Admission

The number of participants is restricted to 40. Priority will be given to Ph.D. students and Post-docs from the European Community but a limited number of researchers and professionals, as well as students from extra-EC countries will be accepted.

Applicants must fill the application form (available at http://www.lirmm.fr/UEE07) by June 15th, 2007. 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 funding, the complement being provided by the participants. The travel will be at the participant own expenses. The organizers will offer the lunches, as well as the welcome and closing receptions, and the sightseeing tour.

For further administrative information, please contact Céline Berger, LIRMM, berger@lirmm.fr

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

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Updated program (August 30th, 2007)

	Tuesday, Sept 4	Wedn., Sept 5	Thursday, Sept 6	Friday, Sept 7	Saturday, Sept 8	Sunday, Sept 9	Monday, Sept 10	Tuesday, Sept 11	Wedn., Sept 12
8h30-9h		Opening							
9h-10h30		Introduction to surgical robotics E. Dombre	Simulation & Haptics O. Claz	Design & Safety O. Company, S. Krut			Medical I Cardiovasc. surg. N. Bonnet	Technical II W.T. Ang	Future trends in surgical robotics C. Stefanini
11h-12h30		Modelling O. Claz	Control I P. Poignet	Control II J. Gangloff			Medical II Neurosurgery C. Bernard	Technical III R. Taylor	Evaluation and closing session
12h30 14h30	Installation at Hotel Citadines	Official Lunch	Lunch	Lunch	Free afternoon	10-19h Sightseeing tour	Lunch	Lunch	Lunch
14h30-16h		Robot registration J. Troccaz	Technical I H. Wörn	Industrial demonstrations (CRDP)	LIRMM demonstrations (LIRMM)		Design & Haptics B. Hannaford	Technical IV G. Morel	
16h30-18h		Medical imaging C. Barillot	Student presentations		Visit of Musée Fabre		Medical III Orthopedics E. Stindel	Medical IV Abdominal surg. L. Soler	
18h15-19h		Student presentations	18h30-20h30 Visit of Montpellier / Student presentations	19h30: Cocktail City of Montpellier			Student presentations	Demo Teleop Montpellier-Seattle (LIRMM) B. Hannaford	

Surgical Robotics

3rd Summer European University

Coordinated by
Etienne Dombre and Philippe Poignet
LIRMM, CNRS-Université Montpellier 2

Montpellier, France,
September 5-12, 2007

ministère éducation nationale enseignement supérieur recherche

PiM programme incitatif pour la mobilité internationale des étudiants

EURON ROBOTICS

Département Hérault Conseil Général

la Région Languedoc Roussillon Vivre en Septimanie

CNRS CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE

um2 UNIVERSITÉ MONTPELLIER 2 SCIENCES ET TECHNIQUES

i2S ECOLE DOCTORALE

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), 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 images to improve precision and reproducibility when cutting, drilling, milling bones, to locate accurately and remove tumours… In both cases, 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 MIS, micro-surgery or image-guided therapy.

The highly interdisciplinary nature of surgical robotics requires close cooperation between medical staff and researchers in mechanics, computer technology, 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 interventions; design and control of guiding systems for assistance of the surgeon gesture. 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 two previous editions held in 2003 and 2005, also in Montpellier, which had been considered as a success by both the participants and the lecturers (http://www.lirmm.fr/manifs/UEE/accueil.htm and http://www.lirmm.fr/UEE05/).

Content

The lectures will be organized in four parts:
- *Fundamental aspects of surgical robotics (2.5 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, neurosurgery, cardiovascular surgery, abdominal surgery);
- *Industrial point of view (1 day)* with exhibition of equipments, presentations of applications, and demonstrations; visit of the LIRMM;
- *Future trends (1 day):* perspectives in small size robots and mechatronic devices for surgery and therapy; perspectives in rehabilitation robotics.

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:

W.T. Ang, Nayang Technological University, Singapore
C. Barillot, IRISA, Rennes, France
C. Bernard, Hôpital St Anne, Toulon, France
N. Bonnet, Hôpital Pitié-Salpêtrière, Paris, France
O. Clatz, INRIA, Sophia Antipolis, France
O. Company, LIRMM, Montpellier, France
C. Stefanini, Scuola Superiore Sant'Anna, Pise, Italy
E. Dombre, LIRMM, Montpellier, France
J. Gangloff, LSIIT, Strasbourg, France
B. Hannaford, Univ. Washington, Seattle, USA
S. Krut, LIRMM, Montpellier, France
G. Morel, ISIR, Paris, France
P. Poignet, LIRMM, Montpellier, France
L. Soler, IRCAD, Strasbourg, France
E. Stindel, CHU-LATIM, Brest, France
R. Taylor, John Hopkins University, Baltimore, USA
J. Troccaz, TIMC, Grenoble, France
H. Wörn, Karlsruhe University, Germany

Lectures and school materials

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

ECTS

The 36-hour courses of the Summer University will be recognized 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 (see map on http://www.lirmm.fr/UEE07/). For convenience, the exhibition and demos will be organized within the experimental facilities of LIRMM. The students will be housed in apartments shared by two or three of them, in the residence "Les Citadines – Antigone", at walking distance from CRDP.