# Master thesis

3D Geometry Reconstruction of Organs based on Monocular Endoscopic Image Sequences

Two main pillars of the department Augmented Vision are 3D Computer Vision and Augmented Reality. The input to both are in most cases 2D images or 2D+T image sequences. Key is hence the computation or estimation of depth information, in order to provide users with semantically correct scene segmentations and/or visually correct enhancements. The process is often called 3D reconstruction and various methods have been developed mainly based on multiple views of the same scene, e.g. stereo image pairs.

In medical imaging multiple views of the exact same scene are not available. This is especially true for endoscopic imagery acquired during surgery. Still 3D reconstructions can be computed based on exploiting the time dynamic nature of video sequences and the assumption of scene rigidity. In the newest research even the rigidity constraints can be relaxed.

Central research goal of the thesis is the development of **next-generation non-rigid 3D reconstruction algorithms** which can operate on monocular image sequences (2D+T video) generated by endoscopes. The resulting 3D reconstructions shall be used in training simulators for medical students and surgeons.
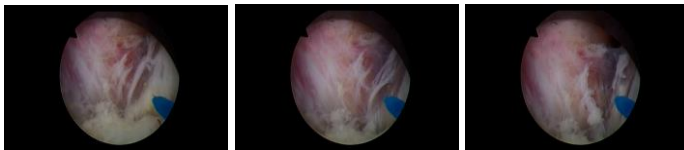
Endoscopic input images

Resulting reconstructions (state of the art)

Your qualifications and skills:

- Deep understanding of Linear Algebra, Calculus and Optimization methods
- Relevant experience in the field of Computer Vision (accomplished lectures / projects / seminars)
- Very good programming skills in C++ on Windows and/or Linux

Additionally at least one of the following will be a plus:

- Medicine as a complementary subject
- Interest to learn about medical applications
- Interest in medical visualization

High motivation and cooperative working skills in an innovative team are expected. In turn DFKI-AV offers excellent working conditions in an interdisciplinary team at an internationally renown research institute. More information about the department and the DFKI can be found at av.dfki.de as well as www.dfki.de.

Severely disabled applicants with similar technical and private qualification will be privileged. DFKI intends to increase the percentage of women in research positions and invites women especially to apply. We are looking forward to your meaningful application documents in paper or electronic form (PDF preferred) sent to the coordinates given below.

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