

CANADIAN ROBOTICS TODAY 2014

Opportunities, Needs and the State Of The Art

November 20th, 2014

McGill Faculty Club
& Conference Centre
3450 McTavish St,
Montreal, QC H3A 1X9
(514) 398-6660

ORGANIZING COMMITTEE

Prof. Gregory Dudek

NCFRN Scientific Director
Chair, School of Computer Science
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Ph.D, NCFRN Manager, McGill University

Travis Manderson

Ph.D student, McGill University

Ian Glenn

MSc., Industrial Partner
CEO/CTO ING Robotic Aviation

SCHEDULE

- 8:00 Registration
- 8:30 Welcome
- 8:45 **Keynote: Ian Glenn, ING Robotic Aviation**
[ING Robotic Aviation spreads its wing over pipelines and polar bears]
- State of the Art: Joelle Pineau
- 9:30 Learning Socially Adaptive Navigation Strategies:
Lessons from the SmartWheeler Project
- 9:50 State of the Art: Michael Jenkin
Computer Vision and Robots
- 10:10 Coffee Break
- 10:25 Panel Discussion: Canadian Robotics (strengths, risks,
and opportunities)
- 11:10 **Keynote: Steve LaValle, Prof. U. Illinois**
Research Scientist, Oculus/Facebook
[Well... How Did I Get Here?]
- 11:55 Lunch (provided) and networking opportunity
- 13:25 Panel Discussion: Robotics Product Development
- 14:10 **Keynote: Jim Tung, VP, MathWorks**
[Challenges in Robotics and Autonomous Systems]
- 14:55 Coffee Break
- State of the Art: Clément Gosselin
- 15:10 Innovative Mechanical Systems to Address Current
Robotics Challenges
- 15:30 Talk: Gregory Dudek
New & upcoming technologies - Learning for Robotics
- 15:50 Panel Discussion: Gaining Visibility in International
Markets
- 16:35 Wrap Up: Where do we go from here?

Gregory Dudek (McGill University)

Professor Gregory Dudek is a James McGill Chaired Professor and the Director of the McGill School of Computer Science. He leads the Mobile Robotics Laboratory, which focuses on sensor-based robotics, multi-robot systems, and vision using underwater, terrestrial and aerial systems. Prof. Dudek has published more than 200 papers in top-tier conferences, three books, and is the recipient of numerous prestigious awards. He is currently the President of the Canadian Image Processing and Pattern Recognition Society (CIPPRS). Since 2012, he has been acting as Scientific Director of the NCFRN (NSERC Canadian Field Robotics Network), a unique research network that is comprised of key academic, government, and industrial researchers in field robotics.

Ian Glenn (ING Robotic Aviation)

Ian obtained his MSc. in Electrical Engineering at the US Naval Postgraduate School and went on to create the Canadian Army ISTAR program that underpinned Canada's operations in Afghanistan. Since retiring from active duty, his company (renamed ING Robotic Aviation) has been flying UAV for the Canadian government almost continuously. In 2011, his company designed and built both fixed wing and rotorcraft unmanned systems for their own commercial services. Today, he inspires an outstanding team that comprises of bright engineers and exceptionally talented operators. Some of his next ventures include providing persistence surveillance for the oil and gas industry and addressing search and rescue in the Arctic.

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Keynote Abstracts

ING Robotic Aviation spreads its wing over pipelines and polar bears by Ian Glenn

Whether it is to support pipeline monitoring, 3D forestry mapping, or polar bear counts, ING Robotic Aviation has been putting its Responder robotic aircraft to work this summer in Canada. From coast to coast, robotic aircraft solutions with promising commercial applications and ready for immediate adoption were successfully tested. This presentation will give an overview of how this sector-leading company is transferring its knowledge from military operational experience to now providing aerial mapping, inspection, and monitoring capabilities all across Canada particularly throughout the oil patch and for environmental science.

Well...How Did I Get Here? by S. LaValle

You never know where your expertise, experience, and Internet presence will take you. This talk will explain how I became involved with Oculus and virtual reality, while being a robotics professor on sabbatical. An important take-away from this talk is that our robotics background may be useful in commercial endeavors that extend well outside of robotics. This is partly due to our comfort with problems and systems that extend across multiple disciplines, such as computer science, electrical engineering, and mechanical engineering. This is a natural consequence of robots mixing sensing, actuation, and computation, which furthermore gives us useful exposure to the gaps between theory and practice.

Challenges in Robotics & Autonomous Systems by J. Tung

Robotics application development requires integration of multiple disciplines, e.g., mechanical, electrical, control, image processing and computer vision, real-time implementation, and more. This poses two unique challenges for the engineer: (i) how to design a robust system for different applications, and (ii) how to leverage existing systems to deliver new applications. Numerous commercial and open-source tools/solutions address the individual challenges; however, the tools and solutions are scattered, and require significant integration skills. In this talk, Jim will present how MATLAB and Simulink offer an integrated platform to confront these challenges and highlight proven success stories from industry and academia.

State of the Art Abstracts

Learning Socially Adaptive Navigation Strategies: Lessons from the SmartWheeler Project by J. Pineau

A key skill for mobile robots is the ability to navigate efficiently through their environment. In the case of social robots, this involves navigating through human crowds. Typical performance criteria, such as reaching the goal using the shortest path, are not appropriate in such environments, where it is more important for the robot to move in a socially acceptable manner. In this talk I will describe new methods based on imitation and reinforcement learning which we have developed to allow robots to achieve socially adaptive path planning in human environments. Performance of these methods will be illustrated using experiments with a smart power wheelchair robot called the SmartWheeler.

Computer Vision and Robots by M. Jenkin

Computer vision has made substantive strides in the last twenty years, to the point where robust and reliable solutions exist for a range of complex problems associated with autonomous systems. This talk will provide a brief snapshot of recent results in computer vision as applied to autonomous robots and speculate on where we might expect computer vision to contribute to autonomous systems in the next five to ten years.

Innovative Mechanical Systems to Address Current Robotics Challenges by C. Gosselin

Recent advances in robotics research make it possible to envision a variety of applications that go beyond traditional industrial robots. These new applications raise several challenges including the performance of advanced manipulation, the variety of working conditions, new means of locomotion and physical interaction with humans. Ultimately, robots live in a physical world and physical interaction with their environment is critical if they are to perform useful work. In this context, the design of novel robotic mechanical systems is a key component of the future progress of advanced robotics. Examples of innovative robotic mechanical systems such as cable-driven parallel mechanisms, human-friendly robots and robotic hands will be presented in order to emphasize their crucial role.

Panel Discussions

Canadian Robotics Strengths, Risks, & Opportunities

Moderator Chahe Bakmazjian, President, Jabez Technologies

Speaker Rebecca Reich, Développement des Affaires, MITACS
"Delivering innovation through research & development"

Bridging the "divide" between academia and industry can be very rewarding. MITACS offers the several programs to facilitate collaborations between companies and researchers, both within Canada and across international borders. This discussion will examine how these programs can further Canada's innovation agenda.

Speaker Sylvie LeBlanc, Account Manager, EDC
"Overview of EDC products and how Canadian companies can leverage EDC to expand internationally"

Robotics Product Development

How do the development-to-sales cycles look to you? What makes robotics different? How to combine software and hardware development and what interactions are there? How to recruit developers, sales people and staff? What resources are lacking, what tricks might you have developed to get things done, how and what to outsource? How has outsourcing worked, or not?

Moderator Ian Glenn, CEO/CTO ING Robotic Aviation

Panelist Waseem Khan, Dir. Technology, Jabez Technologies

Panelist Paul MacKenzie, VP, Simlog Inc.

Panelist Tom Lee, Chief Education Officer, Quanser

Gaining Visibility in International Markets

What's hard in getting international visibility? What advantages do we have? How can we work together? What tricks are there for cracking the international markets? What are the tricks and strategies that work in other places that we can/should duplicate? What is the key to betting traction in Europe, Asia, the developing world, elsewhere?

Moderator Frank P. Ferrie, Electrical & Computer Engineering, McGill University

Panelist Julian Ware, General Manager, Research Products, Clearpath Robotics

Panelist Francois Boucher, Chief Officer, Business Development, Kinova Robotics

Panelist Julien Beaudry, Researcher, Hydro-Québec - IREQ