Computational Mathematics Seminar Series

Asynchronous Optimized Schwarz Methods for Partial Differential Equations in Rectangular Domains

Jose Garay, Louisiana State University

Postdoctoral Researcher

Digital Media Center 1034
September 18, 2018 - 03:30 pm

Abstract:

Synchronous iterative algorithms are parallel iterative algorithms in which iterations and communications are synchronized among processors. Any load imbalance, non-uniformity in hardware performance or the time required to communicate information among processing units and memory causes processing units to idle at the synchronization point and impacts performance. Given the heterogeneous and distributed architecture of modern supercomputers, idle times in processing units are an issue in terms of efficiency.

In asynchronous parallel iterative algorithms, communications and iterations are not synchronized among processors. Thus, as soon as a processing
unit finishes its own calculations, it starts the next cycle with the latest data received during a previous cycle, without waiting for any other processing unit to
complete its own calculation. These algorithms increase the number of updates in some processors (as compared to the synchronous case) but suppress most idle times. This usually results in a reduction of the (execution) time to achieve convergence. Therefore, the use of asynchronous iterative algorithms may help to reduce the inefficiency that occurs in synchronous implementations and to attain convergence faster.

Optimized Schwarz methods (OSM) are domain decomposition methods that are fast (as solvers) in terms of iteration count and can be implemented asynchronously. In this talk we will present a convergence analysis (at the continuous level) of the synchronous and asynchronous versions of OSM applied to solve partial differential equations with a shifted Laplacian operator in bounded rectangular domains. Numerical results illustrate our theoretical results. (Joint work with Frédéric Magoulès and Daniel Szyld)

Speaker's Bio:

Jose Garay is a Postdoctoral Researcher at the Center for Computation & Technology at Louisiana State University. He obtained a bachelor's degree in Electronics Engineering from the Universidad Nacional de Asunción in Paraguay. Later he received a Ph.D. degree in Mathematics from Temple University. His Ph.D. thesis research focused on asynchronous domain decomposition methods. His research interests include Numerical Analysis in general and Numerical Linear Algebra in particular, Domain Decomposition methods, High Performance Computing, Data Science, Dynamical Systems, Asynchronous Algorithms, Computational Physics and Computational Neuroscience.

This lecture has refreshments @ 03:00 pm

Center for Computation & Technology
2003 Digital Media Center • Telephone: +1 225/578-5890 • Fax: +1 225/578-8957