### Sunday, 21 June 2015

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>08:30</td>
<td>Registration and Coffee</td>
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<tr>
<td>09:15</td>
<td>Welcome: Guang-Zhong Yang</td>
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<td>09:20</td>
<td>Opening Address: Ara Darzi</td>
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**Session 1 – MR and Ultrasound-Guided Interventions**

*Chairs: Kevin Cleary, Simon DiMaio*

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<tr>
<th>Time</th>
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<tr>
<td>09:30</td>
<td>Invited Lecture: Andreas Melzer, University of Dundee, UK</td>
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<td></td>
<td><em>MR Image Guided Robotic Assisted Interventions and Focused Ultrasound</em></td>
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<tr>
<td>10:15</td>
<td>MR-Conditional Robot for Transcranial Focused Ultrasound in Infants</td>
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<td>K. Price¹², V. Sin¹, C. Mougenot¹, T. Loo¹², S. Pichardo⁴, A. Waspe¹, J. Drake¹²</td>
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<tr>
<td></td>
<td>¹The Hospital for Sick Children, Canada</td>
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<td></td>
<td>²University of Toronto, Canada</td>
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<td></td>
<td>³Phillips Healthcare, Canada</td>
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<td>⁴Thunder Bay Regional Research Institute, Canada</td>
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<td>10:30</td>
<td>Needle-Guiding Robot for Percutaneous Intervention: Comparative Phantom Study in a 3T MRI Scanner</td>
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<td>E. Franco¹, M. Rea², W. M. W. Gedroyc², M. Ristic¹</td>
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<td></td>
<td>¹Department of Mechanical Engineering, Imperial College London, UK</td>
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<td></td>
<td>²St Mary’s Hospital, London, UK</td>
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<td>10:45</td>
<td>Magnetic Bi-Component Millirobot for Targeted Drug Delivery</td>
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<td>V. Iacovacci¹, G. Lucarini¹, L. Ricotti¹, P. Dario¹, P. E. Dupont², A. Menciassi¹</td>
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<tr>
<td></td>
<td>¹The BioRobotics Institute, Scuola Superiore Sant’Anna, Italy</td>
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<td></td>
<td>²Cardiovascular Surgery, Boston Children’s Hospital, Harvard Medical School, USA</td>
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<tr>
<td>11:00</td>
<td>Fused MRI-Ultrasound Guidance for Robot-Assisted Laparoscopic Prostatectomy: System Architecture and First Clinical Use</td>
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<td>O. Mohareri¹²³, G. Nir¹, J. Lobo¹, R. Savdie², P. Black², S. E. Salcudean¹</td>
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<tr>
<td></td>
<td>¹Department of Electrical and Computer Engineering, University of British Columbia, Canada</td>
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<td>²Department of Urological Sciences, University of British Columbia, Canada</td>
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<tr>
<td></td>
<td>³Intuitive Surgical Inc., USA</td>
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<tr>
<td>11:15</td>
<td>Coffee Break and Poster Session</td>
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</tbody>
</table>
Poster Teaser Session 1 (3 minute presentations)

Chairs: Erik Mayer, Christos Bergeles

P1 Vision-Guided Learning by Demonstration for Adaptive Surgical Robot Control
*The Hamlyn Centre for Robotic Surgery, IGHI, Imperial College London, UK
†Department of Surgery and Cancer, Imperial College London, UK

P2 Design of a Novel Flexible Endoscope
Z. Li†, M. Z. Oo‡, V. D. Thang‡, V. Nalam§, T. Kofidis*, H. Ren§, H. Yu**
†Institute of Digestive Disease and Chow Yuk Ho Technology Centre for Innovative Medicine, The Chinese University of Hong Kong
‡Department of Cardiac, Thoracic and Vascular Surgery, National University of Singapore, Singapore
§Department of Biomedical Engineering, National University of Singapore, Singapore
**Laboratory for Computational Sensing and Robotics (LCSR), Johns Hopkins University, USA

P3 Shoulder-Mounted Robot for MRI-Guided Arthrography Procedure; Second Prototype and Accuracy Study
R. Monfaredi†, E. Wilson†, R. Sze†, K. Sharma†, I. Iordachita§, K. Cleary*
†Sheikh Zayed Institute for Pediatric Surgical Innovation, CNMC, Washington DC, USA
‡Industrial Department, Azad University-South Tehran Branch, Tehran, Iran
§Laboratory for Computational Sensing and Robotics (LCSR), Johns Hopkins University, USA

P4 Dynamic Non-Continuous Virtual Fixtures for Operations on a Beating Heart Using the da Vinci® Research Kit
A. Ruszkowski*, Z. F. Quek*, A. Okamura*, S. E. Salcudean†
†Robotics and Control Laboratory, University of British Columbia, Canada
‡Department of Mechanical Engineering, Stanford University, USA

P5 6-D Localisation of a Magnetic Capsule Endoscope Using a Stationary Rotating Magnetic Dipole Field
K. M. Popek*, J. J. Abbott†
*School of Computing, University of Utah, USA
‡Department of Mechanical Engineering, University of Utah, USA

P6 Google Glass Guidance: First Clinical Experience in Open Abdominal Aortic Aneurysm Repair
P. Pratt*, C. D. Bicknell‡, S. Dindyal§, A. Darzi†,‡
†Hamlyn Centre for Robotic Surgery, IGHI, Imperial College London, UK
‡Department of Surgery and Cancer, Imperial College London, UK
§Imperial Vascular Unit, Imperial College Healthcare NHS Trust, London, UK

P7 Hybrid Actuation for a Bio-Inspired Continuum Robotic Manipulator for Surgical Applications
A. Stilli, H. A. Wurdemann, K. Althoefer*
King’s College London, Department of Informatics, London, UK

Sunday, 21 June 2015
P8 Adaptive Filtering of Fibre-Optic Fetoscopic Images for Fetal Surgery
E. Maneas*, G. Sato dos Santos†, J. Deprest‡, R. Wimalasundera§, A. L. David¶, T. Vercauteren*, S. Ourselin*
†Centre for Medical Imaging Computing, University College London, UK
‡University Hospital KU Leuven, Leuven, Belgium
§Fetal Medicine Unit, University College London Hospital, UK
¶Institute for Women’s Health, University College London, UK

P9 SmartLiver Image Guidance System for Laparoscopic Liver Resection
†Centre for Medical Image Computing, University College London, UK
‡Division of Surgery and Interventional Science, UCL Medical School, UK

P10 Paediatric Surgical Robot (PSR) – MRI-Guided Bone Biopsy System
T. Looi*, L. Ma†, Y. Yi†, A. Goldenberg*, J. Amara†, J. Drake†
†The Hospital for Sick Children, Canada
‡University of Toronto, Canada
§Engineering Services Inc., Canada

P11 Calibration-Free Gravity Compensation for Cooperative Manipulation
P. Wisanuvej*, J. Liu, K. Leibrandt, G.-Z. Yang
The Hamlyn Centre for Robotic Surgery, IGH, Imperial College London, UK

P12 Occupational Radiation Exposure During FEVAR: A Stage-By-Stage Analysis; Targets for Robotic Intervention
M. M. Li*, C. D. Bicknell†, S. Cheung*, N. Burfitt†, R. Thomas†, M. Jenkins*, N. Cheshire†, M. Hamady‡, C. V. Riga†,‡
†Division of Surgery, Department of Surgery and Cancer, Imperial College London, UK
‡Imperial Vascular Unit, Imperial College Healthcare NHS Trust, London, UK

P13 Augmented Visualization for Robotic Prostatectomy
X. Luo*, U. L. Jayaratne*, S. E. Pautler†, T. M. Peters†
†Robarts Research Institute, Western University, London, Canada
‡Department of Urology, St. Joseph’s Hospital, London, Canada

P14 Computer Assisted Laparoscopy Robot - A Low-Cost Lightweight Design
D. Á. Nagy*, Á. Takács*, I. J. Rudas*, T. Haidegger†,‡
†Department of Surgical Research and Techniques, Semmelweis University, Budapest, Hungary
‡Antal Bejczy Center for Intelligent Robotics, Óbuda University, Budapest, Hungary
§Austrian Center for Medical Innovation and Technology, Wiener Neustadt, Austria

12:30 Lunch and Poster Session
Session 2 – Continuum Robots and Navigation

Chairs: Pierre Dupont, Kaspar Althoefer

14:00 Invited Lecture: Garnette Sutherland, University of Calgary, Canada

*Image-Guided Robotic Neurosurgery*

14:45 Comparison of Optimisation Algorithms for a Tubular Aspiration Robot for Maximum Coverage in Intracerebral Hemorrhage Evacuation
Y. Guo, J. Granna, K. D. Weaver, R. J. Webster III, J. Burgner-Kahrs

1. Center of Mechatronics (MZH), Leibniz Universität Hannover, Germany
2. Department of Neurological Surgery, Vanderbilt University, USA
3. Department of Mechanical Engineering, Vanderbilt University, USA

15:00 A Linearly Actuated Catheter Robot for Intelligent Steering Control-Based Tension and Catheter Shaping Tracking
J. Back, R. Karim, K. Rhode, K. Althoefer, H. Liu

1. Centre for Robotics Research, Department of Informatics, King’s College London, UK
2. Division of Imaging Sciences and Biomedical Engineering, King’s College London, UK

15:15 Concentric Tube Robot Kinematics Using Neural Networks
C. Bergeles, F.-Y. Lin, G.-Z. Yang

1. Hamlyn Centre for Robotic Surgery, Imperial College London, UK
2. Medical Device Innovation DTP, University College London, UK

15:30 Cardioscopic Imaging to Guide Manual and Robotic Surgery Inside the Beating Heart
C. Kim, A. Ataollahi, I. Berra, P. E. Dupont

Pediatric Cardiac Bioengineering Lab, Boston Children’s Hospital, Harvard Medical School, USA

15:45 Coffee Break and Poster Session

Session 3 – Navigation and Training

Chairs: Dennis Fowler, Paolo Fiorini

16:15 Invited Lecture: Nassir Navab, TUM, Germany and Johns Hopkins University, USA

*Robotics and Control for Patient and Process Specific Imaging and Visualization*

17:00 Development and Validation of a Training and Assessment Tool for Robot Assisted Radical Prostatectomy - a Multi-Institutional Study

1. King’s College London, UK
2. University of Padua, Italy
3. Roswell Park Cancer Institute, USA
4. OLV Clinic, Belgium

Sunday, 21 June 2015
Clinical Translation of Real Time Cautery Navigation for Breast Surgery
T. Ungi\textsuperscript{1,2}, G. Gauvin\textsuperscript{2}, A. Lasso\textsuperscript{1}, C. T. Yeo\textsuperscript{1}, J. Rudan\textsuperscript{2}, C. J. Engel\textsuperscript{2}, G. Fichtinger\textsuperscript{1,2}
\textsuperscript{1}School of Computing, Queen’s University, Kingston, ON, Canada
\textsuperscript{2}Department of Surgery, Queen’s University, Kingston, ON, Canada

Challenges in Multimodal Image-Guided Targeted Prostate Biopsy
A. Shah\textsuperscript{*1}, O. Zettinig\textsuperscript{1,4}, E. Storz\textsuperscript{2}, T. Maurer\textsuperscript{3}, M. Eiber\textsuperscript{3}, N. Navab\textsuperscript{1,4}, B. Frisch\textsuperscript{1}
\textsuperscript{1}Chair for Computer Aided Medical Procedures, Technische Universität München, Germany
\textsuperscript{2}Urologische Klinik und Poliklinik, Technische Universität München, Germany
\textsuperscript{3}Nuklearmedizinische Klinik und Poliklinik, Technische Universität München, Germany
\textsuperscript{4}Department of Computer Science, Johns Hopkins University, USA

Cognitive Camera Robot for Cognition-Guided Laparoscopic Surgery
M. Wagner\textsuperscript{*1}, A. Bihlmaier\textsuperscript{2}, P. Mietkowsk\textsuperscript{i3}, S. Bodenstedt\textsuperscript{2}, S. Speidel\textsuperscript{2}, H. Wörn\textsuperscript{2}, B. Müller-Stich\textsuperscript{1}, H. G. Kenngott\textsuperscript{1}
\textsuperscript{1}Department for General, Visceral and Transplantation Surgery, Heidelberg University Hospital, Germany
\textsuperscript{2}Institute for Anthropomatics and Robotics, Karlsruhe Institute of Technology, Germany
Monday, 22 June 2015

08:45  Registration and Coffee

Session 4 – Platforms for Microsurgery

Chairs: Toshio Fukuda, Joseph Wang

09:30  Keynote Lecture: Sylvain Martel, École Polytechnique de Montréal, Canada

Harnessing Bacteria to Become Ideal Cancer Fighting Nanorobots

10:30  Motorized 2-DOF Spherical Orienting Mechanism for Laser Micromanipulation in Trans-Oral Laser Microsurgeries

N. Deshpande*, L. S. Mattos, D. G. Caldwell

Department of Advanced Robotics, Istituto Italiano di Tecnologia, Genova, Italy

10:45  Robust, Low-Cost, Modular mm-Scale Distal Force Sensors for Flexible Robotic Platforms

J. Gafford*1,2, R. Wood1,2, C. Walsh1,2

1Harvard School of Engineering and Applied Sciences, Cambridge, MA, USA
2Wyss Institute for Biologically-Inspired Engineering, Boston, MA, USA

11:00  Micro-IGES Robot for Transanal Robotic Microsurgery


The Hamlyn Centre for Robotic Surgery, IGHI, Imperial College London, UK

11:15  Coffee Break and Poster Session

11:45  Poster Teaser Session 2 (3 minute presentations)

Chairs: Colin Bicknell, Stamatia Giannarou

P15  Towards Robotic Needle Steering for Percutaneous Radiofrequency Ablation in the Liver: Procedure-Specific Workspace Analysis

T. K. Adebar*1, J. D. Greer1, P. F. Laeseke2, G. L. Hwang2, A. M. Okamura1

1Mechanical Engineering Department, Stanford University, USA
2Radiology Department, Stanford University, USA

P16  Validation of the RobotIX Mentor Robotic Surgery Simulator

G. Whittaker*, A. Aydin, N. Raison, F. Kum, B. Challacombe, M. S. Khan, P. Dasgupta, K. Ahmed

MRC Centre for Transplantation, King’s College London; Department of Urology, Guy’s and St. Thomas’ NHS Foundation Trust, London, UK
P17  Re-Thinking Patient Specific Instrumentation and Robotics in Orthopaedics: A New Mechatronic Approach  
A. Darwood*, R. Emery¹, R. Richards³, P. Reilly³, F. Rodriguez y Baena², A. Dawood⁴, A. Tambe⁵  
¹Prometheus Surgical Ltd., 24 Upper Wimpole St, London, UK  
²Imperial College London, UK  
³Cavendish Implants, London, UK  
⁴Derby Hospital NHS Trust, UK

P18  Design of a Robotic Implant for In-Vivo Esophageal Tissue Growth  
D. D. Damian*, S. Arabagi, P.E. Dupont  
Boston Children’s Hospital, Harvard Medical School, USA

P19  Analysis of the Instrument Vibrations and Contact Forces Caused by an Expert Robotic Surgeon Doing FRS Tasks  
University of Pennsylvania, Philadelphia, Pennsylvania, USA

P20  Practical Dry Calibration with Medium Adaptation for Fluid-Immersed Endoscopy  
F. Chadebecq*, T. Vercauteren¹, R. Wimalasundera³, G. Attilakos³, A. L. David³, J. Deprest⁴, S. Ourselin⁴, D. Stoyanov⁴  
¹Centre for Medical Image Computing, University College London, UK  
²Fetal medicine Unit, University College London Hospital, UK  
³Institute for Women’s Health, University College London, UK  
⁴Department of Development and Regeneration, Katholieke Universities Leuven, Belgium

P21  Label-Based Optimisation of Dense Disparity Estimation for Robotic Single Incision Abdominal Surgery  
V. Penza*, S. Bacchini², A. Ciullo², E. De Momi², A. Forgione³, L. Mattos¹  
¹Department of Advanced Robotics, Istituto Italiano di Tecnologia, Italy  
²Department of Electronics Information and Bioengineering, Politecnico di Milano, Italy  
³AIMS Academy, Milano, Italy

P22  Recognition of Intentional Violations of Active Constraints in Cooperative Manipulation Tasks  
M. Aricò¹, S. A. Bowyer², E. De Momi*¹, G. Ferrigno¹, S. Pastorelli¹, F. Rodriguez y Baena²  
¹Department of Electronics, Information and Bioengineering, Politecnico di Milano, Italy  
²Department of Mechanical Engineering, Imperial College London, UK  
³Department of Mechanical and Aerospace Engineering, Politecnico di Torino, Italy

P23  Autonomous Execution of Surgical Tasks: the Next Step in Robotic Surgery  
R. Muradore*, G. De Rossi¹, M. Bonfe³, N. Preda³, C. Secchi³, F. Ferraguti¹, P. Fiorini¹  
¹Department of Computer Science, University of Verona, Italy  
²Engineering Department, University of Ferrara, Italy  
³Department of Science and Methods for Engineering, University of Modena and Reggio Emilia, Italy
P24  **Modular Fiber-Optic Shape Sensor for Articulated Surgical Instruments**  
S. Sareh\(^1\), Y. Noh\(^1\), T. Ranzani\(^2\), H. A. Wurdemann\(^1\), H. Liu\(^1\), K. Althoefer\(^1\)  
\(^1\)Centre for Robotics Research, King’s College London, UK  
\(^2\)Bio-Robotics Institute, Scuola Superiore Sant’Anna, Italy

P25  **Image Based Optical Multi-Axis Force Sensor for Medical Robotics**  
Y. Noh\(^1\), S. Sareh\(^1\), H. A. Wurdemann\(^1\), J. Li\(^2\), S. Wang\(^2\), H. Liu\(^*1\), K. Althoefer\(^1\)  
\(^1\)Centre for Robotics Research, Department of Informatics, King’s College London, UK  
\(^2\)School of Mechanical Engineering, Tianjin University, China

P26  **Robotic Technology and the Transformation of Epilepsy Surgery**  
D. R. Sandeman\(^*1\), K. A. Sieradzan\(^2\), H. F. Faulkner\(^3\)  
\(^1\)Department of Neurosurgery, Southmead Hospital, Bristol, UK  
\(^2\)Department of Neurology, Southmead Hospital, Bristol, UK

P27  **Cost Analysis Across Therapeutic Boarders in Non-Metastatic Prostate Cancer**  
J. E. Jacobsen\(^*1,2,4\), E. S. Haug\(^1,2\), T. Grotting\(^2\), V. K. Mishra\(^1\), S. Smeland\(^1\), A. Stensvold\(^3\), J. Cairns\(^4\), H. Danielsen\(^4\)  
\(^1\)Institute for Genetics and Informatics, Oslo University Hospital Trust, Norway  
\(^2\)Department of Urology, Vestfold Hospital Trust, Norway  
\(^3\)Department of Urology, Ostfold Hospital Trust, Norway  
\(^4\)Public Health and Policy, HSRP, London School of Hygiene and Tropical Medicine, UK

P28  **Spring Stiffness and Force Analysis in a Neurosurgical Spring-Based Continuum Robot for MINIR-II**  
Y. Kim, S. S. Cheng, J. P. Desai\(^*\)  
Robotics, Automation and Medical Systems (RAMS) Laboratory, Department of Mechanical Engineering, University of Maryland College Park, MD, USA

12:30  Lunch and Poster Session

14:00  Panel Discussion: **Surgical Robotics: The Next 25 Years**

Chair: Guang-Zhong Yang  
Panel Members: Garnette Sutherland, Lee Swanstrom, Russ Taylor, Cyrill von Tiesenhausen

Session 5 – From Eyes to Hands to Needles

Chairs: Gabor Fichtinger, Azad Najmaldin

15:00  **Beware Credentialing Based on Fundamentals of Laparoscopy: “The Eyes are Open, The Hands Move, But the Prefrontal Brain Has Not Departed”**  
K. Shetty\(^*\), D. R. Leff, G.-Z. Yang, A. Darzi  
The Hamlyn Centre for Robotic Surgery, IGHI, Imperial College London, UK

Monday, 22 June 2015
15:15  Experimental Comparison of Force Feedback vs Tactile Sensory Substitution for Suture Tension Perception
A. Spiers¹, S. Baillie², C. Roke³, A. Pipe³
¹Department of Mechanical Engineering, Yale University, USA
²School of Veterinary Sciences, University of Bristol, UK
³Bristol Robotics Laboratory, University of the West of England, UK

15:30  Development of a High-Fidelity Pediatric Cleft Palate Phantom and Feasibility Testing Using a da Vinci ® Surgical System
D. Podolsky¹,², D. Fisher², K. Wong², T. Looi¹, R. Patel⁴, J. Drake¹,³, C. Forrest¹,²
¹Center for Image Guided Innovation and Therapeutic Intervention, The Hospital for Sick Children, Canada
²Division of Plastic and Reconstructive Surgery, The Hospital for Sick Children, Canada
³Department of Neurosurgery, University of Toronto, Canada
⁴Canadian Surgical Technologies & Advanced Robotics, University of Western Ontario, Canada

15:45  Transoral Steerable Needles in The Lung: How Non-Annular Concentric Tube Robots Can Improve Targeting
P. J. Swaney¹, H. B. Gilbert¹, R. J. Hendrick¹, O. Commichau³, R. Alterovitz³, R. J. Webster III¹
¹Mechanical Engineering, Vanderbilt University, USA
²Hannover Center of Mechatronics, Leibniz Universität Hannover, Germany
³Computer Science, University of North Carolina at Chapel Hill, USA

16:00  Coffee Break and Poster Session

Session 6 – Surgical Robot Challenge

Chairs: Russ Taylor, Rick Satava

16:30  Karl Storz - Harold Hopkins Lecture: Alexandre Mottrie, OLV Clinic, Belgium
Future & New Developments in Robotic Surgery

17:15  Surgical Robot Challenge Finalists Presentations

17:55  Closing Remarks & Awards followed by Drinks Reception

19:30  Programme Committee Dinner

Monday, 22 June 2015
The Hamlyn Symposium 2015 is sponsored by:

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