© 2013 FIZ Karlsruhe

io-port 05979015

Hosseinbor, Ameer Pasha; Chung, Moo K.; Wu, Yu-Chien; Alexander, Andrew L.

Bessel-Fourier orientation reconstruction: an analytical EAP reconstruction using multiple shell acquisitions in diffusion MRI.

Fichtinger, Gabor (ed.) et al., Medical image computing and computer-assisted intervention – MICCAI 2011. 14th international conference, Toronto, Canada, September 18–22, 2011. Proceedings, Part II. Berlin: Springer (ISBN 978-3-642-23628-0/pbk). Lecture Notes in Computer Science 6892, 217-225 (2011).

Summary: The estimation of the ensemble average propagator (EAP) directly from q-space DWI signals is an open problem in diffusion MRI. Diffusion spectrum imaging (DSI) is one common technique to compute the EAP directly from the diffusion signal, but it is burdened by the large sampling required. Recently, several analytical EAP reconstruction schemes for multiple q-shell acquisitions have been proposed. One, in particular, is Diffusion Propagator Imaging (DPI) which is based on the Laplace's equation estimation of diffusion signal for each shell acquisition. Viewed intuitively in terms of the heat equation, the DPI solution is obtained when the heat distribution between temperatuere measurements at each shell is at steady state. We propose a generalized extension of DPI, Bessel Fourier Orientation Reconstruction (BFOR), whose solution is based on heat equation estimation of the diffusion signal for each shell acquisition. That is, the heat distribution between shell measurements is no longer at steady state. In addition to being analytical, the BFOR solution also includes an intrinsic exponential smootheing term. We illustrate the effectiveness of the proposed method by showing results on both synthetic and real MR datasets.

doi:10.1007/978-3-642-23629-7_27