

# Boundary Element Methods for Dirichlet Boundary Control Problems

Thanh Phan Xuan<sup>1</sup>   Günther Of<sup>2</sup>   Olaf Steinbach<sup>3</sup>

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.

---

<sup>1</sup>Institute of Computational Mathematics, Graz University of Technology, Steyrergasse 30, 8010 Graz, Austria,

thanh.phanxuan@tugraz.at

<sup>2</sup>Institute of Computational Mathematics, Graz University of Technology, Steyrergasse 30, 8010 Graz, Austria,

of@tugraz.at

<sup>3</sup>Institute of Computational Mathematics, Graz University of Technology, Steyrergasse 30, 8010 Graz, Austria,

o.steinbach@tugraz.at