



Correcting Magnetic Distortions in MRI Scanners

A Magnetic Resonance Imaging (MRI) scanner uses magnetic fields and radio waves to produce detailed images of the inside of the body. Due to a number of internal and external effects these fields are never completely homogenous, may be distorted, change with time (magnetic drift) and negatively impact the quality of the image. Scanners adjust for this through a process called "shimming".

The shim device comprises a number of coils that produce small magnetic fields which are superimposed on the main magnetic field to correct distortions at the outset of the scan. Drift and interference can still occur during the scan, but this is resolved by implementing this invention which tracks, and corrects for, the main magnetic field drift.

Benefits

- Measure, report and correct for all changes in magnetic field throughout an MRI scan.
- Improved image quality.
- A major advantage is the ability of the double volumetric navigator sequence to measure and adjust shim over selected regions in a 'slab-by-slab' or 'slice-by-slice' fashion.
- It can be integrated into any MRI pulse sequence, including functional MRI (fMRI) and diffusion tensor imaging (DTI).
- Higher order shims can be implemented if the hardware of the particular MRI scanner permits this.

Market

Hospitals, medical practices, MRI instrument manufacturers and veterinary practices that require accurate images in order to investigate the anatomy or physiology of a human or animal body.

Technical Description

A 3D navigator pulse is interleaved in the scanning sequence after the acquisition of each volume. A second navigator is introduced, with a different echo time to the first, before the next volume is acquired. The two corresponding navigator images are obtained and a magnetic field map is determined via complex division of the images. This magnetic field map is then used to determine the parameters required to adjust the system central frequency of the MRI scanner to compensate for drift.

Keywords:
MRI, MRI Correction, Magnetic MRI Correction, Shim Correction

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Technology Readiness Level:
5 – System validation in a relevant environment

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