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Self-navigation to enable efficient 3D DWI SE-EPI multi-slab multi-band imaging

A method for correcting MRI data from corruption due to physiological changes.

IP Status: US Patent Issued, Issued Patent Number: '11,445,933'

Applications

- A self-navigation strategy for improving the reconstruction of diffusion-weighted 3D multishot echo planar imaging (EPI). Self-navigation is a method for extracting the phase correction information from the acquisition itself, eliminating the need for a 2D navigator, and further accelerating the acquisition.

Key Benefits & Differentiators

- Uses the data itself to ensure self-consistency between repeated acquisitions, such as those encountered in 3D dMRI, where subject physiological behavior such as respiration creates gross data in-consistencies for segmented (or averaged) acquisitions.
- Eliminates the need for additional or separate monitoring of physiologically induced variations
- Works for weak signals, such as those from high diffusion weighting
- Works with phase-encoding undersampling
- Works with simultaneous multi-slab

Technology Overview

Diffusion-weighted imaging is the most common MRI technique for determining the structural connectivity in the brain. For high-resolution imaging, multiple repetitions are a requirement, lengthening the total acquisition time. Physiological changes happen on a time scale shorter than the acquisition and introduces a change to the signal that when uncorrected, introduces artifacts in the images. The physiological changes, changes the phase of the MRI signal. The correlation with physiology can be tracked with additional external measurements or from additional measurements integrated with the acquisition – both of which have challenges. The self-navigation approach uses an uncorrupted part of the acquisition as a reference and corrects for the phase changes due to physiology before image reconstruction. The self-navigation enables correct image reconstruction, and the reduction of any additional navigators increases the scan efficiency and SNR and reduces acquisition time.

Phase of Development

TRL: 4-5 Integrated in a Matlab script, and applied to big data which have been processed for the FA maps and for fiber tracking

Desired Partnerships

This technology is now available for:

Technology ID
2019-116

Category
Life Sciences/Diagnostics & Imaging
Life Sciences/MRI & Spectroscopy

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References

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