Bachelor's/Master's Thesis:
Automatic Catheter Tracking in MRI using Machine Learning

Institute of
Biomedical Imaging
Stremayrgasse 16/3
8010 Graz

Overview

Typically, catheter interventions in the heart are done under fluoroscopy. A projection of the whole thorax is obtained using X-Rays and shown to the performing physician in real-time. MRI guidance can provide some distinct advantages which could make it preferrable over fluoroscopy: Instead of a projection of the whole thorax, thin slices can be imaged, the soft-tissue contrast is much better, and there is no ionizing radiation involved.

However, catheter interventions in the heart have not arrived in the clinic and need more research. A problem which we currently face in this area is tracking the catheter during interventions. The goal of this thesis is to apply machine learning to find and track a catheter in an MRI video.

For a master thesis, we furthermore expect the integration of the tracking into our realtime MRI pipeline based on BART.

Specific tasks

- Literature review, gathering existing data
- Implement object tracking algorithm
- Train and apply a neural network on MRI data
- Phantom simulations
- Validation on real data against manual segmentation
- Documentation and illustration of the results

Recommended Knowledge

- Knowledge in Python and C Programming
- Interest in Machine Learning with application to MRI
- Basic git workflow
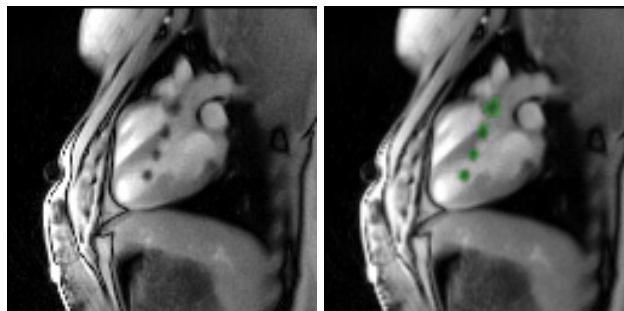
MR image of a catheter in vivo - highlighted in green are the MRI-visible markers of a catheter inside the heart.

Contact

Tina Holliber,
Email: tina.holliber@tugraz.at

Philip Schaten,
E-Mail: philip.schaten@tugraz.at

Moritz Blumenthal,
E-Mail: blumenthal@tugraz.at