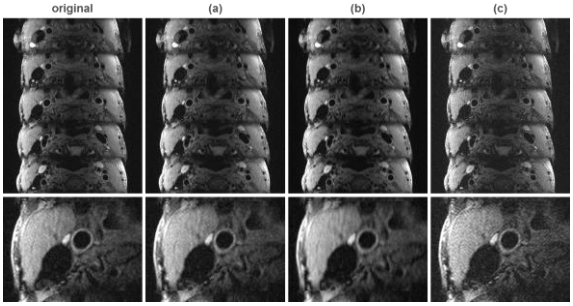
The Cardio-MRI group at the department of Radiology – Medical Physics, University Medical Center Freiburg, is currently looking for **Master** students (physics) for two research projects on

Efficient Sampling Strategies for High-resolution Dark-Blood SPACE-MRI

Magnetic resonance imaging (MRI) provides an excellent soft tissue contrast and is therefore an indispensable tool in diagnostic imaging. With modern MRI scanners, high-resolution imaging (spatial resolution << 1 mm) becomes feasible which for example enables imaging of thin structures such as the wall of blood vessels.

3D vessel wall imaging is typically performed with so-called turbo spin echo (SPACE) sequences which provide a contrast behavior (dark-blood) that allows for clear delineation of the vessel wall. However, such MRI sequences still exhibit long measurements.

The goal of this master's project is to investigate novel sampling strategies for an efficient data sampling process, so that the overall acquisition process is shortened while image quality is maintained. The project is embedded within DFG-funded collaborations on vessel wall imaging in the brain and the carotid arteries.



MR images of the carotid arteries (axial cross-section). Depending on the sampling strategy (a-c), image quality is degraded compared to the original SPACE data set. However, image acquisition would only require half of the original acquisition time.

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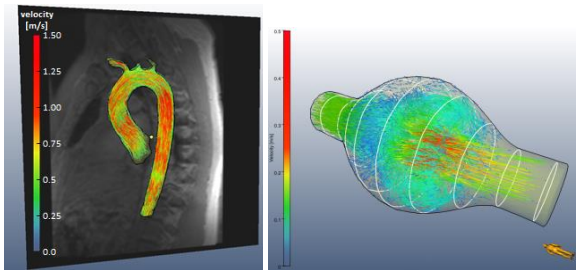
Improved MRI-based Flow Measurements via Adaptive VENC Selection

Besides its excellent capabilities for anatomic information, MRI also enables measurements of quantitative parameters such as velocity. These techniques are for example used for time-resolved 3D measurements of blood flow in the aorta or other structures.

The sensitivity of such measurements mainly depends on the so-called VENC (velocity encoding) parameter. Common techniques use a single, fixed VENC value to measure the different flow velocities which occur over the course of the cardiac cycle.

In this project, we want to develop improved techniques for MRI-based velocity measurements which use an adaptive selection of the VENC parameter to optimize the VENC according to the expected velocities.

The project is part of a DFG-funded collaboration with partners from engineering and numerical computing at TU Darmstadt.



3D visualization of MRI-based measurements of flow in the aorta (left) and in a model of an aneurysm (right).

Motivated students should have an interest in medical physics, MRI and programming (MATLAB, C++). The project will be supervised by Dr. Axel Krafft in the Dept. of Medical Physics (head of department: Prof. Dr. Jürgen Hennig). Starting date for both projects would be as soon as possible.

For further information please contact or send an inquiry including CV to

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