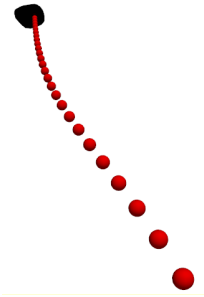
MSc internship – 2019

Real time replanning of trajectories for percutaneous surgery

Supervision: Caroline Essert (essert@unistra.fr) and Sandrine Voros (Sandrine.Voros@univ-grenoble-alpes.fr)

Context:



In surgery, when inserting needles in the human body, an important step is to be able to monitor the needle insertion and replan the trajectory in real time to adjust it if it deviates from the target, because of breathing for instance. Tracking of the surrounding anatomical structures is usually performed under ultrasound monitoring. Our objective is to implement a trajectory replanning algorithm fast enough to be compatible with real-time tracking.

Work:

Using existing 3D patient models and simulation of organs motion, as well as an existing algorithm for the preoperative planning of optimal trajectories on rigid models, the work will consist in proposing a new algorithm capable of detecting changes altering the optimality of the trajectory (displacement of the target, of an obstacle, …) and recompute in real time an alternative optimal trajectory.

The candidate will start with a bibliographic study on surgical planning for image-guided interventions accounting for deformability of the organs, needle steering and tracking. Then, the intern will propose new algorithms, implement them, and conduct experiments to rigorously validate the approach. The results will be analyzed to conclude on the relevance of the proposed approach. Depending on the results, this work may lead to the writing and submission of a scientific publication, and to a PhD.

The development will be done within the platform CamiTK (http://camitk.imag.fr/), using C++ and VTK library.

This project is part of a collaboration between the IMAGeS group of ICUBE lab, University of Strasbourg (http://images.icube.unistra.fr/) and the GMCAO group of TIMC-IMAG in Grenoble (https://www-timc.imag.fr/gmcao). The internship will be located in Strasbourg, but some travels to Grenoble may be considered, funded by the lab, to enrich the internship experience.

Duration of the internship: 6 months, starting January, February, or March 2019.

Profile: MSc with a major in computer science, computer graphics, image processing, or related fields. Proficiency in C++ is required.

The intern will receive the legal stipend for trainees (around 500€ per month).

For further information and application, please contact the supervisors.