# Program Overview

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<td>9:00</td>
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<td><strong>Workshop start</strong></td>
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<td><strong>Transfer to ORSI</strong></td>
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<td>Jean-Pierre Henry</td>
<td>Clément Vidal</td>
<td>Brian Davies</td>
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<td>Stan Institute</td>
<td>EndoControl Medical</td>
<td>Imperial College - IIT</td>
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<td><strong>Session 1</strong></td>
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<td>Image Processing and Control (1)</td>
<td>Continuum &amp; Soft Robots</td>
<td>Clinical Experiences with Robotic Surgery and Training of it</td>
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<td>Modelling &amp; Control</td>
<td>Novel Robotic Hardware</td>
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<td><strong>Lunch break - hands-on surgical robotics</strong></td>
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<td>Jaydev Desai</td>
<td>Oliver Hornung</td>
<td>Philippe Liverneaux</td>
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<td>RAMS Laboratory, University of Maryland</td>
<td>Siemens Healthcare</td>
<td>CHU Strasbourg</td>
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<td><strong>Session 3</strong></td>
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<td>Guidance &amp; Assistance</td>
<td>Benchmarking and performance evaluation</td>
<td>Handheld Instruments and endoscopes</td>
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<td><strong>Session 4</strong></td>
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<td>Horizon 2020 &amp; MAR special session</td>
<td>Image processing and control (2)</td>
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<td>Michel Brochard</td>
<td>Sebastian Ourselin</td>
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<td>European Commission Unit A2 - Robotics</td>
<td>CMIC, University College London</td>
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<td>Panel session - opportunities for CRAS in H2020</td>
<td>Panel session - CRAS future and strategy</td>
<td><strong>Closure of 1st day</strong></td>
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<td><strong>Closure of 2nd day</strong></td>
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<td>Social Dinner at Museum of Music Instruments</td>
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Program

Thursday, September 10th, 2015

9:00  Workshop start - Word of welcome by Prof. Jacques Melin, Vice Rector of Health Sciences Sector of UCL

9:15  Keynote, Jean-Pierre Henry, Stan Institute

Session 1 - Image processing and control (1)
Session chair: Elena De Momì - Danail Stoyanov

9:50  Vocal Folds Disorders Detection and Classification in Narrow Band Imaging Endoscopic Images, Sara Moccìa, Leonardo Mattos, Giuseppe Baselli and Elena De Momì

10:10 Radiometric calibration for a spectrophotometric analysis pipeline for assessing burns, Maria Ruxandra Robu, Matthieu Leclerc-Chalvet and Danail Stoyanov

10:30 Enhancing Endoscopic Image Clarity by Chromaticity Based Smoke Removal, Kevin Tchaka and Danail Stoyanov

10:50 Issues in applying edge-preserving stereo matching to intraoperative laparoscopic video, Jiho Chang and Jae-Il Cho

11:10  Coffee break

Session 2 - Modelling & Control
Session chair: Gianni Borghesan - Laure Esteveny

11:30 Towards 3D Catheter Shape Reconstruction using Electromagnetic and Image Sensors, Phuong Toan Tran, Ping-Lin Chang, Herbert De Praeter, Danail Stoyanov, Emmanuel Vander Poorten and Jos Vander Sloten


12:10 Towards catheter tracking and data-based catheter steering, Bingbin Yu, Abraham Temesgen Tibebu, Jan Hendrik Metzen and Emmanuel Vander Poorten

12:30 Lunch break

13:30 Keynote, Jaydev Desai, RAMS Laboratory

Session 3 - Guidance & Assistance
Session chair: Giancarlo Ferrigno - Kaspar Althoefer

14:05 Computer Vision in Telediagnostics, Thomas Probst, Andrea Fossati and Luc Van Gool

14:25 Robust trocar detection and localization during robot-assisted endoscopic surgery, Lin Dong and Guillaume Morel

14:45 Comparative Study of Haptic Libraries Performances for Deforming Objects, Emidio Olivieri and Leonardo Mattos

15:25  Coffee break

Session 4 - Horizon 2020 & MAR special session
Session chair: Paolo Fiorini - Brian Davies


16:05  Robotic platform for high-intensity focused ultrasound surgery under ultrasound monitoring and guidance: the FUTURA platform, Selene Tognarelli, Gastone Ciuti, Alessandro Diodato, Andrea Cafarelli, Marco Mura and Arianna Menciassi

16:25  Standardization of Accuracy Measurements in Computer Assisted Orthopaedic Surgery, Olivier Cartiaux and Leo Joskowicz

16:45  Keynote, Michel Brochard, EC, Unit A2 - Robotics

17:20  Panel session - opportunities and direction surgical robotics in EU
       Christophe Leroux - MAR status and further developments

18:30  Closure of 1st day
Program
Friday, September 11th, 2015

9:00  Start day 2 - Word of welcome

9:15  Keynote, Clément Vidal, Endocontrol Medical

Session 5 - Continuum & Soft Robots
Session chair: Pierre Lambert - Peter Brett

9:50  Characterization of Magnetic Field for Scanning Laser Module, Alperen Acemoglu and Leonardo S. Mattos
10:10 Hybrid robotic system for applications in robotic surgery, Gabriël Smoljkić, Gianni Borghesan, Dominiek Reynaerts, Joris De Schutter, Jos Vander Sloen and Emmanuel Vander Poorten
10:30 Integrated soft bending sensor for soft robotic manipulators, Helge Arne Wurdemann, Sina Sareh, Ali Shafti, Yohan Noh, Angela Faragasso, Damith S Chathuranga, Hongbin Liu, Shinichi Hira and Kaspar Althoefer
10:50 Design and Validation of Pneumatically Actuated Fetoscope, Alain Devreker, Benoît Rosa, Jun Qian, Tom Vercauteren, Sebastien Ourselin, Emmanuel Vander Poorten and Dominiek Reynaerts

11:10  Coffee break

11:30  Use of Da Vinci surgical system for complex thoracic procedures, Valérie Lacroix and Emiliano Navarra

Session 6 - Novel Robotic Hardware
Session chair: Guillaume Morel - Clément Vidal

12:00 Experiments on a variable stiffness tensegrity mechanism for an MR-compatible needle holder, Quentin Boehler, Anastasios Zompas, Salah Abdelaziz, Marc Vedrines, Philippe Poignet and Pierre Renaud
12:20 Design and Control of a Low-cost Robotic Camera Holder for Laparoscopy Assistance, Dénès Ákos Nagy, Árpád Takács, Szilvia Barcza, Imre Rudas and Tamás Haidegger
12:40 Development of an Endoscopic Biopsy System for Submucosal Tumours, Auguste van Poelgeest and Eberhard Kochs

13:00  Lunch break

13:30  Keynote, Oliver Hornung, Siemens Healthcare

Session 7 - Benchmarking and performance evaluation
Session chair: Villani Luigi - Leonardo Mattos

14:05  Experimental validation of instrument insertion precision in robot-assisted microsurgery, Laure Esteveny, Laurent Schoevaerdts, Andy Gijbels, Dominiek Reynaerts and Emmanuel Vander Poorten
14:25 Quantitative Accuracy Assessment of Pedicle Screw Insertion in Spine Surgery, Virginie Cordemans, Olivier Cartiaux, Ali Boutchichi and Xavier Banse
14:45  Improved Patient Safety through Redundant Sensor Information during Robotic Drilling in the Mastoid, Tom Williamson, Kate Gavaghan, Nicolas Gerber, Marco Caversaccio and Stefan Weber
15:05  Hand guided surgical robotic Micro-drill, Peter Brett, Xinli Du, Chris Coulson, Andrew Reid and David Proops
15:25  Coffee break

Session 8 - **Image processing and control (2)**
Session chair: Tom Vercauteren - David Bouget

15:45  Ontology-based surgical assistance system for instruments recognition, Hirenkumar Nakawala, Elena De Momi, Anna Morelli, Clarissa Tomasina and Giancarlo Ferrigno
16:05  Observer-based SLAM and a model with interconnected landmarks for the retina, Yanick G.M. Douven, Gerrit J.L. Naus, Marinus J.G. V.D. Molengraft and Maarten Steinbuch
16:25  Surgical tool detection temporal consistency with a posteriori tracking in 2D neurosurgical videos, David Bouget, Laurent Riffaud and Pierre Jannin
16:45  **Keynote**, Sebastian Ourselin, CMIC, UCL
17:20  Panel session - CRAS strategy
18:30  **Closure of 2nd day**
Program

Saturday, September 12th, 2015

8:00   Transfer to ORSI
9:00   Welcome at ORSI
9:30   Keynote, Brian Davies, ICSTM, IIT

Session 9 - Clinical experiences with robotic surgery and training of it
Session chair: Brian Davies - Giancarlo Ferrigno

10:05  Transoral Robotic Surgery (TORS) for malignant head and neck tumors: the University Hospitals Leuven experience, Jeroen Meulemans, P. Delaere, Vincent Vander Poorten
10:25  Xron a simulator and training system for robotic surgery, Paolo Fiorini
10:45  Opportunities, limitations and future of robotic surgery in gynaecology, Koen Traen

11:05  Coffee break

Session 10 - Robotic Systems and Clinical Translation
Session chair: Evangelos Mazomenos - Benoit Herman

11:45  Preliminary evaluation of a robot for MRI-guided needle interventions, Pedro Moreira, Gert van de Steeg, Thijs Krabben, Jonathan Zandman, Jan Heidkamp, Kristian Overduin, Edsko E. G. Hekman, Ferdinand van der Heijden and Sarthak Misra
12:05  Development of an Image-guided Robot System for Needle-Based Interventions, Auguste van Poelgeest, Andreas Rothfuss, Lonquan Chen and Torben Paetz

12:25  Lunch break - hands-on surgical robotics

13:25  Keynote, Philippe Liverneaux, CHU Strasbourg

Session 11 - Handheld instruments and endoscopes
Session chair: Emmanuel Vander Poorten - Auguste van Poelgeest

14:00  Novel, modular 2-DOF microsurgical forceps for Trans-oral Laser Microsurgeries, Manish Chauhan, Nikhil Deshpande and Leonardo S Mattos
14:20  A comparison of conventional and robotic catheters in TAVI, Evangelos Mazomenos, Alexander Rolls, Celia Riga, Colin Bicknell and Danail Stoyanov
14:40  Prototyping Novel Instruments for Fetal Surgery through Virtual Reality Simulation and 3D Printing, Caspar Gruijthuijsen, Benoît Rosa, Hélène Snayers, Alexander Engels, Jan Deprest, Emmanuel Vander Poorten and Dominiek Reynaerts
15:00  Towards a novel clip-on sensor for endoscopic cameras using cantilever beam for stiffness computation, Angela Faragasso, Agostino Stilli, Joao Bimbo, Helge A Wurdemann and Kaspar Althoefer
15:40  Awards - pannel session
       Session chair: Paolo Fiorini - Leonardo De Mattos

16:20  *Transport back from ORSI to Brussels / Ghent*
Keynote speech

Jean-Pierre Henry, STAN Institute

Situation Awareness in Robotic Surgery

What can we learn from modern combat aircraft?

All modern combat aircraft cockpits are designed for one single purpose: to bring the crews, in one glance, all the adequate live data they need to build the best Situation Awareness - SA - possible. This iterative process of perceiving informations, understanding them and projecting them to the future is not just the key element to fly efficiently and safely the jet. Above all, SA is an essential step to take the most appropriate decisions in the shortest time. This is the only way to accomplish successfully the mission.

What about today’s surgeons SA in a robotic OR? On the one side, their console provides them an immersive, yet exclusive, 3D view of the patient’s body. On the other side is… the rest of the OR. The only way for surgeons to acquire visual informations from the OR is by removing their head form the console, thus interrupting the control of the robot. Not having all the informations at the same time strongly limits surgeons SA. Their decision making process is thus significantly weakened. Could future systems design fill this gap? Could we efficiently transpose some of combat aircraft principles?

Navigator - Weapon Systems Officer - flying the Mirage 2000D since 1997, Jean-Pierre HENRY took part in many air operations. Human Factors facilitator and CRM (Crew Resource Management) instructor, he co-developed the first Team Training courses using a flight simulator. He also implemented tools such as HFACS (Human Factors Analysis & Classification System), Just Culture and Safety Management System in operational squadrons. Jean-Pierre is president of STAN Institute, a training center in robotic surgery, partner of the University of Lorraine. Their curriculum, based on simulation and live training, leads to the only Inter-University diploma in robotic surgery in Europe.
MRI-guided Robotic Surgery: Challenges and Opportunities

Magnetic resonance imaging (MRI) provides excellent soft tissue contrast and has become a standard tool of physicians in several image-guided interventions. However, the nature of MR imaging imposes several constraints on the choice of materials, sensors, and actuators that can be used in robotic MRI-guided interventions. To understand some of these challenges and potential solutions, both at the macro-scale as well as the meso-scale, this talk will focus on our work in the development of robotic systems for: a) breast biopsy (Bx) and radiofrequency ablation (RFA) of breast tumors under continuous MRI and b) minimally invasive neurosurgical procedures under MRI guidance.

Dr. Jaydev P. Desai is currently a Professor in the Department of Mechanical Engineering and a Member of the Maryland Robotics Center at the University of Maryland, College Park (UMCP). He completed his undergraduate studies from the Indian Institute of Technology, Bombay, India, in 1993. He received his M.A. in Mathematics in 1997, and M.S. and Ph.D. in Mechanical Engineering and Applied Mechanics in 1995 and 1998 respectively, all from the University of Pennsylvania. He was also a Post-Doctoral Fellow in the Division of Engineering and Applied Sciences at Harvard University. He is a recipient of several NIH R01 grants, NSF CAREER award, and was also the lead inventor on the “Outstanding Invention of 2007 in Physical Science Category” at UMCP. He is also the recipient of the Ralph R. Teetor Educational Award. He has been invited to give a talk at the National Academy of Sciences “Distinctive Voices” seminar series on the topic of “Robot-Assisted Neurosurgery” and also attend the National Academy of Engineering’s U.S. Frontiers of Engineering Symposium. He has over 145 publications, is the founding Editor-in-Chief of the Journal of Medical Robotics Research, and Editor-in-Chief of the Encyclopedia of Medical Robotics (currently in preparation). His research interests are primarily in the area of image-guided surgical robotics, rehabilitation robotics, grasping, and cancer diagnosis at the micro-scale. He is a Fellow of the ASME and a Senior Member of the IEEE.
Keynote speech

Dr. Michel Brochard, DG Connect A2 Robotics, European Commission

H2020: Opportunities for Computer/Robot Assisted Surgery

In previous European financing programmes, the support to the Robotics community has received a privileged place. Nevertheless still some gaps must be fulfilled, and the Robotic Public-Private Partnership (SPARC) intends to support future supporting actions. In the context of Horizon 2020, 2 calls were already issued, and their results will be presented, addressing also more specifically the results related to CRAS projects. Future opportunities in next Work-Programmes and calls will be presented. Some hints and advices will conclude the presentation.

Dr. Michel Brochard is an electronic engineer and worked 9 years in the telecommunications sector at Alcatel Bell in Belgium before joining the European Commission in 1995. Since then, he worked for DG Connect (former DG XIII and DG INFSO) as Project Officer, supervising research and non-research projects co-financed by the European Union in different areas such as electronic publishing, HRI, language technologies, eLearning and robotics.
Keynote speech

Clément Vidal, EndoControl Medical

Collaborative robots – an alternative approach to laparoscopic surgery

Laparoscopic surgery is now performed in routine for many simple surgical indications, and for more complex indications in excellence centres, with many benefits to the patients and healthcare systems. Broadening use of this technique to increasingly complex indications requires an evolution of instrumentation. In this context, robotics has entered the operating room to increase precision, to simplify and to secure complex gestures. Telemanipulation is for now the most prevalent surgical robotic practice but this approach has reached some limitations. Collaborative robotics introduces an alternative way to assist surgeons in laparoscopic surgery, combining advantages of telemanipulated and traditional manual laparoscopy.

Clément Vidal, male, received a MSc degree in Biomechanical Engineering from Stanford University and a B.S. from Ecole Polytechnique with an emphasis in medical technologies. He has 9 years’ experience in the medical field both in pharmaceutical industry (GlaxoSmithKline-London, UK) and medical device industry (Praxim, EndoControl-Grenoble, France). Mr. Vidal is co-founder and CEO of EndoControl. Coordinating financial, technical and operational activities, he developed and brought successfully to market in the past years the most compact laparoscopic assistant robot available in the OR and the only 5mm robotic laparoscopic instrument, collaborating with high-class university and medical centers in the USA and Europe.
Keynote speech

Oliver Hornung, Siemens Healthcare

Workflow improvements for spine surgery using multi-axes positioning and high end interventional x-ray imaging

High-end x-ray imaging is becoming more and more important to provide crucial information for complex image guided interventions. Nevertheless, not only imaging is beneficial. To achieve best workflow performance intelligent software solutions and highly flexible and accurate positioning systems are mandatory. Only if these core functionalities will be seamlessly integrated in a system for surgery the acceptance will be given. In recent years, interventional x-ray imaging with fixed mounted C-arm systems (Angiography systems like the Artis family, Siemens Healthcare, Forchheim, Germany) has gained increasing attention in several surgical disciplines such as cardiac and vascular surgery. Modern Angiography systems not only offer the demanded high end Fluoroscopy and rotational 3D imaging accompanied by sophisticated dose saving measures, but also provide dedicated workflows for planning, guidance of the procedure, and final assessment of the treatment success.

Oliver Hornung received his doctoral degree in Mechanical Engineering from the University of Hanover. He has 15 years of experience in the field of robotics 10 of them with focus on medical applications. Mr. Hornung joined Siemens Healthcare in 2006. Starting with the development of innovative devices for in-vitro diagnostics he joined the business unit Angiography & Interventional X-Ray Systems, being responsible for the mechanical design of the C-arm systems until 2015. With the establishment of the new business segment Therapy Systems he took over the responsibility for the spine surgery projects in innovation.
Keynote speech

Prof. Sebastien Ourselin, Head of the Translational Imaging Group (TIG) within CMIC, University College London

From Image-guided Neurosurgery to Intrauterine Intervention

This talk will first focus on our current research programme in image-guided neurosurgery, EpiNav™, developed in conjunction with our clinical partners at the National Hospital for Neurosurgery and Neurology to assist in planning and guiding surgical interventions for epileptic patients. The goal of EpiNav™ is to develop a software platform to assist in planning and guiding surgical interventions for patients at every stage of the clinical process, from pre-operative surgical planning, interaction with a robotic solution for electrode implantation, to surgical guidance using intra-operative MRI for accurate resection.

In the second part of this talk, we will show how the lessons learned from translating computer-assisted neurosurgery in the clinic are shaping the future of minimally invasive surgery in an even more challenging surgical indication. Our GIFT-Surg (Guided Instrumentation for Fetal Therapy and Surgery) project, in collaboration with KU Leuven, is working towards transforming surgery on unborn babies. Our ambition within GIFT-Surg is to develop an integrated surgical platform for intrauterine fetal surgery. This talk will highlight the combination of multidisciplinary expertise already involved in our initial work on the development of the main building blocks for this platform. Results on the design of new surgical manipulators, new intra-operative imaging devices including miniature photo-acoustics probe, new data fusion tools and new surgical planning and guidance solutions will be presented.

Prof. Sebastien Ourselin obtained his PhD in Computer Science from INRIA (France) in the field of medical image analysis. He is currently Director of the Institute of Biomedical Engineering, Director of the EPSRC Centre for Doctoral Training in Medical Imaging and Head of the Translational Imaging Group (TIG) within the Centre for Medical Image Computing (CMIC) at the University College London (UCL). He has published over 300 journal and conference articles (not including abstracts). He is an associate editor for IEEE Transactions on Medical Imaging, Journal of Medical Imaging (SPIE), Scientific Reports (Nature), and member of the Editorial Board of Medical Image Analysis.

Prof. Ourselin is leading the translational imaging research program between CMIC and the UCL Institute of Neurology, and has established in collaboration with Prof Nick Fox a new imaging unit at Queen Square to deliver engineering solutions for clinical trials. In collaboration with Prof John Duncan, he is also leading the development of an image-guided neurosurgery platform, which has already been deployed within the interventional MRI environment at Queen Square for temporal lobe epilepsy. This work built the foundation to expand the work into neurosurgical planning, currently funded under the Wellcome Trust and Department of Health HICF scheme. He is also leading the development of the open-source NifTK platform. Most of these activities are underpinning GIFT-Surg’s technological foundations, an Innovative Engineering for Health grant funded by the Wellcome Trust and EPSRC. In collaboration with KU Leuven, GIFT-Surg will deliver a new platform for fetal therapy and surgery through a unique combination of innovative interventional imaging systems and advanced surgical tools offering new levels of visualisation, flexibility and precision.

5th Joint Workshop on New Technologies for Computer/Robot Assisted Surgery
Keynote speech

Professor Brian Davies, DSc, PhD, DIC, F.I.Mech.E, FREng.

Robotic Surgery: why are there so few clinical applications?

In spite of extensive and high quality research over the last 25 years, there have been relatively few Companies which have undertaken clinical applications of robotic surgery. Having been involved in Robotic Surgery research and in clinical trials since the beginning, this talk will give a personal view of why this is and provide an overview of the situation. The majority of difficulties are not technical in nature but due to the medical and commercial environments, such as the need for a greater emphasis on cost-benefits. Recommendations are provided that will hopefully help to have a greater number of systems to be applied clinically. Some predictions are made for the future which should increase the number of commercial systems and provide surgical benefits as well as improved long term outcomes for patients.

Brian Davies is an Emeritus Professor of Medical Robotics at Imperial College London, where he has been since 1983, and is also a senior research investigator there. He has a PhD in Medical Robotics and was awarded a DSc. in 2001 for his international contribution to Robotic and Computer Aided Surgery systems. He was made a Fellow of the Royal Academy of Engineering in 2005 and served on their focus group on medical technology. He developed the world's first special-purpose surgical robot called PROBOT, to remove quantities of prostatic tissue from a human patient in a clinical trial in April 1991. He subsequently developed the concept of Active Constraints particularly applied to orthopaedic robots and in 1999 he was a co-founder of the spin-off company ACROBOT limited, which developed robots for MIS hip and knee joint replacement and he was their Technical Director until the company was acquired in 2010 by Stanmore Implants Worldwide, which in turn was bought by Mako Ltd and then by Stryker Ltd in 2013. He is a founder of the new "Technologies in Medicine" section of the Royal Society of Medicine. He is on the Board of the IMechE Engineering in Medicine & Health Division. From 2001-2014 he has been program chair for the annual conference of the International Society for Computer Aided Orthopaedic Surgery (CAOS). Since 2006 he has been a Research Fellow advising on Medical Robots for the Advanced Robotics Group of the Italian Institute of technology in Genoa. In July 2012 he gave the Peiyang prestigious lecture in Tianjin, China and became a visiting Professor there. In July 2013 he gave invited Keynote talks on robotic surgery to the CAOS Asia conference in Cairns, Australia. He Chairs the Strategic Advisory Board for the Leeds HTC in Colorectal Cancer group, 2013-2015. He has been awarded the 2015 International Society for Technology in Arthroplasty Lifetime Achievement Award for “pioneering work in the field of surgical robotics”.
Keynote speech

Professor Philippe A. Liverneaux, MD, PhD

Endoscopic telemicrosurgery (minimally invasive robotically assisted microsurgery) for peripheral nerve repair

Microsurgery is a technique that uses optical magnification and fine instruments in order to perform inframillimetric vascular and nerve anastomoses. Since its advent in the 1960s, it has not recorded any technological leap. Robotic could allow this evolution. Endoscopic robotically-assisted telemicrosurgery or microsurgery will, in the future, increase other visual and manual skills that can not be done by conventional microsurgery: magnified vision, three-dimensional vision, functionalized vision, endoscopic vision, enhanced vision, tremor filtration, suppression of physiological tremor, magnification of manual movement, magnification of movements’ amplitudes, the magnification of tactile feedback force, the multimanuel work, increased ergonomics of endoscopic manual work, new hand tools, remote work. All these properties are not yet available with the DaVinci® robot, but some already allow clinical applications in peripheral nerve surgery, including the brachial plexus. Brachial plexus surgery uses very large incisions, either to explore the plexus or to perform neurotization. Apart from the unsightly appearance and lengthening of the hospitalization time, these large incisions involve septic risks and risks of perineural adherences that interfere with the quality of nerve regrowth. Endoscopic telemicrosurgery allows the same procedures but with minimally invasive incisions. Endoscopic telemicrosurgery, through the amplification of human capabilities can be a way to make the expected technological leap in order to introduce microsurgery in the XXI century.

Philippe Liverneaux is the Chairman of the Department of Hand Surgery in Strasbourg University Hospitals. He is the past-President of RAMSES, Robotic Assisted Surgery Endoscopic Microsurgery and Society, past-President of the French Society of Microsurgery, and is currently the General Secretary of the French Society for Hand Surgery. His research focuses on minimally invasive wrist surgery and robotic surgery of the peripheral nerves.