

NUMERICAL STUDIES OF PARALLELING TEST PARTICLES METHOD USING STATISTIC INDEPENDENT TESTS

The test particles method (TPM) as a version of the Monte-Carlo statistic method for the stationary state is considered. Nonparalleling a sequential algorithm of the TPM as large independent subproblems (LISs) has been performed at previous stages. Testing the LISs algorithm using the problem of an internal flow through Laval nozzle followed by the environmental spraying jet has demonstrated a high degree of the efficiency and the algorithm acceleration. However, testing with a problem of an internal flow past has revealed LISs significant disadvantages. It has been found that the algorithm developed has violated in fact some TPM principles resulting in poorly determined velocity fields in the course of iterations. A demand arose for construction of a parallel algorithm to accelerate the determination of velocity fields. Thus, the algorithm for paralleling on statistically independent tests (PSIT) has been developed to take into account velocity disturbances in simulating trajectories of test particles on each operational cores in a single formable field. PSIT reduces to a series of parallel tests conducted singly on each core. Following computations, the data are synchronized between cores, namely, an exchange of accumulated variations in velocity disturbances of field molecules. Subsequent drawing trajectories on all of the cores is conducted on a single renewed velocity field. After all of the tests the summary characteristics due to computational meshes are transferred to one of cores where moments of the disturbance function are averaged on the summing time of residence of particles into meshes. Using the PSIT algorithm, test computations are made using a multi-core processor. The results obtained are compared with the analogue data of the TPM sequential algorithm, as well as the one-core computational results. It is established that the number of cores used is not affected the results obtained and affected only the estimated time when using the PSIT. The time for various versions of the PSIT updated algorithm to minimize the estimated time due to reduction of the number of exchanges between cores is fully considered in the paper.

Keywords: *Monte-Carlo method, test particles method, parallel algorithms, multi-core computer, estimated time.*

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