

Program (updated on July 20th 2017)

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|--|-------------|-------------------------------------|------------------|---|--|--|---------------------------|--|--|--|
| | 8:30-9:00 | | Tuesday, Sept 5 | | | | | | | |
| | 9:00-10:30 | | Wed., Sept 6 | Opening | Introduction to Surgical Robotics P. Pognet | Technical II S. Martel | | | | |
| | 11:00-12:30 | | | Lunch | Control I N. Zemiti | Medical I S. Ferreira | | | | |
| | 12:30-13:45 | | Thursday, Sept 7 | Lunch | Visual Servoing F. Nageotte | Technical III J. Desai | | | | |
| | 14:00-15:30 | Technical I J. Troczak | Friday, Sept 8 | Students' Poster Session 1 | Medical imaging II C. Bergales | Free afternoon | | | | |
| | 16:00-17:30 | Medical Imaging I N. Navab | | Industrial Forum | Lunch | LIRMM Medical School demonstrations (LIRMM) | | | | |
| | 17:30-19:00 | Modelling & Simulation C. Duriez | Saturday, Sept 9 | Future trends in surgical robotics I A. Maizer | Free morning | | | | | |
| | | | Sunday, Sept 10 | | Olympic Games | | | | | |
| | | | Monday, Sept 11 | | Students' Poster Session 2 | Technical IV J. Burgier-Kahns | | | | |
| | | | Tuesday, Sept 12 | | Medical II E. Sindel | Technical V B. Davies | | | | |
| | | | Wed., Sept 13 | | Medical III L. Spier | Technical VI C. Riviere | | | | |
| | | | | | | Medical IV P. Mozer | Technical VII S. Misra | | | |
| | | | | | Medical V J. Hubert | Future trends in surgical robotics III P. Fiorini | | | | |
| | | | | | CRAS 2017 Registration @Montpellier | Future trends in surgical robotics II G. Cluit | | | | |
| | | | | | Evaluation and dosing session | | | | | |

Basics
Applications : technical viewpoint

Applications : surgical viewpoint
Future trends

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 be registered by July 7th, 2017 (www.lirmm.fr/sssr-2017/registred.html). A scientific committee will select the candidates. A letter of confirmation will be sent to accepted participants.

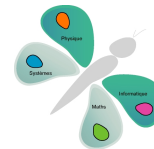
The lodging expenses and the meals will be supported by the organizers thanks to sponsor funding and completed by the registration fees of the participants. The travel will be at the participants' own expenses.



Contact

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8th Summer School Surgical Robotics

September 6-13, 2017
Montpellier (France)



Nouvelle faculté de Médecine de Montpellier - architecte François Fontès

Coordinated by
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LIRMM, CNRS – University of Montpellier
Michel Mondain
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Université de Montpellier
Ecole Doctorale I2S

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 six previous editions held in Montpellier on a biennial basis since 2003:

www.lirmm.fr/sssr-2017/lasted.html

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 (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:

Christos Bergeles, University College of London, UK

Jessica Burgner-Kahrs, LKR, Leibniz Universität Hannover, Germany

Gastone Ciuti, Scuola Superiore Sant'Anna, Pisa, Italy

Brian Davies, Imperial College London, UK

Jaydev Desai, Georgia Tech, Atlanta, USA

Christian Duriez, INRIA, Villeneuve d'Ascq, France

Paolo Fiorini, University of Verona, Italy

Jacques Hubert, CHU-INSERM, Nancy, France

Sylvain Martel, Polytechnique Montréal, Canada

Andreas Melzer, IMSaT, Dundee, UK

Sarthak Misra, University of Twente, The Netherlands

Pierre Mozer, ISIR, Paris, France

Florent Nageotte, ICube, Strasbourg, France

Nassir Navab, TUM, Munich, Germany

Silvana Perretta, IRCAD, Strasbourg, France

Philippe Pognet, LIRMM, Montpellier, France

Cameron Riviere, Carnegie Mellon University, USA

Luc Soler, IRCAD, Strasbourg, France

Eric Stindel, CHU-LATIM, Brest, France

Jocelyne Troccaz, TIMC, Grenoble, France

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-2017/get.html). The attendees will be sharing apartments for two to three persons.