

**Maximum norm estimates for BVP with Neumann boundary data and optimal control problems  
with Neumann boundary control on graded meshes**

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This talk deals with the computation of the numerical solution of boundary value problems with Neumann boundary conditions and optimal control problems with Neumann control in polygonal domains using the finite element method. Due to the corners of the domain, the convergence rate of the numerical solutions can be lower than in case of smooth domains. As a remedy one can use local mesh refinement near the corners. In order to prove optimal error estimates regularity results weighted Sobolev spaces are exploited. In such a case the convergence rate of  $|\ln h|^{(3/2)} h^2$  using piecewise linear ansatz functions can be shown for the state variable as well as the adjoint variable in the domain and the control variable on the boundary. It is also shown how to generate graded meshes by different techniques. Similar results for boundary value problems with Dirichlet boundary conditions and optimal control problems with distributed control were obtained by Th. Apel, A. Rosch and D. Sirch (2009).