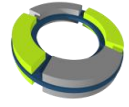




Cedars-Sinai Medical Center
Department of Medicine
Artificial Intelligence in Medicine Program



MoCo

Motion Correction

Reference Manual

Version 2013.1

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User Assistance Information

For assistance please visit our website or contact us via e-mail:

[Website] www.csaim.com

[E-mail] support@csaim.com

WARNING

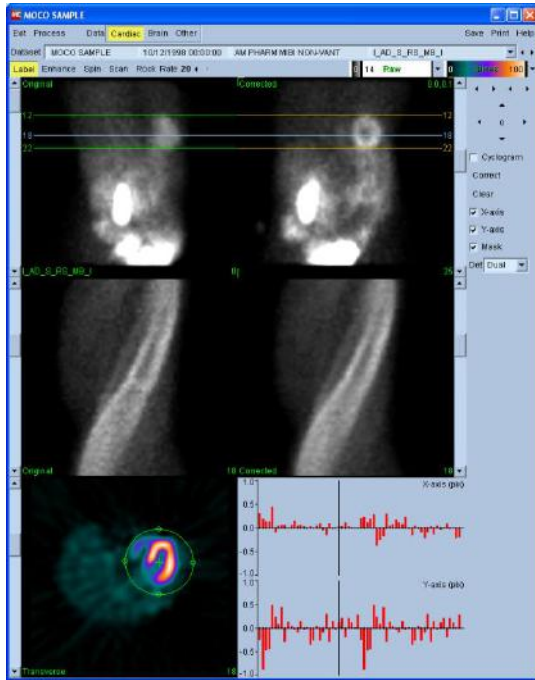
Do not install software applications not approved directly by your workstation vendor. The system is only warranted and supported as configured and delivered. Refer to the vendor documentation for detailed system requirements.

Installation of Cedars-Sinai Cardiac Suite on vendor workstations is only to be performed by an authorized service engineer or applications specialist.

Table of Contents

User Assistance Information	4
1 Introduction.....	6
2 Viewport Display	7
3 Color Control	8
4 Dataset Selector	9
5 Viewport Control.....	9
6 MoCo Control	10
7 MoCo Startup options	11

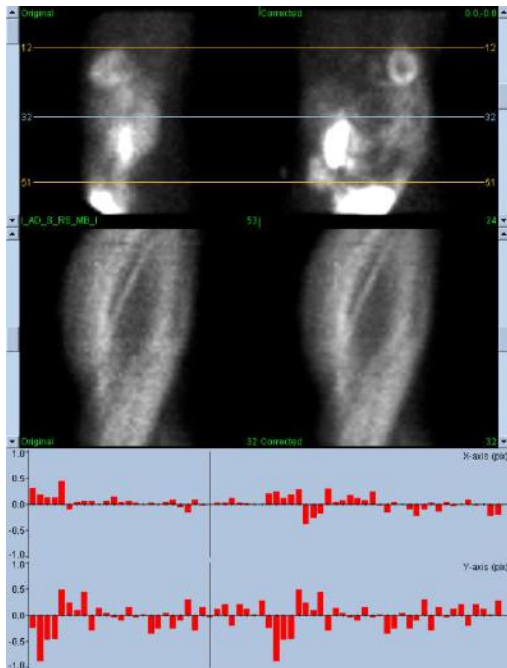
1 Introduction



MoCo (Cedars-Sinai Motion Correction) is an application for the automatic and manual correction of SPECT acquisition motion artifacts. Pattern matching and segmentation algorithms are used in conjunction to minimize motion error metrics over the set of acquired projections; the resulting motion corrected projections are then presented to the operator for validation or modification. MoCo is constructed from the following components:

Viewport Display	Images and results display
Color Control	Selects current color scale and intensity mapping.
Dataset Selector	Selects the currently displayed dataset.
Viewport Control	Controls display of viewports
MoCo Control	Controls automatic and manual motion correction processing and validation.

2 Viewport Display



The interface, which does not include externally accessible exit or save functionality as it is intended primarily to be embedded in a containing application, is constructed from the following components:

Original Projection Viewport	Displays a single projection from the uncorrected dataset. The current projection is selected by its corresponding scrollbar; horizontal motion reference lines are moved by dragging.
Corrected Projection Viewport	Displays a single projection from the corrected dataset. The current projection is selected by its corresponding scrollbar; horizontal motion reference lines are moved by dragging. The motion correction x and y axis offsets are also displayed.
Original Sinogram Viewport	Displays a single sinogram from the uncorrected dataset. The current sinogram is selected by dragging the sinogram reference line in the corresponding projection viewport.
Corrected Sinogram Viewport	Displays a single sinogram from the corrected dataset. The current sinogram is selected by dragging the sinogram reference line in the corresponding projection viewport.
X-axis Motion Graph	Displays the current x-axis motion correction offsets.
Y-axis Motion Graph	Displays the current y-axis motion correction offsets.
Motion Cursor	Manually selects the x and y axis motion correction offsets. Also selects the current projections for the Original and Corrected Projection Viewports.

3 Color Control



Two color scales exist: **Raw** controls most images which include the projections, sinograms and cyclogram displays. **Slices** controls the single slice displays, which is only available when Mask or Cyclogram is selected.

The Color Control is used to select the current color scale and intensity mapping. The color scale is selected by clicking on the color scale option menu and choosing from the ensuing list of available color scales. The intensity mapping is set using two parameters, the lower and upper levels, either of which can range from 0 to 100 percent. They together specify that portion of a dataset's dynamic range that is to be mapped onto the full color scale.

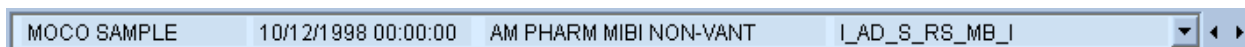
The lower and upper levels of the intensity mapping, represented with the lower and upper level bars, can be set through the color scale viewport, which supports the following interactions:

- Left drag either level bar to move it.
- Left drag any other point on the viewport to move both level bars simultaneously.
- Middle click or drag any point on the viewport to move the closer level bar to that point.
- Double left click anywhere in the viewport to reset the level bars to 0 and 100.

The following features are also provided through the option menu:

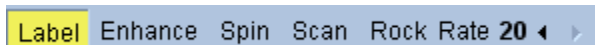
Reset	Resets lower and upper levels.
Invert	Toggles the sense of the lower and upper levels.
Step	Toggles color scale discretization.
Gamma	Toggles display of color scale gamma control.
Expand	Toggles dynamic range expansion of lower and upper levels.
Normalize	Toggles automatic dataset normalization based on segmentation results.

4 Dataset Selector



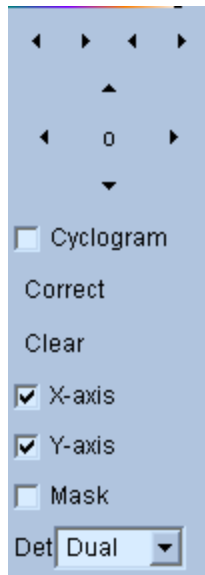
At start up the application is passed a list of one or more datasets as input. The dataset selector selects from this list the current dataset, i.e. the dataset to be viewed. It allows the user to page through the datasets by clicking the arrow buttons. In addition, the user can jump directly to a dataset by clicking on the dataset option menu; this pops up a list of available datasets from which the desired dataset can be selected.

5 Viewport Control



Label	Enables viewport labeling including slice and projection numbers and motion reference lines.
Enhance	Applies a spatial filter designed to enhance motion artifact visibility to the original and corrected projection sequences.
Spin	Toggles projection cine.
Scan	Toggles the sinogram cine.
Rock	Toggles bi-directional projection cine for sub 360° acquisitions (with spin also enabled).
Rate	Selects the cine and scan speeds.

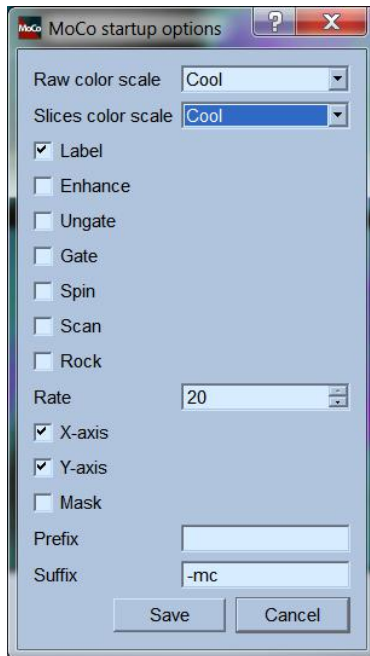
6 MoCo Control



The MoCo Control is used to control automatic and manual motion correction processing and validation. The following controls are available:

Cyclogram	Enables cyclogram display mode. When enabled the sinogram viewports are replaced with their corresponding cyclogram viewports. A cyclogram is constructed by compositing the set of vertical strips defined by the intersection of each projection in the projection sequence with a plane constrained to be perpendicular to the projection and to the transverse plane and further constrained to intersect a user specified point in the transverse plane. A cyclogram accentuates horizontal (x-axis) motion artifacts in a manner analogous to a sinogram's accentuation of vertical (y-axis) motion.
Correct	Initiate automatic or semi-automatic motion correction.
Clear	Reset all motion correction offsets to zero.
X-axis	Enable x-axis motion correction.
Y-axis	Enable y-axis motion correction.
Mask	Enable masking mode. When enabled an additional transverse slice viewport is enabled allowing the user to define a transverse volume delimited by an ellipse and lower and upper slice bounds upon which the motion correction algorithm should focus its efforts.
Det	Selects the number detector heads, permitting differing constraints to be used by the motion correction algorithm based on the camera geometry.

7 MoCo Startup options



The MoCo startup options may be used to set various default startup settings. The startup options menu can be accessed by clicking on **Options**. The following options are available:

Label	Toggles ON labels within the viewports
Enhance	Toggles ON image enhancement (display only)
Gate	Toggles ON image gating when applicable
Spin	Toggles ON image spin when applicable
Scan	Toggles ON image scanning when applicable
Rock	Toggles ON image rocking when applicable
Rate	Set the rate for image gating
X-axis	Motion correction is applied to the X-axis
Y-axis	Motion correction is applied to the Y-axis
Mask	Toggles ON the image mask option
Prefix	Enter the text string that should be prefixed to the motion corrected dataset
Suffix	Enter the text string that should be suffixed to the motion corrected dataset