Error Analysis in an Iterative Algorithm for the Solution of the Regulator Equations for Distributed Parameter Systems

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Abstract

Our work is based on classical geometric regulation theory which involves asymptotic tracking and disturbance rejection for linear parabolic distributed parameter systems. This theory is based on the solution of a coupled pair of operator equations referred to as Regulator Equations.

In general it is not easy to solve the Regulator Equations even for the simplest cases. In this work we present a methodology for tracking and disturbance rejection, which is more general than the one based on the Regulator Equations, and applies to general smooth signals.

Our algorithm is based on the β-iteration method for obtaining approximate solutions of the regulator problem for a class of infinite dimensional linear control systems. A major advantage of this theory is that an explicit error analysis is available for each step in the iteration. In particular, we obtain estimates showing geometric convergence of the error, controlled by the parameter β. We demonstrate our estimates on a variety of control problems in multi-physics applications.