Medical Imaging

Faster, Better Quality Medical Imaging by Constrained Reconstruction

View U.S. Patent No. 9,430,854 in PDF format.

WARF: P120280US01

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a method for reconstructing medical images from limited data samples in which the process is constrained to be consistent with a signal model.

Overview

Quantitative magnetic resonance imaging (qMRI) is a clinical procedure that can yield imaging biomarkers more sensitive and specific to underlying disease than regular MRI. It works by fitting images to analytical models of scan signals to offer unique information by producing maps of parameters that intrinsically characterize underlying tissue, such as relaxation times and chemical species separation. However, qMRI methods often are too time-consuming because they require multiple measurements along all the parameter dimensions.

Similarly, in time-resolved MRI, scan time is the problem —limited by factors like breath holding or contrast propagation, so the clinical need for high spatial and temporal resolution often necessitates image reconstruction from incomplete sets of data.

A method that produces high quality reconstructed images acquired in a clinically practical scan time would represent a significant advancement.

The Invention

UW–Madison researchers have developed a modified algorithm for medical image reconstruction that increases reconstruction speed, improves image quality and provides more accurate results. The algorithm constrains images to be consistent with a signal model, which relates image intensity values to free and control parameters such as relaxation time and multiple echo or inversion times, respectively.

The signal model may be analytical or approximate—learned from acquired image data, as is done in the case of time-resolved MRI. The model consistency condition may be enforced using an operator that projects an image estimate onto the space of all functions satisfying the signal model.

Applications

- Implementation as software on standard MRI systems
- Quantitative and dynamic imaging
- Computed Tomography (CT) dynamic imaging
- Security camera development
- Signal processing

Key Benefits

- High spatial and temporal resolution in time-resolved MRI from incomplete/undersampled data
- Increased reconstruction speed
- Improved image quality compared to existing compressed sensing techniques
- More accurate results with fewer artifacts

Stage of Development

The researchers have favorably tested the method with phantoms and with patient imaging data.

Additional Information

Related Technologies

- WARF reference number P06479US describes a new method for reconstructing highly undersampled images at specific cardiac phases for both X-ray computed tomography and MRI.

Tech Fields

- Medical Imaging : CT
- Medical Imaging : MRI

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