Verification of optimality conditions and discretization error estimates

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Optimal control of a semilinear elliptic partial differential equation is a nonconvex optimization problem. Hence second-order sufficient conditions are needed to ensure local optimality. Such conditions allow to derive a priori error estimates for FE-discretizations.

However, this strategy has an essential drawback. The second-order condition has to be satisfied in the exact solution, but only a numerical approximation of the exact solution is available. Consequently it is impossible to check the second-order sufficient condition.

In this talk we present another strategy. We require only a coercivity condition for the numerical solution which can be checked numerically. This is the main tool to show discretization error estimates for a FE-discretization.