

## Semester Thesis: Design of a Decoupling Mechanism for Disturbance Rejection in Robotic Laser Osteotomy

**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 this thesis is the development of an actuated robotic endoscope with at least two degrees of freedom for unicondylar knee arthroplasty (UKA). During this work, you will mainly focus on the concept and design of a mechanism which is able to decouple the robotic endoscope from the end-effector. This device will be a key element in the realization of a new concept for end-effector positioning and stabilization which is based on a bone mounted parallel mechanism (Eugster et al. 2017, Hamlyn Symposium).



### Your tasks:

- **Basic Research:** Literature research is conducted on robotic endoscopes in order to gain a good general understanding of their mechanical structure, actuation and working principles. Further literature research concentrates on different approaches to decouple the end-effector from the robotic endoscope (for example by releasing the tendon on the bowden cables controlling the robotic endoscope). Strengths and weaknesses of different approaches are summarized.
- **Concept Development:** The requirements of the current system are worked out together with the team. Determine the most promising concept for the decoupling with respect to these requirements and other relevant criteria such as miniaturisation potential and autoclavability.
- **Design:** Design and order the components of the selected decoupling mechanism.
- **Prototype and Evaluation:** Manufacture a prototype in the workshop of the BIROMED-Lab. Test and evaluate the prototype performance and identify and documented further improvements of the design.

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