L^∞-error estimates on graded meshes and its application to optimal control

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In this talk we present an L^∞-error estimate of the finite element approximation of an elliptic boundary value problem with Dirichlet boundary conditions in domains with corners. To achieve an approximation rate of $h^2|\ln h|$ the mesh has to be appropriately graded near corners with an interior angle larger than $\frac{\pi}{2}$. In contrast to previous publications the norm of the function, that has to be approximated, is seperated from the constants in this estimate.

We apply this result to a linear-quadratic optimal control problem with constraints on the control. For discretizing the state linear finite elements are used, the control is approximated by using piecewise constant ansatz functions. Approximations of the optimal solution of the continuous optimal control problem are constructed by a projection of the discrete adjoint state. For this approximation a convergence rate of $h^2|\ln h|$ in the maximum norm is shown.

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