An Adaptive Preconditioning Strategy for Large-Scale Multi-Physics Simulations

Xiaowen Xu [1]

In the implicit time-stepping simulations, a fixed setup-based preconditioner, e.g. AMG, ILU etc, is usually used in the whole simulation process due to its robustness. Setup-based preconditioners, however, lead to poor parallel scalability due to its setup phase. In this work, an adaptive preconditioning strategy is introduced in order to reduce the setup overhead while maintain the robustness. The main idea behind the presented adaptive strategy is the combination of setup-free, setup-reuse, and setup-based parameter auto-tuning via a post-residual estimator during the iterative process. Results for a real multi-physics simulation on O(104) cores show its efficiency and improvement.

[1]Institute of Applied Physics and Computational Mathematics, China (xwxu@iapcm.ac.cn)