

Special Seminar

Smooth Switching LPV Control and Its Potential Applications



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Linear parameter-varying (LPV) control theory has been well-developed over the last two decades, to deal with control engineering problems involving nonlinear plants which change operating points drastically during operations. In LPV controller design based on robust control theory, as the operating region becomes larger, the achievable worst-case closed-loop performance will be more limited. However, in some engineering applications, it is unavoidable to have a large operating region, but at the same time, required performance is higher than the one achievable by single LPV controller design techniques. In such cases, switching LPV control method is useful to push forward the achievable performance. The method divides the parameter region into subregions, designs multiple LPV controllers, each of which is assigned to each subregion, and switches the LPV controllers in real-time based on the operating points. At the switching instants, smooth transitions of LPV controllers are important to avoid undesirable transient behaviors of relevant signals.

In this talk, research on smooth switching LPV control, which is being conducted in UBC Control Engineering Laboratory, is explained. It is shown that the smooth switching LPV control technique has a potential for improving control performance in engineering problems, such as machine tool servo control, automotive fuel-injection control, and wind turbine control.

Bio: Ryoze Nagamune received Bachelor and Master degrees from the Department of Control Engineering, Osaka University, Osaka, Japan, in 1995 and 1997, respectively, and Ph.D. degree from the Division of Optimization and Systems Theory, the Royal Institute of Technology, Stockholm, Sweden, in 2002. From 2003 to 2006, he was a Postdoctoral Researcher at the Mittag-Leffler Institute, the University of California at Berkeley, and the Royal Institute of Technology. He has been with the Department of Mechanical Engineering, the University of British Columbia, Vancouver, BC, Canada since August 2006, and he is currently an Associate Professor. From September to December 2013, he was a visiting researcher at the National Wind Technology Center, the National Renewable Energy Laboratory in Golden, Colorado. His research interests include robust control theory and applications to mechatronics systems. Dr. Nagamune was a recipient of the IEEE CDC Best Student Paper Award in 2001 and of the Best Paper Award in 23rd Canadian Congress of Applied Mechanics in 2011. He is an Associate Editor of ASME Journal of Dynamic Systems, Measurement and Control, and a Chair of IEEE Vancouver Joint Chapter of Control Systems, Robotics and Automation, and Systems, Man, and Cybernetics Societies. Dr. Nagamune is the recipient of the Canada Research Chair (CRC), Tier 2, in Control Engineering.