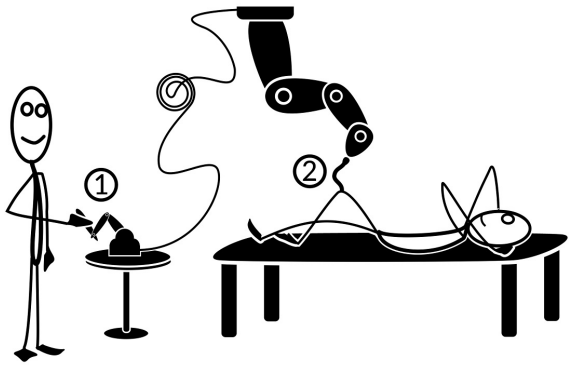
University of Basel

Project MIRACLE
Medical Robotics and Mechatronics
BIROMED-Lab

Department of Biomedical Engineering

Master Thesis:
Enhancement of Telemanipulation: A Survey on Haptic Feedback and Motion Scaling for a Robotic Endoscope

Task description: In this project, you will support our interdisciplinary team in developing an intuitive teleoperation interface (1) for a robotic endoscope (2). The aim of this thesis is to investigate the current state of the art in haptic feedback and motion scaling of telemanipulators. This will help our team to choose and investigate the most promising aspects of the human-robot-interface for our teleoperation system. During this work, you will focus on gathering the relevant literature in the field and summarize it with respect to the interests of the MIRACLE project.



Your tasks:

1. A systematical literature review of the current data presented in electronic databases will be carried out. Concerning the research on haptic feedback, an overview of the current state of the art in force and torque feedback in minimally invasive surgery will be provided. However, the main focus will lie on the application of active constraints, i.e. software- generated constraints that either limit the robot's motion to a pre-defined path or prevent it from entering so-called forbidden regions. Thereby, it is of special interest how the surgeon can be provided with orientational feedback of the endoscope end-effector with regard to the target orientation, since control of the endoscope end-effector's pose is critical for the future surgical application. The part on motion scaling will focus on studies identifying benefits and/or limitations of scaling movements of the operator to a smaller range of motion on the slave side. If this type of motion scaling leads to augmented usability it will be furthermore investigated which scaling ratio provides the best results. Here, a special focus will lie on data regarding the scaling of the slave's orientation.

2. Once the relevant literature has been identified systematically, all relevant findings will be summarized in the form of a structured report.

Start: September 2017
Duration: 16 months, part-time
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