

Magnetic resonance Imaging: Development of New Imaging Method for Diffusion Weighted MRI

Supervisor: Ass.prof. Pål Erik Goa, pal.e.goa@ntnu.no, D4-160.

Project type: C++ programming.

Main Goal: To develop an efficient imaging method for stimulated echo diffusion weighted MRI.

Project Background:

- The contrast in MRI can be made sensitive to the water self-diffusion in human tissue.
- Due to both time and space averaging effects, important information about the mesoscopic scale of cell structure is usually lost in standard diffusion weighted MRI (DWI).
- However, by carefully varying different degrees of freedom in the acquisition of DWI, we can extract more information than in the standard case.
- One such degree of freedom which is usually not explored is the diffusion time (sometimes also called the mixing time). Since the diffusion weighting in MRI depends on the square root of the diffusion time, we need to span a wide range of diffusion time values, from a few ms to around one second.
- One huge disadvantage with the currently available imaging method is that it is very time consuming and therefore not suitable for clinical use.
- The project supervisor has a concrete idea of how to reduce the scan-time for this method significantly, but it requires modification of the software on the clinical MRI scanner.

Project description:

- The student will start by studying the proposed idea for the new imaging method, drawing up the required gradients and rf-pulses to get a clear understanding of how it will work.
- Next the student will implement the new imaging method on the clinical MRI scanner, using the vendor-supplied development software (highly object-oriented, C++).
- The project requires a student with a strong interest in programming, since the MRI vendor software is not well documented and a fair amount of "reverse engineering" must be expected.
- On the bright side you will be working on the real deal, getting first hand knowledge of commercial MR imaging software from one of the worlds leading providers.