13 MR Subtraction

The MR Subtraction package can be used to perform pixelwise image calculations, e.g. subtracting a pre-contrast dynamic scan from the consecutive post-contrast dynamic scans in order to observe the contrast-uptake. A preview is available which shows the resulting image for the current scan/scans. New imaging series can be easily generated and stored.

Indications for Use

MR Subtraction is a post-processing application enabling basic calculations between two volumes, including addition, subtraction and ratio from within a single dynamic series.

Available Calculations

The package provides the possibility to perform different calculations for two e.g. (groups of) slices or dynamic scans, being referred to as source (S) and reference (R) and Weight Factor (W).

It is possible to apply a weighting factor, depending on the type of calculation for source or reference.

Addition of images

- **S+(W*R)**

Subtraction of images

- **S-(W*R)**

Relative subtraction of images

- **(S – (W * R))/(S + (W * R))/2**

Ratio calculations

- **S / R**

Magnetization Transfer Ratio

- **((R – (S * W) / R) * 100**

NOTICE

The selected series can be swapped easily to perform the calculations vice versa.

To swap the series, use the '  Swap' option from step 1 of the Task Guidance.

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Requirements for MR Subtraction datasets

The components Source (S) and Reference (R) can be images of one scan, but also images of different scans. In order to perform calculations with R and S, they have to have the same slice distance (slice thickness and slice gap), FOV and patient position.

User Interface

Screen layout

The MR Subtraction package has a default layout of three viewports with toolbar and panels. The viewports display the following views:

- Source image in the middle of the imaging volume (by default: dynamic 2).
- In real-time calculated subtracted image.
- Reference image in the middle of the imaging volume (by default: dynamic 1).

Task Guidance

Similar to all packages on the IntelliSpace portal, also the MR Subtraction package provides a Task Guidance panel in the left part of the screen.

Follow the steps of the Task Guidance to make optimal use of the package.

The following workflow description is based on this Task Guidance.

NOTICE

Dependent on the selected type of operation, not all workflow steps might be available in the Task Guidance.

With the 'Ratio' type of operation, the workflow step 'Set Weight' is not available.

Toolbar

Subtraction

- To select a type of operation for the source and the reference imaging series:
  - Subtraction
  - Ratio
  - Magnetic Transfer Ratio
  - Relative Subtraction.

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Philips

Viewing Tools

 **Mirror**

This function mirrors the image(s) (Right <-> Left)

 **Flip**

This function flips the image(s) (Up <-> Down)

 **Rotate Clockwise**

This function rotates the image(s) clockwise

 **Rotate Counter-Clockwise**

This function rotates the image(s) counter-clockwise

More Functions within the Subtraction package

In IntelliSpace Portal MR packages, the most important functions can be performed via the Task Guidance and the toolbar. However there are more functions which you can access via the right mouse menus.

For more information, see section “Right mouse menus” on page 12.

Workflow

Launch the MR Subtraction package

You can perform MR Subtraction either on a single dynamic scan or on two different scans. This requires the selection of one or two scans. This selection preferably needs to be done at the launch of the package, but can also be done in the package itself.

▷ In the 'Directory' tab of the activity bar:

1. Select a suitable series.
2. Click ’MR Subtraction’.

   The MR Subtraction package opens.

Select the type of calculation

1. Click the **Operation** drop-down menu from Task Guidance.

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2. Click to select the required type of calculation.

Select Series (Source and Reference)

By default, the current imaging series is used as source and as reference series. You can however select different series for both.

Select another Source Series

1. Click the button besides the 'Source'.
2. Then browse to the series you would like to use as source series and click **OK** to confirm.

Select another Reference Series

1. Click the checkbox 'Use other series as reference' to enable the selection of another reference series.
2. Click the button besides the 'Reference".
3. Then browse to the series you would like to use as reference series and click **OK** to confirm.

Swap the series

1. Click the  'Swap' icon to swap the source and the reference series.

Select Range for Source

By default, all dynamics except for the first one will be selected.

Set range for subtraction

1. Drag the outer edges of the bar to define the range.

   The selected dynamics will be indicated by number on bottom of the bar.
2. Alternatively scroll through dynamics, from the context menu (right click) and click 'Set Start Dynamic' to confirm the first dynamic.

   Scroll again and click 'Set End Dynamic' to confirm the last dynamic.

NOTICE

In order to select a single dynamic for subtraction, use the range scrollbar to scroll to the preferred dynamic and from the context menu click 'Set Start Dynamic' and 'Set End Dynamic' on the same dynamic.

Select Reference

You may define the dynamic being used as reference.

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▷ By default, the 'First Dynamic' will be used as reference.

1. Drag the slider selection to select any other dynamic as reference.
2. Or scroll through dynamics, and from the context menu, click 'Set Reference Dynamic' to make the current dynamic the reference.

Set Weight (Apply Weight Factor)

1. Check the checkbox 'Use weight factor' to enable the slider.
2. Define the weighting factor by dragging the slider.

   The image in the preview will be updated in real-time.

Define Mask

1. Apply mask individually on Source and Reference by selecting source or reference.
2. Enable link to sync the mask threshold edits on both Source and Reference.

Generate Series

You can generate a new imaging series containing the results as defined in the previously described workflow.

1. Click 'Generate Series'.
2. Enter the name of the new imaging series.