

Sujet de thèse

Titre de la thèse : Designing Interaction for Remote Collaboration in the Operating Room

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Envoyer votre candidature par mail, avec [*sujet de la thèse*] en objet, un CV et une lettre de motivation.

Date limite de dépôt de la candidature : 15 Mai 2023

Description du sujet

Context

To perform surgery, surgeons typically work in collaboration with a team of experts, for example a more senior surgeon advising on a surgical technique, a radiologist interpreting an x-ray or ct-scan, or an anatomic-pathologist interpreting microscopic images of tissue to diagnose cancer. These experts are typically not present in the Operating Room (OR), and therefore the surgeon conducts remote consultations through phone calls. Our hypothesis is that existing tools for remote collaboration are not effective nor easy to use when working in the OR because they lack effective interaction mechanisms. The challenges of interacting with a collaborative system are that the primary task, performing surgery, is cognitively demanding, but also physically demanding, as both hands of the surgeon are busy handling instruments (Avellino et al., 2021). Moreover, the hands of surgeons are sterile, and using classic means of interaction (mouse or keyboard) requires breaking sterility and re-sterilizing before going back to the patient. Previous works in Human-Computer Interaction (HCI) and Computer Supported Collaborative Work (CSCW) have studied interaction techniques in the OR, for example controlling imaging systems through voice and gesture (Feng et al., 2021; Mentis et al., 2015) or a combination of gaze and feet (Hatscher et al., 2017), and a robotic endoscope using a multimodal technique that combines several input mechanisms (Avellino et al., 2020). Nonetheless, these techniques (1) have not been studied in the context of remote collaboration, but rather individual work in the OR, and (2) they have not been adopted in real surgical work thus far, pointing to a partial support of the wide variety of needs during surgery. So far, research has been able to conduct studies where the remote expert interacts, such as studying the benefits of remote pointing (Mentis et al., 2020; Semsar et al., 2019, 2020). This project will open the door for a large body of work that can study the benefits and challenges of remote collaboration where both parties can interact with systems.

Sous la co-tutelle de :

Objectives and Contributions

1. The first objective is empirical: it consists of understanding the constraints of the work in the OR for interaction, (2) current practices for using interactive systems, and (3) the needs of surgeons while conducting remote consultations with colleagues. This will be studied through field studies, and the contributions will include guidelines and implications for the design of interaction techniques in the OR.

2. The second objective is technological: it consists of designing and implementing interaction techniques for remote collaboration in the OR. These can include for example the use of AV/VR (Gasques et al., 2021). Then, evaluating the techniques through lab experiments and field studies in the OR.

Impacts

Enabling interaction with remote surgeons, will favour jointly navigating pre-operative images for co-interpretation, to joint decision making when it comes to determining the next steps of the surgery. Moreover, it will open new opportunities for learning surgical techniques, an area that is in need of improvement given the growing number of medical students (Berman et al., 2008).

Seeked Profile

We are seeking candidates with a master degree 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 require 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 to this position. 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!

Double Mentoring Funding and Thesis Environment

The double mentoring of the Institut Universitaire d'Ingénierie en Santé funding, by a researcher and a practitioner, will provide a unique opportunity for the Ph. D. student, as they will work in an engineering lab as well as in a teaching hospital, having access to both technical knowledge, high-end materials and experimental rooms, as well as clinical knowledge, the possibility to observe surgery, and the chance to develop a network of clinicians that can participate in studies.

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 to provide 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. Through regular and personal guidance, we ensure that students lead successful research projects and are prepared for a future academic or industrial job.

Sous la co-tutelle de :

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