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A Non-Hermitian Coarsening Strategy for Algebraic Multigrid

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In recent years, there has been a significant renewed interest in the development of optimally efficient algebraic multigrid solvers and preconditioners for the non-symmetric and non-Hermitian matrices that arise in applications such as fluid dynamics. While much of this work has evolved, either directly or indirectly, from multigrid algorithms for Hermitian problems, not all non-Hermitian matrices can be effectively addressed in this way. In this talk, I will introduce a new inherently non-Hermitian algebraic coarsening algorithm, adapted from multilevel block factorization preconditioners, and the corresponding algebraic multigrid algorithm. While the proposed strategy requires no assumptions on, for example, the diagonal dominance of the matrix, it reduces to a reasonable multigrid method for such problems. The resulting algorithm is, then, more robust than traditional AMG approaches; however, it is also less efficient for the HPD problems for which classical AMG excels.