Master's Thesis:
3D Phase-Contrast Measurement of Flow Vectors using a Self-Navigating Stack-of-Stars MRI Sequence

Institute of
Biomedical Imaging
Stremayrgasse 16/3
8010 Graz

Overview

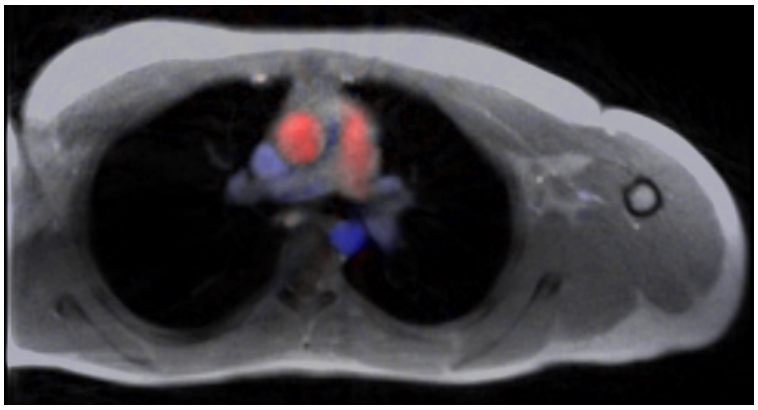
Phase-contrast flow magnetic resonance imaging (MRI) allows simultaneous measurement of morphology and vectorial flow. The aim of this master thesis is to develop and optimise a volumetric flow imaging technique using a stack-of-stars sequence. In phase-contrast flow imaging the phase of the nuclear spin is related to its velocity which makes it possible to measure the direction and speed of fluid flows using MRI. A sequence is a computer program that controls the MRI measurement. For in vivo measurements, resolving the cardiac and respiratory motion while keeping overall scan time low is a great challenge. In this work, we will use an efficient stack-of-stars sequence to encode time-resolved 3D spatial information which has two advantages: First, it is robuster to motion and faster compared to standard acquisition schemes used in clincial practice. Second, the determination of the cardiac and respiratory motion states can be identified from the data itself usign self-gating, which avoids the error-prone use of ECG and respiratory gating.

Specific tasks

- Literature review
- Familiarize with existing sequence code
- Optimization of the sequence
- Reconstruction of acquired data utilizing a novel self-gating approach (SSA-FARY)
- Validation using phantom and in vivo measurements
- Documentation and illustration of the results

Recommended Knowledge

- C or C++ programming
- Basic understanding of MRI
- Basic git workflow



Blood flow in the great vessels measured with 2D phase-contrast imaging (color indicates flow direction)

Contact

M.Sc. Ansgar Adler,
E-Mail: ansgar.adler@tugraz.at