

A fast direct solver for boundary value problems on locally perturbed geometries.

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Many applications including optimal design and adaptive discretization techniques involve solving several boundary value problems on geometries that are local perturbations of an original geometry. This talk presents a fast direct solver for boundary value problems that are recast as boundary integral equations. The idea is to write the discretized boundary integral equation on a new geometry as a low rank update to the discretized problem on the original geometry. Using the Sherman–Morrison formula, the inverse can be expressed in terms of the inverse of the original system applied to the low rank factors and the right hand side. Numerical results illustrate for problems where perturbation is localized the fast direct solver is three times faster than building a new solver from scratch.