IMPROVE ENERGY EFFICIENCY IN THE AVIATION INDUSTRY BY PROJECTING USE OF TECHNOLOGY PARALLEL COMPUTING

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Mathematical modeling of flow compartment finite span wing by parallelization on high performance computer cluster architecture. The results of calculation of integrated aerodynamic characteristics of the wing compartment and effectiveness acceleration calculation based on the number of elements of finite volume mesh and the number of processor cores involved.

Energy saving methods, mathematical modeling, air transport, paralleling technique.

Air transport is relatively energy intensive sector, whose role in agriculture overemphasized. With each passing day it becomes more urgent issues of development and implementation enerhozaoschadzhuvalnyh methods by optimizing the flow of aircraft and application management perspective wall currents. One of the most effective ways of solving these problems is very resursovytratnyh introduction of modern technologies of mathematical modeling based on the use of high performance computing systems.

The aim - to speed up the calculation time for calculating flow finite span wing with increasing number of cores for high-performance computer cluster architecture and determine the effect size of the finite-volume mesh, which describes the estimated area bay wings on integral aerodynamic characteristics of the wing.

Materials and methods of research. In as input for the task selected geometry formulated a console wing of finite span and chord lengthening 5 300mm, which is formed on the basis of the profile P-2-14 [1] of zakintsivkoyu type TsAGI.

Results. Done mathematical modeling of flow finite span wing, which was created based on the profile of the R-2-14 zakintsivkoyu type TsAGI and made a comparative analysis of the obrahunkovyh data with experimental data. Calculations were carried out using the SST model of turbulent viscosity. The results of calculations of aerodynamic coefficients for four different finite-volume networks are shown in Figure 3-a. The obtained depending on acceleration calculation results for 4-different finite number of cell-volume networks.

Conclusions

The results of calculations indicate a significant improvement in results calculated according to experimental data with increasing resolution grid on zavidryvnyh angles. The results of parallel calculations to demonstrate a close linear relationship accelerating computing tasks console simulation flow when the wings described above formalization of the number of processor cores involved with their increase to 30-50. The angular dependence of the rate increases with increasing mesh size, ie more demanding task of computing resources and provides better opportunities for parallelization. Overall, the findings indicate the possibility of accelerating the computation of the actual industrial problem while using up to 84 processor cores in 17 - 29 times depending on the applied grid.

The results demonstrate the effectiveness of the paralleling computing technology, the implementation of which will significantly reduce the time the process of designing new models of aircraft and thorough study possibilities of optimizing aerodynamic configurations. Thus, these technologies can reduce the cost of achieving the design cycle and reduce future operating costs by reducing fuel expenditure through better optimization of the layout, that effectively contribute to saving energy.