Proposition de Stage Recherche Master 2
Ultrasound Image Simulation for Surgical Training
Carleton University
Ottawa, ON, Canada

Research Project Overview - Percutaneous nephrolithotomy (PCNL) is a procedure to remove large kidney stones via a small incision in the patient's back. Despite over 40 years of development, PCNL remains a complex procedure to master and is associated with a high risk of complications. Fluoroscopy is the preferred imaging modality in PCNL, however, ultrasound has been emerging as an easier-to learn alternative. In collaboration with Marion Surgical, the Ottawa Hospital, and the Kingston Health Sciences Centre, the intern will be involved in a project aimed at developing the first virtual reality simulator for ultrasound-guided PCNL. The simulator will enable urologists to immerse in a virtual operating room to practice PCNL in a controlled environment. Specifically, the intern will develop methods to create volumetric ultrasound images from 2D images, display real-time 2D images, and simulate the presence of surgical tools in the images. The researcher will have access to a state-of-the art surgical simulator and will work in close collaboration with a company, urologists, and radiologists in a truly multidisciplinary research environment. An offer to extend the project to a PhD research at Carleton University or in Cotutelle may be extended to exceptional candidates following the completion of the internship.

Position Duties and Responsibilities - The incumbent of this position will, under the direction of Prof. Carlos Rossa, be responsible for leading research activities including but not limited to the following core responsibilities:
- Develop algorithms to create volumetric ultrasound images from 2D images;
- Develop algorithms to simulate 2D images in real-time • Develop methods to simulate the presence of a surgical tool in the images;
- Work with an industry partner to implement the algorithms in a commercial VR surgical simulator; • Prepare manuscripts for publication;
- Assist with graduate student supervision;
- Collaborate with an interdisciplinary team of scientists and industry partners.

Job Requirements - The ideal candidate will have one or more of the following qualifications:
- Background in Computer Science, Engineering, or relevant areas;
- Expertise in medical imaging, or ultrasound imaging would be an asset;
- Strong communication, teamwork, and leadership skills;
- Strong writing skills;
- Expertise with unreal engine and real-time simulation is also an asset but not required.

Department Background Information - The Department of Systems and Computer Engineering at Carleton University (located in Ottawa, Canada) is a recognized world-class institution in computer systems engineering, electrical engineering, software engineering, communications engineering, and biomedical engineering. The department offers a broad range of undergraduate and graduate programs in these disciplines. More information here: https://carleton.ca/sce/

How to Apply - Candidates that would like to apply for this internship are invited to submit the following documents to Prof. Carlos Rossa at rossa@sce.carleton.ca (in English or French)

- A recent CV;
- University transcripts;
- Please indicate your desired state date.

More information here: https://www.biomechatronics.ca/