

Haptics in Surgical Robotics

Istanbul, June 21st, 2011

Abstract: Surgeons' hands are their main tools. They intuitively process both visual and haptic senses to perform a surgery. Yet, in robotic surgery, the use of a teleoperated system removes the direct contact of hands with tissues and thus, diminishes the sense of touch. Although 3D stereoscopic vision and enhanced dexterity are fully exploited in this field, the tremendous potential of haptic feedback has been confined to research activities. Up to now, the essential role of haptic feedback has not been fully recognized by the medical community since its benefits have not been demonstrated for clinical use due to the technical challenges. This half-day workshop aims at discussing these issues by bringing together surgeons, developers and research engineers with a strong experience of robotic surgery. First, we will identify the role of haptics in robotic surgery guided by medical needs. Then, it will be analyzed whether the state-of-the-art haptic technology can satisfy the medical needs. This should enable us to point out future directions and to bridge the gap between the surgeons' dream and what engineers can realize.

1 Organizers

Evren Samur, Ph.D. Laura Santos-Carreras, M.S. Ali Sengül, M.S. Hannes Bleuler, Prof.

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2 List of Presenters

- 1) Monika Hagen, M.D., Intuitive Surgical, USA
- 2) Stéphane Dominguez, M.D., University Hospital in Geneva (HUG), Switzerland
- 3) Andreas Tobergte, German Aerospace Center (DLR), Germany
- 4) Patrick Helmer, Ph.D., Force Dimension, Switzerland
- 5) Katherine J. Kuchenbecker, Prof., University of Pennsylvania, USA
- 6) Vincent Hayward, Prof., Université Pierre et Marie Curie, France

All presenters, except Dr. Dominguez, confirmed their participation as keynote speakers. The workshop is funded by the European Commission in the framework of the ARAKNES and SAFROS Projects.

3 List of Topics

Haptic feedback in surgical robotics, Design of robotic surgery consoles, Surgical simulation and training, Safety in robotic surgery, Cooperative surgery, Multimodal haptics and telepresence.

4 Motivation and Objectives

Robotic surgery has been a domain of intense research activity in recent years and it has still high growth potential in the near future. The goal of this workshop is to bring participants into close

contact with open-minded surgeons and skilled engineering professionals for the progress of robotics surgery.

The objectives of this workshop are, first, to discuss the essential role of haptics in surgical robotics; second, learn more about the current haptic technology for medical robotics and third, identify and prioritize emerging and future developments, especially from the point of view of medical needs.

5 Intended Audience

Researchers, engineers and medical doctors who are involved in surgical robotics and especially in the developments for robotic surgery consoles. In addition, students who would like to learn more about the challenges and the open research questions in this field.

6 Tentative Schedule and Agenda

Time	What	Who
13:00 – 14:00	Informal get together & lunch	
14:00 – 14:10	Welcome	Evren Samur, Hannes Bleuler (EPFL)
Topic 1: Role of Haptic Feedback in (Robotic-)Surgery		
14:10 – 14:30	<i>“Haptic feedback in surgery: A surgeon’s perspective”</i>	Monika Hagen (Intuitive Surgical)
14:30 – 14:50	TBD	Stéphane Dominguez (HUG)
14:50 – 15:30	Group discussions Keywords: Safety, Tissue interaction, Palpation, Temperature feedback, Training	Separate groups
15:30 – 15:50	Summary of group discussions	Plenary
15:50 – 16:10	Coffee Break & Demo of sigma.7	Patrick Helmer (Force Dimension)
Topic 2: Current Technologies for Haptic Surgery Consoles		
16:10 – 16:30	<i>“Hardware & Control Design of a Haptic Surgery Console (MIROSURGE)”</i>	Andreas Tobergte (DLR)
16:30 – 16:50	<i>“Haptic Technologies for Medical Robotics”</i>	Patrick Helmer (Force Dimension)
16:50 – 17:10	<i>“VerroTouch: Tool Contact Acceleration Feedback for Telerobotic Surgery”</i>	Katherine J. Kuchenbecker (UPenn)
Topic 3: Future Directions, Emerging Topics		
17:10 – 17:30	<i>“There is more to haptic feedback than force feedback”</i>	Vincent Hayward (Université Pierre et Marie Curie)
17:30 – 18:10	Group discussions Keywords: Intuitiveness, Telepresence, Sensory substitution, Ergonomic design	Separate groups
18:10 – 18:20	Summary of group discussions	Plenary
18:20 – 18:30	Closing remarks	Evren Samur, Hannes Bleuler (EPFL)

7 Relation to Former Workshops / Tutorials

Organizers regularly participate as speakers to the “Surgical Robotics Course” given by University Hospital in Geneva (HUG) every 3 months. They are invited to give a talk on “Future in Robotic Surgery” to an audience of approximately 30 surgeons.