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Quasi-optimal domain decomposition methods for time-harmonic acoustic and electromagnetic wave problems

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In terms of computational methods, solving three-dimensional time-harmonic acoustic or electromagnetic wave problems is known to be challenging, especially in the high frequency regime and in the presence of inhomogenous media. The brute-force application of the finite element method in this case leads to the solution of very large, complex and possibly indefinite linear systems. Direct sparse solvers do not scale well for such problems, and Krylov subspace iterative solvers can exhibit slow convergence, or even diverge. Domain decomposition methods provide an alternative, iterating between subproblems of smaller sizes, amenable to sparse direct solvers. In this talk I will present a class of non-overlapping Schwarz domain decomposition methods that exhibit quasi-optimal convergence properties, i.e., with a convergence that is optimal for the evanescent modes and significantly improved compared to competing approaches for the remaining modes [1, 2]. These improved properties result from a combination of an appropriate choice of transmission conditions and a suitable localization of the optimal, integral operators associated with the complementary of each subdomain [3]. The resulting algorithms are well suited for high-performance, large scale parallel computations in complex geometrical configurations when combined with appropriate preconditionners [4].

[1] Y. Boubendir, X. Antoine and C. Geuzaine, A quasi-optimal non-overlapping domain decomposition algorithm for the Helmholtz equation. Journal of Computational Physics 231 (2), pp. 262-280, 2012.

[2] M. El Bouajaji, B. Thierry, X. Antoine and C. Geuzaine. A quasi-optimal domain decomposition algorithm for the time-harmonic Maxwell's equations. Journal of Computational Physics 294, pp. 38-57, 2015.

[3] M. El Bouajaji, X. Antoine, C. Geuzaine. Approximate local magnetic-to-electric surface operators for time-harmonic Maxwell's equations. Journal of Computational Physics 279 (15), 241-260, 2014.

[4] A. Vion and C. Geuzaine. Double sweep preconditioner for optimized Schwarz methods applied to the Helmholtz problem. Journal of Computational Physics 266, 171-190, 2014.

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