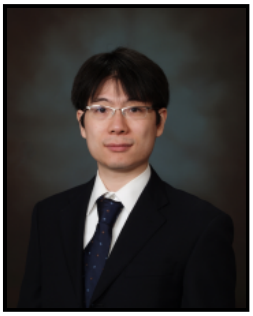

Special Guest Lectures

ICT-SSAI: Hybrid Scalable Parallel Incomplete Cholesky Preconditioning

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Applicant for CCT's CyD IT Analyst Position

Johnston Hall 338
March 12, 2007 - 03:00 pm

Abstract:
Many large scale simulations require robust and scalable sparse linear solution. We have developed a flexible parallel drop-threshold Incomplete Cholesky preconditioner (ICT) to accelerate convergence of Conjugate Gradients (CG). An ICT preconditioning scheme computes a preconditioner that is an approximation to the actual Cholesky factor of the coefficient matrix. Although such a scheme is used widely on uniprocessors its scalable parallel implementation pose two major challenges. First, the performance of parallel triangular solution using, applied at every CG iteration, typically suffers from the high latencies of interprocessor communication. Second, parallel construction of the preconditioner suffers from communication and data structure management overheads because its nonzero pattern cannot be determined at an earlier stage. To address these issues, we have developed a new parallel ICT preconditioner using techniques derived from parallel sparse direct methods in conjunction with selective use of parallel sparse approximate inversion. Our new preconditioner, ICT with Selective Sparse Approximate Inversion (ICT-SSAI), has enabled both efficient preconditioner construction and application together while retaining the effectiveness of the original ICT preconditioning. We will present the performance of our preconditioner on large linear systems from various applications including finite element modeling of solid mechanics.

Speaker's Bio:
Dr. Keita Teranishi is a Postdoctoral Research Associate at the Department of Computer Science and Engineering at Penn State University. He has been working on the software framework on multiscale computational material design funded by the NSF-ITR MatCASE project. In particular, he worked on designing multiscale-multicompnent software framework and data compression for computational materials science applications. Prior to this project, Dr. Teranishi developed parallel scalable preconditioning schemes for iterative solution of large sparse linear systems for his thesis. His research interests concern high performance scientific computing, including parallel graph and matrix algorithms, sparse or unstructured schemes and software and tools to enable large scale modeling and simulation in computational science and engineering. Dr. Teranishi received his B.S. and M.S. in Computer Science at the University of Tennessee, Knoxville in 1998 and 2000 and his PhD. in Computer Science from Penn State University in 2004.

Refreshments will be served.
This lecture has a reception.

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