Optimized finite-difference scheme for cubic-spline Vlasov simulations

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We present a simple modification of the cubic spline interpolation algorithm [1] for the numerical solution of the Vlasov equation. Instead of solving a tridiagonal matrix system for the spline coefficients, we use a dispersion-relation-preserving scheme [2] to construct optimized local derivatives. The method allows greater savings in computing time and it has a simpler implementation in a parallel architecture. Applications of the numerical scheme are shown by solving some examples.

References

[1] C. Z. Cheng and G. Knorr, *J. Comput. Phys.* **22**, 330 (1976)

[2] C. K. W. Tam and J. C. Webb, *J. Comput. Phys.* **107**, 262 (1993)