

# Distributed Time-Delay Filtering for Precision Motion Control

## MAE SEMINAR SERIES

Monday,  
October 3  
3:30 p.m.  
206 Furnas Hall

### PRESENTED BY

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### ABSTRACT:

Involving time delays in control algorithms proved useful in many aspects of vibration suppression and flexible mode compensation of mechanical systems. This is mainly due to ability to store information on the current half period and act proportionally in a subsequent half period or its multiple to beat vibration. Interestingly, it can be done by a dynamic compensator/controller free of poles, though, with infinitely many zeros. The arising infinite dimensionality of the closed loop dynamics then needs to be considered in the design. After highlighting spectral properties of delay systems/controllers and their frequency domain implications towards vibration suppression, the following applications will be targeted: i) theory and validation of optimal input shaping, ii) delayed resonator - from collocated to non-collocated and multi-dimensional vibration absorption, iii) internal model control scheme to suppress periodic disturbance.

### BIO SKETCHES:

**Tomas Vyhliđal** received MSc in Automatic control and engineering informatics in 1998, and Ph.D. in Control and systems engineering in 2003, both from the Faculty of Mechanical Engineering (FME), Czech Technical University (CTU), Prague, Czech Republic. Since 2000, he has been with the Department of Instrumentation and Control Engineering, FME - CTU, professor since 2012 and the department head since 2019. Since 2015, he has also been with the Czech Institute of Informatics, Robotics, and Cybernetics, CTU, where he leads research group Machine and process control. He has been a member of the Technical Committee for Linear Control Systems of IFAC since 2013, vice-chair on industry since 2017. He was IPC chair of two IFAC-TDS workshops (Boston, 2012, and Istanbul 2016). His research interests include analysis and control of time delay systems, vibration suppression, mechatronic control system design, and control of industrial processes.

**Jaroslav Busek** received the B.Sc. degree in Information and automation technology (2009), M.Sc. degree in Instrumentation and control engineering (2011) and Ph.D. in Technical cybernetics (2019), all degrees from the Faculty of Mechanical Engineering (FME), Czech Technical University (CTU), Prague, Czech Republic. His work is focused at anti-windup strategies for time-delay control systems and flexible systems control. He is also a member of research team focusing on application of advanced computational methods, design procedures and innovative algorithms in development, production and control of mechanical and mechatronic systems at Czech Institute of Informatics, Robotics and Cybernetics (CIIRC).



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