



**POLITECNICO
DI TORINO**



Dipartimento di
Scienze Matematiche
G. L. Lagrange

ECCELLENZA 2018 • 2022

Tuesday **October 1, 2019** at 14:30

Politecnico di Torino, DISMA, Aula Buzano (third floor)

Giordano POLA

Associate Professor at Università dell'Aquila

Formal Methods for the Control of Cyber Physical Systems with Logic Specifications

Prof. Giacomo Como introduces the seminar

Abstract

A challenging paradigm in the design of modern engineered systems is Cyber-Physical Systems (CPS). CPS are complex, heterogeneous, spatially distributed systems where physical processes interact with distributed computing units through nonideal communication networks. Key features of CPS are heterogeneity and complexity. Indeed, while differential equations generally describe physical processes, computing units are typically described by finite state machines. Moreover, communication infrastructures convey information in subsystems of CPS and are characterized by a number of non-idealities, needed for robust control design of such systems. The paradigm of symbolic models is promising of being appropriate in coping with the inherent heterogeneity of CPS. Symbolic models are abstract descriptions of control systems, where any state corresponds to an aggregate of continuous states and any control label to an aggregate of control inputs. Since symbolic models offer a sound approach for solving control problems in which software and hardware interact with the physical world, as in the case of CPS.

In this talk, Prof. Pola will give an overview and show an approach based on symbolic models for the control design of CPS. He will first show how a symbolic model can be constructed to approximate a nonlinear control system with any desired accuracy. He then will show how this symbolic model can be used to design digital and quantized controllers for enforcing complex logic specifications on the original nonlinear system. Finally, he will discuss how to extend these results to more realistic scenarios, including disturbance inputs, time-delays in the state and control variables evolution, nonideal communication infrastructures, etc. Techniques to tame the computational complexity of the approach taken will also be briefly discussed.

Biography

Giordano Pola received both a Laurea degree in Electrical Engineering (2002) and a PhD degree in Electrical Engineering and Computer Science (2004) from the University of L'Aquila. He was a Visiting Scholar at the University of Cambridge (2002-2003), an Assistant Researcher and a Research Fellow at the University of Twente (2003-2004), a Postdoctoral Researcher at Università dell'Aquila (2005-2006), and a Postdoctoral Researcher at the University of California - Los Angeles (2006-2007). Then, he was an Assistant Professor with the University of L'Aquila (2008-2018). Since 2018, he has been an Associate Professor with the University of L'Aquila. His research interests include modeling, analysis, and control of embedded and hybrid systems.

Save the date for the next event: **October 3, 2019**

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