

ARC Seminar

Date/Time: 20 December 2017 (Wednesday), 10.30am to 12.00pm

Venue : NUS Faculty of Engineering, Advanced Robotics Centre
Blk E6, Level 7, Engagement Room

Enhanced Performance and Autonomy for Field Robots Through Safe Learning with Degraded Sensing in Unstructured, Uncertain and Changing Environments

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Nowadays, the complexity in the design of robotic systems increases enormously due to the fact that human beings desire a higher level of intelligence and autonomy. Additionally, it is important that the developed systems must be capable of autonomously adapting to the variations in the operating environment while maintaining the overall objective to accomplish tasks even in highly uncertain and unstructured environments. Such robotic systems must display the ability to learn from experience, adapt themselves to the changing environment and seamlessly integrate information to-and-from humans. Traditional controllers have important limitations: i) inability to tune optimally the coefficients of controllers due to the complex nature and the vaguely known dynamics ii) inability to be able to adapt the control parameters considering changing system parameters and varying environmental conditions iii) inability to deal with constraints on systems iv) not account interactions between subsystems. These drawbacks of traditional control algorithms result in suboptimal control performance of systems. Therefore, advanced techniques are required to deal with naturally constrained, nonlinear, and multi-input-multi-output systems. In this talk, nonlinear model predictive control (NMPC) and nonlinear moving horizon estimation (NMHE), which are computationally very intensive, and require the real-time solution, will be addressed to handle aforementioned problems and their applications in field robots will be shown.

About the Speaker



Erkan Kayacan received the B.Sc. and M.Sc. degrees in mechanical engineering from Istanbul Technical University, Turkey, in 2008 and 2010, respectively. In December 2014, he received the Ph.D. degree at University of Leuven (KU Leuven), Belgium. During his PhD, he held a visitor PhD scholar position at Boston University under supervision of Prof. Calin Belta. After his Ph.D., he became a Postdoctoral Researcher with Delft Center for Systems and Control, Delft University of Technology, The Netherlands. He is currently a Postdoctoral Researcher with Coordinated Science Lab and Distributed Autonomous Systems Lab in the University of Illinois at Urbana-Champaign under supervision of Assist. Prof. Girish Chowdhary. His research interests center around real-time optimization-based control and estimation methods, nonlinear control, learning algorithms and machine learning with a heavy emphasis on applications to autonomous systems.

Please register your attendance at the following link by **18 December 2017**:

<https://goo.gl/forms/zWoOsWthVckjwzdf1>

Lunch will be provided.