Visual Simulation Steering for a 3D Neutron Transport AGENT Code System

Abstract:
We have integrated a framework for computational steering developed at the Technische Universität München into the AGENT codebase. This framework allows for the arbitrary interruption of any simulation system for the purpose of modifying internal state. Once the simulation is interrupted, the solver, meshing and resolution parameters, and convergence variables can all be modified to more appropriate values. Depending which settings have been modified, remeshing and refined resolution are then performed, and values are copied from the old set of resolution parameters onto the new set. Then the simulation restarts at whatever state - for example, timestep - it reached previously, without requiring a resubmission into the job control system. The utility of this computational steering process is exemplified during the 3D simulation of the University of Utah’s 100 kW TRIGA reactor (UUTR) core with the AGENT code. In this paper we present an example in which initially the mesh resolution of the UUTR core input set up with a wide ray separation of 1.2 cm that as expected does not converge to the specified criteria after 600 iterations; the AGENT code version we used to demonstrate this new feature does not initiate any of other existing iteration acceleration techniques. Thus, using the aforementioned computational steering framework, the simulation is interrupted after 249 iterations. The ray separation is then changed to a smaller value and after 351 iterations the solution meets the required convergence criteria. The second example illustrates how the user can accelerate the convergence: starting from a coarse mesh resolution an interruption is performed after a few iterations to refine the initial resolution. There is a significant reduction in the CPU time (22.0 the solution using only the...
refined resolution.

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