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GPU-Implementation of the Partition Method for Solving Tridiagonal SLAEs

Systems of linear algebraic equations (SLAEs) with band coefficient matrices may arise after many different scientific and engineering problems, as well as problems of the computational linear algebra where finding the solution of SLAEs is considered to be one of the most important problems. One of the requirements to algorithms for solving band SLAEs is a speed of calculations. Thus, the necessity of development of parallel algorithms is not in doubt. There are a couple of different types of parallel tridiagonal algorithms in the literature - cyclic reduction, recursive doubling, partitioning, and divide and conquer. Here, we are going to present a GPU realization of the parallel partitioning algorithm for tridiagonal matrices suggested in (Austin, 2004). This method is a simple, but quite efficient numerical approach for solving SLAEs with tridiagonal coefficient matrices, splitting the matrix into sub-matrices and then solving smaller SLAEs in parallel. So far, this algorithm is implemented with the help of the MPI technologies. The number of used processors is up to 250. Therefore, a GPU implementation is going to be the novelty which is going to allow faster solving of such systems, being executed on big number of parallel GPU threads. Performance analysis of the implementation is done using the high-performance computing (HPC) platform "HybriLIT". The experimental setup and the results from the conducted computations are presented and discussed.