Boundary Element Methods for
Dirichlet Boundary Control Problems

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Abstract: For the solution of optimal Dirichlet boundary control problems we propose and analyze two different boundary element approaches. The state equation, the adjoint equation, and the optimality condition are rewritten as systems of boundary integral equations involving the standard boundary integral operators of the Laplace and of the Bi-Laplace equation. While the first approach is based on the use of the weakly singular Bi-Laplace boundary integral equation only, the additional use of the hypersingular Bi-Laplace boundary integral equation results in a symmetric formulation. We prove the unique solvability of both boundary integral approaches, and discuss related boundary element discretizations. We also derive error estimates of the boundary control for BEMs. Some numerical tests confirm the analytical results.

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