Open Master Thesis Project

Controller to mimic motion and force of a human jaw with an active phantom

BIROMED-Lab
Department of Biomedical Engineering

The Bio-Inspired RObots for MEDicine-Laboratory (BIROMED-Lab) at the Department of Biomedical Engineering (DBE) at the University of Basel offers an exciting, multidisciplinary, and applied learning- and research environment. Our research is interdisciplinary and organized in close collaboration with clinicians and industrial partners.

Project background:
You will join the BIROMED-Lab performing medical robotics and mechatronics research under the lead of Prof. Dr. Georg Rauter. You will be part of the project team **Miniature Intraoral Robot (MIR) Performing Minimal-invasive, Personalized and Precision Dentistry**. In this project, our aim is to develop a robotic device for tooth preparation enabling a fully digital treatment workflow. To test and evaluate the miniature intraoral robot, we are developing a sensorized dental phantom head.

Project description:
The goal of this thesis is to develop a controller to move the articulated jaw in a dental phantom head. You need to identify and parameterize human jaw motion in 6 degrees of freedom and force profiles. Later, you will develop a path controller to mimic the motion on the articulated jaw. You will extend the control to include a human-robot interaction scheme to manually move the jaw along the path.

Your tasks will include:

- Determine the requirements for the articulator control
- Conduct research on the state-of-the-art of active jaw articulator
- Identify and parameterize jaw motion and force profiles
- Develop and implement concepts to mimic jaw motion and forces with the articulator
- Evaluate and compare the performance of the articulator control with respect to the set requirements

Start date: April 2025 or upon agreement. You will work at the DBE located in the new SIP Basel Area main campus, an exciting and modern working environment in which various research groups of the DBE are located.

Your profile:

- You are pursuing a master's degree in electrical, computational or mechanical engineering or a closely related discipline
- You are a hands-on person who likes to work with hardware
- You are curious, motivated and self-driven
- You want to work in and contribute to an interdisciplinary and applied research project

Ready to revolutionize dentistry? We are.

Supervisors: Dr. Murali Karnam and Carina Schmidt
Advisor: Prof. Georg Rauter

Want to know more about us? check out www.dbe.biromed.unibas.ch and contact us for a lab visit.

University of Basel
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