University
of Basel

Department of
Biomedical Engineering

BIROMED-Lab
Medical Robotics and Mechatronics

Master Thesis: Assessment of Different Grasp Type Handles for a Teleoperated 6-DoF Peg-in-Hole Task with the lambda.6 Device

Context: This thesis is part of an interdisciplinary project called Minimally Invasive Robot Assisted Computer-guided LaserosteotomE (MIRACLE) that is carried out at the Department of Biomedical Engineering of the University of Basel. The principal aim of this project is the development of a minimally invasive robotic endoscope for cutting bone with laser light. In this project, you will support our interdisciplinary team in assessing different grasp type handles for a teleoperation device. Previous work has shown that the telemanipulator handle influences the functional rotational workspace (Zoller et al., 2019). In a follow-up study, we want to investigate if this difference can also be shown for surgery related tasks.

Task description: The goal of this thesis is to perform a user study assessing the performance of different grasp type handles in a 6-DoF peg-in-hole task. You will be involved in all steps of the user study: study design, study conduction, data analysis, and evaluation. Based on the results of the study, you will investigate if there is a correlation between the functional rotational workspace of the handles and their feasibility for inserting a peg in a hole with a given orientation.

Workpackages:

- Literature research: Conduct a broad literature research on existing knowledge about telemanipulator handles and their applicability for specific tasks, as well as about peg-in-hole tasks and the analysis of such tasks.
- Setup familiarization: Get familiar with the hard- and software (lambda.6 haptic device, HTC Vive, CHAI3D, Unity) used to conduct the study.
- Study design: Design user study, write ethics application, conduct pilot tests, and adapt the study design according to the pilot test results.
- Study conduction: Recruit participants for the study and carry out the study.
- Data analysis and evaluation: Analyze the acquired data and conduct a statistical evaluation on the data to draw conclusions from the study.

Student: Sibylle von Ballmoos
Start: September 2019
Duration: 6 months

Supervision: Esther Zoller
Professor: Prof. Dr. Georg Rauter
Professor ETH: ...

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