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Robotics 2019

2nd International Conference on

Robotics and Artificial Intelligence

May 23-24, 2019 | Vienna, Austria

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Assistive exoskeletons for motion assistance: Mechanism design, motion detection and interaction control

Shaoping Bai
Aalborg University, Denmark

As the global ageing predictions become reality, assistive exoskeletons are being increasingly considered as future aids to help elderly persons staying active in their daily living tasks and rehabilitation systems for effectively restoring patient's motor functions. The exoskeletons are also considered as useful power assistance for labor workers in the manual work to reduce muscle fatigue and to prevent musculoskeletal injuries. This talk is focused on the development of assistive exoskeletons and their applications in the motion assistance. A brief overview of exoskeletons with their classification and applications will be presented. The design and development challenges will be discussed, including mechanism design, compact and compliant actuation, human motion intention detection and exoskeleton interaction control. In the talk, research projects on exoskeleton at Aalborg University will be presented, together with progresses and results newly obtained.

Speaker Biography

Shaoping Bai is an Associate Professor at the department of Materials and Production, Aalborg University (AAU), Denmark. His research interests include assistive robots, parallel manipulators, walking robots, dynamics and design. He is one of the founders of Centre for Robotics Research (CRR), AAU. He was the coordinator of the CRR for the year 2010-2012. He leads several national and international research projects in exoskeletons, including EU AAL project AXO-SUIT and IFD Grand Solutions project EXO-AIDER, among others. He is a recipient of IEEE CIS-RAM 2017 best paper, IFToMM MEDER 2018 best application paper, and Grand Prize of WearRAcon Innovation Challenges 2018. He is an Associate Editor of ASME of Mechanisms and Robotics, an Associate Editor of IEEE Robotics and Automation Letters, and a deputy chair of IFToMM Technical Committee of Robotics and Mechatronics.

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Robotics for a sustainable precision agriculture

Gerassimos Peteinatos
University of Hohenheim, Germany

The irruption of Information and Communication Technologies in agriculture has provided new tools, enabling the more regular and rational distribution of efforts and inputs. This leaded into the current farm management systems and crop management strategies, that take into account the temporal and spatial variability of the crop. This irruption of new digital technologies, known as Agriculture 4.0 incorporated within Precision Agriculture, can revolutionize agriculture and herald the dawn of a more autonomous and stable agricultural world. A pallet of different applications can utilize this novel technologies, for example in plant breeding, nutritional assistance or pest management. A pest monitoring system and the equivalent localized treatment applicator can be conceived as a complex artificial system consisting of (1) perception (sensors) for detection and 3D modeling of natural structures, focusing on values of importance and interest. (2) Decision making (processing) for the elaboration of an action plan that monetizes the parameters of interest extracted from the models into treatment decisions, always taking into consideration the perceived and established objectives. (3) Actuation (actuators): implementation of the treatment plan, closing the perception-decision - actuation loop through the control and development of intelligent tools. The integration of perception systems for the detection and control of action devices for treatment on autonomous mobile platforms will allow a more exhaustive, and therefore effective, pest treatment, as well as being more precise and safe both for the agri-food chain and the environment. This general approach is the basis for agricultural robotics.

Speaker Biography

Gerassimos Peteinatos is working into the development and implementation of sensors and sensor systems in Precision Agriculture. He has a Master and Diploma in Agriculture Engineering from the Agricultural University of Athens and a Diploma in Electrical and Computer Engineering from the National Technical University of Athens.

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Bio-inspired artificial intelligence with applications to various robotic systems

Simon X Yang
University of Guelph, Canada

Studies of biologically inspired artificial intelligence have made significant progress in both understanding the biological systems and developing innovative bionic applications to diversified robotic systems for information acquisition, signal processing, data analysis, decision making, and system control. In this talk, I will start with a very brief introduction to some biologically inspired intelligent computations and their applications to early vision and sensory motion in biological systems. After that, I will focus on our recent works on innovative applications of bio-inspired artificial intelligence to various robotic systems, such as real-time intelligent sensing, path planning, tracking, control, and teleoperation of autonomous robotic systems including mobile robots, water surface robots, underwater robots, and unmanned aerial robots; intelligent real-time monitoring and control of livestock odors using novel robotic e-noses; intelligent robotic system for real-time harvesting of agricultural products; and intelligent real-time coordination and cooperation of multi-robot systems.

Speaker Biography

Simon X Yang received the B.Sc. degree in engineering physics from Beijing University, China in 1987, the first of two M.Sc. degrees in biophysics from Chinese Academy of Sciences, Beijing, China in 1990, the second M.Sc. degree in electrical engineering from the University of Houston, USA in 1996, and the Ph.D. degree in electrical and computer engineering from the University of Alberta, Edmonton, Canada in 1999. He joined the School of Engineering at the University of Guelph, Canada in 1999. Currently he is a Professor and the Head of the Advanced Robotics & Intelligent Systems (ARIS) Laboratory at the University of Guelph in Canada. He has diversified research expertise. He has published about 450 referred papers, including over 200 journal papers (over 30 in IEEE Transactions). He has been very active in professional activities. He serves as the Editor-in-Chief of International Journal of Robotics and Automation, and an Associate Editor or Editorial Board member of IEEE Transactions on Cybernetics, and several other journals. Currently he is a panel member of the NSERC Discovery Grants Selection Committee on Electrical and Computer Engineering, a panel member of the NSERC-CIHR (Canadian Institutes of Health Research) Collaborative Health Research Projects (CHRP) Selection Committee, and a panel member of CIHR Grants Selection Committee. He was General Chair of the 2011 IEEE International Conference on Logistics and Automation. Among many of his awards, he was a recipient of the Distinguished Professor Award at the University of Guelph.

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