

Abstract Submitted
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Discrete-Event Simulation of Poisson-Based Particle Systems

Y.A. OMELCHENKO, H. KARIMABADI, SciberQuest, Inc/UCSD — We describe a new algorithm for simulating multi-scale kinetic (N-body) systems, where particles interact via potential forces obtained from the solution of Poisson's equation. Such models range from electrostatic plasma to fluid to astrophysical (gravitational) applications. Our technique is based on two novel principles: (i) we use a self-adaptive, *discrete-event simulation* (DES) technique [1,2] for the asynchronous integration of particle equations of motion; (ii) we find the particle forces by convolving mesh-averaged Green's functions with asynchronous *changes* to the particle (charge or mass) density, computed with respect to periodically updated reference states of the system. We demonstrate the new approach by providing examples of space-charge beam simulations. [1] H. Karimabadi, J. Driscoll, Y.A. Omelchenko, N. Omidi, J. Comp. Phys. 205, 755 (2005). [2] Y.A. Omelchenko, H. Karimabadi, J. Comp. Phys. 216, 153 (2006).

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