Lothar-Collatz-Seminar

Tue, 27. Sep · 2:15 pm · Geom H3

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Magnetic Particle Imaging
- Modeling and Solving a Dynamic Inverse Problem

Abstract:

Magnetic particle imaging (MPI) is a functional, tracer-based medical imaging technique, which measures the non-linear response of magnetic nanoparticles to a dynamic magnetic field. The visualization of tracer dynamics with high temporal resolution is of particular interest in many applications, e.g. cardiovascular interventions or blood flow measurements. While MPI offers a very high spatial and temporal resolution, the size of its field-of-view is limited by physiological constraints. Multi-patch scans, sequentially scanning smaller subvolumes, so- called patches, allow to increase the total field-of-view. The forward operator, or system matrix, required for image reconstruction can be determined by calibration scans or physical models. Neither measured system matrices nor the standard forward models in MPI account for changes in the tracer concentration during a single scanning cycle. As a result, to date, non-periodic dynamic tracer distributions are mostly reconstructed as a time-series of frames under the assumption of nearly static behavior during the scan of each frame. While being a feasible approach for limited velocities, the reduced temporal resolution and data gaps in multi-patch sequences and the ignorance of dynamics in the forward operators cause motion and displacement artifacts in the case of strong dynamics. This talk presents a dynamic forward model and a reconstruction method for dynamic tracer distributions based on the dynamic forward model and a spline representation of the concentration.

For further information please contact

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www.c3s.uni-hamburg.de/news-events/seminar-c3s.html