

Schwarz Methods for the Time-Parallel Solution of Parabolic Control Problems

F. Kwok¹

Abstract: Discretized parabolic control problems lead to very large systems of equations, because trajectories must be approximated forward and backward in time. It is therefore of interest to devise parallel solvers for such systems, and a natural idea is to apply Schwarz preconditioners to the large space-time discretized problem. The performance of Schwarz preconditioners for elliptic problems is well understood, but how do such preconditioners perform on discretized parabolic control problems? We present a convergence analysis for a class of Schwarz methods applied to a model parabolic optimal control problem. We show that just applying a classical Schwarz method in time already implies better transmission conditions than the ones usually used in the elliptic case, and we propose an even better variant based on optimized Schwarz theory.

¹ Department of Mathematics,
Hong Kong Baptist University
Kowloon Tong, Kowloon, Hong Kong
felix.kwok@hkbu.edu.hk