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AVVISO DI SEMINARIO

Si comunica che **lunedì 16 marzo 2015 a partire dalle ore 11.30**
si terrà presso l'aula **C2** (via Mesiano 77) il seguente seminario

Embedded quadratic optimization algorithms and their application in control and structural engineering

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ABSTRACT: Algorithms for solving a convex quadratic program (QP) have been studied since the 1950's. Nonetheless, it is still a very broadly studied subject, because of its application in an extremely large variety of domains, ranging from machine learning to economics, finance, and several engineering fields. In this talk, I will focus on QPs tailored to control engineering applications within the framework of Model Predictive Control (MPC). MPC is one of the most successful techniques adopted in industry to control multivariable systems in an optimized way under constraints on input and output variables. In MPC, the manipulated inputs are defined by the solution of a (usually dense and small-size) QP that depends on the current state and reference signals. To adopt MPC in embedded control systems under fast sampling and limited CPU and memory resources, one must be able to compute such dependence with high throughput, using simple code and simple arithmetic operations (often under limited machine precision), and provide tight estimates of worst-case execution time. I will review recent advances in embedded quadratic optimization for control, analyzing pros and cons of different solution methods, and showing numerical evidence obtained on embedded control hardware platforms under fixed and floating point precision. Finally, I will show how the ideas developed for QP tailored to embedded control are also capable of solving the frictionless unilateral normal contact problem between a rough rigid surface and a linear elastic half-plane, at least two order of magnitude faster than state-of-the-art methods.

BIOGRAPHY: Alberto Bemporad received his master's degree in Electrical Engineering in 1993 and his Ph.D. in Control Engineering in 1997 from the University of Florence, Italy. He spent the 1996/97 academic year at the Center for Robotics and Automation, Department of Systems Science & Mathematics, Washington University, St. Louis, as a visiting researcher. In 1997-1999 he held a postdoctoral position at the Automatic Control Laboratory, ETH Zurich, Switzerland, where he collaborated as a senior researcher in 2000-2002. In 1999-2009 he was with the Department of Information Engineering of the University of Siena, Italy, becoming an associate professor in 2005. In 2010-2011 he was with the Department of Mechanical and Structural Engineering of the University of Trento, Italy. In 2011 he joined the IMT Institute for Advanced Studies Lucca, Italy as a full professor, where he also became the director in 2012. In 2011 he cofounded ODYS S.r.l., a spinoff company of IMT Lucca. He has published more than 250 papers in the areas of model predictive control, hybrid systems, automotive control, multiparametric optimization, computational geometry, robotics, and finance. He is

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author or coauthor of various MATLAB toolboxes for model predictive control design, including the Model Predictive Control Toolbox (The Mathworks, Inc.). He was an Associate Editor of the IEEE Transactions on Automatic Control during 2001-2004 and Chair of the Technical Committee on Hybrid Systems of the IEEE Control Systems Society in 2002-2010. He received the IFAC High-Impact Paper Award for the 2011-14 triennial. He has been an IEEE Fellow since 2010.

Tutti gli interessati sono invitati a partecipare.

Il seminario è organizzato dal gruppo di Scienza delle Costruzioni
(D. Bigoni, L. Deseri, N.Pugno, M. Gei, A. Piccolroaz, F. Dal Corso, M.F. Pantano, R. Springhetti)

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