COMPUTER ASSISTED MEDICAL INTERVENTIONS

Haptic interface in robotic surgery simulation systems

Post-doctoral project supported by the LABEX CAMI, http://cami-labex.fr/

Location: LIRMM Lab. (Montpellier University)

Involved researchers and contact:

Philippe Poignet, LIRMM, poignet@lirmm.fr
Nabil Zemiti, LIRMM, zemiti@lirmm.fr

Pierre Jannin, LTSI, pierre.jannin@univ-rennes1.fr
Fabien Despinoy, LTSI, fabien.despinoy@univ-rennes1.fr

Starting date: April 2018

Duration: 18 months

Salary: Montpellier University grid – according to CV

Keywords: surgical training, robotic assistance, virtual mentoring, haptic interface, learning and automation.

1. The CAMI context

Medical Interventions (surgery, interventional radiology, radiotherapy) can benefit from a significant boost for progress in terms of patient-specific optimal planning and performance. To fulfil the patient's demands for quality, senior operators demand to see beyond the immediately visible, to be assisted in their real-time vital decisions and to provide access to enhanced dexterity, while junior operators need to "learn to fly" before being left alone, and public health authorities and companies require demonstrations of the medical benefit of innovations.

The Computer Assisted Medical Interventions LABEX (CAMI LABEX) strategic vision is that an integrated approach of medical interventions will result in breakthroughs in terms of quality of medical interventions, demonstrated in terms of medical benefits and degree of penetration of CAMI technology in routine clinical practice.

Among the different actions undertaken in the scope of the CAMI LABEX, 6 to 10 theses starting yearly are to be financed. Subjects dealing with themes within LABEXs scientific field and resulting from collaboration between different CAMI partners will be favoured. The following thesis proposal falls within this framework.

2. Context and objectives

Besides the advantages of robotic-assisted surgery which can lead to lower post-operative pain, shorter hospital length of stay and convalescence time and better cosmetic results for the patient, the use of robotic system in the operating room increases capacities of the surgeon in term of comfort and precision during manipulation. However, the medical community agrees that handling such device required to acquire dedicated technical and non-technical skills. Different ways to improve suck skills are discussed in the literature but all support that surgical training is of primary importance[1].

[1] Rapport de la Haute Autorité de Santé (HAS), *Bilan de l'enquête concernant les robots chirurgicaux Da Vinci de la société Intuitive Surgical à destination des professionnels de santé*, Agence Nationale de Sécurité du Médicament et des Produits de Santé, Février 2014.

Where one developed augmented feedback to the surgeon by using visual features for advanced visualization in training, other argue that shared control between surgeon and machine through for instance haptic feedback can help to better understand and learn specific gestures to realize.

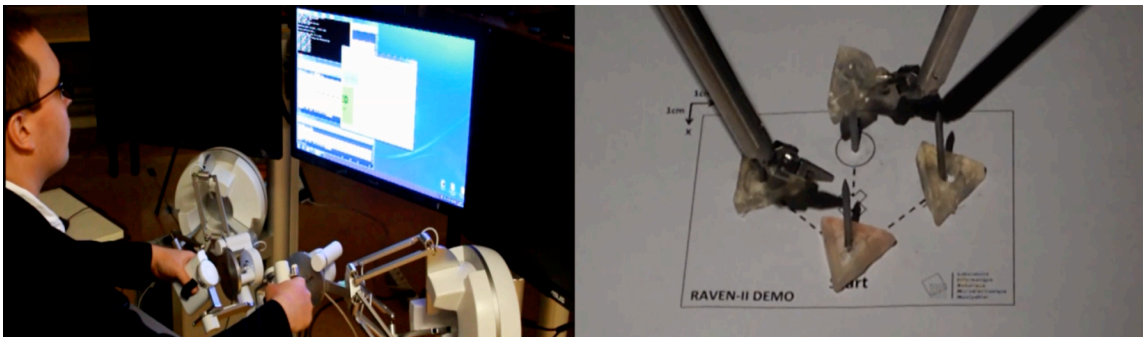

Fig. 1: The robotic-assisted surgical training platform at the LIRMM lab. The left view shows the Force Dimension console with two Sigma.7 devices allowing the user to control the Raven-II robot with two needle holder surgical instruments at the right. This platform is equipped with a 3D visual feedback.

In this work, we want to focus on the second aspect by studying the influence of integrating haptic feedback in surgical robotics simulation platforms. It will consist first in analyzing the interaction forces applied during simple simulated robotic assisted laparoscopic tasks. The postdoc will study new approaches and metrics for comparing forces between operators. Secondly, the postdoc will integrate a new haptic interface into a surgical robotics simulator (namely the Actaeon Console from BBZ available at LIRMM) and assess its impact on the performance of the basic tasks.

The project will be performed between the LIRMM Lab. (Montpellier University) and the LTSI Lab. (INSERM and Rennes 1 University). The Postdoc will be recruited by the University of Montpellier (UM) for 18 Months and will work at the LIRMM offices located at the Medical School of Montpellier. Several meetings between LIRMM and LTSI will take place during the first months in order to better define and adjust the proposed objectives as well as create a detailed work program (including bibliography study, specifications and requirements, etc.). A close clinical collaboration between the candidate and surgeons of the Medical school of Montpellier will be held.

Requirements: mechatronics design, software development (solid background in programming especially in C/C++), knowledge in signal/image processing, familiar with Linux OS.
Previous experience in Haptics for medical robotics and/or computer-assisted surgery is highly appreciated
English, CEFR B2 level (minimum)

Degrees/desired profile: Engineer or PhD in Robotics or Mechatronics, or an equivalent area.

Workplace: Shared between the LIRMM (University of Montpellier / CNRS) and the Montpellier Medical School.

Contact:
Thanks for sending your CV, a cover letter, and contact information of two referees to:

Philippe.Poignet@lirmm.fr and Nabil.Zemiti@lirmm.fr