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Intrinsic Navigation from Velocity-Encoding Gradients in Phase-Contrast MRI

Time-resolved phase contrast MRI (4D flow) can quantify cardiac function and flow. The technique may even permit complex anatomical assessment, thus comprising a comprehensive exam in a single scan. Unfortunately, artifacts from respiratory motion compromise this ability. Therefore, we developed a simple method to measure motion using readily available navigation information from the velocity-encoding gradients without any significant modification to conventional sequences.

Applications

- Can be used in conjunction with any type of phase-contrast MR imaging scheme and any type of reconstrucgtion strategy.
- Allows for high-quality images to be reconstructed from exams with long acquisition times and other types of exams that are sensitive to motion defects.
- Can be used for any part of the body that requires assessment using phase-contrast imaging. It is especially useful in cases when patients have difficulty holding still for long time periods.
- For longer scans (>1 min), breath-holds are no longer possible and respiratory motion must be considered. With the navigation technique, this imaging modality can be made accessible to a wider patient population.

Advantages

- In conventional phase-contrast sequences, no alterations to the sequence timing or gradient waveform.are needed.

- Navigator information is available for every repetition time and is naturally synchronized to the acquired imaging data.
- For multi-direction phase-contrast imaging different navigators are available to describe multi-dimensional linear motion.
- In conjunction with a with a high-density multi-channel coil receiver, each coil element provides spatial localization to the navigator signals.
- The navigator measured can be used for motion compensation purposes or to prospectively gate the acquisition.
- The method can be used for any sampling strategy (both Cartesian and non-Cartesian).

Patents

- Published Application: 20160349346
- Issued: 10,132,902 (USA)

Innovators

- Joseph Cheng
- John Pauly
- Marcus Alley
- Shreyas Vasanawala
- Michael Lustig

Licensing Contact

Irit Gal

Senior Licensing Manager

Email