

Litvinov V.N., Nikitina A.V., Dolgov V.V., Bogdanova N.Yu. (Don State Technical University, Rostov-on-Don). **Probabilistic estimation of the grid equations solving time by iterative methods.**

The solution of applied problems of hydrophysics and hydrobiology, such as the study of the process of pollution spreading in the water area of water bodies, the dynamics of populations of microorganisms and commercial fish, using modern numerical methods, is reduced to solving systems of linear algebraic equations (SLAE) of high dimension (10^9 and more) [1]. Such features of the functioning of heterogeneous computing systems as multithreading and the hierarchical structure of the cache memory lead to the probabilistic nature of the process of solving grid equations by iterative methods.

The aim of the study is to estimate the execution time of one iteration of the modified alternating-triangular iterative method (MATM) in heterogeneous computing systems, depending on the dimension of fragments of a three-dimensional uniform computational grid. Experimental studies were carried out on the K-60 computing cluster of the Institute of Applied Mathematics, Russian Academy of Sciences. Keldysh. As a result of the study, the following theorem was formulated.

Theorem. The calculation time of one iteration by the MATM method is determined by the formula $T_{matm} = 2 \sum_{s=1}^{N_s} \max(\mathbf{T}_s)$, $N_s = N_x N_z + N_y - 1$, where s , N_s are the step number and the number of steps of the parallel-pipeline computing process, respectively; \mathbf{T}_s is the 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 are numbers of fragments of the computational grid along the spatial coordinates x , y and z , respectively.

REFERENCES

1. *Sukhinov, A.* Computational Aspects of Solving Grid Equations in Heterogeneous Computing Systems / A. Sukhinov, V. Litvinov, A. Chistyakov [et al.] // Lecture Notes in Computer Science. – 2021. – Vol. 12942 LNCS. – P. 166-177. – DOI 10.1007/978-3-030-86359-3_13.