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"Neto Henriques, R., Correia, M.M., Nunes, R.G., Ferreira, H.A., 2015. Exploring the 3D Geometry of the Diffusion Kurtosis Tensor - Impacts on the Development of Robust Tractography Procedures and Novel Biomarkers. NeuroImage 111, 85-99. doi.: 10.1016/j.neuroimage. 2015.02.004."

And

"Neto Henriques, R., Ferreira, H.A., Correia, M.M., 2015. United Diffusion Kurtosis Imaging (UDKI) toolbox. MAGMA 28 (S1): 511-512. doi: 10.1007/s10334-015-0490-7."

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Annex 1

Abstract

United Diffusion Kurtosis Imaging (UDKI) is a toolbox for Diffusion Kurtosis Imaging (DKI) data processing. It includes DKI pre-processing steps and modules to estimate the kurtosis tensor and standard diffusion and kurtosis rotational invariant measures. This toolbox also includes DKI biological modelling for estimation of axonal water fraction and DKI based tractography. UDKI is fully implemented in MATLAB and it is compatible with any operating system (Window, Linux or Mac OS X) with a base installation of MATLAB (version 7.8 onwards). The base MATLAB license is not provided with this toolbox. UDKI functionalities are grouped in six modules: pre-processing; DTI/DKI model fitting; estimation of diffusion tensor rotational invariant measures; estimation of kurtosis tensor rotational invariant measures; fitting of DKI biophysical models; and DKI based tractography reconstruction.

Toolbox Details

Pre-processing: includes optional procedures to smooth diffusion-weighted data, functions for voxel resolution resampling, and functions to remove background voxels. All these procedures are implemented using basic MATLAB functions.

DTI/DKI model fitting: includes the constrained tensor estimation approach as suggested by Tabesh et al. (2011), and the robust fast estimation of the mean diffusivity and kurtosis (Neto-Henriques, 2012a; 2012b).

Estimation of diffusion tensor rotational invariant measures: includes the estimation of the mean diffusivity, axial diffusivity, radial diffusivity, fractional anisotropy according to Pierpaoli and Basser (1996), and the estimation of the linear, planar and spherical anisotropy according to Westin et al. (1997).

Estimation of Kurtosis tensor rotational invariant measures: includes the estimation of mean, axial and radial kurtosis following to Tabesh et al. (2011)

Fitting of DKI biophysical models: includes the DKI based biological model fit as proposed by Fieremans et al. (2011).

DKI based tractography reconstruction: includes the fiber direction estimation algorithms as proposed by Jensen et al. (2014) and Neto Henriques et al. (2015). From the fiber direction estimates, tractography is reconstructed using an adapted version of a brute force streamline algorithm described by Huang et al. (2004), however generalized to handle cases of crossing fibers.

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