1. Objectives
To provide clinicians with tools allowing to analyze Multiple Sclerosis (MS) brain MRI:
- Works on a convenient database.
- Visualisation of images in 2D and/or 3D.
- Quantitative lesion burden evaluation (manually or automatically).
- Brain atrophy evaluation (manually or automatically).
- Comparison of different sequences or of binary segmentations.

2. Data Management & Visualisation
The database interface allows to:
- Import images from DICOM and other formats.
- Rotate/Flip images.
- Export results in DICOM or other formats (e.g. the segmentations).
- Automatic co-registration of images:
  - Monomodal,
  - Multimodal.
- Quantitative comparisons of two binary segmentations to assess evolutions:
  - Computation of the image difference.
  - Visualisation in the same window, side to side or by image fusion.

3. Lesion Segmentation
Manually:
- Drawing slice by slice.
- The drawing of a slice can be used for the following slice.

Semi-automatically:
- Click in the center of a lesion.
- The segmentation is achieved thanks to a 3D region growing.

Automatically:
- From four sequences (T2, PD, T1, T2-FLAIR).
- Images normalization.
- Segmentation of WM, GM, CSF taking into consideration partial volume effects.
- Segmentation of the lesions.
- Lesion burden computation.

4. Atrophy Evaluation
2D linear manual measurements:
- Automatic images aligning on an image of reference. Reference slices are saved into memory.
- Selection of the measurement:
  - Brain width,
  - Lateral ventricles width,
  - Third ventricle width.
- Automatic display of the corresponding 2D slice.
- Click to move landmarks.
- Save the measurement.

Automatically:
- From three sequences (T2, PD, T1).
- Sequences alignment.
- Segmentation of the brain.
- Intensity inhomogeneities correction.
- Segmentation of WM, GM, CSF taking into consideration partial volume effects.
- WM, GM, CSF volume and Brain Parenchymal Fraction (BPF) computation.

\[
\text{BPF} = \frac{\text{Volume}(\text{GM}) + \text{Volume}(\text{WM})}{\text{Volume}(\text{GM}) + \text{Volume}(\text{WM}) + \text{Volume}(\text{CSF})}
\]

Results:
- 2D linear measurements saved and exported.
- Display evolution of the BPF. This evolution reflects atrophy.

5. Image comparison
- Automatic co-registration of images:
  - Monomodal,
  - Multimodal.
- Quantitative comparisons of two binary segmentations to assess evolutions:
  - Computation of the image difference.
  - Visualisation in the same window, side to side or by image fusion.

6. Conclusion
- SepINRIA can be freely downloaded at:
  - http://www-sop.inria.fr/asclepios/software/SepINRIA/
- SepINRIA is available on different platforms:
  - SepINRIA is based on ITK, VTK, wxWidgets, vtkINRIA3D libraries and the MedINRIA framework.