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N-body, parallel simulation using a Barnes-Hut algorithm: performance versus accuracy[1] NORMAN CHONACKY, Department of Applied Physics, Yale University, BRIAN DOBBINS, Department of Mechanical Engineering, Yale University — The Barnes-Hut method facilitates prioritizing two-body interactions in an N-body system according to their likely significance in calculating the system's dynamics. In particular, it allows a consistent segregation of two-body interactions into those that should be treated by direct calculation versus those that can be aggregated in subsets and then treated by mean-field approximations. In this paper we describe the principles of the Barnes-Hut method, its use in parallelized N-body simulations, and the performance/accuracy trade-offs it presents. We present the latter in the context of results from simulation cases: N-bodies interacting via a gravitational potential, and N-bodies interacting via a Lennard- Jones potential. These should be available in the near future to operate as part of the "Bootable Cluster CD" parallel computation environment of the National Computational Science Institute of the Shodor Educational Foundation.

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