DTIWEB - USER MANUAL

The objective of this document is to present the DTIWeb platform and describe the main steps that have to be followed to obtain from a DTI data set a white matter fiber map grouped into anatomical bundles.

Figure 1 shows the main screen of the application. This consists of a top menu area to select the different options, a left menu to perform the main steps of the proposed technique and a main area to display the obtained results.
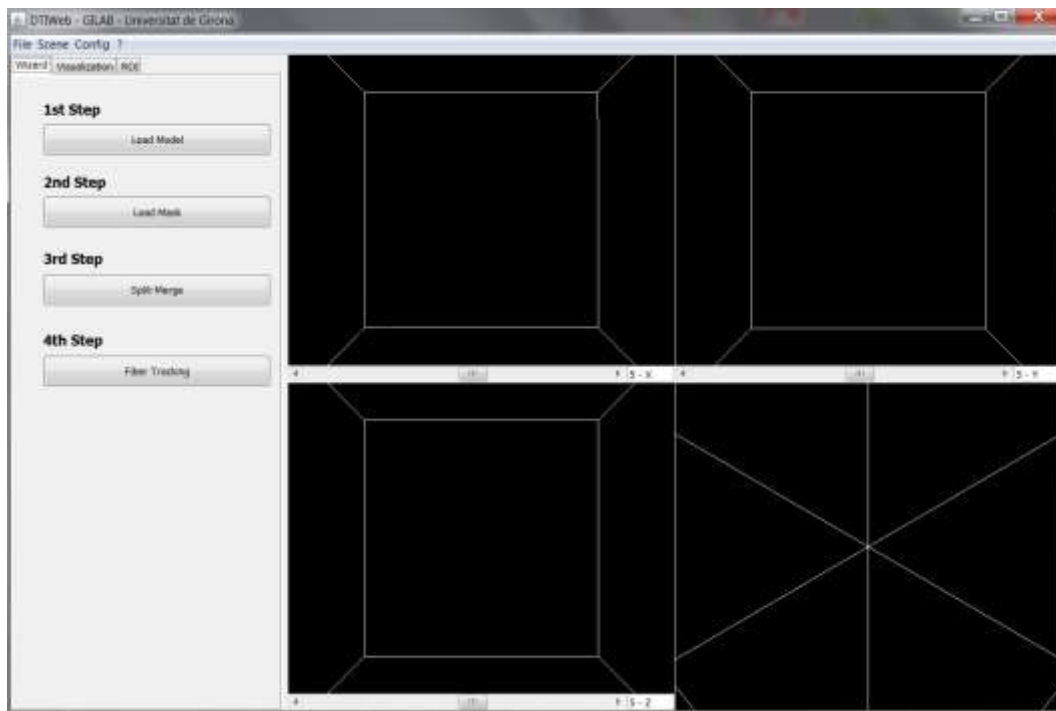

Figure 1 - Main screen of the DTIWeb application

To obtain the automatic fiber reconstruction we have to apply the four following steps:

1. Press Load Model button

With this option the user accesses to the directory with the testing data sets and he has to select one of them. It is important to remind the name of the data set (it will be needed in the next step). Once a data set is selected, a progress bar appears (see Figure 2) and, then, the axial, coronal, sagittal and multiplanar reconstructions of the selected data set are rendered in the visualization area (see Figure 3 - Reconstruction of the selected data set are rendered in the visualization area).
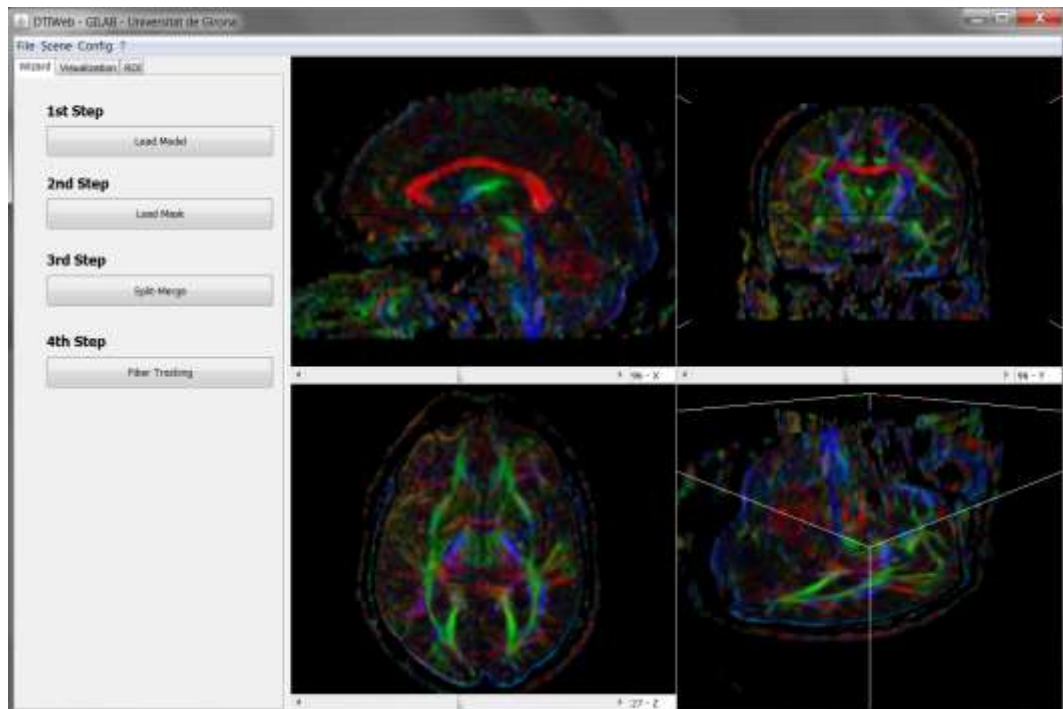
Figure 3 - Reconstruction of the selected data set are rendered in the visualization area

2. Press Load Mask button

With this option, the background of the loaded data set is removed and a directory with the masks corresponding to each one of the data sets appears. Select the mask of the data set and, then, a progress bar will appear. When the process ends, the axial, coronal, sagittal and multiplanar reconstructions (without the background) of the selected data set are rendered in the visualization area (see Figure 4).
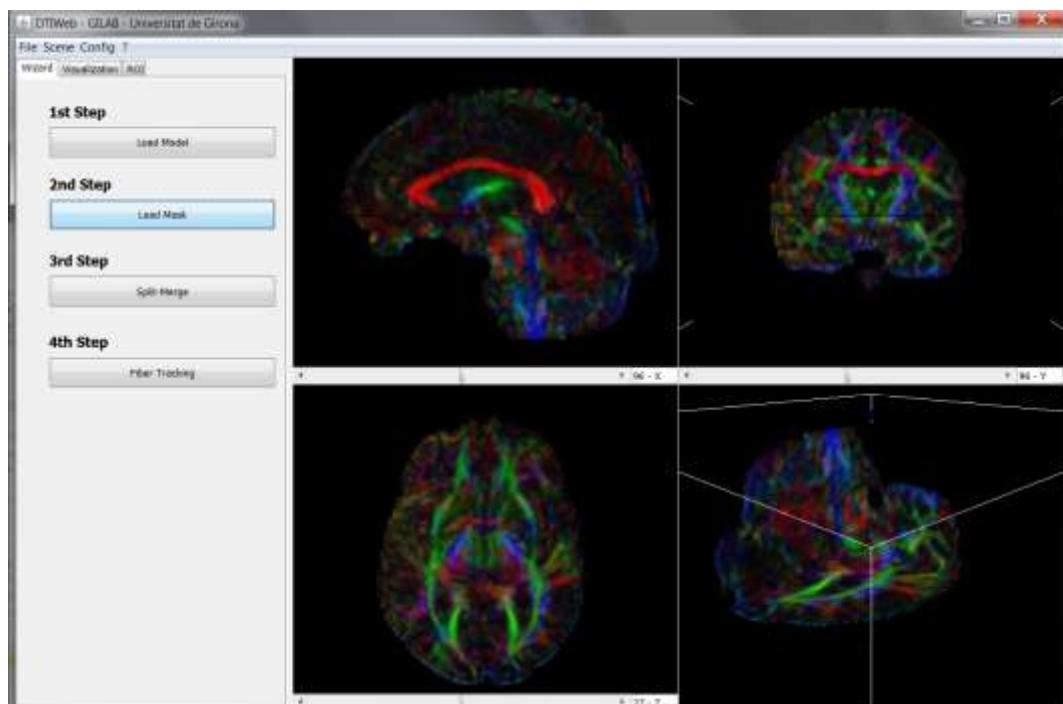
3. Press Split and Merge button

With this option the proposed approach with the default parameters is applied. These parameters can be modified using the *Config Menu* described in Section 7.

A progress bar appears to show the evolution of the BSP computation, the Region removal and the Merge computation (see Figure 5). When the merging phase is finished, the obtained VOI decomposition with each VOI represented with a different color (see Figure 6) is visualized. At this step of the process, the user has the option of editing the obtained VOIs following the indications of Sections 10 and 11.

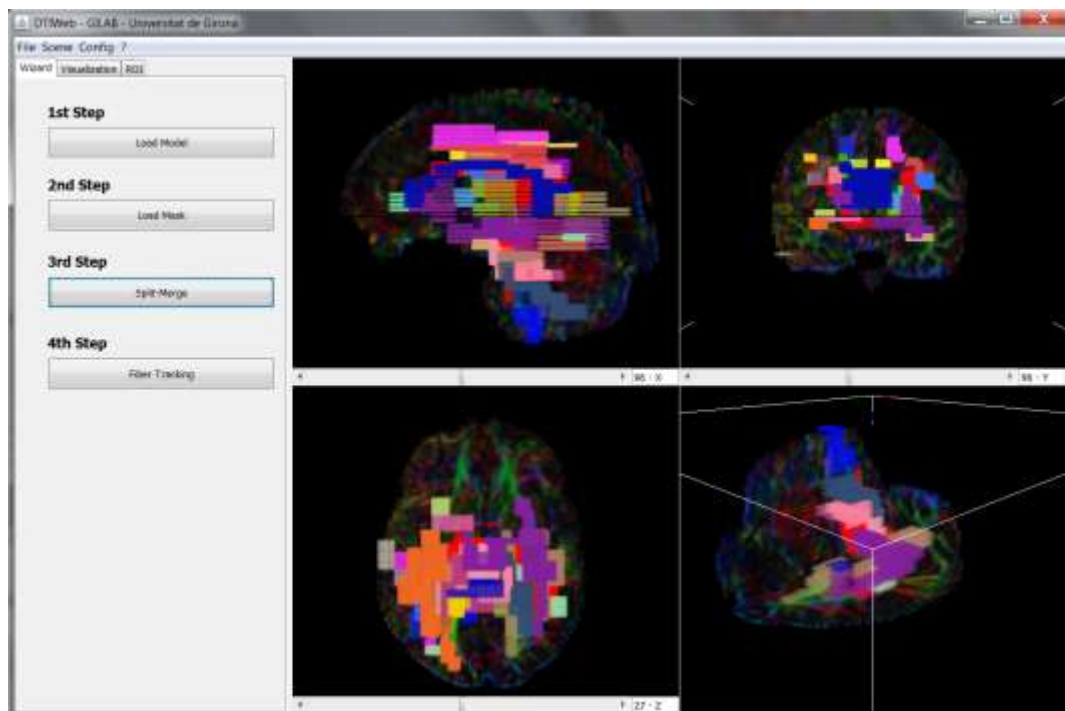Figure 5 - Progress bar of BSP computation

Figure 6 - Visualization of the obtained VOI decomposition

4. Press Tracking Computation

The last step of the process places seeds in the defined VOIs and performs tracking. By default, the method uses the 75% of planes with 4 seeds per voxel. The user can modify the tracking technique and the number of seeds following the indications of the Config menu described in Section 7.

Once the parameters have been set, a progress bar (see Figure 7) appears and, then, the obtained fiber clusters are rendered in the visualization area (see Figure 8).
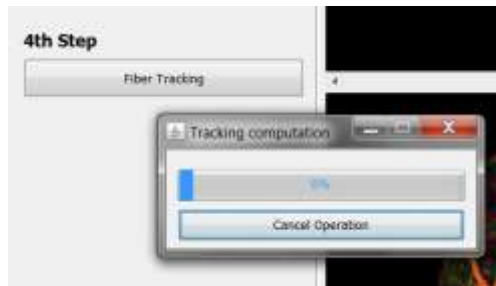

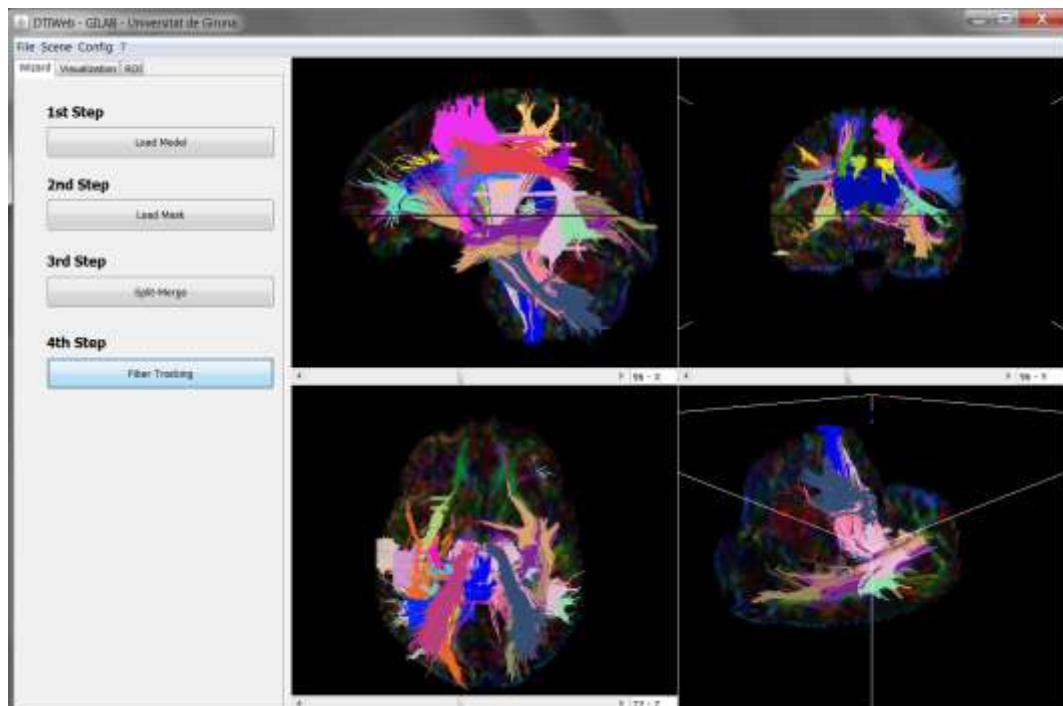**Figure 7 - Progress bar of tracking computation**

Figure 8 - Visualization of obtained fiber clusters

ADVANCED OPTIONS

In this section we describe the advanced options supported by the DTIWeb application. For each option we present the menu and the description of the main options.

5. File menu

The File menu (see Figure 9) has the next options:

- *Open*: with this option the user can access to the directory and select a data set for loading
- *Save*: the user can save the tracking results in the Fiber DTIStudio format, or the anisotropy maps in the Analyze format
- *Snapshot*: this option is used to take snapshots of the different views
- *Exit*: this option closes the DTIWeb application
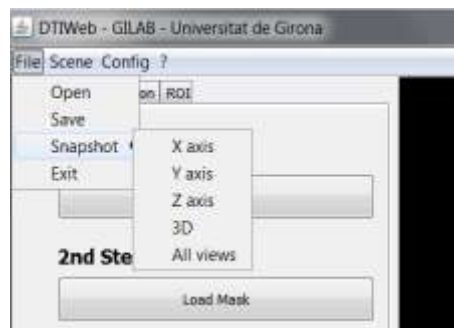
Figure 9 - File menu

6. Scene menu

The Scene menu (see Figure 10) has options to load or save ROIs or VOIs, Fibers or Masks.

- ROIS: this option is used to load the file of ROIs or to save the ROIs that are shown in the main visualization area
- Fibers: this option can load fiber trackings or save fiber trackings
- Load mask: this option can load a binary file to remove the background of the loaded image

Figure 10 - Scene menu

7. Config menu

The Config menu (see Figure 11) has options to set the parameters of tracking, Binary Space Partition (BSP), merge and seeding algorithms. For each option we present the different parameters that can be modified (see Figures 12, 13 and 14).
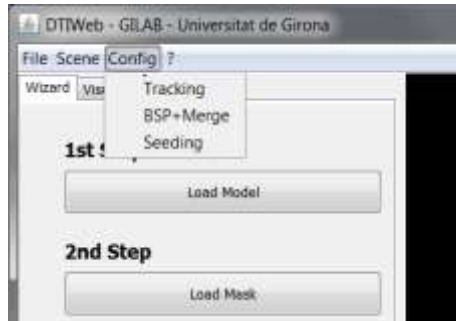
Figure 11 - Config menu
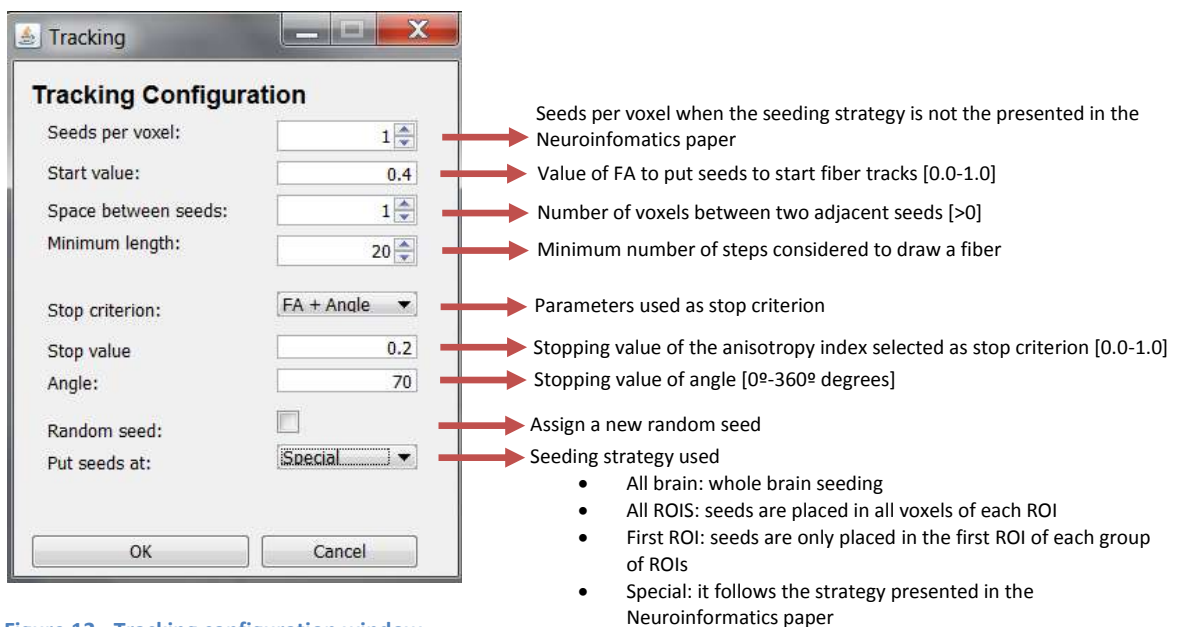
Figure 12 - Tracking configuration window

Seeds per voxel when the seeding strategy is not the presented in the Neuroinfomatics paper

Value of FA to put seeds to start fiber tracks [0.0-1.0]

Number of voxels between two adjacent seeds [>0]

Minimum number of steps considered to draw a fiber

Parameters used as stop criterion

Stopping value of the anisotropy index selected as stop criterion [0.0-1.0]

Stopping value of angle [0º-360º degrees]

Assign a new random seed

Seeding strategy used
- All brain: whole brain seeding
- All ROIS: seeds are placed in all voxels of each ROI
- First ROI: seeds are only placed in the first ROI of each group of ROIs
- Special: it follows the strategy presented in the Neuroinformatics paper

Partition

Method:	BSP + Merge ▼	← Algorithm used for VOI detection
Treshold:	0.4	← Value of stop criterion [0..1 for MIR and an integer for the number of regions]
Stop criterium:	MIR ▼	← Index used as stop criterion: MIR or number of regions
Region:	All brain 3D ▼	← Region where the VOI detection algorithm is applied
Mesure 1:	Main Direct... ▼	← First data set used for VOI detection
Mesure 2:	FA ▼	← Second data set used for VOI detection
Final regions:	50	← Number of final VOIs, the process could stop before if no more regions can be obtained
Remove BSP:	0.4	← At the end of the BSP process, regions with FA less than the selected value are removed
Remove Merge:	0.4	← At the end of the merge process, regions with FA less than selected value are removed
☐ Save result file		← Save the intermedium results using the Analyze format

Figure 13 - Partition configuration window

Seeding Parameters

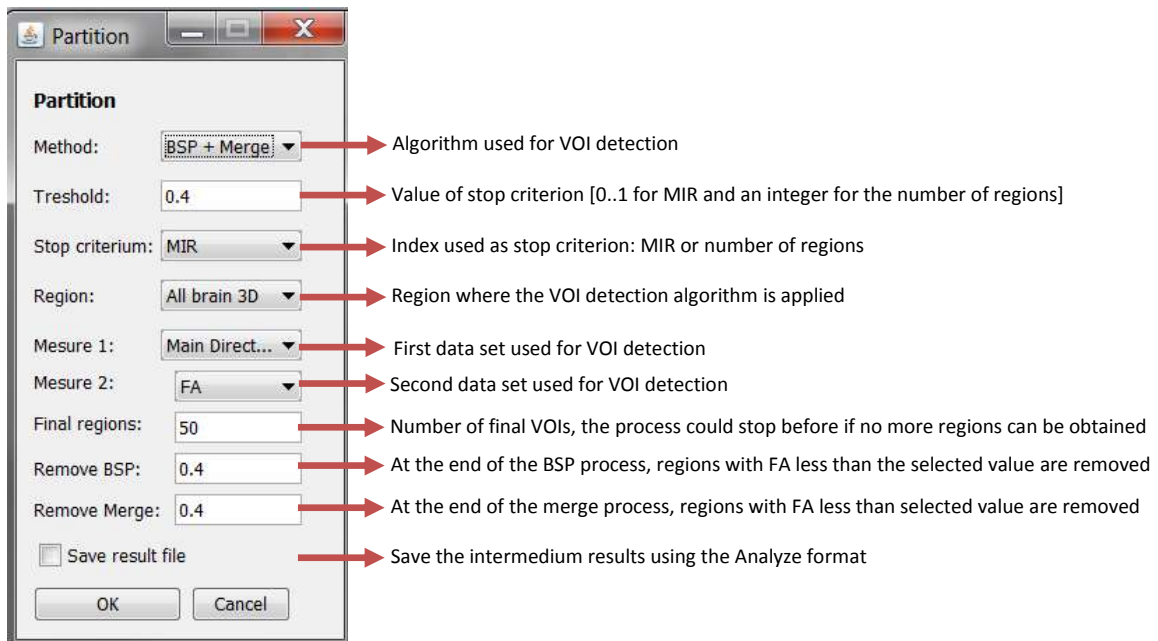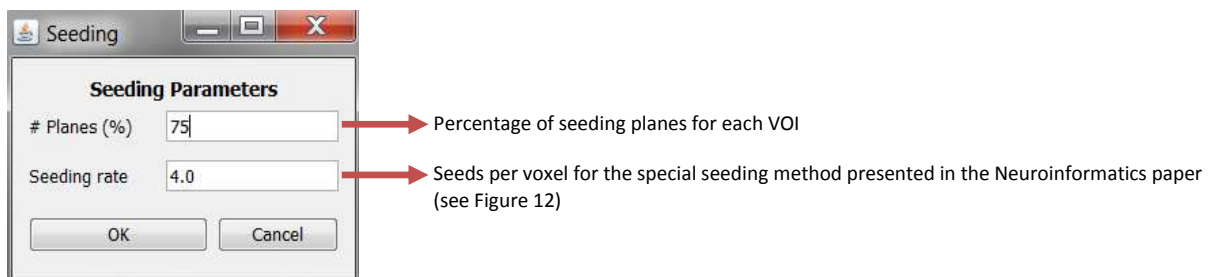|		
# Planes (%)	75	← Percentage of seeding planes for each VOI
Seeding rate	4.0	← Seeds per voxel for the special seeding method presented in the Neuroinformatics paper (see Figure 12)

Figure 14 - Seeding parameters window

8. Help menu

This menu (see Figure 15) has three options:
- Reset: to reset and refresh the main visualization area
- Help: to open the user manual
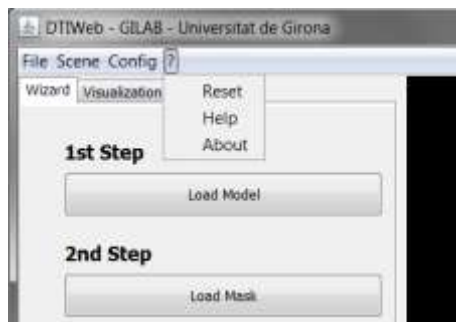- About: a little explanation about us

Figure 15 - Help menu options

9. Tab Visualization

From this tab panel (see Figure 16) we can modify the visualization options.
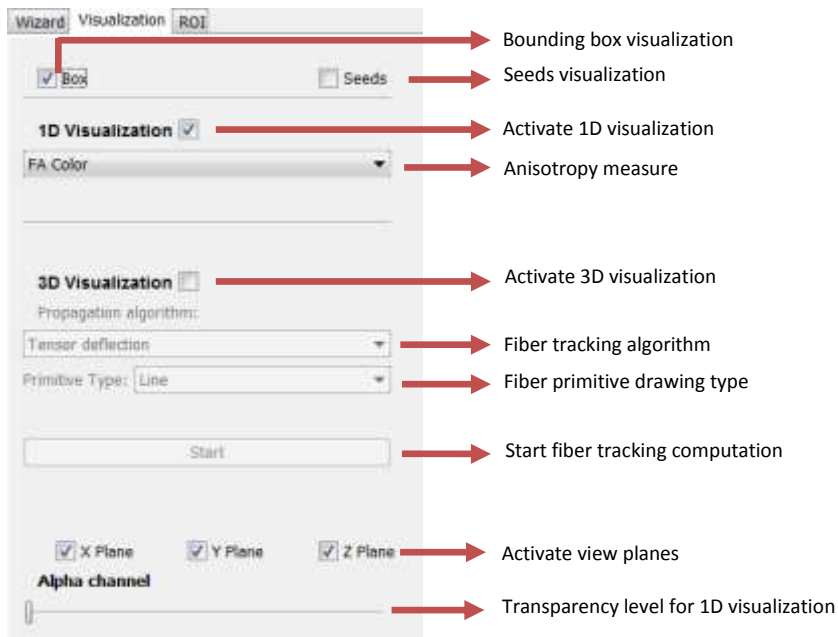

Figure 16 - Detail of the visualization tab panel

10. Tab ROI

This panel (see Figure 17) provides all the operations needed to manipulate ROIs or VOIs.
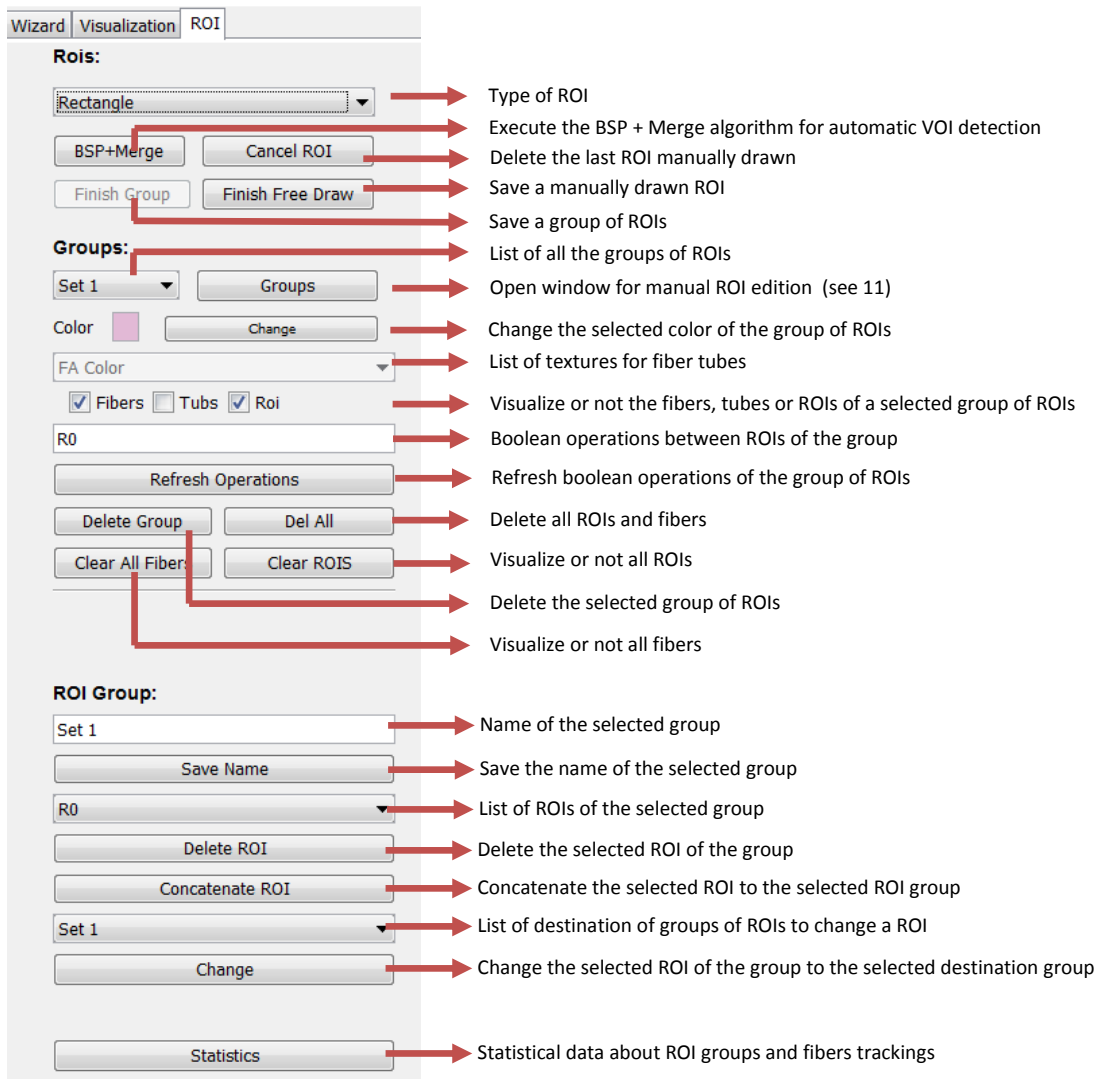

Figure 17 - Detail of the ROI tab panel

11. Manual editing ROIS

From this window (see Figure 18), the user can edit the voxels of each group of ROIs and can apply boolean operations between them, such as, union, erasure or intersection.
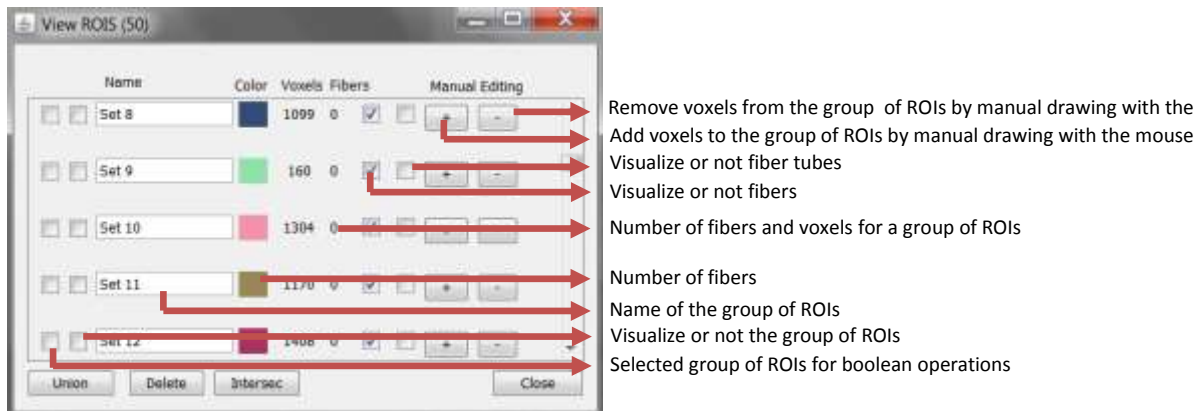

Remove voxels from the group of ROIs by manual drawing with the
Add voxels to the group of ROIs by manual drawing with the mouse
Visualize or not fiber tubes
Visualize or not fibers
Number of fibers and voxels for a group of ROIs
Number of fibers
Name of the group of ROIs
Visualize or not the group of ROIs
Selected group of ROIs for boolean operations

Figure 18 - Manual editing ROIs window

12. Statistics

This window provides information of the obtained VOIs or fibers and represents it in a tabular mode or as a graph (see Figure 19). The user can print, export or make a snapshot of the obtained results.
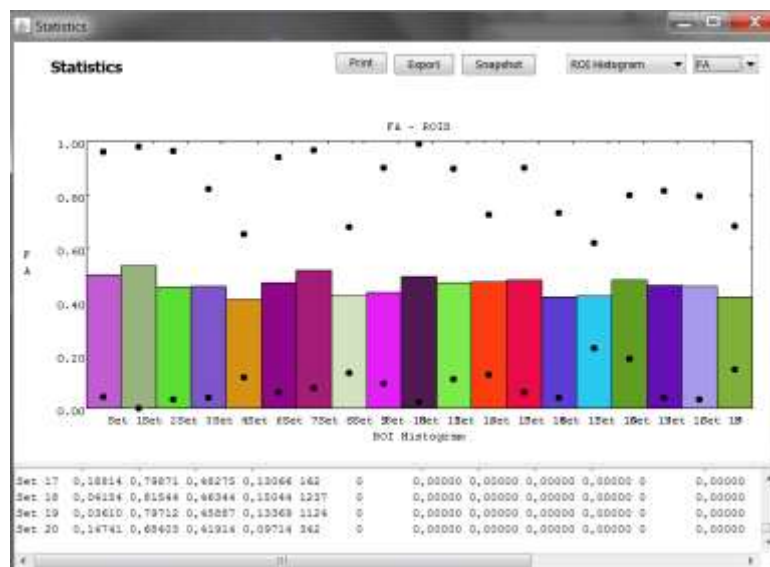

Figure 19 - Example of statistical results

For more details or information about the application please contact with Ferran Prados at ferran.prados@udg.edu