

COLLOQUE REPARTI WORKSHOP 2019

Regroupement stratégique FRQNT : Systèmes cyberphysiques et intelligence machine matérialisée



**École de Technologie Supérieure
Pavillon A
1100, rue Notre-Dame Ouest
Montréal (Qc) H3C 1K3**

13 juin 2019 – June 13, 2019

La session du matin aura lieu à l'Auditorium A-1600. La session d'affiches aura lieu dans l'espace vitré 'Pas perdus'.

The morning session will take place in the A-1600 Auditorium. The poster session will take place in the 'Pas perdus'.

- 10h15 – 10h30** **Inscription / Registration** (Auditorium A-1600, 1^{er} étage / 1st floor)
- 10h30 – 10h55** **Mot de bienvenue / Opening remarks** (Auditorium A-1600)
Clément Gosselin (Directeur de REPARTI / REPARTI Director)
- 11h00 – 12h00** **Présentation invitée / Invited Talk** (Auditorium A-1600)



Dynamics and Model-based Control of Biomechatronic Systems

John McPhee

Systems Design Engineering, University of Waterloo, Ontario

<https://uwaterloo.ca/systems-design-engineering/profile/mcphee>

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- 12h00 – 13h30** **Repas de midi / Lunch** (Cafétéria, rez-de-chaussée / ground floor)
- 13h30 – 16h30** **Session d'affiches / Poster Session** (Pas perdus A-1062, 1^{er} étage / 1st floor)



Dynamics and Model-based Control of Biomechatronic Systems

John McPhee

Systems Design Engineering, University of Waterloo, Ontario, Canada

mcphee@uwaterloo.ca

In the Motion Research Group at the University of Waterloo (morg.uwaterloo.ca), we investigate the dynamics, model-based control, and design optimization of multibody systems. Deriving the equations for complex biomechatronic systems is tedious and error-prone, so we have automated the dynamic modelling process by combining linear graph theory from mathematics with fundamental principles from physics and biology. Our symbolic computer implementation, now part of MapleSim™, will generate real-time simulation code and dynamic controllers for systems ranging from exoskeletons to autonomous vehicles.

In this talk, I will discuss the real-time dynamics and model-predictive control of biomechatronic systems, with an emphasis on applications that include user-tailored electronic power steering for Toyota, optimal performance in golfing and cycling, and a stroke rehabilitation robot; in all cases, unified dynamic models of the human and their equipment are used to determine optimal control actions. Symbolic computing is exploited to achieve real-time model-based controllers, and experiments are used to validate the models and demonstrate the controller performance. I will also discuss our current research to combine physics-based models with machine learning, with applications to markerless motion capture, the Waterloo autonomous car (Autonomoose), and an environment recognition system for exoskeleton users.

Biography:

John McPhee is a Professor and Canada Research Chair in Biomechatronic System Dynamics at the University of Waterloo, which he joined in 1992. Prior to that, he held research fellowships at Queen's University, Canada, and the Université de Liège, Belgium.

McPhee's research is focused on the dynamics, control, and optimization of biomechatronic systems. His research partners include Toyota, Maplesoft, Intellijoint Surgical, the Canadian Space Agency, Cycling Canada, Magna, Ping Golf, and the Canadian Sports Institute.

Prof. McPhee is the past Chair of the International Association for Multibody System Dynamics and a co-founder of 2 journals and 3 international technical committees. He provides editorial duties for 6 leading journals in his field, and has had the pleasure of supervising nearly 100 graduate students and postdoctoral fellows.

McPhee is a Fellow of the Canadian Academy of Engineering, the American Society of Mechanical Engineers, the Engineering Institute of Canada, and the Canadian Society of Mechanical Engineers. He has won 5 Best Paper Awards and, in 2014, he received the NSERC Synergy Award from the Governor-General of Canada.

Colloque REPARTI Workshop 2019 Affiches / Posters

REPARTI : Modélisation / Raisonnement / Apprentissage REPARTI : Modelling / Reasoning / Learning

Uncertainty Aware Learning from Demonstrations in Multiple Contexts using Bayesian Neural Networks

Sanjay Thakur, Herke Van Hoof, Juan Higuera, Doina Precup and David Meger

Tangible robotic fleet control

David St-Onge, Vivek Shankar Varadharajan and Giovanni Beltrame

A robust index for global tissue deformation analysis in ultrasound images

Arnaud Brignol, Farida Cheriet and Catherine Laporte

Adversarial Learning of General Transformations for Data Augmentation

Saypraseuth Mounsaveng, David Vazquez, Ismail Ben Ayed and Marco Pedersoli

Decoupling Direction and Norm for Efficient Gradient-Based L2 Adversarial Attacks and Defenses

Jérôme Rony, Luiz G. Hafemann, Luiz S. Oliveira, Ismail Ben Ayed, Robert Sabourin and Eric Granger

Weakly Supervised Object Localization Using Min-Max Entropy: An Interpretable Framework.

Soufiane Belharbi, Jérôme Rony, Jose Dolz, Ismail Ben Ayed and Eric Granger

An Adaptive Siamese Network for Real-Time Tracking in Video Surveillance

Madhu Kiran, Eric Granger, Le Thanh Nguyen-Meidine and Louis-Antoine Blais-Morin

Online local pool generation for dynamic classifier selection

Mariana A. Souza, George D. C. Cavalcanti, Rafael M. O. Cruz and Robert Sabourin

Metric Learning for Visual Place Recognition

Amar Ali-Bey, Brahim Chaib-Draa and Philippe Giguère

Titre à venir

Amran Bhuiyan, Eric Granger and Ismail Ben Ayed

Modélisation et compensation des déformations mécaniques dues à la sonde en échographie 3D main libre

Jawad Dahmani et Catherine Laporte

Automatic Palate Delineation in Ultrasound Videos

Guillaume Faucher, Elham Kharimi, Lucie Ménard and Catherine Laporte

Learning object proposals for weakly supervised detection

Akhil Meethal Pilakkatt, Marco Pedersoli and Eric Granger

REPARTI : Modélisation / Raisonnement / Apprentissage
REPARTI : Modelling / Reasoning / Learning

An Improved Trade-off Between Accuracy and Complexity with Progressive Gradient Pruning
Le Thanh Nguyen-Meidine, Eric Granger, Madhu Kiran, Louis-Antoine Blais-Morin and Marco Pedersoli

Context-Aware Abnormal Event Classifier in Videos
Pankaj Raj Roy and Guillaume-Alexandre Bilodeau

Semantic labeling for pedestrians in video footage
Jules Simon and Guillaume-Alexandre Bilodeau

Person Re-Identification in Videos
Yacine Khraimeche and Guillaume-Alexandre Bilodeau

Tracking Pedestrians using Constraint Programming
Alexandre Pineault, Guillaume-Alexandre Bilodeau and Gilles Pesant

Instance Segmentation based Semantic Matting for Compositing Applications.
Guanqing Hu and James J. Clark

REPARTI : Interaction

Kinematically Redundant (6+3)-dof Hybrid Parallel Robot with Large Orientational Workspace and Remotely Operated Gripper
Kefei Wen, David Harton, Thierry Laliberté and Clément Gosselin

A grasp manipulation selection chart to pick-up objects lying on hard surfaces
Vincent Babin and Clément Gosselin

Tangible capture of virtual objects with mid-air and wearable haptics
Vincent Levesque, Danny Sauval and Hayat Ankour

Haptic Feedback for Audiovisual Content
Samy Goulli and Vincent Levesque