Robust Magnetic Field Map Estimation Improves MRI Fat-Water Separation

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WARF: P130370US01

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a method for performing chemical species (e.g., fat-water) separation by using a more robust estimate of the magnetic field map.

Overview

In magnetic resonance imaging (MRI), the main magnetic field is symbolized B_0. Accurately estimating a B_0 field map is critical to distinguishing different chemical species like water and fat. If the B_0 field map is estimated accurately, then water and fat signals can be separated using a straightforward technique.

Conversely, inaccurate estimation of the B_0 field map can lead to "swaps" of the water and fat signals. This is a problem because the radiologist may be unable to discern true pathology from an artifact in the image. As a result, important anatomical findings may be completely missed.

The Invention

UW–Madison researchers have developed a method to improve the robustness of chemical species separation in MRI. Their approach uses an object-based initial estimate of the B_0 field map.

More specifically, an MRI system scans a subject to acquire k-space data at different echo times and subsequently reconstructs images. The pixel values of these images are used to estimate a distribution of magnetic susceptibility values found in the subject. A magnetic field inhomogeneity map is estimated from the magnetic susceptibility distribution, and chemical species separation (e.g., fat-water separation) then can be performed.

The new approach is intended to improve the robustness of existing techniques for chemical shift encoded chemical species separations.

Applications

- Relevant to any complex-based chemical species separation technique
- Software for MRI, susceptibility-weighted imaging and quantitative susceptibility mapping
- Especially useful for clinical imaging of regions prone to fat-water swaps, including the liver, brachial plexus and lower extremities

Key Benefits

- Achieves more robust chemical species separation
- Reduces computational burden
- Helps correct for image distortions and generate magnetic field shimming values

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Stage of Development

The researchers estimate the new method could save up to 95 percent of reconstruction time compared to conventional techniques, as well as augment existing water-fat swap solutions.

Additional Information

For More Information About the Inventors

- Scott Reeder

Related Technologies

- For more information about MRI fat-water separation with full dynamic range using in-phase images, see WARF reference number P120173US01.
- For more information about a method to improve MRI images of multiple chemical species including fat-water separation, see WARF reference number P100217US01.

Tech Fields

- Medical Imaging : MRI

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