

Improved LU Decomposition on Graphics Hardware

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In November 2005, the Gamma group at the University of North Carolina at Chapel Hill presented LUGPU, a software package which performs LU decomposition on a graphics processing unit (GPU). This software enables a significant speed increase over traditional CPU-targeted implementations, including those provided by ATLAS and LAPACK. However, inefficiencies prevent LUGPU from obtaining higher performance. One major limiting factor is its use of communication between the CPU and GPU during the pivoting phase of computation.

We present a new LU decomposition package which eliminates some of the inefficiencies of UNC's implementation. One contribution is general speedup of LU decomposition without pivoting through improved memory management. Also, a new approach to pivoting circumvents the need for an expensive GPU-to-CPU read-back. We show that applying these improvements generates better performance than LUGPU by more fully utilizing hardware capabilities.