

P515**SLF: a MS white matter lesion filling toolbox for the SPM software**

S Valverde¹, A Oliver¹, D Pareto², JC Vilanova³, À Rovira²,
L Ramió-Torrentà⁴, X Lladó¹

¹University of Girona, Girona, Spain, ²Magnetic Resonance Unit (Department of Radiology), Vall d'Hebron University Hospital, Barcelona, Spain, ³Girona Magnetic Resonance Center, Girona, Spain, ⁴Neuroimmunology and Multiple Sclerosis Unit. Dr. Josep Trueta University Hospital, Girona, Spain

Background: Several works have investigated the effects that white matter (WM) lesions have on gray matter (GM) and WM tissue volume estimations, proposing to improve volume measurements by filling WM lesions with intensities similar to WM before segmentation. Filling methods can be divided into local techniques, which use the intensities from the surrounding neighboring voxels of the lesions to fill them, and global techniques, which use WM intensities from the whole brain.

Objectives: To propose a new approach (SLF) to fill multiple sclerosis (MS) lesions in T1-w images that overcomes some of the existing limitations of the global and local filling techniques.

Methods: For each T1-w slice composing the whole brain image, WM lesion voxel intensities are replaced by random intensities of a normal distribution generated from the mean WM intensity of the current slice. Compared to global methods based on the mean signal intensity of all slices, our method re-computes the mean signal intensity of the WM at each two-dimensional slice with the aim of reproducing more precisely the signal variability between slices, especially in low resolution images.

Results: We computed the deviation in GM and WM tissue volume between a set of healthy images and the same images where artificial WM lesions similar to the mean GM/WM interface were filled with the proposed technique. Manual annotations done by experts of WM lesion masks from MS patients were registered into two sets of 30 1.5T and 3T T1-w images of healthy subjects, respectively. Tissue volume was computed using FAST and SPM8 segmentation methods. The results were compared with three state of the art filling methods (Chard et al., Battaglini et al., Magon et al.). The results on 1.5T showed that SLF reduced the deviation in WM between original and filled images, independently of the segmentation method used. SLF also provided the lowest differences in GM when FAST was used, and a similar performance to Chard et al., when SPM8 was employed. On 3T data, SLF again provided the lowest differences in GM and WM tissue when FAST was used. When SPM8 was used, SLF presented also a similar performance to Chard et al. Furthermore, volume estimations of lesion filled images using SLF appeared to be not affected by the segmentation method.

Conclusions: The proposed method obtained satisfactory results in both 1.5T and 3T, improving especially the results in low resolution images. SLF will be available to researchers as a SPM library extension.