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Fakultät Bio- und Chemieingenieurwesen

LS für Systemdynamik und Prozessführung

Diplomarbeit / Masterarbeit

Optimizing Control of a Tubular Polymerization Reactor with Multiple Side-Injections using Proper Orthogonal Decomposition

Abstract:

Recently optimizing-based controllers have found many industrial applications. Due to optimizing nature of these controllers, it is very convenient to impose any desired constraint on the control inputs or states which is very difficult or almost impossible in many other control schemes. These controllers employ a model of the system and try to optimize a desired cost function over a finite prediction horizon.

Many literatures have shown the applicability of these controllers on the systems with small to medium size. For the systems with thousands of states, the evaluation of the process model is computationally expensive and the controller can not be used for real-time applications.

The obvious remedy to overcome this problem is to use reduced order model of the system. Several methods have been proposed for this purpose in literature. Proper orthogonal decomposition (POD) is one of such methods. This method builds a snapshot matrix of the system states and tries to reproduce it using only its significant Eigen values.

The objective of this thesis is to design a model-based optimizing controller for a polymerization reaction in a tubular reactor with multiple side injections of monomer employing a reduced order model of the system using POD. The designed controller will be compared with a controller which employs the full model of the system in terms of accuracy and computation time.