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A FRAMEWORK FOR MODELING AND OPTIMIZING DYNAMIC SYSTEMS UNDER UNCERTAINTY

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Abstract

Algebraic modeling languages (AMLs) have drastically simplified the implementation of algebraic optimization problems. However, there are still many classes of optimization problems that are not easily represented in most AMLs. These classes of problems are typically reformulated before implementation, which requires significant effort and time from the modeler and obscures the original problem structure or context. In this work we demonstrate how the Pyomo AML can be used to represent complex optimization problems using high-level modeling constructs. We focus on the operation of dynamic systems under uncertainty and demonstrate the combination of Pyomo extensions for dynamic optimization and stochastic programming. We use a dynamic semibatch reactor model and a large-scale bubbling fluidized bed adsorber model as test cases.

Keywords: Stochastic Programming, Dynamic Optimization, Optimal Control, Parameter Estimation

1. Introduction

A common challenge rarely mentioned or addressed in the optimization research community is the difficulty associated with implementing cutting-edge methods or industrial-sized optimization problems. This includes not only the implementation of new solution techniques for a particular class of optimization problems

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