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Bootstrap Algebraic Multigrid

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We develop an Algebraic Multigrid (AMG) cycling scheme based on the adaptive Bootstrap AMG framework. The approach we present adaptively computes a set of test vectors and then uses them to define interpolation.

The setup of the method consists of two parts. First, we introduce concept of Least Squares Interpolation which allows us to define interpolation in an algebraic multigrid context that is solely based on a set of test vectors. In addition, we propose and analyze a Bootstrap process to enhance the set of test vectors used in the definition of Least Squares Interpolation in a multigrid fashion. We demonstrate that this setup procedure allows us to iteratively improve the multigrid hierarchy until suitable performance of the resulting method is achieved while retaining control over the complexity of the multigrid hierarchy and overall setup costs. We present tests for a variety of applications that show the flexibility and robustness of this approach.