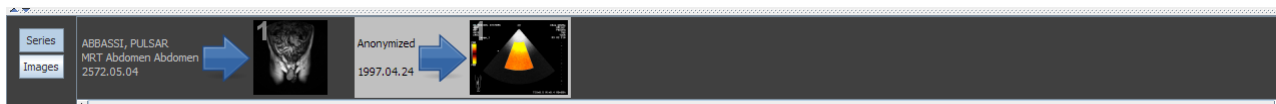
Finally, it is possible to set if only the currently selected series must be played in cine-mode, or if all currently displayed series must be played:

- *Play current series*: only the currently selected series is played in cine-mode.
- *Play all series*: all displayed series are played in cine-mode.

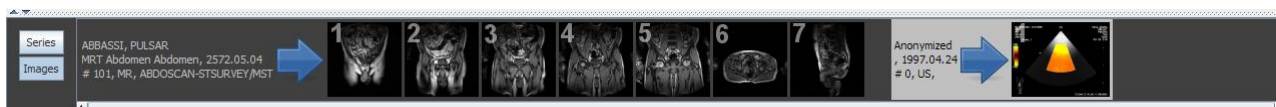
7 Thumbnails panel

The *Thumbnails* panel displays thumbnail images.

If the *Series* option button is selected on the *Thumbnails* panel, then each thumbnail image will represent a Series currently loaded in LocalEye Viewer, and the number of displayed thumbnail images will be equal to the number of Series currently loaded in LocalEye Viewer. Also, in this case the thumbnails will be grouped by Study.



On the other hand, if the *Image* option button is selected on the *Thumbnails* panel, then each thumbnail image will represent a single Image currently loaded in LocalEye Viewer, and the number of displayed thumbnail images will be equal to the total number of Images currently loaded in LocalEye Viewer. Also, in this case the thumbnails will be grouped by Series.



Drag&drop of images or series from the *Thumbnails* panel to the *Main Image* panel is supported. You can also select multiple thumbnails in the Thumbnails panel, by the Windows-usual SHIFT-click or CTRL-click, and then dragging & dropping all selected images or series (depending on the active mode) to the *Main Image* panel.

Double-clicking on a thumbnail image will load the *Main Image* panel with the scene starting at the double-clicked series or image.

The thumbnail panel may be hidden or shown by clicking on the small down and up arrows appearing at the top left of the panel itself.

8 Main Image panel

The *Main Image* panel is the panel where medical images are actually displayed. It can contain one or several *Series* panels, depending on the Series Tiling setting (i.e., the number of Series columns and Series rows). In turn, each Series panel can contain one or several *Image* panels, depending on the Image Tiling setting (i.e., the number of Image columns and Image rows, for each Series panel). Hence, the Main Image panel can show several series at once, and several images for each series.

Once you have the *Main Image* panel set with a given display layout, and you have several images loaded on screen, you can maximize a given image (thus switching to 1x1 series tiling and 1x1 image tiling) by double-clicking on it when the *Select/Stack* tool is associated to the double-clicked mouse button. Then,

when you are done with this image, you can double-click again on it in order to return to the previous display mode, and all previously displayed images will be restored on screen.

9 Mouse-driven functions

9.1 Drag & Drop

LocalEye Viewer supports Drag & Drop operations from the *Thumbnails* panel to the *Main Image* panel. Dragging a single image or series from the *Thumbnails* panel to the *Main Image* panel causes that image or series to be displayed into the image panel where it is dropped. You can also select multiple images or series in the *Thumbnails* panel (by the usual Windows-like CTRL-click or SHIFT-click for selecting ranges of frames) and dragging all of them to the *Main Image* panel. Finally, you can automatically load an entire scene (i.e., the whole display matrix) by selecting the start image or series of the scene in the *Thumbnails* panel and then ALT-dragging it to the *Main Image* panel.

9.2 Pop-up menu

LocalEye Viewer features a pop-up menu which allows for a fast selection of the most common tools and functionalities. In order to show this pop-up menu it is necessary to right-click on a non-empty and selected image panel while keeping the CTRL key of the keyboard pressed.

Since now LocalEye Viewer allows a flexible association of image tools to both left and right mouse buttons, pressing CTRL on the keyboard is now necessary, in addition to right-clicking, to display the pop-up menu.

The pop-up menu is particularly useful when operating in dual-head display environments, in order to avoid the need for continuous “mouse travels” from one monitor to the other one. Also, this pop-up menu is very useful when operating in Full-Screen mode, since most functions may be

accessed without the need for the side panels or the main toolbar.

Set Image Tiling...	▶
Associate tool with LEFT mouse button	▶
Associate tool with RIGHT mouse button	▶
Associate tool with mouse wheel	▶
Rotate / Flip...	▶
Apply Filter...	▶
Navigate through images...	▶
Reset Image	
Reset Series	
Reset All	
View Key Images	
Full Screen Mode	

10 How to report issues

In case you encounter issues or you detect a malfunctioning while using the LocalEye Viewer software, please report the problem to the NeoLogica Support Staff.

NeoLogica uses a ticket-based online support system. In order to report a problem, please browse to the following web address:

<http://www.neologica.it/SupportTickets>

You will then be able to open a new "support ticket", and specify the details of the issue you have detected. The NeoLogica Support Staff will analyze the reported issue and will reply promptly, then making every effort to solve the issue in the shortest possible time.

11 Acknowledgements

LocalEye Viewer relies on the CharLS library in order to decode JPEG-LS-compressed images.

LocalEye Viewer includes software developed by L2FProd.com for GUI skinning (<http://www.l2fprod.com>).

