数学与系统科学研究院

计算数学所学术报告

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报告题目：

On the Numerical Solution of State-Constrained Optimal Control Problems

邀请人： 白中治 研究员

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上午 9:30-10:30

报告地点： 数学院南楼七层

702 教室

Abstract:

Optimal control problems with constraints given by a partial differential equation arise in many different types of important applications. The problem involves both a state and a control variable, and a Lagrange multiplier to cope with the constraint. We consider problems, where in addition the state variable is constrained by lower and upper bounds. Such problems are harder to solve than when the box constraint holds only for the control variable. The problem must be regularized, both to limit the cost of the optimal control variable, normally by use of a standard Tikhonov regularization term in the objective function to be minimized, and by a regularization for the state variable to handle the box constraint.

The algebraic problem that arises after discretization is nonlinear and is solved using the so-called semi-smooth Newton method. Clearly, due to the large size of the so-obtained linear systems to be solved at each Newton step, iterative methods are the methods of choice. The latter inevitably requires utilization of robust and numerically and computationally efficient preconditioners.

In this talk we address an efficient preconditioning technique for two-by-two block matrices with square blocks, amended for the particular problem in focus. We also discuss the interplay between the discretization parameter, the two regularization parameters, the stopping criteria for the linear and nonlinear solvers, as well as constructing good enough initial guess to ensure fast convergence of the nonlinear solver.

The theoretical analysis of the properties of the preconditioner and the robustness of the overall solution procedure is illustrated with numerical experiments.

欢迎大家参加！