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Advances in Chemical Production Scheduling

Abstract:

We present an overview of recent advances in chemical production scheduling, including a general framework, new modeling and solution methods, and some concepts for the online solution of scheduling problems. First, we develop a framework for the description of scheduling problems in the chemical industries. While building upon ideas used in discrete manufacturing, the proposed framework accounts for features such as material handling restrictions which make chemical production environments different. Second, we present a classification of the various modeling approaches that have been presented in the process systems engineering (PSE) literature and offer some critical insights. Third, we briefly review a series of mixed-integer programming (MIP) models developed to address limitations of existing approaches and present an overview of two solution methods that lead to order-of-magnitude speedups, namely, a constraint propagation algorithm for the calculation of parameters used to generate tightening constraints, and a series of reformulations. Finally, we close with some thoughts on the treatment of scheduling as an online problem with desired closed-loop properties.

Biography:

Christos was born in Athens, Greece. He obtained a Diploma in Chemical Engineering at the National Technical University of Athens, an MSc in Operational Research from the London School of Economics (London, UK), and his PhD from Carnegie Mellon University. He joined the Department of Chemical and Biological Engineering at the University of Wisconsin – Madison in 2004. He is the recipient of an NSF CAREER award, the 2008 David Smith and the 2013 Outstanding Young Researcher Awards from the CAST division of AIChE, as well as the 2012 Best Paper Award from Computers and Chemical Engineering. Christos' research interests lie in the areas of chemical production scheduling; supply chain optimization; chemical process synthesis and analysis; and computational methods for novel material discovery.

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