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ТЕЗИСТЕР

ABSTRACTS

Халықаралық конференция "Ғылымдағы, техникадағы және білім берудегі есептеулер мен ақпараттар технологиясы"

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High-performance mobile computing of heat convection problems

In this paper, for the differential equations of heat convection in the variables "stream function-vorticity" is considered the difference equations with non-self-adjoint operators. To find the decision used a modified method of variational type minimal corrections [1]. Considered an iterative algorithm of the type of variable directions, using by conducting auxiliary function of the vorticity with homogeneous boundary values. Parallel program using CUDA (Compute Unified Device Architecture) technology was written, computational experiments and results analysis were conducted [2]. Experiments are tested on Nvidia Shield Tablet with Tegra K1 processor. Tegra K1 created on the base of the same NVIDIA Kepler architecture and has 192 CUDA-cores in the configuration 192:8:4 at 950 MHz frequency and with 360 GFLOPS performance. Calculation time of the parallel algorithm on the graphics card of the mobile device as compared with a personal computer, only 2-3 times slowly. Parallel algorithm modified alternating triangular method already has been known and implemented on the CPU using the technology of MPI [3], a parallel algorithm on the video card is improved through the effective use of shared memory and a choice of block size. Data flows of the inner cells subdomain are copied from the global memory to the shared memory, and then the boundary nodes are copied from the global memory. In this case, the size of subdomain does not change. Because the shared memory is the fastest memory, this algorithm is effective. It is impossible avoid re-copying the data on the boundary of the subdomain global memory. In the above cases, the copied columns and rows on the borders of the subdomain. Therefore, it is necessary to change the scheme of two-dimensional decomposition to one-dimensional. Thus, we exclude the repeated copying of columns [4]. In some cases, this benefit is comparable to the performance of a similar program running on the desktop GPU, which shows that mobile technologies now provide sufficient computing power. In the first part of this article will be shown a problem statement, ie the mathematical model and the iterative method for solving the equations of thermal convection. In the second part will show a parallel algorithm for solving the heat convection problem using CUDA technology. In the last part of the work will be shown comparisons, analysis of test and conclusions. In the future date is planned to create a hybrid parallel program in heterogeneous systems.

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