A Posteriori Error Estimation for Optimal Controls with Application to POD

E. Kammann[1] and <u>F. Tröltzsch</u>[2]

Abstract: We consider the question of estimating the distance of a numerically computed optimal control to an unknown (exact) locally optimal control for a nonlinear parabolic control problem. For this purpose, we apply some perturbation method that has already been used by several authors to derive a priori error estimates for the numerical approximation of optimal control problems. If the exact optimal control satisfies a second-order sufficient optimality condition and an estimate on the associated coercivity parameter is available, then the distance can be estimated by the perturbation technique.

As an application, we consider the model reduction of optimal control problems by proper orthogonal decomposition (POD). Suboptimal controls are determined by solving a POD reduced optimal control problem. We estimate the distance of the suboptimal control to the closest locally optimal control of the original control problem.

Two examples are presented, a boundary control problem for the 1D heat equation with Stefan-Boltzmann boundary condition and a 2D distributed control problem for a nonlinear heat equation.

[1,2] Institut für Mathematik
Technische Universität Berlin
Str. d. 17. Juni 136, D-10623 Berlin, Germany
kammann@math.tu-berlin.de, troeltz@math.tu-berlin.de