Method for Error-Compensated Chemical Species Signal Separation with Magnetic Resonance Imaging

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a method for accurate fat quantification in the presence of phase errors in the acquired data.

Overview

Fat quantification using magnetic resonance imaging (MRI) has important clinical applications including the early diagnosis and quantitative staging of non-alcoholic fatty liver disease (NAFLD). Compared to biopsy, the current gold standard for quantitative assessment of NAFLD, MRI methods have the advantages of being non-invasive and allowing volumetric coverage of the whole liver. Chemical shift-based fat quantification methods are able to provide measurements of proton density fat fraction, a biomarker for NAFLD. In these methods, several images are acquired with different echo time shifts, and water, fat and fat fraction maps are obtained by post-processing.

Confounding factors such as phase errors must be corrected to accurately measure proton density fat fraction, eliminate bias and reach reliable quantitative results. Magnitude-based methods have been shown to avoid bias in fat fraction estimates in the presence of phase errors. These methods discard the phase of the acquired signals to remove phase errors; however, magnitude fitting can result in severe noise amplification, particularly for certain echo time combinations. A method for chemical species signal separation that addresses phase errors without discarding valuable phase information is needed.

The Invention

A UW–Madison researcher has developed a method for separating the relative signal contributions of multiple chemical species in which echo signal information containing errors is discarded during signal separation. The method enables production of an image with an MRI system in which relative signal contributions from the chemical species are separated while accounting for errors. It requires using multiple echo signals acquired at different times to form signal models that account for relative signal components for each chemical species. Then, each echo signal that contains errors is identified and discarded from the relative signal components for each chemical species. Finally, an image is produced using the reliable data from the relative signal components of the chemical species.

Applications

- Image reconstruction for MRI used to measure fat fraction or other phase base imaging

Key Benefits

- Overcomes systematic error and bias
- Maintains superior noise performance compared to magnitude fitting methods

Additional Information

For More Information About the Inventors

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Tech Fields

- Medical Imaging : MRI

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