

Engineering Neuroscience & Health

Department of Biomedical Engineering

Division of Biokinesiology and Physical Therapy



ENH SEMINAR SERIES



Presents:

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Monday

March 1, 2010

4:00 p.m.

Refreshments served: 3:30– 4 pm

“Design of optimal structured controllers for large-scale interconnected systems”

Mihailo Jovanovic PhD

Assistant Professor

Department of Electrical & Computer Engineering

We consider the design of optimal static feedback gains for interconnected systems subject to structural constraints on the distributed controller. These constraints are in the form of sparsity requirements for the feedback matrix, implying that each controller has access to information from only a limited number of subsystems. For this non-convex constrained optimal control problem, we derive necessary conditions for optimality in the form of coupled matrix equations. For stable open-loop systems, we show that in the limit of expensive control, the optimal controller can be found analytically using perturbation techniques. We use this feedback gain to initialize homotopy-based Newton iteration that finds an optimal solution to the original (non-expensive) control problem. We further employ the augmented Lagrangian method to alleviate the difficulty of finding a stabilizing structured gain to initialize efficient Newton and quasi-Newton methods that exploit the sparsity structure of the constraint set. The developed technique is used to design optimal localized controllers in large-scale vehicular formations. The issue of scaling, with respect to the number of vehicles, of global and local performance measures in the optimally-controlled formation will be discussed in detail.

Bio:

Mihailo Jovanovic received the Dipl. Ing. and M.S. degrees from the University of Belgrade, Serbia, in 1995 and 1998, respectively, and the Ph.D. degree from the University of California, Santa Barbara, in 2004. He was a Visiting Researcher with the Department of Mechanics, the Royal Institute of Technology, Stockholm, Sweden, from September to December 2004. He joined the University of Minnesota, Minneapolis, as an Assistant Professor of Electrical and Computer Engineering in December 2004. His primary research interests are in modeling, analysis, and control of spatially distributed dynamical systems. He is a member of IEEE, SIAM, and APS and an Associate Editor of the IEEE Control Systems Society Conference Editorial Board. He received a CAREER Award from the National Science Foundation in 2007.

LOCATIONS: *Seminar is simultaneously presented*

UPC: HNB 100 — LIVE
Hedco Neurosciences Building

UPC Campus Map/Directions:
<http://www.usc.edu/about/visit/upc/>

HSC: CHP 147 – Video Conference
Center for the Health Professional

HSC Campus Map/Directions:
<http://www.usc.edu/about/visit/hsc/>

Organized by Professor Francisco Valero-Cuevas <http://bme.usc.edu/valero/>

Web Cast

<http://capture.usc.edu/college/Catalog/pages/catalog.aspx?catalogId=946350f1-ca84-40e7-b867-e16adba01e4e>

Information about all seminars can be found at
<http://bme.usc.edu/valero/ENH/ENH-Schedule.html>