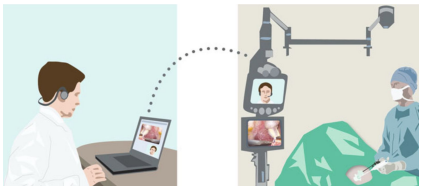
Ph.D. Thesis: Interactive Surgical Telementoring

Interacting with a remote mentor while performing surgery

Labs: ISIR, Sorbonne Université and TIMC-IMAG, Université Grenoble Alpes.
Supervisors:
ISIR: Ignacio Avellino and Marie-Aude Vitrani
TIMC-IMAG: Sandrine Voros and Jocelyne Trocaz
Funding: Labex CAMI
Dates: starting between September 2021 and January 2022. Duration: 36 months.
Application Deadline: April 1st, or until position is filled.

Context

Surgery is a fundamental part of illness treatment in healthcare, however, access to specialized surgeons is a pressing concern: the number of surgeons per population is constantly declining (Sheldon et al., 2008), largely because the difficulty of learning surgery results in students dropping out of surgical school (Berman et al., 2008). Having surgeons travel to teach specialized procedures is not cost effective, and as the global COVID-19 pandemic has shown, many times simply not possible. It is thus important to develop technologies through which surgeons can teach surgery remotely. This project studies interactive systems for **surgical telementoring** from the perspective of the *mentee* (figure, right), a surgeon that is guided in real-time while performing surgery by a *mentor* (figure, left), a remote expert surgeon.



Project goals

1. Study the surgical mentoring model in a co-located setting (two surgeons side by side) to understand the challenges in collaboration when being guided by a surgeon. This will involve both literature review as well as field studies involving observing and interviewing surgeons.
2. Design interaction mechanisms to support *tele*mentoring: mentoring at a distance.
3. Implement these mechanisms, and evaluate them with surgeons

Contributions

Empirical: through empirical studies, this thesis will contribute to the growing literature on the practice of surgical mentoring (Feng et al., 2019; Feng & Mentis, 2018; Mentis et al., 2014, 2016).

Conceptual: through this thesis, we will conceptualize novel interaction mechanisms to support remote collaboration with a remote mentor, while grounded on the constraints of the operating room, such the need for touchless interaction given the need for sterility (Mentis et al., 2015; O'Hara et al., 2014).

Technological: the implementation of these interaction mechanisms will benefit from a unique opportunity to use the equipment and knowledge of the Labex CAMI, in particular the *Surgical Cockpit* platform at ISIR and *Augmented Endoscopy* at TIMIC-IMAG. This includes for example instrument tracking through kinematics (Avellino et al., 2020) or image-based (Zhao et al., 2019) approaches. We encourage the candidate to further explore novel technologies such as Augmented Reality and Virtual Reality (Weibel et al., 2020).

Profile

We are seeking candidates with a master in one of the following topic areas: Human–Computer Interaction (HCI), Computer Supported Cooperative Work (CSCW), Cognitive Science or Healthcare Technology. Candidates from other fields are encouraged to apply given they have an interest in interaction and surgery. We value an interest in reading and writing academic research, as well as having a good academic record. Lastly, candidates should be fluent in English.

Please keep in mind that a Ph.D. student is exactly that: *a student*. Thus, we do not expect candidates to have a full set of skills when applying. What we expect is to have the motivation to learn and develop certain skills throughout this thesis. So please reflect on what skills you bring and want to develop further, and what new skills you want to acquire when applying. As supervisors, we will do our best to support you in developing them and becoming a successful Ph.D!

How to apply?
Send an e-mail to ignacio.avellino@sorbonne-universite.fr with:

- Subject line: [Ph.D. Application] <your name>
- A paragraph indicating why you want to work with one or two of the supervisors in particular
- A paragraph with your research interests, and how they align with this project
- A paragraph indicating your skills. This can include for example coding, collecting data for studies through interviews, qualitative or quantitative data analysis, writing, reviewing literature, machine learning..
- An element that highlights one skill, such as a piece of writing or something you have coded
- Contact for 2 references
- Your CV

If you send an application that feels tot generic, without showing particular interest in the topic or supervisors, you might not get a reply.

Thesis and Environment

This thesis will be co-supervised in two labs: ISIR, Sorbonne Université and TIMC-IMAG, Université Grenoble Alpes. The student will integrate and work in both labs, spending half of the thesis time in each one, although this is highly flexible especially given the uncertainties of the COVID-19 pandemic.

The Ph.D. candidate will integrate a multi-disciplinary environment that provides a unique and healthy research environment, with many other fellow Ph.D. students working in a wide variety of topics, including: robotics, HCI, machine learning, perception, cognitive science, haptics and social interaction. We strive for providing fertile ground for personal and academic growth through regular team and individual meetings, giving students the chance to explore their own interests and exchange freely with fellow students. The development and the success of our students from bachelor to Ph.D. is our highest priority at both labs. Through regular and personal guidance, we ensure that students lead successful research projects and are prepared for a future academic or industrial job.

References

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