Multiple Boris integrators for particle-in-cell simulation

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We construct Boris-type schemes for integrating the gyration of charged particles in particle-in-cell (PIC) simulation. The new solvers virtually combine the classic 2-step Boris solver arbitrary *n* times, and then they provide n^2 times smaller errors. We derive a single-step form of the multiple Boris solvers, whose coefficients are given by polynomials. We carry out numerical tests of the new solvers, in comparison with other particle integrators.

Keywords: Particle-in-Cell (PIC) simulation, Numerical scheme, Boris integrator