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Multigrid Smoothers for Ultra-Parallel Computers

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Multigrid methods are often critical for solving huge linear systems efficiently, and they have demonstrated scalability on hundreds of thousands of processors. However, the petascale architectures on the horizon are expected to have millions of processors, and future exascale machines could have even more. The immense degree of parallelism on these machines requires a similar level of concurrency in the algorithms that run on them. One major component of multigrid is the smoother, but many of the most effective smoothers used today unfortunately don't exhibit this degree of concurrency without losing their good smoothing properties. In this talk, we will discuss several approaches for doing effective smoothing in highly concurrent settings and we will also present supporting numerical results.