UNIVERSITY OF MINNESOTA
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MRI Contrast Software Based on RAFF-n

Higher MRI Magnetic Field Strength Decreases MRI T1 Contrast

As the magnetic field strength increases in clinical magnetic resonance imaging (MRI) scanners, the images become less sensitive to classic T1-weighting, which is based on T1 relaxation time. T1-weighted images are often used in biomedical imaging since it inherently provides tissue-specific differences that provide contrast in images (darker and lighter areas in the MRI image).

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Try • 18 months non-exclusive license • $15,000 Trial Fee waived for MN companies
Buy • $25,000 Conversion Payment (includes all patent expenses) • Royalty: $1500/unit for new MRI installation; $1000/unit for MRI system upgrade • Royalty discount for MN companies • Royalty holiday on 1st $1M in sales

Pulse Sequences have High Specific Absorption Rate

Various pulse sequences have been developed to compensate for this loss in sensitivity, but their effectiveness have been limited by FDA limits on specific absorption rate (SAR). SAR is a measure of the rate at which energy is absorbed by tissue (essentially a measure of tissue heating) and exceeding certain levels may lead to tissue damage.

Improved MRI Contrast with Reduced Specific Absorption Rate

The RAFF-n MRI pulse sequence creates a novel contrast using a unique relaxation time constant that reduces SAR and provides the ability to probe slow fluctuations, such as water molecules interacting strongly with macromolecules. Additionally, frequency-swept pulses utilizing RAFF-n (n>2) technology allow for systems using fields of rank n>2 to refocus magnetization and further reduce SAR. Reduced SAR allows for safe use of higher strength magnetic fields and expands the diagnostic capabilities of MRI. The lower radio frequency (RF) power (half the peak power of adiabatic T1rho and T2rho) is safer for the subject in that it can generate less tissue heating. It also provides increased bandwidth, which can reduce certain types of image artifacts. Moreover, it generates unique contrast that enables detection of certain pathologies by providing access to different time scales of molecular dynamics. In addition to improving image contrast in classic MRI T1-weighted images, this pulse sequence potentially opens up applications in gene therapy, and diagnosis of Parkinson's disease, demyelinating neuropathies and osteoarthritis because cell densities can be differentiated more easily. RAFF-n can accommodate a wide bandwidth that further reduces unwanted image distortion.

FEATURES AND BENEFITS OF MRI CONTRAST BASED ON RAFF-n:

Technology ID
20110161

Category
Life Sciences/Diagnostics & Imaging
Life Sciences/Research Tools
Software & IT/Image & Signal Processing

Learn more

- Improved contrast mechanism - potential to expand diagnostic capabilities of MRI. Unique inherent tissue contrast that may assist the detection of certain pathologies for the first time by providing access to very slow molecular dynamics.
- Reduced SAR - less radio frequency (RF) power (approximately half the peak power of adiabatic T1r and T2r). Potential to reduce tissue heating in the subject and enable certain procedures to move into FDA approved guidelines
- Expanded diagnostic capabilities for MRI - applications in gene therapy, and diagnosis of Parkinson's disease, demyelinating neuropathies and osteoarthritis
- Reduced image artifacts - provided by the increased bandwidth of RAFF-n

Phase of Development

Experiments have been done in 3T scanners and above and were able to detect cartilage degradation where other methods could not.

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