第 25 回先進スーパーコンピューティング環境（ASE）研究会実施報告

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東京大学情報基盤センターASE 研究会（Advanced Supercomputing Environment）は内外からの講演者を招いて不定期に開催している。2016 年 12 月 8 日（木）に実施された第 25 回 ASE 研究会[1]では，学際大規模情報基盤共同利用・共同研究拠点（JHPCN）平成 28 年度国際共同研究課題として実施している「High-performance Randomized Matrix Computations for Big Data Analytics and Applications（代表 : 片桐孝洋（名古屋大学情報基盤センター），副代表 : 王偉仲（國立臺灣大學應用數學科學研究所））」[2]に参加している名古屋大学，國立臺灣大學の研究者に，Integrated Singular Value Decomposition (iSVD) に関する話題を中心にご講演いただいた。学内外から合計 22 名の出席者があり，活発な議論が行われた。

表 1　プログラム

時間帯	講演者	題　目
14:00-14:05	Hiroshi Nakamura (Director, Information Technology Center (ITC), The University of Tokyo)	Welcome Address
14:05-14:30	Kengo Nakajima (ITC, The University of Tokyo)	Overview of the Oakforest-PACS System at JCAHPC
14:30-15:15	Takahiro Katagiri (Information Technology Center, Nagoya University)	Integration of Multiple Randomized Low-Rank Singular Value Decompositions for Large Matrices on Parallel Computers
Integrated Singular Value Decomposition (iSVD) is a randomized method proposed by T.Chen et.al. iSVD is carefully designed to obtain high parallelism with respect to accuracy and execution speed. In this project, we evaluate the iSVD algorithm with several supercomputers provided in JHPCN. Adaptation of auto-tuning to iSVD and other applications will also discussed.		
15:25-16:25	Weichung Wang (National Taiwan University, Taiwan)	Evaluating a Randomized Algorithm for Singular Value Decomposition with Supercomputers and Adaptation of Auto-tuning
Integrated Singular Value Decomposition (iSVD) is a randomized method that was proposed recently to compute low-rank SVD of large matrices arising in data analysis and scientific computing. The iSVD randomly projects the coefficient matrix to several low-dimensional subspaces and performs low-rank SVD on each of them. The method then integrates these low-dimensional approximate SVDs by solving a minimization problem. We will discuss the recent developments of iSVD in various forms of parallelism and its extension to the principal component analysis matrices and high order SVD of tensors. Collaborations in iSVD in terms of high-performance computing, auto-tuning, applications, etc. are sincerely welcome.		
16:25-16:55	Cheng-Han Du (National Taiwan University, Taiwan)	Scaling-Up Finite-Difference Frequency-Domain Photonic Simulation on Multi-GPU Systems
We develop a GPU-accelerated and compressed hierarchical Schur algorithm for finite-difference frequency-domain photonic device analysis. The compressed hierarchical Schur (CHiS) method is a customized sparse linear system solver which is inspired from common features in photonic structure design, numerical method, and modern HPC architectures. Several numerical tests show significant memory and time saving. When performing GPU acceleration, several modifications are investigated. In particular, proper workload distribution is a critical factor for efficient multi-GPU acceleration. Numerical results using quad-GPU demonstrates over 6X speedup compared to CPU-only simulation, and good multi-GPU scaling with our GPU-accelerated CHiS code.		
16:55-17:00	Kengo Nakajima (ITC, The University of Tokyo)	Closing

[1] http://www.cc.u-tokyo.ac.jp/event/ase/25.html
[2] http://jhpcn-kyoten.itc.u-tokyo.ac.jp/ja/abstract.php?ID=jh160025-DAHI