A Genetic Algorithm for the Load Balance of Parallel Computational Fluid Dynamics Computation with Multi-Block Structured Mesh

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Abstract : Large-scale CFD simulation relies on high-performance parallel computing, and the load balance is the key role which affects the parallel efficiency. This paper focuses on the load-balancing problem of parallel CFD simulation with structured mesh. A mathematical model for this load-balancing problem is presented. The genetic algorithm, fitness computing, two-level code are designed. Optimal selector, robust operator, and local optimization operator are designed. The properties of the presented genetic algorithm are discussed in-depth. The effects of optimal selector, robust operator, and local optimization operator are proved by experiments. The experimental results of different test sets, DLR-F4, and aircraft design applications show the presented load-balancing algorithm is robust, quickly converged, and is useful in real engineering problems.

Keywords : genetic algorithm, load-balancing algorithm, optimal variation, local optimization

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