Numerical Analysis for Dirichlet Optimal Control Problems on Convex Polyhedral Domains

Johannes Pfefferer[1] Boris Vexler[2]

This presentation is concerned with the error analysis for finite element discretizations of Dirichlet boundary control problems. In contrast to most of the publications from the literature the underlying domain is assumed to be convex and polyhedral but not only polygonal. Optimal discretization error estimates are established in this case using the concept of variational discretization or using the approach of full discretization each based on standard linear finite elements. The convergence rates, which are proven, solely depend on the size of the largest interior edge angle. To be more precise, below the critical angle of $2\pi/3$, a convergence rate of one (times a log-factor) can be achieved for the discrete controls in the L^2-norm on the boundary. For larger interior edge angles the convergence rates are reduced depending on the size of this angle, which is due the impact of singular (domain dependent) terms in the solution. The results are comparable to those for the two dimensional case. However, the theoretical approaches from the two dimensional setting seem not to be directly extendable such that new techniques have to be used. At the end of the talk, the theoretical results are confirmed by numerical experiments.

References:

[1] https://arxiv.org/abs/2401.02399

[1]Universität der Bundeswehr München, Fakultät für Elektrische Energiesysteme und Informationstechnik
johannes.pfefferer@unibw.de

[2]Technische Universität München, School of Computation, Information and Technology
vexler@cit.tum.de