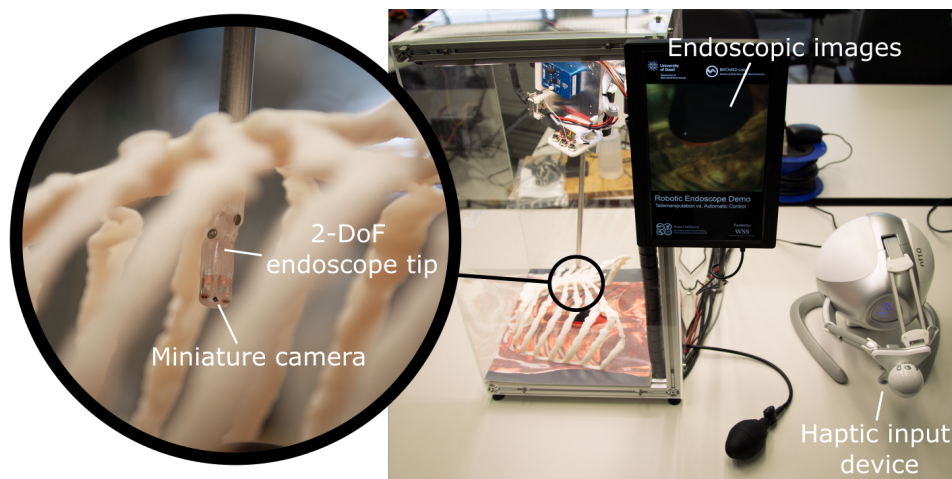


Master Thesis: Shared control of a robotic endoscope

Context: Minimally invasive surgeries, i.e., procedures with a minimal number and size of skin incisions, offer many benefits to the patient, but are challenging for the surgeons. When operating with an endoscope, the surgeon has to steer the advancement and the rotation of the endoscope, while the actual task is inspecting the surgical site, taking biopsies, or resecting pathological tissue. Robotic endoscopes with some level of autonomy are a promising solution to simplify endoscope manipulation. While the robot performs endoscope steering, the surgeon could focus more on the tasks that cannot be automated.

We built a robotic endoscope prototype that uses endoscopic images to control the endoscope movement (i.e., visual servoing). By tilting the endoscope tip in two degrees of freedom, it can follow a specific target and keep it in the image center. For safety and practical reasons, the surgeon should always have the possibility to take over the endoscope steering and move the endoscope tip manually.



Task description: The goal of this thesis project is to implement a "shared control" for the existing robotic endoscope, i.e., a control strategy that coordinates manipulation commands from the automatic vision-based control and the surgeon. Recommended work packages:

- Literature research: state-of-the-art and theory in robot telemanipulation with haptic devices, requirements analysis for applications in surgical robotics
- Concept development and evaluation: Different concepts based on the literature research and own ideas, evaluation of these concepts with respect to requirements
- Control strategy implementation
- Evaluation of the control strategy with respect to its requirements

Your profile: Background in mechatronics, robotics, mechanical engineering, electrical engineering, biomedical engineering, applied physics, or in a closely related discipline.

Start: Jan 2022
Duration: 6 months

Supervision:
Lorin Fasel
Dr. Nicolas Gerig
Prof. Dr. Georg Rauter

Contact:
Lorin Fasel (lorin.fasel@unibas.ch)
T: +41 61 207 54 72
<https://biomed.dbe.unibas.ch>