# Intraoperative model based identification of tissue properties based on multimodal and multiscale experiments

(IoC 105: Intraoperative modellgestützte Identifikation von Gewebeeigenschaften auf Basis multimodaler und multiskaliger Daten)

## Start of the project

01.01.2014

## Duration of the project

2 Years

## Project description

Minimally invasive surgery has for many applications replaced the open surgery, since the amount of tissue, which has to be cut, is reduced, resulting in a quicker recovery of the patient connected with reduced post operational stress. Moreover, offering some aesthetical advantages such as for facial operations. Besides all these advantages, minimal invasive surgery has restricted the working environment of the surgeon due to the loss of two mayor human senses (helping to guide the surgeon through the operation), the three dimensional vision and haptic feedback. The work described here focuses on the recovery of the latter. Haptic feedback is an important tool for the discrimination of different types (e.g. benign, maligned) and kind of tissue (e.g. fat, kidney). Our approach to recover the sensation of touch in minimally invasive surgery is based on elastography. Measurements are recorded on multiple scales of resolution (cell, tissue, organ) employing multiple elastographic techniques (e.g. AFM, 2D image correlation). Results are fed into a Finite Element (FE) model to generate an accurate description with regards to the elastic behavior of an organ. Different scenarios with alternating position, shape and size of a tumor within the organ are simulated (databank generation). For real time classification and segmentation of tissue in the surgical environment, the highly complex FE model is either reduced (e.g. principle component analysis) and/or template matching is applied to the minimally invasive measured 2D displacement map, while maintaining the important data describing the geometry of the tumor.

## Partners

The project is carried out in the cooperation with industry (Aesculap AG) and research (ISYS - Institute for System Dynamics, ITO - Institute of Applied Optics, IMWF - Institute for Materials Testing, Materials Science and Strength of Materials, UKT - Universitätsklinikum Tübingen and IAP - Institute for Applied Physics) partners.

## Acknowledgement

The Industry-on-Campus project IoC105 is funded by the Ministerium für Wissenschaft, Forschung und Kunst Baden-Württemberg, by the Universities of Tübingen and Stuttgart and the associated industrial partner Aesculap AG.

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## Webpage of the project

www.medizin.uni-tuebingen.de/Forschung/Forschungsverb%C3%BCnde/IZST/Industry_on_Campus-port-10443-p-76962.html