



A.R.A.K.N.E.S.
Array of Robots Augmenting the KiNematics
of Endoluminal Surgery

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RE	Restricted to a group specified by the consortium (including the Commission Service)	
CO	Confidential, only for members of the consortium (including the Commission Service)	

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3	30/11/2012	Paolo Dario (SSSA)	Approval of the document and submission

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Executive summary

This document presents the report regarding the organization of the training activities held during the last period and the extension period of the ARAKNES project. A summary of all training activities is provided.



1 ARAKNES training activities summary

Training and educational (T&E) activities were addressed to experts and general public. Undergraduate, master and PhD students, post-doctoral scholars and internationally known lecturers were involved. Thus, these activities were essential for the implementation of the integrated project itself.

The specific actions identified within this task were:

- internal T&E actions in University labs and at research sites to increase excellence of the involved researchers and to enable the staff to work on the RTD tasks and demonstration of technology;
- internal qualification and training efforts;
- education plan for the technological partners of the Consortium on international regulations to fulfil;
- exchange of researchers between the partners for face-to-face interaction in internships/ delegations of up to three months;
- lectures about ARAKNES related topics at Universities and new forms of
- cooperation between schools and research that target at the stimulation of excitement for science and to interest students in medical and technical studies, and motivate them – especially women – for a career in technology science are planned;
- executives within the industrial society will use the insights out of successful scientific projects for professional exploitation. To educate those persons will be a further task within and after the ARAKNES project;
- summer schools on the main topics of the project including e.g. biomedical robotics, innovative surgery, microfabrication techniques, innovative technologies and systems in medicine.

Concerning the previous actions, the ARAKNES Project demonstrated to be very dynamic. The following results should be mentioned:

- 22 PhD students and post-doctoral scholars and 21 master students were formed through internal T&E actions in ARAKNES University labs and at research sites. They followed internal T&E courses and a “learning by doing” education methodology. In addition, a successful long-term collaboration among students coming from different countries and universities was created. 8 PhD students spent short periods in different ARAKNES labs for joint experimental activities. This T&E approach increases the excellence of the involved young researchers and contributed to consolidate a collaboration that will last beyond the end of the ARAKNES project and that will contribute to strengthen our research community.
- More than 28 lectures about ARAKNES have been presented at conferences, workshops, special sessions, open lectures and other events contributing also to stimulate excitement for science and to interest students in medical and technical studies, and motivate them for planning a career in technology science.
- Two summer schools took place in Montpellier with very positive feedbacks, as it will be described in the next section. Due to this success, another summer school is envisaged in 2013 in which the ARAKNES results will be also evoked.

The list of the finished/ongoing PhD and master theses and Post-Doc trainings related to the ARAKNES topics are summarised in the tables below.

Table 1. Updated list of PhD theses and Post-Doc Trainings related to ARAKNES topics.

Trained persons	Argument	Main partner involved	Collaboration	Status
Alonso Sanchez	Real-time control architecture for bilateral teleoperation of surgical meso-robots	CNRS	SSSA, EPFL	Ongoing
Minh-Quyen Le	Post-doc, Force-reflecting teleoperation in surgical robotics	CNRS	-	Finished
Kanty Rabenoroso	Post-doc, Wireless teleoperation for surgical robots	CNRS	-	Finished
Laura Santos Carreras	Multimodal haptic feedback for bimanual manipulation	EPFL	ICL	Defended
Ali Sengul	Cognition-Based Surgeon to Surgical Robot Mapping and Control Strategies	EPFL	CNRS, SSSA	Finishing
Mathieu Stephan	Modelling and Design of a Gripper for a Robotic Surgical System Integrating Force Sensing Capabilities	EPFL	-	Ongoing
Gianluigi Petroni	Control architecture for the SSSA bimanual robot	SSSA	CNRS	Ongoing
Giuseppe Tortora	Design of alternative solutions for the transluminal approach	SSSA	ICL	Finished
Sebastiano Caccavaro	Development of end effectors for SSSA bimanual robot	SSSA	-	Ongoing
Marco Salerno	Magnetic frame for robotic anchoring	SSSA	OVE	Ongoing
Massimiliano Simi	Design of a magnetically activated robotic camera	SSSA	-	Ongoing
Selene Tognarelli	Study and development of adhesion mechanism of instrumentation for endoluminal surgery	SSSA	-	Finished
Claudio Quaglia	Study and design of miniaturized robotic systems for medical applications	SSSA	-	Finished
Michele Silvestri	Design of a 3D vision system for endoscopic	SSSA	-	Ongoing

	applications			
Bogachan Tahirbegi	Chemical sensors for endoluminal surgery	UB	-	Ongoing
Andrea Peri MD	General surgery specialization thesis La chirurgia robotica single-port: progetto ARAKNES	UNIFI	-	Finished
Giuseppe Turini	Development of the surgical simulator	UNIFI	-	Finished
Sara Condino	Development of abdominal silicone organs	UNIFI	-	Finished
Marina Carbone	Development of the surgical navigator	UNIFI	SSSA	Ongoing
Praveen Ashok	Microfluidic Applications of Raman Probes	USTAN	-	Finished
Annett Klemm	Development of Miniaturised Sensors	USTAN	-	Ongoing
Rajesh Kumar	MRI Compatible Optical Probes	USTAN	-	Ongoing
Maurizio Gentili	Control architecture for the bimanual robot	STM	SSSA	Ongoing

Table 2. Updated list of master theses related to ARAKNES topics.

Trained persons	Argument	Main partner involved	Collaboration	Status
Giulia Toncelli	Bilateral teleoperation for surgical robots	CNRS	SSSA	Finished
Francesca Rizzo	ARAKNES robot control	CNRS	SSSA	Finished
Rognini Giulio	Numerical Modelling of Human Organs for the Design of Robotic Systems	EPFL	SSSA	Finished
Marco Caproni	NIRS signal analysis coming from the endoscopist brain during endoscopy	ICL	SSSA	Finished
Agnese Sgorbini	Development and evaluation of technologies for enhancing instrument dexterity for low-invasive surgical procedures	NVN	SSSA	Finished
Gianluca Sardi	Robotic vision system that exploits magnetic levitation for laparoscopic surgery	SSSA	-	Finished
Francesca Sau	Design of docking-undocking mechanism for NOTES procedure	SSSA	-	Finished
Valentina Valori	Development of the esophageal access port	SSSA	MT	Finished
Gianluigi Petroni	Control of robot manipulators for surgery through Phantom	SSSA	-	Finished

	haptic interface			
Andrea Dimitracopoulos	Development of a magnetic endoluminal frame based on SMA actuators	SSSA	-	Finished
Katharina Weimer	Developing a mock-up of a bimanual robot for abdominal surgery for testing its insertion, fixation and manoeuvrability	SSSA	NVN	Finished
Michele Silvestri	Development of a stereoscopic system for robotic vision	SSSA	-	Finished
Alessandro Sala	Computer graphic simulation	UNIPI	-	Finished
Rosanna Viglialoro	Development of a simulator for cholecystectomy	UNIPI	-	Finished
Paola Nicoli		UNIPI	-	Ongoing
Praveen Ashok	Microfluidic applications of Raman Probes	USTAN	-	Ongoing
Calum Wilson	Electronic interfaces for backscattering probes	USTAN	-	Finished
Christopher Vincent Severino	Idem.	USTAN	-	Finished
Nigel Mycock	Idem.	USTAN	-	Finished
Simon Costantino	Infrared Monitoring of Oxygenated and Deoxygenated Haemoglobin in Human Tissue	USTAN	-	Finished
Annett Klemm	Infrared monitoring of in-vivo tissue oxygenation	USTAN	-	Finished
Jonathan Morton	The development of a diagnostic algorithm and Graphical User Interface for cancer diagnosis using a fibre based Raman system	USTAN	-	Finished

2 Summer Schools in Surgical Robotics

One of the first and main training activities was the European Summer School in Surgical Robotics that was organized in Montpellier on September 2009. This Summer School followed three previous editions held in 2003, 2005 and 2007, also in Montpellier, which had already been considered as a success by participants and lecturers. A second summer school in the framework of ARAKNES was held in Montpellier in September 2011, following the same scheme and the same objectives of the previous one, i.e. to give the participants a deep insight into the various surgical robotics solutions, including the ARKNES platform, which are able to assist surgeons in their daily routine.

Table 3 presents the program of the last edition of the School. The Summer Schools were organized in four parts:

- Fundamental aspects of surgical robotics (9 lectures): introduction to surgical robotics, medical imaging (Ultrasound, CT-scan, MRI and PET-scan), modelling, control, design and safety, planning and registration, simulation and haptics;

- Applications: technical point of view (from design to experiment, 4 lectures), and surgical point of view (orthopaedics, abdominal surgery, urology and ENT surgery: 4 lectures);
- Future trends (3 lectures): perspectives in small size robots and mechatronics devices for surgery and therapy; collaborative robotics for assistance to gesture;
- Demonstrations including an industrial forum (1 afternoon) and a visit of the LIRMM (1 morning).

The lectures consisted of 4 surgeons and 15 researchers working in leading hospitals and laboratories worldwide, and having a wide insight into practical integration problems (see the list of lecturers in Table 4). Eight of them came from other countries than France (1 Italian, 1 Japanese, 1 English, 1 Canadian and 4 American). The PhD students also presented their work.

During the last three editions of the Summer School, an Industrial Forum was organized. Nine companies were represented (Table 5). They had a whole afternoon to present their activities in a formal manner, then to demonstrate their products.

All together, the lectures, student presentations and demonstrations represented 42 hours.

An evaluation has been made with a questionnaire, showing a high level of satisfaction about the educational content and general organization (see appendix 1).

All the material (including students' presentations and industrial forum presentations) is available on the websites of the Schools¹. Other information such as program, flyer, abstracts, mail address of students and lecturers, pictures is also available.

The course of the Summer School has been recognized by the *Doctoral School* on Information, Systems and Structure (I2S) of the University of Montpellier 2 (which manages the Master and PhD programs). 5 ECTS credit points have been awarded to each student attendee.

The course was 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. 53 participants have attended the last edition of the school (Figure 1). Among them:

- 36 from the European Community (among them 12 Italian, 8 French, 7 German for the most represented countries);
- 17 from different countries (5 Brazilian, 4 North American ...);
- 39 PhD students, 7 MSc students, 4 post-docs, 3 scientists and senior researchers.

56 participants with a similar distribution of attendants participated in the 4th edition of the Summer School (Figure 2).

In addition to the officially registered students, most of the lecturers have attended 2 or 3 days. Accounting for several "local" attendees, the audience in the mean was between 60 and 65 people.

¹ <http://2011.sssr.fr>, <http://www2.lirmm.fr/~w3rob/UEE09/>

Table 3: Program of the 5th Summer School in Surgical Robotics.

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

<table style="border: none;"> <tr> <td style="width: 20px; height: 15px; background-color: #cccccc; display: inline-block;"></td> <td>Basics</td> </tr> <tr> <td style="width: 20px; height: 15px; background-color: #ffff00; display: inline-block;"></td> <td>Applications: technical viewpoint</td> </tr> </table>		Basics		Applications: technical viewpoint	<table style="border: none;"> <tr> <td style="width: 20px; height: 15px; background-color: #90ee90; display: inline-block;"></td> <td>Applications: surgical viewpoint</td> </tr> <tr> <td style="width: 20px; height: 15px; background-color: #ff69b4; display: inline-block;"></td> <td>Future trends</td> </tr> </table>		Applications: surgical viewpoint		Future trends
	Basics								
	Applications: technical viewpoint								
	Applications: surgical viewpoint								
	Future trends								

Table 4: List of Lecturers. Three of them are from the ARAKNES Consortium (Dario, Poignet, Yang)

SPEAKER	UNIVERSITY / COMPANY
Paolo Dario	The BioRobotics Institute, Scuola Superiore Sant'Anna, Pisa, Italy
Etienne Dombre	LIRMM, University Montpellier 2 / CNRS, France
Christian Duriez	INRIA, Villeneuve d'Ascq, France
Blake Hannaford	BioRobotics Lab., University of Washington, Seattle, USA
Robert Howe	BioRobotics Lab., Harvard School of Engineering & Applied Sciences, Cambridge, USA
Guillaume Morel	ISIR, University Pierre et Marie Curie - Paris 6/CNRS, France
Pierre Mozer	ISIR, University Pierre et Marie Curie - Paris 6/CNRS and Service d'Urologie. Groupe Hospitalier Pitié-Salpêtrière, France
Florent Nageotte	LSIIT, University of Strasbourg / CNRS, France
Philippe Poignet	LIRMM, University Montpellier 2 / CNRS, France
Jacob Rosen	Bionics Lab., Baskin School of Engineering, Univ. of California Santa Cruz, USA
Ishiro Sakuma	Biomedical Precision Engineering Lab., The University of Tokyo, Japan
Tim Salcudean	Electrical and Computer Engineering Department University of British Columbia, Vancouver, Canada
Luc Soler	IRCAD, Strasbourg, France
Eric Stindel	LATIM, ENST Bretagne / INSERM / CHU Brest, France
Russ Taylor	CISST ERC, The John Hopkins University, Baltimore, USA
Jocelyne Troccaz	TIMC-IMAG, University Joseph Fourier / CNRS, Grenoble, France
Guang-Zhong Yang	Hamlyn Centre for Robotic Surgery, Imperial College London, UK

Table 5: Participants of the Industrial Forum

Company	Location	Contact	Activity	Equipment presented	Web site
Axilum Robotics	Strasbourg, France	Romuald Ginhoux	Robot for Transcranial Magnetic Stimulation (TMS)	Videos	http://www.axilumrobotics.com/
B. Braun Médical	Echirolles, France	François Leitner	Navigation	OrthoPilot	http://www.aesculap.com/
EndoControl	Grenoble, France	Carine Hugel	Robotics for endoscopic surgery	ViKY	http://www.endocontrol-medical.com/
GE Healthcare Europe	Buc, France	Omar Al Assad	Global vascular positioner	Videos	http://www.gehealthcare.com/index.html
Intrasense	Montpellier, France	Christophe Bonnel	Review and analysis of medical images	Surgical planning software; Virtual colonoscopy	http://www.intrasense.fr/
Intuitive Surgical	Aubonne, Switzerland	Nathalie Wellens	Robot-assisted minimally invasive surgery / da Vinci	Videos	http://www.intuitivesurgical.com
Koelis	La Tronche, France	Michael Baumann	CAS systems for diagnosis & therapy in urology	Navigation platform	http://www.koelis.com/
SurgiQual	La Tronche, France	Diane Maniouloux	Generic components for augmented interventions in medicine	Videos	www.surqigual-institute.com
Terumo Europe	Guyancourt, France	Bruno de la Forterie	Kymerax Precision drive articulation system for MIS	Kyremax system	http://www.terumo-europe.com/

3 Organization of the Summer Schools

The lectures of both Summer Schools were imparted in the Centre Régional de Documentation Pédagogique (CRDP), located in the city center of Montpellier. The students were housed in apartments shared by two of them, in the residence “Les Citadines – Antigone”, 1 km away from the CRDP. Lunches were arranged in the CRDP.

The Summer School lasted 8 full days, including a weekend in the middle that has allowed the attendees (and the organizers) to relax and socialize on Saturday afternoon and Sunday. The previous has been very much appreciated. Several social events were organized as well (for edition 2011):

- a guided tour of the historical center of Montpellier (Wednesday Sep. 7);
- a reception offered by the City Hall of Montpellier in an old mansion (Salle Pétrarque) (Friday Sep. 9);
- a sightseeing tour at Saint Guilhem le Désert and canoeing in Hérault river (Sunday Sep. 11).

The organizers sponsored these events and lunches. The lodging was partly supported by the organizers (250 € was charged to the students by residence Les Citadines).

The evaluation results of the Summer School organization were very positive in 2009 and 2011. (D11.7b, Appendix 1).



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5th Summer School in Surgical Robotics
Montpellier, September 7-14, 2011



Figure 1: Group photo 2011.



5th Su
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4th Summer School in Surgical Robotics
Montpellier, September 9-16, 2009



Figure 2: Group photo 2009.

Table 6: List of Attendants of the 5th Summer School (2011).

	G	Family name	First name	Nationality	Fonction	Research activity	University / Lab.	City	Country
1	M	ALLEGRINI	Francesco	Italian	PhD student	Lower limb rehabilitation: human artificial leg mechatronics and neurointerfaces	Technical University of Tallinn	Tallinn	Estonia
	M	BELL	Brett	USA	Postdoc, Group head Surg. Rob. of the Institute	Endonasal surgery for sinus and skull base	University of Bern, Institute of Surgical Technology and Biomechanics	Bern	Switzerland
	M	BOLLEN	Xavier	Belgian	PhD student	Design of a robotic device for minimally invasive resection of the aortic valve by the transapical route	Université Catholique de Louvain, Center for Research in Mechatronics	Louvain-la-Neuve	Belgique
	M	CAMPOS	Jordi	Spanish	PhD student / Engineer	Human robot interface in surgery	UPC Barcelona & Sanitary Corp. Parc Tauli	Sabadell	Spain
5	M	CHELLAL	Ryad	Algerian	PhD student	Vision-based control of cable robots	University of Strasbourg-CNRS, LSIT	Strasbourg	France
	M	CHELLALI	Amine	Algerian	Postdoc	Human-computer interaction and ergonomics studies for the da Vinci	Ecole des Mines de Nantes, Dpt Automatique / Productique	Nantes	France
	M	COLLO	Andrea	Italian	PhD student	Development of an implantable device for the correction of post-operative ligament unbalance	University Montpellier 2-CNRS, LIRMM & ENST Bretagne-INSERM, Brest, LATIM	Montpellier & Brest	France
	F	COSTA BERNARDES	Mariana	Brazilian	PhD student	Robotic system for adaptive steering of flexible needles in percutaneous procedures	University Montpellier 2-CNRS, LIRMM	Montpellier	France
	M	DALL'ALBA	Diego	Italian	PhD student	US image processing for real time surgical navigation	University of Verona, Department of Computer Science, ALTAIR Robotics Laboratory	Verona	Italy
10	M	DE DONNO	Antonio	Italian	PhD student	Robotic assistance to single port access surgery	University of Strasbourg-CNRS, LSIT	Strasbourg	France
	M	ELIAS DE OLIVEIRA	Marcelo	Brazilian	PhD student	Characterization of the mechanical properties of the human spine	University of Bern, Institute for Surgical Technology and Biomechanics	Bern	Switzerland
	F	ESTEVENY	Laure	French	PhD student	Robotic assistance for interventional radiology	University of Strasbourg-CNRS, LSIT	Strasbourg	France
	M	GALLO	Simon	Italian	PhD student	Multimodal haptics devices for robotic surgery	EPFL, Laboratoires de Systèmes Robotiques	Lausanne	Switzerland
	F	GAVAGHAN	Kate	Australian	PhD student	HMI for the Improvement of Surgical Technologies	University of Bern, Centre of Computer Aided Surgery, ARTORG Centre	Bern	Switzerland
15	M	GOMES DORILEO	Éderson Antonio	Brazilian	Researcher (Master level)	Ultrasound image processing	University Montpellier 2-CNRS, LIRMM	Montpellier	France
	M	HAN	Bo	Chinese	PhD student	Modular micro robot for transluminal surgery	University of Genova, DIMEC, PMAR Robotics	Genova	Italy
	F	HELLINGS	Anja	German	Research engineer (Master level)	Modelling deformable scenes	German Aerospace Center (DLR), Institute of Robotics and Mechatronics	Wessling	Germany
	M	HULTMANN AYALA	Helon Vicente	Brazilian	Master student (EMARO)	Nonlinear Multivariable Systems Identification with Neural Networks Models and Multiobjective Training Through Particle Swarm Optimization	European Master of Advanced Robotics, Power and Aeronautics Department, Technical University of Warsaw	Curitiba	Brazil

	M	KAZMITCHEFF	Guillaume	French	PhD student (CIFRE Collin)	Development of a simulator for robotized middle ear surgery	Univ. Paris 7, INSERM UMR-S 867 & Univ Lille 1-INRIA	Paris	France
20	M	KIYAK	Ismail Utku	Turkish	Master student (EMARO)	Multi-criteria geometric optimization of 7-R manipulators using interval analysis	European Master of Advanced Robotics, Power and Aeronautics Department, Technical University of Warsaw	Warszawa	Poland
	M	KOBLER	Jan-Philipp	German	PhD student / Research Assistant	Minimally invasive robot assisted cochlear implant surgery	Leibniz Universität Hannover, Institut für Mechatronische Systeme	Hannover	Germany
	M	KRATCHMAN	Louis	USA	PhD student	Bone-attached parallel robot for percutaneous cochlear implantation surgery	Vanderbilt University, Department of Mechanical Engineering	Nashville	USA
	F	LUCARINI	Gioia	Italian	PhD student	Robotic microsystems in diagnosis and endoluminal surgery	Scuola Superiore Sant'Anna, The BioRobotics Institute	Pontedera	Italy
	M	MAGALHAES SOBRAL	Rafael	Brazilian	Master student	Design of a robot for endonasal sinus and skull base surgery	University Montpellier 2-CNRS, LIRMM & University of São Paulo	Montpellier	France
25	M	MARIS	Bogdan Mihai	Romanian	PHD student	Motion planning algorithms for surgical robotics	University of Verona, Department of Computer Science, ALTAIR Robotics Laboratory	Verona	Italy
	M	MARTINEZ HERRERA	Sergio Ernesto	Mexican	Master student	Erasmus Mundus Computer vision & Robotics	Universitat de Girona	Girona	Spain
	F	MARX	Anja	German	PhD student (CIFRE GE Healthcare)	Underactuated comanipulation in the context of breast cancer screening	Univ. Pierre et Marie Curie - Paris 6, CNRS, ISIR	Paris	France
	F	MASSON-SIBUT	Agnès	French	PhD student (CIFRE Aesculap)	Design of software to assist orthopedic surgeon	University Paris Est Créteil, Laboratoire LISS	Echirrolles Cedex	France
	M	MILORO	Piero	Italian	PhD student	Milli/micro technologies for vascular applications	Scuola Superiore Sant'Anna, The BioRobotics Institute	Pontedera	Italy
30	M	MOHARERI	Omid	Iranian	PhD student / Research Assistant / Teaching Assistant	Image guidance in robotic-assisted surgery	University of British Columbia, Electrical and Computer Engineering Department	Vancouver	Canada
	M	MOREIRA	Pedro	Portuguese	PhD student	The influence of viscoelastic models for soft tissues on model based force control using active observers	University Montpellier 2-CNRS, LIRMM	Montpellier	France
	M	NEUMANN	Markus	German	PhD student	Computer-assisted interventional MRI	University of Strasbourg-CNRS, LSIT	Strasbourg	France
	M	NGUYEN	Yann	French	PhD student, Médecin	Design of a robotic system for MIS of the middle ear	Department of Otorhinolaryngology, Hosp. Beaujon and University Paris 7-INSERM	Paris	France
	M	PIETQUIN	Olivier	Belgian	Associate Professor	Automatic learning and signal processing	SUPELEC - Metz Campus	Metz	France
35	M	PRADA SARASOLA	Miguel	Spanish	Engineer (Master level)	Design of a human-safe manipulator prototype	TECNALIA, Health Technologies Unit	San Sebastian	Spain
	M	RAABE	Daniel	German	Postdoc, Research Associate	6-dof robot replicating human chewing	University of Bristol and The University of West of England, Bristol Robotics Laboratory	Bristol	UK
	M	RABENOROSOA	Kanty	Malagasy	Postdoc	Microbotic systems, MOEMS design and force control at the microscale	University Montpellier 2-CNRS, LIRMM	Montpellier	France
	M	RANZANI	Tommaso	Italian	PhD student	Design of modular robots for symbiotic multi-robot organisms	Scuola Superiore Sant'Anna, The BioRobotics Institute	Pontedera	Italy
	M	RIBEIRO	David	Portuguese	PhD student	Safety in robotic surgery	EPFL, Laboratoire de Systèmes Robotiques	Lausanne	Switzerland

40	M	ROSA	Benoît	French	PhD student	Precise micropositioning of a probe for confocal laser endomicroscopy during laparoscopy	Univ. Pierre et Marie Curie - Paris 6, CNRS, ISIR	Paris	France
	M	RUBBERT	Lennart	French	PHD student	Robot-assisted stabilization for coronary surgery	University of Strasbourg-CNRS, LSIIIT	Strasbourg	France
	F	RUSSO	Sheila	Italian	PhD student	Actuation of modular robots for symbiotic multi-robot organisms	Scuola Superiore Sant'Anna, The BioRobotics Institute	Pontedera	Italy
	F	SCHNEIDER	Caitlin	USA	PhD student	US guidance for a kidney cancer procedure	University of British Columbia, Electrical and Computer Engineering Department	Vancouver	Canada
	M	SHAHRIARI	Navid	Iranian	Master student	1st year Master IA & Rob.	Sapienza University of Rome, Dipartimento di Informatica e Sistemistica	Rome	Italy
45	M	SIMI	Massimiliano	Italian	PhD student	Magnetic mechanisms for microrobotic modules	Scuola Superiore Sant'Anna, The BioRobotics Institute	Pontedera	Italy
	F	SIROKAI	Beata	Hungarian	Master Student	Electromagnetic navigation systems: assessment of distortion fields caused by the environment	Budapest University of Technology and Economics, Dept. of Control Engineering and IT	Budapest	Hungary
	M	SOMMERKORN	Alexander	German	PhD student	Robot-assisted high tibial osteotomy	TU Braunschweig, Institut für Robotik	Braunschweig	Germany
	M	TORRES	Pedro	Portuguese	PhD student	Orthopedic robot surg. (ultrasound navigation & control)	Technical University of Lisbon, IDMEC/IST	Lisboa	Portugal
	F	TORTEROTOT	Cécile	French	PhD student	Design and control of an endorectal probe-holding comanipulated robot	Univ. Pierre et Marie Curie - Paris 6, CNRS, ISIR	Paris	France
50	M	TORTORA	Giuseppe	Italian	PhD student	Design of modular in vivo robots	Scuola Superiore Sant'Anna, The BioRobotics Institute	Pontedera	Italy
	M	TREVILLOT	Vincent	French	Master student, Surgeon Internship	Specification of a robot for endonasal sinus and skull base surgery	University Montpellier 2-CNRS, LIRMM	Montpellier	France
	M	TULLY	Jan	German	Research associate (Master level)	Middleware for surgical robotic platform	German Aerospace Center (DLR), Institute of Robotics and Mechatronics	Wessling	Germany
	M	VACCARELLA	Alberto	Italian	PhD student	Sensor fusion in the OR, Robotic neurosurgery	Politecnico di Milano, Bioengineering Department	Milano	Italy
	M	WHITE	Lee	USA	PhD student / Research Assistant	Surgeon training and performance evaluation	University of Washington, BioRobotics Laboratory	Seattle	USA
55	M	WILLIAMSON	Tom	Australian	PhD student / Research Engineer	Robot for implantation of hearing devices	University of Bern, Institute for Surgical Technologies and Biomechanics	Bern	Switzerland

Table 7: List of Attendants of the 4th Summer School (2009)

	G	Family Name	First name	Nationality	Position	University
1	M	ALVES	Eduardo	Brazilian	M.Sc. Student	University of Brasilia, Dept. of Electrical Engineering
	M	ANDREFF	Nicolas	French	Professor	Université de Franche Comté, Femto-st
	M	BALICKI	Marcin	USA / Poland	Ph.D. Student	Johns Hopkins University, Computer Science
	M	BELLY	Christian	French	Ph.D. Student	UTBM, M3M - Cedrat Technologies
5	F	BERNARDES	Mariana	Brazilian	Ph.D. Student	University of Brasília, Electrical Engineering Department
	M	BERTELSEN	Álvaro	Spanish	Ph.D. Student	University of Navarra, School of Engineering
	M	BONACCORSO	Filippo	Italian	Ph.D. Student	University of Catania
	M	BRULS	Olivier	Belgium	Professor	University of Liège
	M	CATHERINE	Julien	French	Ph.D. Student	CEA FAR-DRT-DTSI-SRI-LRM, Fontenay-aux-Roses
10	M	COELEN	Vincent	French	Ph.D. Student	Polytech'Lille, C.O.L, LAGIS
	F	CONDINO	Sara	Italian	Ph.D. Student	University of Pisa, Department of Oncology Transplantation and New Technologies in Medicine
	M	DE LORENZO	Danilo	Italian	Ph.D. Student	Politecnico di Milano, Bioengineering Department

	M	DE NOVI	Gianluca	Italian	Ph.D. Student	University of Bologna, DEIS- Department of Electronics, Computer Sciences and Systems
	M	DÍAZ	Jesús	Spanish	Research Assistant	University of Hannover, Institute of Mechatronic Systems
15	F	DIMITRACOPOULOS	Andrea	Italian	M.Sc. Student	Scuola Superiore Sant'Anna, Pisa
	M	DUMAS	Cédric	French	Assistant Professor	Ecole des Mines de Nantes
	M	FABEL	Stephan	German	Research Graduate Assistant	University of Hawaii, Mechanical Engineering
	M	FLOREZ	Juan Manuel	Colombian	Ph.D. Student	Université Pierre et Marie Curie, ISIR, Paris
	M	GARCIA	Oscar	Spanish	Ph.D. Student	Universidad de Zaragoza, Departamento de informática e ingeniería de sistemas
20	F	GOYETTE	Brina	Canadian	M.Sc. Student	Carnegie Mellon University, Robotics Institute
	M	HASSAN ZAHRAEE	Ali	Iranian	Ph.D. Student	Université Pierre et Marie Curie, ISIR, Paris
	M	HOURTASH	Arjang	USA	Engineer	Intuitive Surgical, Inc.
	M	HUNGR	Nikolai	Canadian - Czech	Research Engineer	Université Joseph Fourier, Faculté de Médecine, Grenoble
	M	KELEMEN	Marton	Hungarian	B.Sc. Student	Budapest University of Technology and Economics, Department of Control Engineering and Information Technology
25	M	KHATAIT	Jitendra	Indian	Ph.D. Student	University of Twente, Faculty of Engineering Technology

	M	KING	Hawkeye	USA	Ph.D. Student	University of Washington, Department of Electrical Engineering
	F	LE	Minh-quyen	French	Ph.D. Student	Laboratoire Ampère, INSA de Lyon
	M	MELO	Javier	Colombian	Ph.D. Student	School of Engineering, University of Navarra
	F	MONASTERO	Andrea	Italian	Researcher	University of Verona, Computer Science department
30	F	MOREAU	Sandrine	French	Assistant Professor	University of Poitiers
	M	MOUBARAK	Salam	Lebanese	Ph.D. Student	INSA Lyon, Mechanical engineering, Ampère Laboratory
	F	NADEAU	Caroline	French	Ph.D. Student	IRISA/INRIA Rennes-Bretagne Atlantique
	M	PIRES	Pedro	Portugal	Ph.D. Student	Instituto Superior Técnico, Lisboa
	M	POLYGERINOS	Panagiotis	Greek	Ph.D. Student	King's College London
35	M	QUINTANA	Marcel	Spanish	Ph.D. Student	Technical University of Catalonia (UPC), Systems Engineering, Automation and Industrial Informatics; Aerospace Research and Technology Centre (CTAE)
	M	REILINK	Rob	The Netherlands	Ph.D. Student	University of Twente, Control Engineering
	M	RICHA	Rogério	Brazilian	Ph.D. Student	University Montpellier 2, LIRMM
	M	RICHTER	Lars	German	Ph.D. Student	University of Luebeck, Institute for Robotics and Cognitive Systems

	M	RODRIGUEZ	Javier	Spanish	Ph.D. Student	IBEC, Barcelona
40	M	SALERNO	Marco	Italian	Research assistant	Scuola Superiore Sant'Anna, Pisa
	M	SANCHEZ SECADES	Luis Alonso	Costa Rican	Ph.D. Student	Université Montpellier 2, LIRMM
	M	SÁNCHEZ SERRANO	Víctor	Spanish	Ph.D. Student	Universidad Politécnica de Cataluña (UPC), ESAII
	M	SANTANA	Pedro	Brazilian	M.Sc. Student	University of Brasília, Electrical Engineering Department
	M	SAVARIMUTHU	Thiusius Rajeeth	Danish	Ph.D. Student	University of Southern Denmark, The Maersk Mc-Kinney Moller Institute
45	F	SCHILLING	Tanja	German	Ph.D. Student	Czech Technical University in Prague, CMP
	M	SENGUL	Ali	Turkish	Ph.D. Student	EPFL, Microtechnic
	F	SOLANO	Belen	Spanish	Post-Doc	CEA, Fontenay-aux-Roses
	M	SOUSA	Cristovao	Portugal	Ph.D. Student	Institute of System and Robotics - University of Coimbra
	M	TEODORO	Pedro	Portugal	Ph.D. Student	IDMEC - Instituto Superior Técnico - Universidade Técnica de Lisboa
50	F	THIELMANN	Sophie	German	Researcher	German Aerospace Center, Institute of Robotics and Mechatronics
	F	TOGNARELLI	Selene	Italian	Ph.D. Student	Scuola Superiore Sant'Anna, Pisa

	M	UHERCIK	Marian	Slovakia	Ph.D. Student	Czech Technical University in Prague, Center for Machine Perception
	F	VANCAMBERG	Laurence	French	Ph.D. Student	University Pierre and Marie-Curie, ISIR, Paris
	M	WIN TUN LATT	Win	Myanmar	Researcher	Nanyang Technological University
55	M	XIA	Tian	USA	M.Sc. Student	Johns Hopkins University, Laboratory for Computational Sensing and Robotics
	F	ZDENKA	Uhrikova	Slovakia	Ph.D. Student	Czech Technical University in Prague, Faculty of Electrical Engineering

4 Financial report

The two ARAKNES Summer Schools have been supported by:

- the Araknes project;
- the CNRS in the frame of the "Ecole Thématique" annual program;
- the University of Montpellier 2;
- the LIRMM;
- the City Hall of Montpellier.

The funds (about 800 € per student) have been used to cover the travel expenses and housing of the lecturers, partly the lodging of the students, and the overheads of the Summer School.

5 Conclusions

In this document, the training activities held during the ARAKNES project have been presented.

Long-term collaborations between the ARAKNES project partners, including students and staff, were successfully created. Moreover, many other students external to the ARAKNES Consortium were taught about the ARAKNES developments, mainly through the two Summer Schools held in Montpellier in 2009 and 2011. Concerning these events, the scheme, scope, content, Lectures and school materials of the two Summer Schools of 2009 and 2011 have been described in this deliverable.

From the scientific point of view, a very broad state of the art of the surgical robotics domain together with a deep insight of the upcoming research topics and developments have been taught.

The two Summer Schools were very appreciated by both students and lecturers. The most profitable benefits for the audience, as pointed out in the evaluation, have been:

- making contacts with the community and sharing experience;
- the broad and depth multidisciplinary overview on surgical robotics.

The success of this 5th Summer School motivates us to organize a 6th edition in 2013, again in Montpellier.

Appendix 1: Evaluation results of 5th Summer School in Surgical Robotics

(on the basis of 53 questionnaires)

Level in education	Electrical Engineering	Mechanical Engineering	Computer Science	Other	Total
Master			1	6	7
1st half doctoral	3	5	4	14	26
2nd half doctoral		5	1	6	12
Other	2	2	2	2	8
	5	12	8	28	53

Quality	Very good	Good	Acceptable	Bad
Program	31	22		
Lectures	28	24	1	
Industrial forum	2	28	20	2
Visit LIRMM	21	22	9	

Level of lectures	Adapted to my level	Too high	Not well balanced	Too low
	41	1	10	

Interest of students' presentations	Very good	Good	Acceptable	Bad
	21	24	7	

Organizer support	Very good	Good	Acceptable	Bad
Localization	40	10	1	1
Meals	22	19	12	
Hotel	20	25	5	1
Social events	37	12	1	

Costs	OK	Somewhat high	Much too high
	47	1	1

Quality of presentations & lectures	Excellent	Good	Average	Bad
	42 %	40 %	15 %	3 %

Most profitable benefits

The students are unanimous on the two following benefits from the Summer school:

- Networking: making contacts in other labs with the community and sharing experience;
- Broad and in depth multidisciplinary overview of surgical robotics.