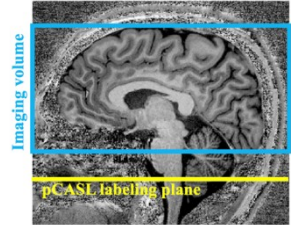


Simulation of Labeling Efficiency in pseudo Continuous ASL (pCASL)

Arterial Spin Labeling (ASL) is a non-invasive MR technique for measuring perfusion in tissue. Instead of using a contrast agent, this technique uses arterial blood water which is magnetically labeled, as an endogenous tracer. This labeling is done by inverting the magnetization of the arterial blood water spins using so called flow driven adiabatic inversion. In principle, a combination of a series of short radiofrequency (RF) pulses with a gradient applied in the in the direction of the arteries manipulates the phase of the flowing spins resulting in an inversion. The efficiency of the inversion should be near to 100% to achieve a good SNR. However, the efficiency is vulnerable to several factors like flow velocity and field inhomogeneities¹.



Objective:

In this Master thesis the influence of different factors (e.g. field inhomogeneities, blood flow velocity) on the labeling efficiency for pCASL should be investigated. In a second step a simulation tool should be implemented in Matlab based on an existing simulation kernel which allows calculating the labeling efficiency under different influence factors. The thesis is structured as follows:

- Literature research (Influence factors for pCASL labeling efficiency)
- Implementation the simulation tool for pCASL in Matlab
- Simulation of the labeling efficiency under different circumstances

Qualifications:

- Interest on Biomedical Imaging
- Basic knowledge in mathematics
- Programming experience in Matlab/Python
- Interest to work in an interdisciplinary team

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1. Wen-Chau Wu, María Fernández-Seara, John A. Detre, Felix W. Wehrli, and Jiongjiong Wang. *A Theoretical and Experimental Investigation of the Tagging Efficiency of Pseudocontinuous Arterial Spin Labeling*. *Magnetic Resonance in Medicine* 58:1020–1027 (2007)