



Open Master Thesis Project

Implementing a dental tool tracking system into a sensorized phantom head

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 team for the project **Miniature Intraoral Robot (MIR) Performing Minimal-invasive, Personalized and Precision Dentistry**. In this project we aim to develop a robotic device for tooth preparation enabling a fully digital treatment workflow. The basis for the development of this miniature intraoral robot is a sensorized dental phantom head, which we are currently developing.

Project description:

The goal of this thesis is to allow automated recording and tracking of a dental treatment procedure (e.g. a tooth preparation for a crown) inside a phantom head. You will work on the design of a camera system that can be integrated into the mouth cavity of a dental phantom head. This camera system will consist of a set of miniature cameras and a tool tracking algorithm. The main challenges of the project are the restricted space in the phantom head and the observation of the manually operated dental tools in different treatment locations.

Your tasks will include:

- Determine the requirements for the camera system
- Conduct research on the state-of-the-art for miniature cameras and vision tool tracking
- Develop concepts for the camera system based on the defined requirements and the state-of-the-art
- Identify the best concept and setup a prototype of the camera system
- Adapt the selected tool tracking algorithm if necessary
- Evaluate the performance of the camera system with respect to the set requirements

Start date: March 2024 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

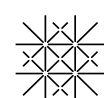
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- CV
- diplomas and course transcripts



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**University
of Basel**

Department of
Biomedical Engineering