Method to Reconstruct Motion-Compensated Magnetic Resonance Images with Non-Cartesian Trajectories

View U.S. Patent No. 8,306,299 in PDF format.

WARF: P110008US01

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a method for producing motion-compensated images without the need for additional navigator data or external motion estimation schemes.

Overview

Magnetic resonance imaging (MRI) is highly sensitive to patient motion. Depending on the k-space acquisition trajectory, which determines at what positions of the spatial frequency domain data points are collected, motion may cause blurring, ghosting or other artifacts that reduce image quality and diagnostic value of the images. Most physiological motion artifacts can be suppressed or corrected by proper gating techniques; however, bulk motion remains a clinical problem, particularly in three-dimensional imaging where prolonged acquisition time increases the likelihood of motion artifacts. Especially challenging subject groups include pediatric, uncooperative and impaired patients.

Despite reduction in imaging times achieved through improved hardware and rapid acquisition schemes, motion artifacts can compromise the quality of MRI-acquired images, especially in three-dimensional imaging where scan durations are prolonged and the assumptions for most state-of-the-art two-dimensional rigid body motion compensation techniques break down. Hence, an improved method for producing motion-compensated images in three dimensions is needed.

The Invention

UW–Madison researchers have developed a motion-compensated image depiction method for use with magnetic resonance imaging systems. An MRI system is used to acquire a time series of k-space data from a subject by sampling k-space along non-Cartesian trajectories, such as radial or spiral, at a plurality of time frames. The time frames at which motion occurred are identified and used to segment the time series into a plurality of k-space data subsets containing consistent data.

The k-space data subsets contain k-space data acquired at temporally adjacent time frames that occur between those identified time frames at which motion occurred. Transformation matrices are derived from co-registration of images created from these consistent subsets. Motion correction parameters are determined from the k-space data subsets. The determined parameters are applied to the individual consistent subsets of k-space data, and these corrected data subsets are combined to form a corrected k-space data set from which a motion-compensated image is reconstructed.

Applications

- Software used in MRI post-processing, particularly neuro-imaging applications

Key Benefits

- Improves MR image clarity
- Allows focused application of correction algorithm to datasets with no motion

Tech Fields

- Medical Imaging : MRI

For current licensing status, please contact Jeanine Burmania at jeanine@warf.org or 608-960-9846