

Finite element error analysis of a state-constrained optimal control problem with boundary control

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We consider a linear quadratic optimal control problem with pointwise state constraints and control constraints, where the control acts at the boundary. It is well known that problems with pointwise state constraints inhibit a lot of difficulties since the Lagrange multipliers are in general only Borel measures. Therefore, different regularization concepts are developed in the last years. However, a direct extension of the Lavrentiev regularization concept is not possible since the control is not defined in the domain where the state constraints are given.

We will use the concept of a virtual distributed control in the domain Ω . Thus the Lavrentiev regularization is applicable. The effect of regularization is influenced by different parameter functions depending on a regularization parameter $\varepsilon > 0$. Furthermore, the problem is discretized by finite elements. We derive an error estimate of the optimal solution of the original problem to the corresponding discretized and regularized one. Since the regularization error and the discretization error appears simultaneously, we have to balance the regularization parameter and the mesh size in an appropriate manner.

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