Development of a sensorized glove for assessment of grip forces during manual and robotic manipulation of surgical instruments

Receiving applications until January 2016

Internship duration: From 4 to 6 months, starting February or March 2016

Keywords: Electronic system development, medical robotics, minimally invasive surgery

Context

STRAS is a telemanipulated robotic system developed by the ICube laboratory for use in intraluminal surgery, and which has now reached the level of pre-clinical trials. Such robotic assistance to minimally invasive surgery can provide many advantages for surgeons, when compared with the manual manipulation of laparoscopic surgical instruments: more comfort, less people required for handling several instruments... However there remain several open questions concerning the evolution in the use of such telemanipulated robotic systems. For this purpose, several information can be gathered from users during manipulation of manual and robotic systems, for instance by recording motions of their arms / hands and forces induced by the user on the instruments.

Objectives

The objective of this Master project is to study the evolution (with practice) of manually induced forces during "traditional" and robotic surgical instruments manipulations (time-space mapping of grip forces during tool-manipulation). Previous research has shown that the force signatures of well-practiced experts yield significantly smaller magnitudes than those of novices in "traditional" laparoscopic tool use, but nothing is known yet about grip force evolution with practice during motorized tool
manipulation. To approach this question, the intern will be expected to build a glove-like sensor system for the time-space mapping of grip force signatures, and to run a pilot experiment measuring the evolution of mapped time-space parameters with practice, comparing classic laparoscopic tool use to robotic tool use.

The internship will mainly consists in three stages:

- 1/ Development of the measurement system,
- 2/ Design and preparation of the experiments with people from the lab and surgeons,
- 3/ Acquisition and analysis of data.

**Wanted Skills**

Candidates should be preparing a master with a major in one of the following fields: electronics, robotics, computer engineering.

He / She should have skills in the following topics:

- Programming of microcontrollers (knowledge of Arduino is a plus)
- Design and realization of electronic / embedded systems

The candidate should be sufficiently skilled to work autonomously during the first stage of the internship (realization of the device). He / She should like experimental work.

**Work environment**

The internship will be mainly carried out at the robotic platform of ICube located at the IRCAD in downtown Strasbourg. The intern will have access to the robotic system STRAS for the experimental part. He / She will work with researchers and engineers in medical robotics and will interact with surgeons from the IRCAD.

The intern will receive the standard "gratification" (520 euros / month).

Supervision will be assured by Florent Nageotte (Associate professor in medical robotics), Ufuk Batmaz (PhD student with a strong background in electronics and microcontroller programming) and Birgitta Dresp (Researcher in cognitive science).

To apply for the internship, please send an email with CV and cover letter to Florent Nageotte : Nageotte@unistra.fr