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Industrial Algorithms

Industrial Flowsheet Optimization and Estimation (IFOE) using IMPL

Abstract:

Presented in this talk is an overview of how to model and solve industrial types of optimization and estimation problems which invariably require a flowsheet, network or superstructure to accurately represent their complexity. These types of problems involve maximizing both profit and performance in an integrated fashion and are difficult for several reasons i.e., they are large-scale, dynamic, mixed-integer, non-linear and non-convex. To manage the complexity of these problems we use our Industrial Modeling and Programming Language (IMPL) which is flowsheet-aware given our Unit-Operation-Port-State Superstructure (UOPSS) to model the structural or spatial objects (e.g., batch and continuous processes, pools, pipelines, pilelines, etc.) and our Quantity-Logic-Quality Phenomena (QLQP) to model the phenomenological and temporal details (e.g., densities, components, properties, conditions and coefficients). IMPL can be called from any computer programming language such as C, C++, C#, Java, Python, VBA, etc. where it has bindings to all commercial and community-based solvers such as CPLEX, GUROBI, XPRESS, GLPK, LPSOLVE, COINMP, SCIP, CONOPT, IPOPT, KNITRO, etc. Several examples are provided taken from the fields of advanced planning and scheduling (APS) as well as data reconciliation and parameter estimation (DRPE) to highlight the concepts.

Biography:

J. D. Kelly is an Advanced Planning and Scheduling (APS) and Advanced Process Control (APC) expert in the Process Industries. He holds a Bachelor's and a Master's degree in Chemical Engineering and was the first research engineer at the largest APC group in Canada. He has worked at two petroleum refineries for the world's largest oil companies implementing both on-line and off-line control and optimization strategies on their major processing units. He has performed consulting services around the world in the areas of APS, APC, Advanced Production Accounting (APA), Advanced Process Monitoring (APM) and Information Technology. Mr. Kelly has worked for the largest Distributed Control System (DCS) vendor developing and deploying advanced statistical and scheduling technology and software which are multi-million dollar businesses installed globally and diversely across many vertical markets. He has published over 35 papers, presented many talks and holds several US patents on these topics.



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