Parallel algorithms for nonlinear modeling of dynamic objects on a supercomputer.

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Results

The development of modern technologies in the field of electronics and the complexity of the devices being designed leads not only to an increase in time spent on the solution, but also increases the probability of the analysis procedures failure due to the accumulation of instrumental and methodological errors. At the present stage of microminiaturization, more physical effects should be taken into account complicating significantly the process of the objects' dynamic analysis. The ability to automatically adapt the solving method to the task features allows improving considerably the reliability of getting solution. The dynamic analysis procedures reliability improving is possible with increasing amounts of information used to take decisions, but this requires more computing powers available only with multiprocessor computing systems (MCS).

Based on the investigation results, the methods have been developed which differ from known ones by the strategies of new operating point coordinates choosing to secure time step maximization, a local error minimization, a Newton method iterations number minimization and by the criteria to define rejected step indications. The calculation control models for the complex systems dynamic analysis have been suggested. The base method to develop methods with the increased reliability and effectiveness for solving complex system dynamic analysis tasks with a possibility to be implemented in the both common and distributed memory MCS has been chosen.

The base approaches have been developed and the new algorithms have been created for increased reliability and accuracy numeric integration to solve complex object dynamic analysis tasks. Direct and indirect analysis algorithms for numeric integration methods have been proposed to reveal step and order selection optimality when using methods which make use of the calculation control algorithms.

The non-linear objects dynamic analysis algorithms are implemented as parallel procedures as a part of NetALLTED circuit design complex on the NTUU "KPI" supercomputer.

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