David Appelhans

Parallel Solution of PDEs using weighted FOSLS-AMR-AMG

1115 35th St Apt A
Boulder
CO 80303
dappelha@gmail.com
Toby Jones
Tom Manteuffel

This talk presents results on a domain decomposition multigrid method that builds a patchwork global solution from overlapping processor grids that do not communicate during a V-cycle. Typical domain decomposition parallel multigrid implementations exchange information along processor boundaries on each grid level; however, modern supercomputer architecture continues to add more computational power while communication remains expensive. This necessitates a new breed of numerical algorithms that are designed to minimize communication from the start, even at the expense of more on-processor computation. The method presented in this talk leverages the power of ACE adaptive mesh refinement and weighted FOSLS by specifying a weighted functional that emphasizes a processors domain and falls off with distance. By using this weighted functional with ACE, a grid is adaptively generated that focuses on the processor domain while still allocating grid points to areas outside the processor domain where the functional is large and, importantly, extends to the boundary of the global domain. The total number of grid points used by each processor is a small multiple of the grid points within the home domain. The solutions from each processor are then patched into a gloabal approximation and the process can be iterated.