Fast BEM methods for the efficient treatment of elliptic shape optimization problems

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Based on a related shape calculus, the aim of the talk is to develop efficient optimization algorithms for the solution of elliptic shape optimization problems. Complete boundary integral representations for the shape gradient and the shape Hessian provide Gradient or Newton update rules directly for the boundary. In some specific cases, integral equation methods turn out to be a powerful tool. Nevertheless, the requirements from invoking the ingredients from shape calculus into an operating optimization algorithm, urgently need optimal or almost optimal complexity for the BEM like for wavelet compression techniques. This is illustrated by the computation of free surfaces in electromagnetic shaping and for other free boundary value problems.

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