

Program (updated on June 25th 2019)

8:00 - 8:15	Sunday Sept 22	Monday Sept 23	Tuesday Sept 24	Wednesday Sept 25	Thursday Sept 26	Friday Sept 27	Saturday Sept 28				
8:15 - 8:30 8:30 - 9:00 9:00 - 9:30 9:30 - 10:00 10:00 - 10:30 10:30 - 11:00 11:00 - 11:30 11:30 - 12:00 12:00 - 12:30 12:30 - 13:00 13:00 - 13:30 13:30 - 14:00	Sunday Sept 22	Opening/registration									
		Welcome Talk	Visual Servoing (F. Nageotte)	Technical IV (L. Soler)	Technical VI (C. Riviere)	BUS to Montpellier	Medical II (J. Hubert)				
		Introduction to Surgical Robotics (P. Polgret)									
		Medical imaging I (D. Stoyanov)						Poster teasing	Poster teasing	Technical VII (C. Bergeles)	
		Break (30')	Poster teasing	Break	Break	Break	Break	Break			
		Medical imaging II (D. Stoyanov)	Technical II (P. Jannin)	Future trends in surgical robotics I (A. Menclassi)	Future trends in surgical robotics II (P. Fiorini)	Technical VIII (E. Vander Poorten)	Technical IX (R. Taylor)				
		Lunch at Belambra	Lunch at Belambra	Lunch at Belambra	Lunch at Belambra	Lunch at Belambra	Lunch at LIRMM	Lunch at Belambra			
		14:00 - 14:30 14:30 - 15:00 15:00 - 15:30 15:30 - 16:00 16:00 - 16:30 16:30 - 17:00 17:00 - 17:30 17:30 - 18:00 18:00 - 18:30 18:30 - 19:00	Installation at the Belambra Clubs	Control I (G. Morel)	Registration I (J. Troccaz)	Clinical Challenges @ Montpellier (M. de Boutray, C. Taoum, PE Chammass)	Modelling & Simulation I (C. Duriez)	LIRMM Medical School demonstrations	Lunch at Belambra		
				Break (30')	Break (30')					Break (30')	Industrial Forum & Hands on sessions (during break)
Control II (G. Morel)	Registration II (J. Troccaz)			Medical I (E. Shindel)	Modelling & Simulation II with Hands-on (Soft Robotics simulation)	Social event downtown Montpellier					
Technical I (M. Tavakoli)	Technical III (J. Desai)			Technical IV (G. Hattab)							

Admission

The number of participants is restricted to 50. Priority will be given to Ph.D. students and Post-docs. However, a significant number of researchers and professionals, as well as students will be accepted.

Applicants must be registered by July 26th, 2019 (<https://www.lirmm.fr/sss-2019/register.html>). A scientific committee will select the candidates. A letter of confirmation will be sent to accepted participants.

The lodging expenses and the meals will be supported by the organizers thanks to sponsor funding and completed by the registration fees of the participants. The travel will be at the participants' own expenses.



Contact

For further administrative information, please contact Mégane Miquel, LIRMM, Megane.Miquel@lirmm.fr
For further scientific information, please contact Philippe Poignet / Nabil Zemiti, LIRMM, Philippe.Poignet@lirmm.fr / Nabil.Zemiti@lirmm.fr



LIRMM

9th Summer School Surgical Robotics

September 23-28, 2019
Montpellier (France)



Coordinated by
Philippe Poignet and Nabil Zemiti
LIRMM, CNRS – University of Montpellier
Michel Mondain
Montpellier-Nîmes Medical School- University of
Montpellier, CHRU Montpellier
<http://www.lirmm.fr/sss-2019>

Labex CAMI
Labex NUMEV
Centre National de la Recherche Scientifique (CNRS)
I-site MUSE - Université de Montpellier
Ecole Doctorale I2S



MUSE
MONTPELLIER UNIVERSITÉ D'EXCELLENCE



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/her fatigue and to restrict his/her 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.

These courses are 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 eight previous editions held in Montpellier on a biennial basis since 2003.

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, abdominal surgery, ENT);
- *Industrial forum & clinical hands-on session (1/2 day)* with exhibition of equipments, presentations of applications, and demonstrations; visit of the LIRMM facilities; clinical hands-on and serious game, ...
- *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:

Christos Bergeles, University College of London, UK

Marie de Boutray, CHU-LIRMM, Montpellier, France

Pierre-Emmanuel Chammas, CHU-LIRMM, Montpellier, France

Jaydev Desai, Georgia Tech, Atlanta, USA

Christian Duriez, INRIA, Villeneuve d'Ascq, France

Paolo Fiorini, University of Verona, Italy

Georges Hattab, National Center for Tumor Diseases (NCT) Dresden, Germany

Jacques Hubert, CHU-INSERM, Nancy, France

Pierre Jannin, LTSI, Rennes, France

Florent Nageotte, ICube, Strasbourg, France

Arianna Menciassi, Scuola Superiore Sant'Anna, Pisa, Italy

Guillaume Morel, ISIR, Paris, France

Philippe Pognet, LIRMM, Montpellier, France

Cameron Riviere, Carnegie Mellon University, USA

Luc Soler, IRCAD, Strasbourg, France

Eric Stindel, CHU-LATIM, Brest, France

Danail Stoyanov, University College of London, England

Christophe Taoum, ICM-LIRMM, Montpellier, France

Mahdi Tavakoli, University of Alberta, Canada

Russ Taylor, John Hopkins University, Baltimore, USA

Jocelyne Troccaz, TIMC, Grenoble, France

Emmanuel Vander Poorten, KU Leuven, Belgium

Nabil Zemiti, LIRMM, Montpellier, France

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 (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 at the "Belambra Club Presqu'île du Ponant", which is located at La Grande-Motte (seaside resort near Montpellier) (www.lirmm.fr/sssr-2019/venue.html). The attendees will be sharing apartments for two to three persons.