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A COMPARISON OF PARALLELIZATION STRATEGIES FOR THE MATERIAL POINT METHOD

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Recently the Lagrangian Material Point Method (MPM) [1] has been integrated into the Eulerian finite volume shock physics code CTH [2] at Sandia National Laboratories. CTH is a Eulerian finite volume shock physics code that has the capabilities of adaptive mesh refinement, multiple materials and various material models for equation of state, strength and failure. In order to parallelize the MPM in CTH two different approaches were tested. The first was a ghost marker concept, where the particles are mirrored onto neighboring processors in order to correctly assemble the mesh boundary values on the grid. The second approach exchanges the summed particle values at mesh boundaries without the use of ghost particles. Both methods have distinct advantages for parallelization. These parallelization approaches were tested for scaling where processor count, mesh blocks and marker counts are used to compare the two approaches. This paper will compare the parallel scaling efficiency, and memory requirements of both approaches for parallelizing the MPM.

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