

Diffusion Tensor MR Tractography using Successive Fermat Median Filtering Method

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Tractography using Diffusion Tensor Magnetic Resonance Imaging (DT-MRI) is a method to determine the architecture of axonal fibers in the central nervous system by computing the direction of greatest diffusion in the white matter of the brain. To reduce the noise in DT-MRI measurements, a tensor valued median filter, which is reported to be denoising and structure-preserving in the tractography, is applied. In this paper, we propose the Successive Fermat (SF) Method, successively using Fermat point theory for a triangle contained in the two-dimensional plane, as a median filtering method. We discuss the error analysis and numerical study about the SF method for phantom and experimental data. By considering the computing time and the image quality aspects of the numerical study simultaneously, we showed that the SF method is much more efficient than the Simple Median (SM) and Gradient Descents (GD) methods.