Distributed Dense Numerical Linear Algebra Algorithms on Massively Parallel Architectures: DPLASMA

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Abstract: We present DPLASMA, a new project related to PLASMA, that operates in the distributed memory regime. It uses a new generic distributed Direct Acyclic Graph engine for high performance computing (DAGuE). Our work also takes advantage of some of the features of DAGuE, such as DAG representation that is independent of problem-size, overlapping of communication and computation, task prioritization, architecture-aware scheduling and management of micro-tasks on distributed architectures that feature heterogeneous many-core nodes. The originality of this engine is that it is capable of translating a sequential nested-loop code into a concise and synthetic format which it can interpret and then execute in a distributed environment. We consider three common dense linear algebra algorithms, namely: Cholesky, LU and QR factorizations, to investigate their data driven expression and execution in a distributed system. We demonstrate from our preliminary results that our DAG-based approach has the potential to bridge the gap between the peak and the achieved performance that is characteristic in the state-of-the-art distributed numerical softwares on current and emerging architectures.
Direct Acyclic Graph Memory Hierarchy Multicore Processor Numerical Linear Algebra Tile Algorithm. These keywords were added by machine and not by the authors. Bosilca, G., Bouteiller, A., Danalis, A., Faverge, M., Haidar, A., Herault, T., Kurzak, J., Langou, J., Lecerf, G., Luszczek, P., Ltaief, H., YarKhan, A., Dongarra, J.: Flexible development of dense linear algebra algorithms on massively parallel architectures with DPLASMA. In: IEEE International Symposium on Parallel and Distributed Processing Workshops and PhD Forum, pp. 1432–1444 (2011) Google Scholar. University of Tennessee: PLASMA Users’ Guide, Parallel Linear Algebra Software for Multicore Architectures, Version 2.2 (2009) Google Scholar. 25. Dense Linear Algebra. David Bindel 20 Oct 2015. Logistics. To avoid issues xed? May still be some issues: Login issues â€“ working on it Intermittent node non- responsiveness â€“ working on it. Factorization â€œ switch to basis that makes problem easy. Numerical linear algebra in a nutshell. Two avors: dense and sparse Dense == common structures, no complicated indexing General dense (all entries nonzero) Banded (zero below/above some diagonal) Symmetric/Hermitian Standard, robust algorithms (LAPACK) Sparse == stuff not stored in dense form! Maybe few nonzeros (e.g. compressed sparse row formats) May be implicit (e.g. via nite differencing) May be â€œdenseâ€œ, but with compact repn (e.g. via FFT) Most algorithms are iterative; wider variety, more subtle Build on dense ideas. History. approximate computing, linear algebra, matrix inversion, matrix p-th roots, numeric algorithm, parallel computing. ACM Reference Format: Michael Lass, Stephan Mohr, Hendrik Wiebeler, Thomas D. KÄ¼hne, and Chris-tian Plessl. 2018. A Massively Parallel Algorithm for the Approximate Cal-culation of Inverse p-th Roots of Large Sparse Matrices. In Proceedings. Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and