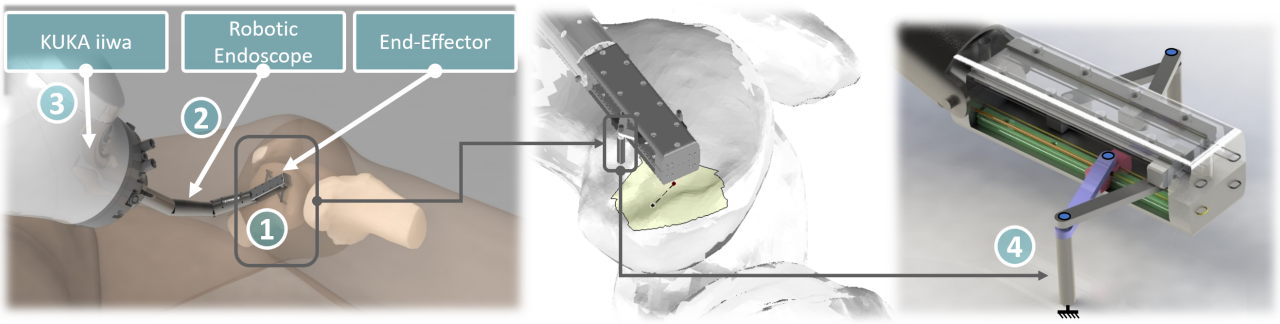
University of Basel

Project MIRACLE
Medical Robotics and Mechatronics
BIROMED-Lab

Department of Biomedical Engineering

Bachelor Thesis:
Design of Active Leg Fixation for a Self-Stabilizing Robotic Endoscope

Task description: In this project, you will support our interdisciplinary team in stabilizing and controlling the end-effector ① of a robotic endoscope ② which is guided by a serial robot ③. The aim of your thesis is the development of active leg fixation ④ for the bone mounted parallel mechanism that stabilizes the end-effector (Eugster et al. 2017, Hamlyn Symposium). These legs attach the end-effector to the bone and act therefore as the base of the parallel mechanism.



Your tasks:

- Basic Research: After familiarizing yourself with the current state of our work you conduct a broad literature research on different attachment strategies and leg designs. One main focus should lay on non-destructive approaches for the endoscope fixation to the bone (e.g. suction). Strengths and weaknesses of different strategies are summarized, especially with regard to the miniaturization potential of the concept.
- Concept Development: You will work out the requirements of the leg design with respect to the application in the knee (UKA). Particular consideration shall be given to the properties of the attachment surface in the knee and the integration of the legs into the end-effector. You will develop different leg designs according to the specified requirements and based on your literature research and creativity.
- Prototype Development and Control: You build a prototype of at least two of the designed legs. You will use the Beckhoff TwinCAT3 software system to control necessary hardware (e.g. vacuum pump and pressure regulator).
- Control and Evaluation: You evaluate the performance of your legs on different surfaces including a knee phantom, muscle and a pig knee. Further improvement possibilities of the design are identified and documented.

Start: May 2018, Duration: 6 months

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