

Program

8:30-9:00	Tuesday, Sept 6	Installation at Residence Hotel "Les Citadines"	16:30-18:00	Control II F. Nageotte	Students' presentations	18:00-19:00	Visit of Montpellier
9:00-10:30	Wed., Sept 7	Opening	12:30-14:30	Lunch	Lunch	14:30-16:00	Registration J. Troccaz
11:00-12:30	Wed., Sept 7	Introduction to surgical robotics E. Dombre	14:30-16:00	Design & Safety J. Rosen	Students' presentations	16:30-18:00	Control II F. Nageotte
12:30-14:30	Thursday, Sept 8	Future trends in Surgical robotics I P. Dario	14:30-16:00	Industrial forum (CRDP)	Students' presentations	18:00-19:00	Students' presentations
14:30-16:00	Thursday, Sept 8	Future trends in Surgical robotics II P. Dario	16:30-18:00	Free afternoon	Students' presentations	18:00-19:00	Students' presentations
16:30-18:00	Friday, Sept 9	Medical Imaging (Ultrasound) T. Saicudean	18:00-19:00	Lunch	Lunch	18:00-19:00	Cocktail, City of Montpellier
18:00-19:00	Friday, Sept 9	Medical Imaging (CT, MRI) Guang-Z. Yang	18:00-19:00	Lunch	Lunch	18:00-19:00	Cocktail, City of Montpellier
	Saturday, Sept 10	LIRMM demonstrations (LIRMM/)					
	Sunday, Sept 11	Sightseeing tour					
	Monday, Sept 12	Technical I R. Taylor					
	Monday, Sept 12	Modelling & Simulation C. Duriez					
	Tuesday, Sept 13	Technical III R. Howe					
	Tuesday, Sept 13	Technical IV I. Sakuma					
	Wednesday, Sept 14	Medical III: Orthopedics E. Stindel					
	Wednesday, Sept 14	Medical IV: Urology P. Mozer					
	Wednesday, Sept 14	Medical I: Abdominal surg. L. Soler					
	Wednesday, Sept 14	Medical II: ENT O. Stelkers & B. Lallamant					
	Wednesday, Sept 14	Future trends in Collaborative robots G. Morel					
	Wednesday, Sept 14	Evaluation and closing session					

Admission

The number of participants is restricted to 50. Priority will be given to Ph.D. students and Post-docs from the European Community but a significant number of researchers and professionals, as well as students from extra-EC countries will be accepted.

Applicants must fill the application form (www.sssr2011.org/registred.php) by June 15th, 2011. A scientific committee will select the candidates. A letter of confirmation will be sent to accepted participants.

The lodging expenses will be partially supported by the organizers depending on fundings, the complement being provided by the participants. The travel will be at the participants' own expenses. The organizers will offer the lunches and the sightseeing tour.

For further administrative information, please contact Justine Landais, LIRMM, Justine.Landais@lirmm.fr

For further scientific information, please contact Etienne Dombre / Philippe Poinet, LIRMM, dombre@lirmm.fr / poignet@lirmm.fr



5th Summer School Surgical Robotics

September 7-14, 2011
Montpellier (France)



Coordinated by
Etienne Dombre and Philippe Poinet
LIRMM, CNRS – Université Montpellier 2

www.sssr2011.org



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Centre National de la Recherche Scientifique (CNRS)
Université Montpellier 2
Ecole Doctorale I2S
Ville de Montpellier

Surgical robotics

Robotics enables surgery to be less invasive and/or to enhance the performance of the surgeon. In minimally invasive surgery (MIS) for instance, robotics can improve the dexterity of conventional instruments, which is restricted by the insertion ports, by adding intra-cavity degrees of freedom. It can also provide the surgeon with augmented visual and haptic inputs. In open surgery, robotics makes it possible to use in real time pre-operative and per-operative image data to improve precision and reproducibility when cutting, drilling, milling bones, to locate accurately and remove tumours. In both cases, as in other surgical specialities, robotics allows the surgeon to perform more precise, reproducible and dextrous motion. It is also a promising solution to minimize his fatigue and to restrict his exposition to radiation. For the patient, robotics surgery may result in less risk, pain and discomfort, as well as a shorter recovery time. These benefits explain the increasing research efforts made all over the world since the early 90's.

Surgical robotics requires great skills in many engineering fields as the integration of robots in the operating room is technically difficult. It induces new problems such as safety, man-machine cooperation, real time sensing and processing, mechanical design, force and vision-based control... However, it is very promising as a mean to improve conventional surgical procedures, for example in neurosurgery and orthopedics, as well as providing innovative new ones in micro-surgery, image-guided therapy, MIS and Natural Orifice Transluminal Endoscopic Surgery (NOTES).

The highly interdisciplinary nature of surgical robotics requires close cooperation between medical staff and researchers in mechanics, computer sciences, control and electrical engineering. This cooperation has resulted in many prototypes for a wide variety of surgical procedures. A few robotics systems are yet available on a commercial basis and have entered the operating room namely in neurosurgery, orthopedics and MIS.

Depending on the application, surgical robotics gets more or less deeply into the following fields: multi-modal information processing; modelling of rigid and deformable anatomical parts; pre-surgical planning and simulation of robotic surgery; design and control of guiding systems for

assistance of the surgeon gesture. During the Summer school, these fields will be addressed by surgeons and researchers working in leading hospitals and labs. They will be completed by engineers who will give insight into practical integration problems.

This course is addressed to PhD students, post-docs and researchers already involved in the area or interested by the new challenges of such an emerging area interconnecting technology and surgery. Basic background in mechanical, computer science, control and electrical engineering is recommended.

This Summer School follows four previous editions held in Montpellier on a biennial basis since 2003:

<http://www.lirmm.fr/uee09/lasted.php>

Content

The lectures will be organized in four parts:

- *Fundamental aspects of surgical robotics (2 days)*: medical imaging, modelling, control, design and safety, planning and registration, haptics;
- *Applications (2 days)*: technical point of view (from design to experiment), and surgical point of view (orthopedics, urology, ENT and abdominal surgery);
- *Industrial forum (1 day)* with exhibition of equipments, presentations of applications, and demonstrations; visit of the LIRMM facilities;
- *Future trends (1 day)*: perspectives in small size robots and mechatronic devices for surgery and therapy; perspectives in NOTES.

Time will be reserved for the participants to present their own research work.

Invited lecturers

Chosen among the most well-known experts worldwide, the lecturers have a significant theoretical and practical background in Surgical Robotics. They represent the clinical, scientific and engineering communities:

Paolo Dario, Scuola Superiore Sant'Anna, Pisa, Italy

Etienne Dombre, LIRMM, Montpellier, France

Christian Duriez, INRIA, Villeneuve d'Ascq, France

Blake Hannaford, Washington University, Seattle, USA

Richard Howe, Harvard University, Cambridge, USA

Benjamin Lallemand, CHU Nîmes, France

Guillaume Morel, ISIR, Paris, France

Pierre Mozer, ISIR, Paris, France

Florent Nageotte, LSIIT, Strasbourg, France

Philippe Pognet, LIRMM, Montpellier, France

Jacob Rosen, University of California, Santa Cruz, USA

Ichiro Sakuma, BPME, Tokyo University, Japan

Tim Salcudean, U. British Columbia, Vancouver, Canada

Luc Soler, IRCAD, Strasbourg, France

Olivier Sterkers, Hôpital Beaujon, Clichy, France

Eric Stindel, CHU-LATIM, Brest, France

Russ Taylor, John Hopkins University, Baltimore, USA

Jocelyne Troccaz, TIMC, Grenoble, France

Guang-Zhong Yang, Imperial College, London, UK

Lectures and school materials

All lectures will be given in English. The lecturers' slides will be available on line at the time of the class. All the School material (including slides of students' presentations) will be available by the end of September on the website of the Summer school together with significant papers of the lecturers as well as videos.

ECTS

The 36-hour courses of the Summer School will be accredited by the *Doctoral School on Information, Systems and Structure (I2S)* of the University of Montpellier 2 (a *Doctoral School* in the French Universities manages the Ph.D. degree). 5 ECTS credit points will be awarded to student attendees.

Accommodation

The lectures will be given in the "Centre Régional de Documentation Pédagogique", which is located downtown Montpellier (www.sssr2011.org/get.php).

The students will be housed in apartments for two people, in the residence "Les Citadines – Antigone", at walking distance from CRDP.