Hormozd Gahvari

Performance Modeling in Algebraic Multigrid: Latest Developments

P O Box 808
L-561
Livermore
CA 94551
gahvari1@llnl.gov
William Gropp
Kirk E. Jordan
Martin Schulz
Ulrike Meier Yang

Algebraic multigrid (AMG) solvers are very popular due to their ideal algorithmic complexity and applicability to unstructured problems, but there are concerns about scalability when solving large problems on massively parallel machines. These concerns stem from large numbers of messages being sent between processors on coarse grids. To improve the performance and scalability of AMG in the parallel setting, we have turned to performance modeling to guide data redistribution at runtime in the AMG solve cycle that reduces the number of messages. A performance model is employed on the fly to control when in the cycle the redistribution occurs, and how much of it is performed. We are now in the process of turning this inline modeling into a feature that can be employed in production software. In this talk, we discuss what we have achieved so far and our plans for the future. We have already been able to obtain significant speedups on multiple machines on both simple and more complicated problems, and we can now make machine parameter measurements for the performance models on the fly instead of having to input them beforehand.