University of Connecticut

United Technologies

UTC Institute for Advanced Systems Engineering Seminar Series


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ADAPTIVE CONTROL FOR UNINTENDED SYSTEM BEHAVIOR

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***Abstract*:** Due to model inaccuracy and system complexity, unintended behaviors arising from environmental disturbances, uncharacterized interactions, and unanticipated dynamics, are widely observed in industrial systems. Another source of unintended behaviors is component degeneration and faults. These behaviors cause the system to run in off-nominal situations, which presents challenges in both controller design and its Verification & Validation (V&V). In order to handle these off-nominal situations, L1 adaptive control algorithm is proposed for improved performance and reduced tuning efforts. In this project, HVAC (Heating Ventilation Air Conditioning) will be used as an example to demonstrate the application of adaptive control for practical systems. The goal is to maintain optimal performance (stability, energy) for changing environmental conditions and equipment degradation, and handle off-nominal situations. A software toolbox with GUI will also be developed to facilitate the control design.

Speaker Bio: Dr. Chengyu Cao is an Assistant Professor in the Mechanical Engineering Department at the University of Connecticut since 2008. Prior to that, he was a research scientist in the Department of Aerospace and Ocean Engineering at the Virginia Polytechnic Institute and State University. He received his Ph.D. in Mechanical Engineering from the Massachusetts Institute of Technology in 2004. Dr. Cao's research is in the area of dynamics and control, unmanned and intelligent systems, and control of aerospace systems. He has published one book and over one hundred papers in journals and peer-reviewed conference proceedings.