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

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