Recent advances in model predictive control for real-time systems

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Blue Room
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Abstract:
Model Predictive Control (MPC) has been used in the process industries for more than thirty years now for its ability to control rather complex multivariable systems, maximizing their performance under specified restrictions on input and output variables. Traditionally labelled as a technology for slow processes requiring substantial control hardware for computations, significant advances have been done in the last decade to push MPC to fast-sampling applications operating with limited CPU/memory resources, mainly driven by the automotive industry.

This talk introduces a few selected topics in MPC, with an emphasis on MPC for fast-sampling applications and real-time implementation, either computed by embedding a numerical solver in the real-time control code, or pre-computed off-line and evaluated through a lookup table of linear feedback gains.

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 academic year 1996/97 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. Since 2011 he is a full professor and the deputy director at the IMT Institute for Advanced Studies Lucca, Italy. He has published more than 230 papers in the areas of model predictive control, hybrid systems, automotive control, multiparametric optimization, computational geometry, robotics, and finance. He is author or co-author 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 is IEEE Fellow since 2010.