AIChE Webinar Series

Computing & Systems Technology Division (CAST) Welcomes

Jeff Renfro

Engineering Fellow
UniSim Design Development Team
Honeywell Process Solutions

Honeywell

Equation Oriented Dynamic Modeling: A Perspective on Progress and Challenges

Abstract:

Equation Oriented (EO) modeling (also known as "equation based" or "open equation" modeling) is a formulation approach to solving simulation and optimization problems in a variety of engineering and scientific disciplines, but in particular chemical engineering. It is an alternative approach to methods involving sequential solution of model equations, e.g. the sequential modular approach. EO based modeling has been the basis of a number of successful commercial systems that are used for developing Online Model Based Applications (OMBAs). Steady state EO modeling approaches have been widely used in industrial Real Time Optimization (RTO) applications and EO dynamic modeling has been key to the successful implementation of Nonlinear Model Predictive Control (NMPC) applications, which incorporate the solution of dynamic optimization problems in a fully simultaneous approach. These applications would be quite challenging to develop using an alternative modeling approach when all requirements for OMBAs are considered. However, EO modeling has limited penetration into the world of process design and EO dynamic modeling faces a number of challenges to replacing sequential modular approaches as the basis for Operator Training Simulators (OTS), which is a key commercial application for dynamic simulation. In this presentation I will discuss my perspective on the progress and challenges for EO modeling, with an emphasis on dynamic modeling. The progress noted is critical to understanding what the strengths of EO are and the challenges are critical to face and address if the vision and goals of life cycle modeling (using the same model in a variety of different applications/domains) and a wider commercial use of dynamic simulation and optimization in design are to be achieved.

Biography:

Jeff is an Engineering Fellow in Honeywell Process Solutions, which is a part of Honeywell's Performance Materials and Technologies division. At Honeywell, Jeff has worked in the Advanced Solutions business in the areas of advanced process control, Manufacturing Execution Systems (MES) and simulation as a solutions architect, developer and consultant. Jeff is currently a member of the UniSim Design development team. He has also worked for Shell Development, Dynamic Matrix Control Corporation, Dynamic Optimization Technology Products and PAS before joining Honeywell. During his career he has supported the OPERA, DMO and NOVA Optimization and Modeling Systems, Profit NLC and served as both a consultant and implementer for their online applications. Jeff holds a B.S. degree in chemical engineering from the University of Texas at Austin (1982), and a Ph.D. in chemical engineering from the University of Houston (1986).

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