Porting an aggregation-based algebraic multigrid method to GPUs

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We present a hybrid GPU-CPU version of the AGMG software, which implements an aggregation-based algebraic multigrid method. The original AGMG software is designed to run on CPU, and is known to be both fast and robust when compared to traditional AMG methods. With the new GPU-CPU implementation, the solution stage runs on GPU, except for operations on the coarsest grids, which are executed on CPU. We shall discuss some of the distinctive features of the new implementation, including weighted (polynomial) ℓ_1-Jacobi smoothing and relaxed W multigrid cycle. We demonstrate that the resulting GPU-CPU implementation inherits the robustness of the original AGMG software, while bringing significant speedups with respect to the original CPU version. A comparison is also provided with AMGX solver from NVIDIA, showing that AGMG-GPU is more robust and significantly faster in the solution stage.

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