Estimating A Modified Ball-and-sticks Diffusion Model with Expectation Maximization and Rician Likelihood

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Abstract

This is a summary of the modified ball-and sticks model estimation experiments.

1 Experiments

1.1 Which to estimate: diffusivities or weights?
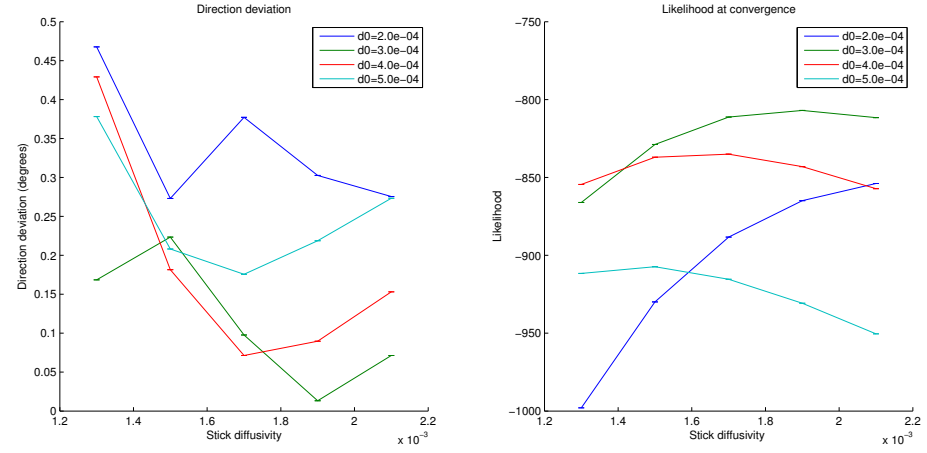
1.1.1 Synthesized data

1. **Single compartment**

   DW signal is simulated with the multi-tensor model, with major and minor diffusivities ranging from $[1.3 \times 10^{-3}, 2.1 \times 10^{-3}]$ and $[2 \times 10^{-4}, 5 \times 10^{-4}]$, respectively. It is also assumed that the diffusivities in perpendicular directions are equal. When estimating the fiber compartment, the diffusivities are fixed at $(1.7e-3, 3e-4, 3e-4)$, while the weights are to be optimized. For each combination of diffusivities, the estimation is repeated for 200 times to test its stability.

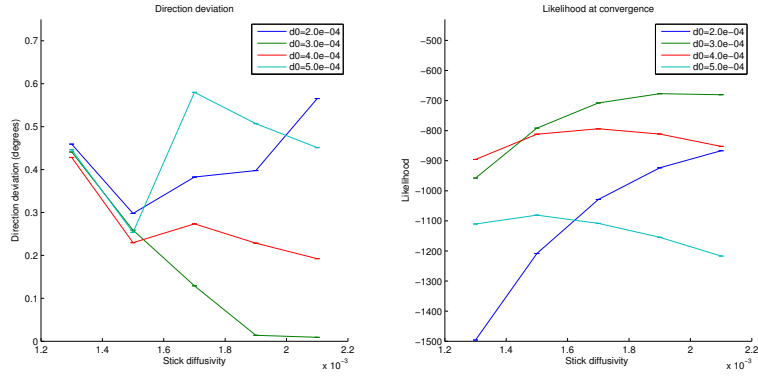   Figure 1 are results of single compartment estimation.

   When estimating the modified ball-and-sticks model, the diffusivites are fixed at $(1.7e-3, 3e-4, 3e-4)$, while the weights are to be estimated, initialized as equal weights.

1.1.2 Phantom data

Figure 1: Single compartment estimation results

(a) SNR=20

(b) SNR=40

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