

Measures for the Strength of Nodal Dependence in AMG for Vector-Field Problems

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The detection of strong coupling is an important task in (classical) algebraic multigrid (AMG) methods since it directly affects the quality of coarsening and thus convergence properties. However, in many cases, especially for vector-fields a proper measure for nodal dependence is not that apparent. The talk will outline the important steps of the AMG approach based on computational molecules (introduced by J. Kraus in 2005). We will especially focus on measures of connectivity of so-called “algebraic vertices”. For vector-field problems (e.g. problems in linear elasticity) one natural generalization of a commonly used scalar measure will be presented in this talk and some of its advantages will be discussed: Based on the construction of “algebraic edges” and related local matrices we are able to determine the local CBS constant associated with the angle between two subspaces spanned by basis functions corresponding to the respective algebraic vertices. This provides us with a reliable measure for the strength of nodal dependence, which can easily be adapted to various situations, e.g., problems arising from nonconforming and/or higher-order finite element discretization.