Job Offer: PhD Position in Robotics for Minimally Invasive Surgery

Project Title: Development of Accurate Control Models for Tendon-Actuated Continuum Robots in Endoscopic Surgery

Context: Continuum robots have emerged as revolutionary tools in Minimally Invasive Surgery due to their unique ability to navigate through small incisions or openings, offering flexible and curved access to intricate anatomical structures within the body. Tendon-actuated robots, in particular, are commonly employed in surgical settings, offering precise manipulation within the surgical environment. However, achieving precise control of these robots presents significant challenges, primarily due to their deformable nature and complex interactions with anatomical structures.

Objectives: This project aims to develop accurate control models capable of capturing the nonlinear behavior of tendon-actuated continuum robots, especially when navigating through endoscope working channels. By incorporating realistic nonlinear Finite Element (FE) models into the robot's control system, the project seeks to address factors such as friction, interactions with the channel, and environmental effects. The primary application of this research focuses on enhancing Endoscopic Submucosal Dissection (ESD) procedures by automating specific tasks, thus reducing the surgeon’s workload.

Relation to the State of the Art: Traditionally, models for continuum robots have progressed from simplistic geometric assumptions to more intricate mechanics-based frameworks. Despite advancements, accurately representing interactions such as friction and contact remains a challenge. This project aims to bridge this gap by integrating advanced numerical models and interaction models to manage factors crucial for addressing challenges in surgical robotics.

Methodology and Planned Timetable: The project methodology involves several critical aspects, including modeling continuum robots, addressing nonlinear phenomena in robot control, and exploring advanced control strategies. The planned timetable spans over three years, with the first year dedicated to modeling the endoscope and investigating Cosserat formulation. The second year will focus on using the model in iFE simulation, defining constraint objectives linked to clinical tasks. The third year will involve experiments and parameterization.

Job Details:

- Position: PhD Researcher
- Duration: 3 years, starting in September
- Location: Strasbourg
- Responsibilities: Conduct research, develop control models, perform simulations, collaborate with interdisciplinary teams, publish findings in peer-reviewed journals, and contribute to project milestones.
- Qualifications: Master’s degree in Robotics, Mechanical Engineering, or related field, strong background in control theory, robotics, and simulation techniques, proficiency in programming languages such as C/C++. excellent communication and teamwork skills.

How to Apply: Please submit your CV, cover letter outlining your research interests and relevant experience, academic transcripts, and contact information for two referees to hcourtecuisse@unistra.fr. Application deadline: 01/05/2024.

Join us in this exciting opportunity to advance the field of robotic surgery and make a meaningful impact on patient care. We look forward to welcoming a motivated and talented individual to our team.