Tuning of Cascade Control Structures Subject to Process Constraints

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Abstract

A method is proposed for the simultaneous tuning of proportional-integral-derivative (PID) controllers in cascade control structures based on the concept of co-simulation. The uniqueness of the proposed method is the simultaneous design/tuning of the controllers in a cascade structure. The method is applicable to series as well as parallel cascade control. The controllers are simultaneously tuned while a performance criterion is optimized subject to process constraints. Important constraints include controlled variable, manipulated variable and rate of change constraints. The tuning method is independent of the PID controller type and accommodates controllers with proportional and/or derivative action on the error or process variable. It accounts for robustness in response to modeling errors by including constraints on the maximum sensitivity function. The performance of the proposed method is demonstrated using simulation and experimental runs.

Biography

Vassilios Tzouanas is an Associate Professor of Computer Science and Engineering Technology at the University of Houston – Downtown, in Houston, Texas. He also serves as assistant department chairman. He received all his degrees in chemical engineering and obtained his Ph.D. from Lehigh University. His area of specialization is process modeling, simulation and control. He has worked in the industry for 19 years where he held technical and management positions with major operating companies as well as process control technology development companies. Since 2010, he has been with UHD where he teaches courses in process control, modeling and simulation, process design and operation. Dr. Tzouanas' research interests include process modeling, simulation and design, process control, and renewable energy systems. Dr. Tzouanas is an ABET Program Evaluator (PEV) for Engineering and Engineering Technology programs. He is also member of AIChE and ASEE. Dr. Tzouanas can be reached at tzouanasv@uhd.edu