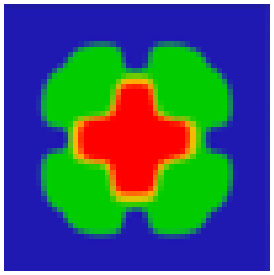

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Present and Future of adaptive, parallel, geometric multigrid in deal.II

Monday, July 23, 2018 9:45 AM (45 minutes)

Multigrid methods are the only known approach to efficiently solve large linear systems for solving PDEs by having runtime cost proportional to the number of unknowns. Algebraic multigrid methods construct a hierarchy of problems from the system matrix, while geometric multigrid methods use the mesh hierarchy and system matrices from each level of this hierarchy.

While algebraic multigrid methods have been successful in the past and are still the method of choice for large problems in deal.II, they have several disadvantages over geometric multigrid methods when implemented in a matrix-free version: First, scaling to more than a few thousand cores is limited due to the large setup cost. Second, the low arithmetic intensity does not lend itself to modern architectures. Third, implementation of multithreading is difficult. Fourth, the matrices consume large amounts of system memory.

Here we present the current status of adaptive, parallel, geometric multigrid how it is implemented in deal.II. Several numerical tests demonstrate the approach. Finally, we will close with future plans.

Primary author: HEISTER, Timo (Clemson University)

Co-authors: KANSCHAT, Guido (Heidelberg University); KRONBICHLER, Martin (TU Munich); CLEVENGER, Thomas (Clemson University)

Presenter: HEISTER, Timo (Clemson University)

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