

## The Toolbox `besa_average_images`

### Purpose

The toolbox `besa_average_images` creates averages of BESA 3D source images and exports the averaged image to a data file (\*.dat) that can be imported in the Source Analysis window of BESA Research.

The toolbox accepts two types of input:

- BESA image ASCII files (\*.dat)
- MATLAB structures transferred from BESA Research using the MATLAB interface.

For surface minimum norm images, averaging is possible but the output file cannot be re-imported into BESA Research. Optionally, the averaged image can be displayed in a MATLAB figure (this option is available only if the minimum norm images have been calculated on a standard as opposed to the individual brain surface).

Images can be averaged only if the options “Current image” and “Voxel amplitude” have been selected during export.

### Usage

Use this toolbox in MATLAB as:

```
besa_average_images
```

```
besa_average_images('OutputFileName')
```

```
besa_average_images(besa_image_all)
```

or

```
besa_average_images(besa_image_all, 'OutputFileName')
```

Here, `besa_image_all` is a struct containing multiple 3D images as transferred from BESA Research. If no input parameter is specified, the toolbox will prompt for image files or a previously saved MATLAB \*.mat file (see section **Parameter Specification** below).

`'OutputFileName'` is a string giving the name of the ASCII (\*.dat) file in which the averaged image is saved. If no output file name is provided, a default name is used. This default name can be edited in the file `besa_average_images.m` together with input and output path names.

Some details:

After a validity check (number of latencies and data dimension), images are compared with respect to image type and grid size, since only images of the same type and size can be averaged. The user is offered a choice of the available image types and – after selection of the image type – grid sizes. If only one image type and grid size are found in the input, averaging proceeds without any need for user interaction. Should only one image remain for averaging, the averaging process is bypassed and the image is simply written to the output file. Some brief messages about image number etc. are displayed in the MATLAB command window that do not appear if the toolbox is called via a batch command from BESA Research.

## Parameter Specification

You may specify some parameters of the toolbox by editing the first section of the MATLAB script *besa\_average\_images.m*:

```

17
18 %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
19 %% Please edit
20
21 -
22 UserInterface = 0;
23     % 0: Recommended for batch mode: Runs automatically if
24     %    <besa_image_all> exists in workspace; otherwise user interface
25     %    opens
26     % otherwise: Always open user interface for file selection
27
28 -
29 InputPath = userpath;
30     % Path for image file selection (BESA *.dat or MATLAB *.mat files)
31     % (used if <UserInterface> = 1 or if there is no <besa_image_all>
32     % in the MATLAB workspace). You can modify this to be any
33     % path, e.g.
34     % InputPath = 'C:\MyPath'
35
36 -
37 OutputPath = userpath;
38     % Path for saving averaged image files. You can modify this
39     % to be any path, e.g.
40     % InputPath = 'C:\MyPath'
41
42 -
43 DefaultName = 'Average';
44     % Default output filename for averaged image file
45
46 -
47 UseDefaultName = 1;
48     %1: Recommended for batch mode: Saves averaged image as
49     %    <OutputPath>/<DefaultName>.dat
50     %0: user interface for specifying output filename is opened
51
52 -
53 PlotOutput = 1;
54     %0: output is not displayed
55     %otherwise: output plotted as MATLAB figure
56
57 %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
58 %% Clear Path variables if required
59 -
60 if OutputPath(end) ~= '\', OutputPath=OutputPath(1:end-1); end
61 -
62 if OutputPath(end) ~= '\', OutputPath=[OutputPath, '\']; end

```

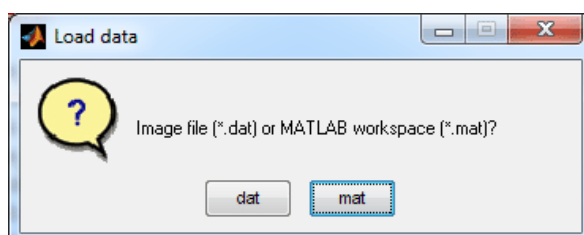
- **UserInterface:**

- 0 (default): The function runs automatically without prompting for input data if a variable *besa\_image\_all* is passed in the function call.

This setting is recommended for batch mode. If the toolbox is called as *besa\_average\_images(besa\_image\_all)*, the images contained in struct *besa\_image\_all* will be averaged.

If no variable *besa\_image\_all* is, a user dialog opens and allows for the loading of image \*.dat files or MATLAB workspace from a pre-defined directory.

- 1: When called, the toolbox always prompts for input data even if *besa\_image\_all* is among the arguments.



- **InputPath:**

The directory from which files are to be loaded. Default: MATLAB userpath.

- **OutputPath:**

The directory in which the averaged image is saved. Default: MATLAB userpath.

- **DefaultName:**

Default basename of the averaged image to be saved. Default: *Average*. If called as *besa\_average\_images('OutputFileName')* or *besa\_average\_images(besa\_image\_all, 'OutputFileName')*, the specified name overrides the default.

- **UseDefaultName:**

- 0: A user interface for the specification of the output filename is opened.
- 1 (default): The averaged image is saved in the directory OutputPath under the name DefaultName (recommended for batch mode)

- **PlotOutput:**

- 0: No graphical output.
- 1 (default): The resulting averaged image is displayed in a MATLAB figure.

