

Litvinov V. N., Chistyakov A. E., Porksheyan M. V. (Don State Technical University, Rostov-on-Don). **Probabilistic estimation of grid equations solving time on a graphics accelerator.**

The search for solutions to the grid equations obtained as a result of discretization of the mathematical model of hydrodynamics was performed using a modified alternating-triangular iterative method (MPTM) on a graphics accelerator using NVIDIA CUDA. The aim of the study was to obtain an estimate of the time for solving grid equations using the MPTM method on a graphics accelerator, depending on the decomposition parameters of the three-dimensional computational domain. Numerical experiments were conducted on the K-60 computing cluster of the Keldysh Institute of Applied Mathematics. As a result of the research, the following theorem is formulated.

Theorem 1. *The calculation time of the MATM method on graphics accelerator is determined by the formula $T_{GPU} \leq T_{TR1} + 2N_{it} \sum_{s=1}^{N_s} \max(\mathbf{T}_s) + T_{TR2}$, $N_s = N_x N_z + N_y - 1$, where T_{TR1}, T_{TR2} – the average time required to transfer data structures describing the grid equation from RAM to video memory and vice versa, respectively; N_{it} is the average value of the number of iterations required to obtain a solution using the MATM method; s, N_s are the step number and the number of steps of the parallel-pipeline computing process, respectively; \mathbf{T}_s – a vector containing the values of the time spent on computing fragments of the computational grid by all calculators at step s ; N_x, N_y, N_z – the number of fragments of the computational grid along the spatial coordinates x, y and z , respectively.*

REFERENCES

1. *Sukhinov, A.I.* Solving grid equations using the alternating-triangular method on a graphics accelerator / A.I. Sukhinov, V.N. Litvinov, A.E. Chistyakov [et al.] // Bulletin of the South Ural State University. Series: Computational Mathematics and Software Engineering. – 2023. – Vol. 12, No. 2. – P. 78-92. – DOI 10.14529/cmse230204.