

# SPReg: Shape-priors registration in ITK applied to diffusion weighted MRI

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## Research Topic

## ABSTRACT

In whole-brain connectivity analysis of diffusion MRI (dMRI) data, an accurate delineation of the white-matter and grey-matter surfaces is required. While high-standard segmentation is readily available for anatomical MRI, such as T1-weighted, dMRI typically have lower resolution and severe geometrical distortions. We propose a dMRI segmentation-registration framework that exploits the detailed anatomy extracted from anatomical MRI as shape-prior. We use an “active contours without edges”-like model to look for a deformation field that optimally maps the shape prior on the multivariate features in diffusion space. This joint approach reflects the intrinsic coupling of segmentation and distortion correction. Complementary, a precise and consistent cortical parcellation on dMRI is straightforward by projection from T1 space. Thus, we expect to improve the reliability and robustness of the resulting connectivity networks and their comparability within and across subjects. First results on synthetic datasets and simulated dMRI confirm the effectiveness of our approach.

**Keywords:** non-linear registration, shape priors, active contours, diffusion MRI, susceptibility distortion, cortical parcellation

## REFERENCES