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Postdoctoral position:

Optimized noise filters for improved contrast in MRI

The Technical University of Dortmund has an opening for a postdoctoral researcher in a newly funded project that will develop and implement optimized experimental schemes for magnetic resonance imaging (MRI) experiments. The newly developed sequences of shaped pulses will modulate the interaction between the nuclear spins and their environment such that the information content of the resulting images is maximized. Depending on the specific diagnostic requirements, it can be optimized to either (i) optimally suppress decoherence (noise) effects in structured media characteristic of living tissue or (ii) optimally measure and analyze the noise spectra, and extract diagnostic information from the noise. For both goals, the optimal modulation scheme must be robust against experimental imperfections that are typically encountered in a clinical environment and keep the SAR values at acceptable levels. We expect that such optimally designed field modulation schemes will result in substantial improvements in signal-to-noise ratios and / or generate images that provide more direct information, e.g. on molecular diffusion processes in the tissues. The sequences will be designed with the help of optimal control theory, building on a substantial amount of expertise in the group in Dortmund as well as in the group of Gershon Kurizki, our cooperation partner in Israel. Initial experiments will be performed on a high-resolution NMR spectrometer. This allows for more measurement time, avoids many of the complications associated with clinical scanners and allows the most direct comparison between theory and experiment. When the initial checks are completed, we will move the experiment to a microimaging system that allows well-controlled tests of all aspects that require spatial resolution. To test aspects that are specific to whole-body imaging systems, we will implement the experiments on the 7 Tesla MRI scanner of the Erwin Hahn Institute. As the ultimate result, we expect that clinical MRI will have new tools at its disposal that significantly extend the diagnostic toolset of MRI.

Additional information on the research environment is available at http://e3.physik.tu-dortmund.de/research.

The ideal candidate for this position has a solid background in optimal control and / or magnetic resonance imaging. He / she should send an application, including CV, academic transcript, statement of previous research experience, and contact information for 3 referees to Dieter.Suter@tu-dortmund.de.