TEMPLE UNIVERSITY
Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

Wednesday, 9 March 2016, 4:00 p.m.
Room 617 Wachman Hall

(refreshments and social at 3:45 p.m)

The extinction of the dinosaurs and parallel computing

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Abstract. In parallel computing, expecially in hetergeneous networks it is desirable to that each process begin its computations without waiting for information from the other processes. This is called asynchronous computations. We present asynchronous optimized Schwarz methods for the solution of general PDEs on a domain. Schwarz iterative methods use a decomposition of the domain into two or more (possibly overlapping) subdomains. In essence one is introducing new artificial boundary conditions on the interfaces between these subdomains. In the classical formulation, these artificial boundary conditions are of Dirichlet type. Given an initial approximation, the method progresses by solving for the PDE restricted to each subdomain using as boundary data on the artificial interfaces the values of the solution on the neighboring subdomain from the previous step. In the case of optimized Schwarz, the boundary conditions on the artificial interfaces are of Robin or mixed type. In this way one can optimize the Robin parameter(s) and obtain a very fast method. We proved that under certain conditions, the proposed method converges. Numerical results are presented on large three-dimensional problems illustrating the efficiency of the proposed asynchronous parallel implementation of the method. The main application shown is the calculation of the gravitational potential in the area around the Chicxulub crater, in Yucatan, where an asteroid is believed to have landed 66 million years ago contributing to the extinction of the dinosaurs. (Joint work with Fréderic Magoués and Cedric Venet).