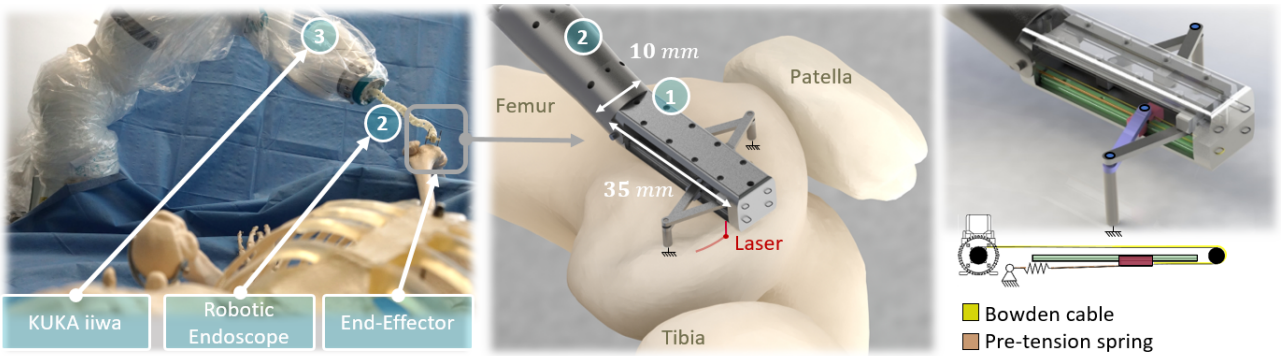
University of Basel

Project MIRACLE
Medical Robotics and Mechatronics
BIROMED-Lab

Department of Biomedical Engineering

Master Thesis:
Actuation Design for a bone-mounted Parallel Mechanism

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 is to obtain high precision and accuracy in the robot's pose to enable precise laser cuts despite present disturbances. You will redesign and improve the actuation of a mechanism for end-effector positioning and stabilization which has been designed and developed recently (Eugster et al. 2017, Hamlyn Symposium).



Your tasks:

1. Basic Research: Literature research is conducted on existing concepts for linear actuation with special regard to the miniaturisation and positioning accuracy, as well as possible sensor principles for position feedback.

2. Concept Development: Based on the methods found in literature and the creativity of the team, at least two new concepts for the linear actuation inside the end-effector are developed. Evaluation of the concepts (including the already existing concept) with respect to the relevant criteria such as miniaturisation potential, accuracy, autoclavibility and sensor position feedback possibilities is carried out. Based on the evaluation, the most promising concepts are selected.

3. Design and Experimental Setup: Design and order the components of the selected actuation concepts. Build a prototype of the selected concepts and set up the required test environment. Implement corresponding control algorithms.

4. Testing and Evaluation: Experiments are conducted to test and evaluate the functionality of the actuation concepts. Based on the results the most promising actuation concept is identified and integrated in the current prototype of the end-effector mechanism.

Start: November 2017, Duration: 6 months
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