



## Final Program (as of August 17, 2010)

### Monday, October 4

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16:00-18:00	Registration open	Atrium
18:00-19:30	Welcome Reception	Atrium

### Tuesday, October 5

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07:00-17:30	Registration open	Foyer of Régence A
07:00-07:45	Author's Breakfast	Saint-Laurent
08:00-08:20	Opening Lectures	Régence AB
08:20-09:50	<b>Session GS 1</b> <b>Robotics for the Power Industry: Overview Presentations</b>	Régence AB

*Session Chair:*  
**Nicolas Pouliot**, Canada

08:20 – 08:35

**0627 - The Specific Requirements of Applied Robots for the Power Utility**

Binhai Wang (1), Lei Han (1), and Bingqiang Li (1, 2)

(1) Electric Power Robotics Laboratory, Shandong Electric Power Research Institute, China

(2) Shandong Luneng intelligence Co., Ltd., China

08:35– 08:50

**0689 - Smart View for a Smart Grid – Unmanned Aerial Vehicles for Transmission Lines**

Janos Toth, and Adelana Gilpin-Jackson

BC Hydro, Canada

08:50 – 09:05

**0697 - About the Future of Power Line Robotics**

Serge Montambault and Nicolas Pouliot

Robotics and Civil Engineering Department, Hydro-Québec's research institute (IREQ), Canada

09:05 – 09:20

**0720 - Overview of Robotic Applications for Energized Transmission Line Work – Technologies, Field Projects and Future Developments**

David Elizondo (1), Thomas Gentile (1), Hans Candia (1), and Gregory Bell (2)

(1) Quanta Technology, USA

(2) Quanta Energized Services, USA

09:20 – 09:35  
0723 - **Benefits and Challenges Involved with Introduction of Robotics at BC Hydro**  
Bernhard Spalteholz  
BC Hydro, Canada  
09:35 – 09:50  
Questions and discussion

**09:50-10:20      Networking Break      Foyer**

**10:20-12:00      Parallel Technical Session      Régence A**  
**Transmission & Distribution - TD1 – Power Line Robots I**

Session Chairs:  
**Janos Toth**, Canada  
**Paulo Debenest**, Japan

10:20 – 10:40  
0673 - **Transmission Line Inspection Robot and Deicing Robot: Key Technologies, Prototypes and Applications**  
Gongping Wu, Hua Xiao, Xiaohui Xiao, Zhenglie Huang, and Yingsong Li  
School of Power and Mechanical Engineering, Wuhan University, China

10:40 – 11:00  
0644 - **Research of Power Transmission Line Maintenance Robots in SIACAS**  
Wang Hongguang (1), Jiang Yong (1), Liu Aihua (1), Fang Lijin (2), and Ling Lie (1)  
(1) State Key Laboratory of Robotics, Shenyang Institute of Automation, Chinese Academy of Sciences, China  
(2) School of Mechanical Engineering and Automation, Northeastern University, China

11:00 – 11:20  
0650 - **Expliner - From Prototype Towards a Practical Robot for Inspection of High-Voltage Lines**  
Paulo Debenest and Michele Guarnieri  
HiBot Corp., Japan

11:20 – 11:40  
0680 - **Improvement of LineROver: A mobile Robot for De-icing of Transmission Lines**  
Jinlong Zhao, Rui Guo, Lei Cao and Feng Zhang  
Electric Power Robotics Laboratory, Shandong Electric Power Research Institute, China

11:40 – 12:00  
0610 - **Field Experiences Using LineScout Technology on Large BC Transmission Crossings**  
Janos Toth (1), Nicolas Pouliot (2), and Serge Montambault (2)  
(1) British Columbia Transmission Corporation (BCTC), Canada  
(2) Robotics and Civil Engineering department, Hydro-Québec's research institute (IREQ), Canada

**10:20-12:00      Parallel Technical Session      Régence B**  
**Power Generation - PG1 – Underwater Applications**

*Session Chair:*  
**Nicolas Jardin**, France  
**Alain Croteau**, Canada

10:20 – 10:40

**0649 - Design of ROVs for the Mexican Power and Oil Industries**

T. Salgado-Jimenez (1), J. L. Gonzalez-Lopez (1), J. C. Pedraza-Ortega (2), L. G. García-Valdovinos (1), L. F. Martínez-Soto (1) and P. A. Resendiz-Gonzalez (1)

(1) CIDESI, Mexico

(2) UAQ (Universidad Autónoma de Querétaro), Mexico

10:40 – 11:00

**0702 - Robotic Rectification of Underwater Structural Elements in Power Dams**

Julien Beaudry (1), Luc Provencher (1), Pierre-Luc Richard (1), Stéphane Gendron (1), Dominique Thuot (2) and Michel Blain (1)

(1) Robotics & Civil Engineering Unit, Hydro-Quebec Research Institute (IREQ), Canada

(2) Department of Mechanical Engineering, Ecole de Technologie Supérieure (ETS), Canada

11:00 – 11:20

**0667 - Underwater Robotized High Speed Machining for Maintenance**

N. Jardin, V. Delalande, B. Delaunay

Electricité de France – R&D, France

11:20 – 11:40

**0661 - The Maski Underwater Robot: Technology, Field Experience and Benefits**

Alain Croteau (1) and Normand Duguay (2)

(1) Hydro-Québec (Research Institute), Canada

(2) Hydro-Québec (Generation), Canada

11:40 – 12:00

**0679 - Underwater Inspection Experiment for a Long Tunnel of EDF's Hydroelectric Facilities**

F. Loisy (1), P. François (1), G. Douchet (1), P. Hope-Darby (2), K. Shimmin (2), T. Bonner (2), E. Laurent (3) and R. Colin (3)

(1) EDF R&D, France

(2) The Water Services Group Ltd., United Kingdom

(3) Advitam, France

**12:00-13:30      Lunch Break                      Please verify your coupon for location of lunch.**

**13:30-14:30      Keynote Presentation                      Régence AB**  
**KP1 - The Latest Topics on Field and Service Robotics at Tokyo Institute of Technology**  
Shigeo Hirose, Tokyo Institute of Technology, Tokyo, Japan

I will introduce some of our latest topics related to the field and service robotics, e.g. snake-like robots and snake-like rescue robot "Souryu", arm mounted buggy robot "Gryphon V" for humanitarian demining, quadruped walking robot "TITAN XI" for steep slope construction tasks, and multi-wheeled "Expliner" for the inspection of high-voltage transmission lines. The snake-like robots were started from the observation of real snake and they are already exhibiting high terrain adaptability especially suitable for rescue operations. The buggy vehicle of the "Gryphon V" is mounting an arm with wide motion range and other devices for mine detection. Through several experiments conducted on mine test sites in Cambodia and Croatia, the Gryphon V already showed high robustness and better performance of mine detection than that of human deminers. The 7 ton world largest quadruped walking robot "TITAN-XI" can walk around on the surface of steep slope by avoiding the damage of the lattice-like Ferro concrete frames by using a pair of suspension wires, new vision system and intelligent gait control system.

<b>14:30-15:30</b>	<b>Session GS2</b> <b>Robotics for the Power Industry: Overview Video Session</b>	<b>Régence AB</b>
	Session Chair: <b>Jean-François Allan</b> , Canada	
	14:30 – 14:45 <b>0662 - MagneBike: Compact Magnetic Wheeled Robot for Power Plant Inspection</b> Fabien Tâche (1), François Pomerleau (1), Wolfgang Fischer (1), Gilles Caprari (1), Francesco Mondada (2), Roland Moser (3), and Roland Siegwart (1) (1) Autonomous Systems Laboratory, Eidgenössische Technische Hochschule Zürich (ETHZ), Switzerland (2) Laboratoire de Systèmes Robotiques, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland (3) ALSTOM (Switzerland) Ltd, ALSTOM Power Service, Switzerland	
	14:45 – 15:00 <b>0676 - Field Experience with LineScout Technology for Live-Line Robotic Inspection and Maintenance of Overhead Transmission Networks</b> Serge Montambault and Nicolas Pouliot Robotics and Civil Engineering department, Hydro-Québec's research institute (IREQ), Canada	
	15:00 – 15:15 <b>0704 - Robotic System for Diagnosis of Large Underwater Hydroelectric Structures</b> Bruno Dubé and Simon Pelletier-Thibeault Automation Machine Design RC Inc., Canada	
	15:15 – 15:30 <b>0719 - Robotic Penstock Welding</b> Bruce Hazel and Jean Côté Institut de Recherche, Hydro-Québec, Canada	
<b>15:30-15:50</b>	<b>Networking Break</b>	<b>Foyer</b>
<b>15:50-17:30</b>	<b>Parallel Technical Session</b> <b>Transmission &amp; Distribution - TD2 – Modeling and Control</b>	<b>Régence A</b>
	Session Chairs: <b>Joao Sequeira</b> , Portugal <b>Bill Ross</b> , USA	
	15:50 – 16:10 <b>0681 - Longitudinal Dynamics Modeling of the RIOL Robot</b> Joao Sequeira Institute for Systems and Robotics, Instituto Superior Técnico, Portugal	
	16:10 – 16:30 <b>0709 - Dynamic Model and Simulation of an Inspection Robot for Power Transmission Lines: Preliminary Results</b> Luis G. García-Valdovinos, Arturo Velarde-Sánchez, Luis del Llano-Vizcaya, Tomás Salgado-Jiménez, Fernando Hernández-Rosales, Felipe Martínez-Soto Applied Research Division, Center for Engineering and Industrial Development (CIDESI), Mexico	

16:30 – 16:50

**0696 - Control of a Brachiating Robot for Inspection of Aerial Power Lines**

Vinicius Menezes de Oliveira (1), and Walter Fetter Lages (2)

(1) Center for Computational Sciences, Federal University of Rio Grande, Brazil

(2) Department of Electrical Engineering, Federal University of Rio Grande do Sul, Brazil

16:50 – 17:10

**0625 - Haptic-Enabled Control of Hydraulic Manipulators Applied to Power Line Maintenance: Concept & Implementation**

Kurosh Zarei-nia (1), Nariman Sepehri (1), Tim Olson (2), and Wes Mueller (2)

(1) Department of Mechanical & Manufacturing Engineering, University of Manitoba, Canada

(2) Line Transmission Assets Services, Manitoba Hydro, Canada

17:10 – 17:30

**0705 - High Performance Teleoperation for Industrial Work Robots**

Bill Ross, David LaRose, Hank Wilde, L. Douglas Baker

The National Robotics Engineering Center, Carnegie Mellon University, USA

**15:50-17:30**

**Parallel Technical Session**

**Régence B**

**Power Generation - PG2 – Hydraulic and Thermal Applications I**

Session Chairs:

**Ekkehard Zwicker**, Switzerland

**Bruce Hazel**, Canada

15:50 – 16:10

**0639 - A Parallel Link Scanner for Inspection of Bores and Tubes**

Wolfgang Zesch (1), Ekkehard Zwicker (1), Markus Wiesendanger (1), Jim F. Knowles (2)

(1) ALSTOM Inspection Robotics Ltd, Switzerland

(2) ALSTOM Power, Switzerland

16:10 – 16:30

**0657 - Robotic Refurbishment of Gate Wheel Tracks**

J.L. Gagné (1), L. Bédard-T. (1), L. Lavoie (1), B. Hazel (2), J. Côté (2), Y. Laroche (2) and P. Mongenot (2)

(1) Énergie Électrique, Rio Tinto Alcan, Canada

(2) IREQ, Hydro-Québec, Canada

16:30 – 16:50

**0665 - A Prototype of a Specialized Robotic System for Repairing Hydraulic Turbine Blades**

J. M. S. T. Motta, C. H. Llanos, G. C. Carvalho and S. C. A. Alfaro

University of Brasília, Brazil

16:50 – 17:10

**0666 - Robotic Approach to Improve Turbine Surface Finish**

M. Sabourin (1), F. Paquet (1), B. Hazel (2), J. Côté (2) and P. Mongenot (2)

(1) Alstom Hydro Canada, Canada

(2) Institut de Recherche, Hydro-Quebec, Canada

17:10 – 17:30

**0706 - Pneumatic Impact-drive and Tube Crawler Device for Non-destructive Inspections**

Andres Peralta

Alstom Power - Thermal Services, Switzerland

**17:30-19:00**

**Networking Cocktail**

**Foyer**

## Wednesday, October 6

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**07:00-17:30**    **Information desk open**    **Foyer of Régence A**

**07:00-07:45**    **Author's Breakfast**    **Saint-Laurent**

**08:00-09:00**    **Keynote Lecture**    **Régence AB**

**KL2 - ROBTET: Lessons Learnt from Aerial Live-line Maintenance**

Manuel Ferre, Universidad Politécnica de Madrid, Madrid, Spain

Telerobotic systems developed for aerial live-line have proven to be powerful tools for maintenance tasks. These developments have represented a breakthrough for the security and standardization of live-power line maintenance. The experience derived from the application of Robtet in the Spanish network from 2000 to 2004 could be a reference for future telerobotics developments. Main technologies that have been successfully applied in Robtet are focused on two directions. The first line is to provide the operator with the sufficient information from the remote robot worksite. It has been done by using stereoscopic video cameras and reflecting the robot-environment forces to the operator, the sum of both has allowed manipulating objects with dexterity. The second line is to provide an efficient operator-machine interaction that assists the operator in executing teleoperated tasks. The main tools that have been applied for operator assistance are: voice recognition, virtual forces, and remote environment calibration. The integration of the mentioned technologies has proven a high performance of the Robtet achieving same productivity as the classical human teamwork. Other non-technical factors that have to also be considered for exploiting telerobotics systems are related to: equipment service maintenance costs, training of operators, and norms and regulation for live-line works.

**09:00-09:30**    **Networking Break**    **Foyer**

**09:30-10:50**    **Parallel Technical Sessions**    **Régence A**

**Transmission & Distribution - TD3 – Image Processing I**

Session Chairs:

**Wai Ho Li**, Australia

**Jean-Philippe Tardif**, USA

09:30 – 09:50

**0701 - Over Head Line Real-time Tracking for Automatic Inspection or User Interface Enhancement**

Joao Gomes-Mota and Tiago Gusmao

Albatroz Engineering, Portugal

09:50 – 10:10

**0651 - Visual Live-Line Condition Monitoring of Composite Insulators**

Chithambaram A. Veerappan, Peter R. Green, and Simon M. Rowland

The University of Manchester, Manchester, UK

10:10 – 10:30

**0663 - Image Processing to Automate Condition Assessment of Overhead Line Components**

Wai Ho Li (1), Arman Tajbakhsh (2), Carl Rathbone (2), and Yogendra Vashishtha (2)

(1) Department of Electrical and Computer Systems Engineering, Monash University, Australia

(2) SP AusNet, Australia

10:30 – 10:50

**0647 - Vision-aided Inertial Navigation for Power Line Inspection**

Jean-Philippe Tardif, Michael George, Michel Laverne, Alonzo Kelly, and Anthony Stentz  
National Robotics Engineering Center, Carnegie Mellon University, USA

**09:30-10:50**

**Parallel Technical Sessions**

**Régence B**

**Power Generation - PG3 – Nuclear Applications I**

Session Chairs:

**Andrew Goldenberg**, Canada

**Patricia García-Borras**, Spain

09:30 – 09:50

**0612 - AARM: A Robot Arm for Internal Operations in Nuclear Reactors**

Andrew Goldenberg (1), Matt Gryniewski (1), and Todd Campbell (2)

(1) Engineering Services Inc. (ESI), Canada

(2) Atomic Energy of Canada Ltd (AECL), Canada

09:50 – 10:10

**0616 - Application of Robotics for the Nuclear Power Plants in Korea**

Seungho Kim, Seung Ho Jung, Sung Uk Lee, Chang Hoi Kim, Ho Chul Shin, Yong Chil Seo, Nam Ho Lee and Kyung Min Jung

Nuclear Robotics Laboratory, Korea Atomic Energy Research Institute, Korea

10:10 – 10:30

**0629 - Dedicated and Standard Industrial Robots used as Force-Feedback Telemaintenance Remote Devices at the AREVA Recycling Plant**

G. Piolain (1), F. Geffard (2), A. Coudray (3), P. Garrec (2), J-F. Thro (4) and Y. Perrot (2)

(1) Maintenance Department, AREVA NC La Hague plant, France

(2) Interactive Robotics Laboratory, CEA, LIST, France

(3) Robotics Department, AREVA/MECACHIMIE, France

(4) AREVA NC, Paris – La Defense, France

10:30 – 10:50

**0645 - TechnoFusión Remote Handling Laboratory: Contributions to Nuclear Fusion Facilities Maintenance Tasks**

Patricia García-Borras, Pablo García-Robledo, Jorge Barrio, Manuel Ferre, Rafael Aracil  
Centro de Automática y Robótica, Spain

**10:50-11:00**

**Short Break**

**Foyer**

**11:00-12:00**

**Parallel Technical Sessions**

**Régence A**

**Transmission & Distribution - TD4 – Image Processing II**

Session Chairs:

**Binhai Wang**, China

**Walter Fetter Lages**, Brazil

11:00 – 11:20

**0699 - Robotized Inspection of Power Lines with Infrared Vision**

Jonathan Henrique Efigênio de Oliveira, and Walter Fetter Lages

Department of Electrical Engineering, Federal University of Rio Grande do Sul, Brazil

11:20 – 11:40

**0656 - Research on the Infrared and Visible Power-Equipment Image Fusion for Inspection Robots**

Hongwei Li, Binhai Wang, and Li Li

Electric Power Robotics Laboratory, Shandong Electric Power Research Institute, China

11:40 – 12:00

**0643 - Advances in Vegetation Management for Power Line Corridor Monitoring Using Aerial Remote Sensing Techniques**

Zhengrong Li (1), Rodney Walker (2), Ross Hayward (1), Luis Mejias (2)

(1) Faculty of Science and Technology, Queensland University of Technology (QUT), Australia

(2) Australian Research Centre for Aerospace Automation (ARCAA, QUT), Australia

**11:00-12:00**

**Parallel Technical Sessions  
PG4 – Nuclear Applications II**

**Régence B**

Session Chairs:

**Clément Gosselin**, Canada

**R. O. Buckingham**, UK

11:00 – 11:20

**0692 - Underactuated Versatile Gripper for the Cleaning of Nuclear Sites**

Clément Gosselin and Thierry Laliberté

Department of Mechanical Engineering, Université Laval, Canada

11:20 – 11:40

**0714 - Dexterous Manipulators for Nuclear Inspection and Maintenance – Case Study**

R. O. Buckingham and A. C. Graham

OC Robotics, UK

11:40 – 12:00

**0722 - Robotic Removal of High-Activity Debris from a Nuclear Primary Heat Transfer System**

Anthony Hamilton (1), Steve J. Burany (1), Samuel B. Peralta (1), and Lindsay Greenland (2)

(1) Kinectrics, Canada

(2) Ontario Power Generation, Canada

**12:00-13:30**

**Lunch Break**

**Please verify your coupon for location of lunch.**

**13:30-15:10**

**Parallel Technical Sessions  
Transmission & Distribution - TD5 – Distribution Applications**

**Régence A**

Session Chairs:

**Vinicius de Oliveira**, Brazil

**Derek C. Wilson**, Canada

13:30 – 13:50

**0611 - Autonomous Navigation for Underground Energy Line Inspection Robot**

Emanuel Estrada, Luan Silveira, Eder Goncalves, Nelson Duarte Filho, Vinicius de Oliveira, Silvia Botelho

Center for Computational Science (C3), Federal University of Rio Grande, Brazil

13:50 – 14:10

**0632 - System Development of a Robotic Pole Manipulator**

Andrew Paul Turner (1) and Derek C. Wilson (2)

(1) MDA Inc., Canada

(2) BC Hydro, Canada

14:10 – 14:30

**0638 - The Evolution of UT Pole Climbing Robots**

M. Nili Ahmadabadi (1), H. Moradi (1), A. Sadeghi (2), A. Madani (1), and M. Farahnak (1)

(1) University of Tehran, Iran

(2) Scuola Superiore Sant' Anna, Italy

14:30 – 14:50

**0653 - Robotics Applied to Work Conditions Improvement in Power Distribution Lines Maintenance**

R. A. Roncolato (1), N. W. Romanelli (1), A. Hirakawa (2), O. Horikawa (2), D. M. Vieira (2), R.

Yamamoto (2), V. C. Finotto (2), V. Sverzuti (2) and I. P. Lopes (2)

(1) Paulista Power and Light Company – CPFL, Brazil

(2) Escola Politécnica of the University of São Paulo, Brazil

14:50 – 15:10

**0707 - Climbing and Pole Line Hardware Installation Robot for Construction of Distribution Lines**

J.-F. Allan, S. Lavoie, S. Reiher and G. Lambert

Robotics and Civil Engineering department, Hydro-Québec's research institute (IREQ), Canada

**13:30-15:10**

**Parallel Technical Sessions**

**Régence B**

**Power Generation - PG5 – Hydraulic and Thermal Applications II**

Session Chairs:

**Gilles Caprari**, Switzerland

**Patrick Mongenot**, Canada

13:30 – 13:50

**0690 - Tubulo – A Train-like Miniature Inspection Climbing Robot for Ferromagnetic Tubes**

Patrick Schoeneich (1), Frédéric Rochat (1), Olivier Truong-Dat Nguyen (3), Gilles Caprari (2),

Roland Moser (3), Hannes Bleuler (1), Francesco Mondada (1)

(1) Laboratoire de Systèmes Robotiques (LSRO), Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland

(2) Autonomous Systems Lab, Eidgenössische Technische Hochschule Zürich (ETHZ), Switzerland

(3) Inspection Technologies, ALSTOM Power, Switzerland

13:50 – 14:10

**0691 - Automated Abrasive Water Jet Pin Cutting System**

Vera de Vries (1), Roland Moser (1) and Philippe Roth (2)

(1) ALSTOM Power, Switzerland

(2) Waterjet Technologies Ltd, Switzerland

14:10 – 14:30

**0686 - In-situ Robotic Interventions in Hydraulic Turbines**

B. Hazel, J. Côté, Y. Laroche and P. Mongenot

Institut de Recherche, Hydro Québec, Canada

14:30 – 14:50

**0641 - A Modular Inspection Robot Platform for Power Plant Applications**

Ekkehard Zwicker (1), Wolfgang Zesch (1), and Roland Moser (2)

(1) ALSTOM Inspection Robotics Ltd, Switzerland

(2) ALSTOM, Switzerland

14:50 – 15:10

**0640 - Light-weight Mobile Robot for Hydrodynamic Treatment of Concrete and Metal Surfaces**

Zdenko Kovacic (1), Borislav Balac (2), Stjepan Flegaric (2), Kristijan Brkic (1) and Matko Orsag(1)

(1) LARICS - Laboratory for Robotics and Intelligent Control Systems, Faculty of Electrical Engineering and Computing, University of Zagreb, Croatia

(2) Inteco d.o.o., Croatia

**15:10-15:30      Networking Break      Foyer**

**15:30-16:30      Parallel Technical Sessions      Régence A**  
**Transmission & Distribution - TD6 – Unmanned Aerial Vehicles (UAVs)**

Session Chairs:

**Stefan Hrabar**, Australia

**Julien Beaudry**, Canada

15:30 – 15:50

**0648 - Development of an Autonomous Helicopter for Aerial Powerline Inspections**

Stefan Hrabar, Torsten Merz, and Dennis Frousheger

Australian Research Centre for Aerospace Automation (ARCAA), Commonwealth Scientific and Industrial Research Organisation (CSIRO) ICT Centre, Australia

15:50 – 16:10

**0658 - On the Application of VTOL UAVs to the Inspection of Power Utility Assets**

Serge Montambault, Julien Beaudry, Kristopher Toussaint and Nicolas Pouliot

Robotics and Civil Engineering department of Hydro- Québec's research institute (IREQ), Canada

16:10 – 16:30

**0646 - Power Line Inspection with A Flying Robot**

Binhai Wang (1), Xiguang Chen (1), Qian Wang (1), Liang Liu (1), Hailong Zhang (1) and Bingqiang Li (1,2)

(1) Electric Power Robotics Laboratory, Shandong Electric Power Research Institute, China

(2) Shandong Luneng intelligence Co., Ltd., China

**15:30-16:30      Parallel Technical Sessions      Régence B**  
**General Session - GS3 – Construction and Maintenance Applications**

Session Chairs:

**José Saenz**, Germany

**Alberto Oscar**, Italy

15:30 – 15:50

**0721 - New Technology for Multiple Conductor Stringing Machinery**

A. Oscar

Stringing Equipment Division, TESMEC SpA, Italy

15:50 – 16:10

**0624 - Manipulator Arm of a Shredder for Power Line Corridor Maintenance Applications**

Marin Ene (1), Peter Radziszewski (2), and Liviu Ciupitu (3)

(1) Department of Applied Sciences, University of Quebec in Abitibi Temiscamingue, Canada

(2) Department of Mechanical Engineering, McGill University, Canada

(3) Department of Machines and Manufacturing Systems, Politehnica University, Romania

16:10 – 16:30

**0668 - Robotic Systems for Cleaning and Inspection of Large Concrete Pipes**

José Saenz (1), Norbert Elkmann (1), Thomas Stuerze (1), Sven Kutzner (1) and Heiko Althoff (2)

(1) Fraunhofer IFF, Germany

(2) Emschergenossenschaft, Germany

**18:00-22:00**

**Banquet**

**Please refer to page ??? for details.**

07:30-12:00	Information desk open	Foyer of Régence A
07:30-08:15	Author's Breakfast	Saint-Laurent
08:30-09:50	<b>Parallel Technical Session Transmission &amp; Distribution - TD7 – Power Line Robots II</b>	Régence A

Session Chairs:  
**JiDai Wang**, UK  
**Joao Sequeira**, Portugal

08:30 – 08:50

**0698 - Research on a New Crawler Type Inspection Robot for Power Transmission Lines**

Jidai Wang (1), Aiqin Sun (1), Candong Zheng (1) and Jihong Wang (2)

(1) School of Mechanical and Electronic Engineering, Shandong University of Science and Technology, China

(2) School of Electronic, Electrical and Computer Engineering, University of Birmingham, UK

08:50 – 09:10

**0659 - Research on the Motion System of the Inspection Robot for 500kV Power Transmission Lines**

L. J. Fang (1) and H. G. Wang (2)

(1) School of Mechanical Engineering and Automation, Northeastern University, China

(2) Shenyang Institute of Automation, Chinese Academy of Science, China

09:10 – 09:30

**0670 - Development of a Novel Power Transmission Line Inspection Robot**

Ludan Wang (1), Fei Liu (1), Zhen Wang (1), Shaoqiang Xu (1), Sheng Cheng (1), and Jianwei Zhang (2)

(1) Laboratory of Intelligent Robot Engineering, KunShan Institute of Industrial Research, China

(2) TAMS, University of Hamburg, Germany

09:30 – 09:50

**0677 - Reachability Analysis of the RIOL Robot**

Joao Sequeira

Institute for Systems and Robotics, Instituto Superior Técnico, Portugal

08:30-09:50	<b>Parallel Technical Session Power Generation - PG6 – Wind Turbines and Power Plants Applications</b>	Régence B
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Session Chairs:  
**Gilles Caprari**, Switzerland  
**Vikram Chopra**, Canada

08:30 – 08:50

**0664 - Robot for Rotor Blade Inspection**

Torsten Felsch, Tilo Förster and Norbert Elkmann

Fraunhofer IFF, Germany

08:50 – 09:10

**0630 - Wind Turbine Control Using a Gearless Epicyclic Transmission**

Xiao Qing Ma (1), Vikram Chopra (1), S. H. H. Zargarbashi (1), and Jorge Angeles (1,2)

(1) Centre for Intelligent Machines, McGill University, Canada

(2) Department of Mechanical Engineering, McGill University, Canada

09:10 – 09:30

**0674 - Development of a Bridge Transport System with Telescopic Motion**

Hyo Jik Lee, Jong Kwang Lee, Byung Suk Park, Kiho Kim and Ho Dong Kim

Korea Atomic Energy Research Institute, Republic of Korea

09:30 – 09:50

**0615 - Highly Compact Robots for Inspection of Power Plants**

Gilles Caprari (1), Andreas Breitenmoser (1), Wolfgang Fischer (1), Christoph Hürzeler (1), Fabien

Tâche (1), Roland Siegwart (1), Patrick Schoeneich (2), Frédéric Rochat (2), Francesco Mondada

(2), Roland Moser (3)

(1) Autonomous System Lab, ETH Zürich, Switzerland

(2) Laboratoire de Systèmes Robotiques (LSRO), Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland

(3) Inspection Technologies, ALSTOM Power, Switzerland

**09:50-10:10**

**Short Break**

**Foyer**

**10:10-11:10**

**Parallel Technical Sessions**

**Régence A**

**Transmission & Distribution - TD8 – Inspection Robots and Subsystems**

Session Chairs:

**Plutarcho M. Lourenco**, Brazil

**Nicolas Pouliot**, Canada

10:10 – 10:30

**0669 - Remote Detection of Internal Corrosion in Conductor Cables of Power Transmission Lines**

Ary Vaz Pinto Jr (1), Mauro Zanini Sebrao (1), Celia Regina S. H. Lourenco (2), Ildejairo Sant'Anna de Almeida (1), Joao Saad Jr, (3), Plutarcho M. Lourenco (2)

(1) Department of Special Technologies, Eletrobras-Cepel, Brazil

(2) Department of Systems Automation, Eletrobras-Cepel, Brazil

(3) Department of Lines and Stations, Eletrobras-Cepel, Brazil

10:30 – 10:50

**0672 - A Mobile Robot for Inspection of Substation Equipments**

Rui Guo, Lei Han, Yong Sun, Mingrui Wang

Electric Power Robotics Laboratory, Shandong Electric Power Research Institute, China

10:50 – 11:10

**0642 - Transmission Line Inspection Robots: Design of the Power Supply System**

Joao Caxias (1), Fernando A. Silva (1,2), Joao Sequeira (1,3)

(1) Department of Electrical and Computer Engineering, Instituto Superior Técnico, Portugal

(2) Center for Innovation in Electrical and Energy Engineering, Instituto Superior Técnico, Portugal

(3) Institute for Systems and Robotics, Instituto Superior Técnico, Portugal

<b>10:10-11:10</b>	<b>Parallel Technical Sessions</b> <b>Power Generation - PG7 – Nuclear Applications III</b>  Session Chairs: <b>Yann Perrot</b> , France <b>Éric Lavoie</b> , Canada  10:10 – 10:30 <b>0678 - Development of a Force Reflecting Tele-robot for Remote Handling in Nuclear Installations</b> D.D. Ray and Manjit Singh Bhabha Atomic Research Centre (BARC), India  10:30 – 10:50 <b>0623 - Master-Slave Servo Manipulator System for the PRIDE Facility</b> Jong Kwang Lee, Byung Suk Park, Hyo Jik Lee, Kiho Kim, and Ho-Dong Kim Korea Atomic Energy Research Institute, Korea  10:50 – 11:10 <b>0637 - Long Reach Articulated Robots for Inspection in Hazardous Environments, Recent Developments on Robotics and Embedded Diagnostics</b> Yann Perrot (1), L. Gargiulo (2), M. Houry (2), N. Kammerer (1), D. Keller (2), Y. Measson (1), G. Piolain (3), A. Verney (1) (1) CEA, LIST, Interactive Robotics Laboratory, France (2) Commissariat à l’Energie Atomique, Institut de Recherche sur la Fusion par confinement Magnétique, France (3) AREVA NC, France	<b>Régence B</b>
<b>11:10-11:15</b>	<b>Short Break</b>	
<b>11:15-11:30</b>	<b>Closing Words</b>	<b>Régence C</b>
<b>11:30-12:45</b>	<b>Box Lunches are served in foyer.</b> Bus departure for Robotics Demonstrations at 11:45 from main entrance of the hotel.	
<b>12:45-15:45</b>	<b>Robotic Demonstrations at IREQ – Hydro-Québec’s Research Institute</b> Please refer to the following pages for details.	
<b>15:45-17:00</b>	<b>Bus return to hotel</b>	

### **Mobile Unit for Underground Distribution System Jobs**

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The Mobile Unit is a vehicle-mounted robotic system for remotely operating underground switchgear. The system is able to switch loads and ground medium-voltage cables prior to maintenance work. An overview is given of Hydro-Québec's underground distribution system, vault configurations, switches, security concerns and related difficulties in vault access. Such subsystems as the vehicle, long-reach arm, manipulator, tools and automatic task control are explained in detail. The Mobile Unit will perform a number of tasks on a switch to demonstrate its capabilities.

#### ***Unité Mobile d'intervention sur le réseau souterrain de distribution***

*L'Unité Mobile est un système robotisé autonome assemblé sur un véhicule permettant de réaliser des interventions à distance sur les interrupteurs du réseau souterrain en effectuant un transfert de charge et en isolant un câble de moyenne tension préalablement aux opérations de maintenance. Un aperçu sera présenté sur les réseaux de distribution souterrains chez Hydro-Québec, le rôle des interrupteurs et les difficultés d'accès aux voutes. Les sous-systèmes incluant le véhicule, le bras d'approche, le manipulateur et les outils seront exposés. Des explications seront données sur le contrôle automatique des tâches. L'Unité Mobile sera mise en opération pour réaliser quelques manœuvres.*

#### **Contact person / Personne ressource:**

Stéphane Reiher, Hydro-Québec

### **Scompi Technology**

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Demonstration of the Scompi portable multi-process robotic technology developed for a variety of jobs at Hydro-Québec's hydroelectric generating facilities. Two typical robotic tasks will be presented: polishing a curved surface and wheel track refurbishment. Measuring, grinding, welding and hammer peening tools will be displayed.

La technologie Scompi

Présentation de la technologie de robotique portable multi-procédé Scompi permettant une variété d'intervention dans les équipements de production hydrauliques d'Hydro-Québec. Démonstration de deux cellules robotisées typiques, soit le polissage d'une surface courbe et la rectification de voie de roulement. Les équipements de mesure, de meulage, de soudage et de martelage seront exposés.

#### **Contact person / Personne ressource:**

Bruce Hazel, Hydro-Québec

## **Power line Robotics: LineScout and LineROVer Technologies**

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In 2003, Hydro-Québec's research institute, IREQ, initiated the development of LineScout Technology for the robotic inspection of live transmission lines of up to 765 kV. LineScout is designed to be installed and operated on energized conductors, conductor bundles and ground wires, while crossing such obstacles as clamps, spacer-dampers, vibration dampers and aircraft warning markers. It can perform visual and infrared inspections, assess the condition of splices by measuring their electrical resistance, repair broken conductors and remove damaged bolt-mounted components. Since 2006, LineScout has performed numerous detailed, comprehensive inspections of live transmission lines.

*La Technologie LineScout, un robot mobile pour l'inspection sous tension des lignes de transport, circule sur les conducteurs, les faisceaux de conducteurs et les câbles de garde en franchissant la plupart des obstacles s'y trouvant tel que les chaînes d'isolateurs et les balises de signalisation aérienne. Il permet l'inspection visuelle, l'inspection thermographique, la mesure de la résistance électrique des manchons, l'intervention sur les assemblages boulonnés et la réparation temporaire de brins brisés. La démonstration permettra de voir le LineScout franchir des obstacles et déployer son bras manipulateur. Des extraits vidéo des nombreuses inspections réalisées sous tension depuis 2006 seront aussi présentés.*

### **Contact person / Personne ressource:**

Serge Montambault, Hydro-Québec

## **Remote Removal of Feeders for Gentilly-2 Nuclear Power Plant**

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In planning the refurbishment of Gentilly-2 nuclear power plant, Hydro-Québec conducted research on a method of remotely controlled removal of feeders as an alternative to the method proposed by the plant designer, AECL. Based on robotic teleoperation techniques and remote visual control, this method minimizes worker exposure to radiation at reasonable cost for jobs with a very tight schedule. This demonstration not only simulates the proposed method but also implements on our full-scale model the actual removal of a feeder from one of the most hard-to-reach area of the reactor.

### **Retrait à distance des Tuyaux d'Alimentation du Réacteur (TAR) pour la centrale nucléaire de Gentilly 2**

*En prévision de la réfection de la centrale nucléaire Gentilly-2 prévue pour 2012, Hydro-Québec a étudié une méthode robotisée de retrait à distance des tuyaux d'alimentation du réacteur en guise d'alternative à la méthode proposée par le concepteur (AECL). Cette méthode, basée sur des techniques de télémanipulation robotique avec des systèmes de vision à distance, permettrait de limiter considérablement l'exposition des travailleurs à la radiation, tout en conservant un échancier très court et des coûts raisonnables. Cette démonstration montrera une simulation virtuelle de la méthode proposée ainsi que le retrait physique complet d'un TAR de l'une des zones les plus contraintes du réacteur, reproduit en grandeur réelle dans les laboratoires de l'IREQ.*

### **Contact person / Personne ressource:**

Eric Lavoie, Hydro-Québec

## **The Maski Underwater Robot**

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The Maski underwater robot has been used by Hydro-Québec Production for dam inspections since 2006. Visitors will see the inside of the control station and watch the vehicle live as it moves around the test pool. Simulations of typical tasks will show Maski's most distinctive features: automatic control, measurement of visual observations and 3D reconstruction from sonar data. Members of the Maski operation team will share the experience they have gained through numerous jobs in the field.

### **Le robot sous-marin Maski**

*Le robot sous-marin Maski est utilisé depuis 2006 par Hydro-Québec Production pour l'inspection de ses barrages. On pourra visiter l'intérieur du poste de commande et observer le véhicule en direct alors qu'il se déplace dans le bassin d'expérimentation. Le sous-marin simulera quelques tâches qui permettront d'illustrer ses caractéristiques les plus marquantes, telles que la navigation en mode automatique, la mesure d'observation visuelles et la reconstruction 3D à partir de données sonar. Des membres de l'équipe d'exploitation de Maski seront présents pour partager l'expérience qu'ils ont acquise lors de nombreux chantiers.*

#### **Contact person / Personne ressource:**

Alain Croteau, Hydro-Québec

## **Neptune: Underwater Robotic System for High-Precision Inspection on Hydro Power Facilities**

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The Neptune system is designed for high-precision inspections of underwater embedded parts in hydro power facilities. Its modular structure allows the system to be adjusted to fit the vast majority of facilities. Inspections are performed using a submersible laser scanner mounted on a 3-DOF robot arm, precisely aligned sighting wires and laser tracking of the system's bearings. The results will include measurements of flatness, and vertical, horizontal and parallel alignment. Residual metal thickness can also be measured using a special ultrasonic scanner. The demonstration will use a mock-up of the complete system with major subsystems presented in greater detail.

### **Neptune : système robotisé submersible pour le diagnostic à haute précision des installations hydro-électriques**

Le système Neptune est conçu pour fournir un diagnostic précis des pièces encastrées submergées des centrales hydro-électriques. Sa structure modulaire lui permet de s'ajuster à la grande majorité des configurations de centrales. Le diagnostic est basé sur un scanneur laser monté sur un bras robotisé, sur des fils de localisation précisément alignés ainsi qu'un trackeur laser à la surface pour obtenir le référentiel du système. Neptune permet la mesure de la planéité, de la verticalité/horizontalité ainsi que du parallélisme. L'épaisseur résiduelle des pièces peut également être mesurée grâce à un scanneur à ultrasons. La démonstration utilisera une maquette du système où chacun des principaux sous-systèmes pourra être présenté plus en détail.

#### **Contact person / Personne ressource:**

Michel Blain, Hydro-Québec