LAROCARE Open Master Thesis

Kinematic Modeling of a Robotic Arthroscope

BIROMED-Lab
Department of Biomedical Engineering

Join us for the project «Laser-Assisted RObot-guided Cartilage Regeneration (LAROCARE)»

Project Background

LAROCARE is a joint project between three labs at the Department of Biomedical Engineering and aims to improve the outcome of chondral and osteochondral defects regeneration in the knee by combining two approaches. First, by precise, controlled, and standardized shaping of the chondral and osteochondral defects using a laser. We call this robotic device “minimally-invasive smart robotic laser arthroscope” because we are aiming at an arthroscopic-assisted or a mini-arthrotomy procedure. Second, we combine this precise bed preparation with novel regenerative cell-based methods and biopolymer-based hydrogel.

Job Description

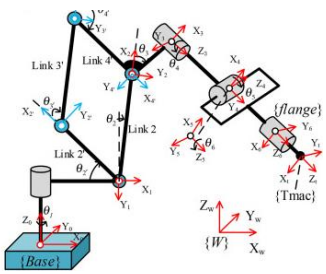
This master thesis focuses on the kinematic modeling of a 4-DoF hand-held robotic arthroscope. The main challenge will be to find fast and accurate forward (and backward) kinematics for a non-holonomic robot. Your tasks include:

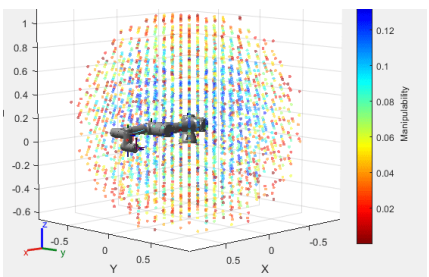
- Model the kinematic strain of the robot and identify the system boundary parameters
- Develop a simulation tool for the arthroscope (e.g., in Gazebo)
- Derive the parameterized kinematic equations
- Analyze the robot’s manipulability and optimize the geometry if necessary

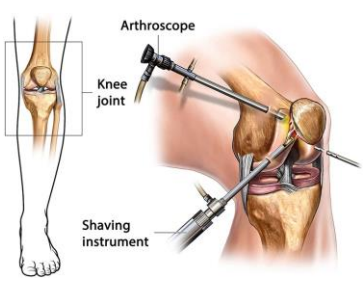
Start date: November 2024 or upon agreement. You will work at the DBE located in the new SIP Basel Area campus in Allschwil, an exciting and modern working environment with various research groups.

Your profile:

- You are pursuing a master’s degree in mechanical engineering or a closely related discipline
- You have solid skills in kinematics and geometry
- You like to work with simulation
- You are curious, motivated and self-driven
- You are a team player and eager to work with other students
- You want to work in and contribute to an interdisciplinary and applied research environment
- Experience with Matlab, Gazebo, or a similar simulation tool is advantageous







Apply to this project by email. Send us (michael.sommerhalder@unibas.ch) the following materials:

- CV
- Diplomas and Course Transcripts

Want to know more about us? check out www.dbe.biromed.unibas.ch or plan a lab visit.

BIROMED-Lab

University of Basel Department of Biomedical Engineering