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Preconditioning Unfitted Nitsche methods for high contrast interface elliptic problems

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We present some basic preconditioning techniques for the solution of the linear systems arising from CutFEM and unfitted Nitsche finite element approximations to elliptic interface problems with discontinuous coefficients. We introduce simple one level and two level methods in the spirit of classical Schwarz and Dirichlet-Neuman (domain decomposition) methods. We analyse the asymptotic convergence of the proposed solvers, addressing their optimality and their robustness with respect to the coefficients and the interface-mesh configuration. We present extensive numerical experiments to verify the theory and asses the performance of the proposed preconditioners.