

Master's thesis: Radial Arterial Spin Labeling Sequence

Overview:

The aim of the master thesis is to develop a radial arterial spin labeling (ASL) sequence. ASL is a magnetic resonance imaging (MRI) technique to measure perfusion in tissue, i.e. the amount of fluid transported through tissue.

A sequence refers to the control software that controls the electromagnetic field during a MRI experiment, and a radial sequence makes use of radial encoding to measure the Fourier data of the image. In contrast to classical methods that utilize a diffusible tracer to determine the transported fluid, ASL allows tracking of the water proton itself without the use of a contrast agent.

More precisely, the water protons in the flowing blood that supply the imaged region are inverted by a radio-frequency pulse before they enter the measurement area.

Afterwards an image acquired with inverted (tagged image) and one without inverted (control image) inflowing spins are subtracted from each other to obtain an image of the inflowing blood. Because the kinetics of a tracer and of protons in the blood could be different in biological tissue (e.g. the brain), ASL allows tracking the true transport pathways.

Specific Tasks:

- Literature review
- Understanding the existing code
- Coding a radial ASL sequence
- Phantom and in vivo MRI measurements and quantification
- Reconstruction of acquired data
- Documentation and illustration of the results

Recommended Knowledge:

- C or C++ programming
- Interest in sequence programming
- Basic git workflow



Example of a control (left) and perfusion weighted image (right) of a slice through a human brain.

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