PARALLEL ADAPTIVE MESH REFINEMENT FOR SOLID EARTH GEOPHYSICS PROBLEMS

Many problems in solid earth geophysics are characterized by dynamics occurring on a wide range of length and time scales, which complicates the numerical solution of the governing partial differential equations (PDEs). One approach to overcoming the tyranny of scales is adaptive mesh refinement (AMR), which locally and dynamically adapts the mesh to resolve spatio-temporal scales and features of interest.

While AMR promises to help overcome the challenges inherent in modeling multiscale problems, the benefits are difficult to achieve in practice, particularly on highly parallel supercomputers. Due to complex mesh topology and communication patterns, and frequent data exchange and redistribution, scaling dynamic AMR to tens of thousands of processors has long been considered a challenge. Additional difficulties are encountered when extending parallel AMR techniques to high-order-accurate, complex-geometry-respecting finite element methods that are favored for many classes of solid earth geophysical problems.

We present the ALPS (Adaptive Large-scale Parallel Simulations) framework for parallel adaptive solution of PDEs and describe applications to selected solid earth geophysics problems: global mantle convection with nonlinear rheology and global seismic wave propagation.

Dr. Burstedde is a Research Associate at the Institute for Computational Engineering and Sciences of The University of Texas at Austin.

DATE: Wednesday, May 19
PLACE: Bioscience Research Bldg. 2.168
CONTACT: DR. ROMERO – 747-5916 – RAROMERO2@UTEP.EDU
REFRESHMENTS: 1:30 – 2:00 pm
TALK TIME: 2:00 – 3:00 pm

This Distinguished Lecture is funded in part by NSF Grant NEESR-SG CMMI-0619078