AIM 2016 Workshop on
Advanced Intelligent Mechatronics for Neuromuscular Rehabilitation and Recovery Assessment
Banff, AB, Canada, Tuesday, July 12, 2016

Abstract: The population of seniors over the age of 65 is expected to triple by 2050 worldwide. This is likely to increase the incidence rate of age-related neuromuscular and sensorimotor problems such as post-stroke disabilities and Parkinson's disease, and musculoskeletal dysfunctions and corresponding injuries and adverse events such as cerebral palsy and spinal cord damage. Among age-related neuromuscular and sensorimotor problems, stroke alone costs the Canadian economy $3.6 billion per year. Annually, patients with stroke spend more than 639,000 days in acute care in Canadian hospitals and 4.5 million days in residential care facilities. A similar trend has been reported globally because of the increasing ageing population. Improving medical and pharmaceutical care is likely to increase the survival rates from age-related neuromuscular problems and reduce hospital costs but will result in even more patients in need of Assistance, Rehabilitation and Assessment (ARA) services. Most of the survivors would experience permanent or long-lasting disability and often require labor-intensive motor therapy as early as possible and for extended periods, placing a significant burden on the healthcare system. The likely result is that, with a healthcare system that is already under-resourced, many patients suffering from a lifetime major functional deficit would not receive sufficient ARA services. One potential solution is to develop intelligent mechatronic technologies that provide efficient, effective and affordable ARA services for patients living with neuromuscular disabilities.

Goals and Topics: In this workshop, we aim to bring together recent developments on advanced intelligent mechatronics for motor assistance, neuromuscular rehabilitation, and recovery assessment. The goal is to discuss a broad range of related subjects from academic, clinical and industry perspectives. The topics included in this workshop are

1) *Intelligent mechatronics for motor assessment, rehabilitation and assistance,*
2) *Intelligent mechatronics for understanding neural and musculoskeletal motor function and dysfunction,*
3) *New techniques, system architectures, and intelligent technologies for accelerating neurorehabilitation.*

List of Invited Talks:

From Academia:

A-1) Dana Kulić, University of Waterloo, Canada.
A-2) Kim Adams, University of Alberta, Canada
A-3) Albert Vette, University of Alberta, Canada
A-4) Greg Kawchuk, University of Alberta, Canada
A-5) Patrick Pilarski, University of Alberta, Canada
A-6) Rosalie Wang, University of Toronto, Canada
A-7) Lesley Wiart, University of Alberta, Canada
A-8) Mahya Shahbazi, S. Farokh Atashzar, Rajni V. Patel, University of Western Ontario, Canada
A-9) Mahdi Tavakoli, University of Alberta, Canada

From Industries:

I-1) BKIN Technologies, Kingston, Ontario, Canada.
I-2) Kinova Robotics, Boisbriand, Quebec, Canada.
I-3) Bionik Laboratories Corp., Toronto, Ontario, Canada

Biographies of the Invited Speakers: Link
Abstracts of Talks: Link

Organizing Committee: S. F. Atashzar [1], M. Shahbazi [1], M. Tavakoli [2], R. V. Patel [1]

[1] University of Western Ontario, Canada
[2] University of Alberta, Canada

S. Farokh Atashzar obtained his B.Sc. degree in Electrical Engineering/Control Systems from K. N. Toosi University of Technology, Tehran, Iran, in 2008 and his M.Sc. degree in Mechatronics from Amirkabir University of Technology, Tehran, Iran, in 2011. Farokh joined the Department of Electrical and Computer Engineering at Western University (UWO), London, Ontario, Canada, in 2011, to pursue his Ph.D. degree under the supervision of Professor Rajni Patel. His research work is being carried out at Canadian Surgical Technologies and Advanced Robotics (CSTAR). He also served as a visiting research scholar at the University of Alberta, AB, Canada, in 2014. During his Ph.D., He has received several awards including the prestigious Ontario Graduate Scholarship (OGS) in 2013 and NSERC CREATE program scholarship in Computer-Assisted Medical Intervention (CAMI) in 2011. His research areas include advanced haptic and telerobotic systems, rehabilitation and surgical robotics, mechatronics, vision-guided robot navigation, and robust nonlinear control theory.

Mahya Shahbazi received the B.Sc. degree in electrical engineering from K. N. Toosi University of Technology, Tehran, Iran, in 2008, and the M.Sc. degree in mechatronics from Amirkabir University of Technology, Tehran, in 2011. She is currently working toward the Ph.D. degree in electrical and computer engineering at the University of Western Ontario, London, ON, Canada. She is a doctoral trainee in the NSERC CREATE program in Computer-Assisted Medical Interventions and a research assistant at Canadian Surgical Technologies and Advanced Robotics (CSTAR), London, ON. She has been a visiting research scholar at the University of Alberta, AB, Canada, and also among the very few international students at Western University granted the prestigious Ontario Graduate Scholarship (OGS) award in 2014. Her research interests include medical robotics focusing on applications in surgical training and rehabilitation; haptics and teleoperation; mechatronics; and control systems.

Mahdi Tavakoli is an Associate Professor in the Department of Electrical and Computer Engineering, University of Alberta, Canada. He received his BSc and MSc degrees in Electrical Engineering from Ferdowsi University and K.N. Toosi University, Iran, in 1996 and 1999, respectively. He received his PhD degree in Electrical and Computer Engineering from the University of Western Ontario, Canada, in 2005. In 2006, he was a post-doctoral researcher at Canadian Surgical Technologies and Advanced Robotics (CSTAR), Canada. In 2007-2008, he was an NSERC Post-Doctoral Fellow at Harvard University, USA. Dr. Tavakoli's research interests broadly involve the areas of robotics and systems control. Specifically, his research focuses on haptics and teleoperation control, medical robotics, and image-guided surgery. Dr. Tavakoli is the lead author of Haptics for Teleoperated Surgical Robotic Systems (World Scientific, 2008).

Rajni V. Patel received the PhD degree in Electrical Engineering from the University of Cambridge, England, in 1973 and currently holds the position of Distinguished University Professor and Tier-1 Canada Research Chair in the Department of Electrical and Computer Engineering with cross appointments in the Department of Surgery and the Department of Clinical Neurological Sciences in the Schulich School Medicine and Dentistry at Western University, Ontario, Canada. Dr. Patel also serves as Director of Engineering for Canadian Surgical Technologies \& Advanced Robotics (CSTAR). He is a Life Fellow of the IEEE, and a Fellow of the ASME, the Royal Society of Canada and the Canadian Academy of Engineering. He has served on the editorial boards of the IEEE Transactions on Robotics, the IEEE/ASME Transactions on Mechatronics, the IEEE Transactions on Automatic Control, and Automatica, and is currently on the Editorial Board of the International Journal of Medical Robotics and Computer Assisted Surgery and the Journal of Medical Robotics Research.