
This paper presents a theoretical framework to gauge the sensitivity of axisymmetric B-tensors diffusion MRI sequences for white matter fascicle orientations estimation. Theory and simulations confirmed the intuition that linear encoding, because it maximizes B-tensor anisotropy, possesses an intrinsic advantage over all other axisymmetric B-tensors for orientations estimation. However, oblate B-tensors yield higher signal and may be more robust to acquisition noise than their prolate counterparts.
This paper proposes a framework for diffusion MRI generalized gradient waveform design with optimized sensitivity to selected microstructure features. The sensitivity is evaluated by computing a score based on the Fisher information matrix from Monte-Carlo diffusion MRI simulations, which offer greater flexibility and realism than conventional analytical models. The proposed framework can be generalized to optimize the waveforms for any microstructure feature of interest.