Many simulation codes in physics or engineering require the repeated solution of large linear systems stemming from (or closely related to) the discretization of scalar elliptic PDEs. For large 3D simulations, it is nowadays standard to use multigrid methods. These methods are indeed scalable in the sense that the overall computational work to obtain the solution up to a prescribed tolerance is proportional to the number of unknowns.

However, developing a truly efficient implementation for massively parallel computers is still considered a challenge. It is especially the case for algebraic multigrid schemes, whose setup stage requires only the system matrix, and that are therefore not limited to certain types of discretization.

In this talk we consider in particular a nowadays popular aggregation-based algebraic multigrid method, as implemented in the AGMG software code (which has several hundreds of users in both academia and industry). To improve performance on massive parallel systems, some critical algorithmic components have been redesigned, in a relatively simple yet not straightforward way. Thanks to this, excellent weak scalability results have been obtained on some of the Europe’s top supercomputers.

http://homepages.ulb.ac.be/~ynotay/AGMG


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