

The Rapid Evaluation of Potential Fields in Particle Systems



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Reviews

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MIT Press Ltd, United States, 2003. Paperback. Book Condition: New. 274 x 212 mm. Language: English . Brand New Book. The Rapid Evaluation of Potential Fields in Particle Systems presents a group of algorithms for the computation of the potential and force fields in large-scale systems of particles that are likely to revolutionize a whole class of computer applications in science and engineering. In many areas of scientific computing, from studying the evolution of galaxies, to simulating the behavior of plasmas and fluids, to modelling chemical systems, a numerical scheme is used to follow the trajectories of a collection of particles moving in accordance with Newton's second law of motion in a field generated by the whole ensemble. Extending the earlier work of Rokhlin, Greengard has developed general, numerically stable methods for evaluating all pairwise interactions in linear time, a great improvement over the quadratic time required by the naive approach, and significantly better than any other proposed alternative. The Rokhlin-Greengard algorithm promises to make previously prohibitive simulations feasible, with speedups of three to four orders of magnitude in a system of a million particles. Moreover, the algorithm is well-suited for vector and parallel machines, and should make full use of their capabilities. The author presents his work with great clarity, and demonstrates the superiority of his methods both by mathematical analysis and by the results of numerical experiments. Leslie Greengard received his doctorate from Yale University where he is a NSF Postdoctoral Fellow in the Computer Science Department. The Rapid Evaluation of Potential Fields in Particle Systems is a 1987 ACM Distinguished Dissertation.



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