



Better MRI Performance with Improved 3-D UTE Imaging

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a method for magnetic resonance imaging (MRI) in which a radial cone k-space trajectory is utilized for rapid and efficient sampling.

Overview

MRI produces medically valuable images of a patient's internals using magnetic fields and pulses that align and excite nuclei. The signals emitted by excited nuclei can be measured in 'k-space' and used to reconstruct an image.

A particular approach, called three-dimensional ultrashort echo time (UTE) imaging, has the potential to visualize areas with short signal times—like the lungs, which often appear blurry in images—and to dramatically improve efficiency. Achieving both benefits in a single scan, however, is challenging. UTE sampling can be fourfold less efficient than other schemes, for example, or suffer from image artifacts. Overcoming these drawbacks is critical.

The Invention

A UW–Madison researcher has developed a method for three-dimensional UTE imaging to maximize k-space coverage. The approach combines radial- and spiral-based techniques.

In the method, an MRI system establishes a radial magnetic field gradient that increases, then decreases in amplitude over time. While increasing, the sampling trajectory extends outward. While decreasing, an oscillating magnetic field gradient is established. The two field gradients together form a sampling trajectory that spirals outward in a cone.

Applications

- MRI, especially when imaging areas with rapid signal decay
- Imaging tendons, ligaments and superparamagnetic iron oxide (SPIO)-labeled stem cells

Key Benefits

- Readily implemented
- Rapid and efficient sampling
- Reduced streak artifacts
- Images show better edge detail.
- Diffuse point spread function
- Method is compatible with Highly Constrained Backprojected Reconstruction (HYPR), compressed sensing and other diffuse undersampling methods.

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Additional Information

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For More Information About the Inventors

- [Kevin Johnson](#)

Publications

- Johnson K.M. 2012. Radial-Cones: A New Sampling Scheme for Compressed Sensing Accelerated 3D Ultrashort Echo Time Imaging. ISMRM 20th Annual Meeting.

Tech Fields

- [Medical Imaging : MRI](#)

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

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