OMICS Group Conferences
Accelerating Scientific Discovery

International Conference on
Radiology & Imaging
August 14-16, 2013 Holiday Inn Chicago-North Shore, IL, USA

CBIR: Common bi-dimensional information enhanced reconstruction for DWI

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In vivo diffusion weighted MR imaging (DWI) can probe not only microstructural but also functional information of the tissue, thus it has tremendous potentials in clinical applications and neuroscience research. Due to technical limitations, traditional DWI uses single shot acquisition method to suppress motion artifacts, which inevitably has low spatial resolution, low signal to noise ratio (SNR) and severe image distortion artifacts. In this study, a multi-shot diffusion MRI technique was developed for high resolution imaging. The signal acquisition was based on an optimized variable-density spiral (VDS) sampling trajectory. And Common Bi-dimensional Information (multiple-direction and multiple-channel) enhancement Reconstruction (CBIR) was used to preserve SNR and reduce scan time. Specifically, the proposed CBIR method consists of two steps. First, under-sampled and complementary k-space data is collected using interleaved VDS. The complementary trajectories can be combined to form a full or over-sampled k-space. Second, common information among different diffusion encoding directions is used during the reconstruction of the final images. Results show that compared to conventional parallel imaging techniques, CBIR can significantly improve image quality in terms of SNR. Temporal and spatial resolution can also be increased. The proposed CBIR method might break through the barriers of separate signal acquisition and independent image reconstruction for different direction diffusion weighted images, which can definitely improve the image speed and accuracy.

Biography

Hua Guo is a Professor in the Department of Biomedical Engineering at Tsinghua University, Beijing, China. He received his Ph.D. from Duke University in 2006. His research interests focus on MRI Physics including novel sequence design and image reconstruction, multi-parametric quantitative imaging and functional imaging and liver imaging.

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