On spectral geometric particle-in-cell methods

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October 10, 2019

Geometric variational discretizations are known for preserving key physical invariants in a natural way, leading to long-time stability properties. Following the GEMPIC framework [5] proposed for electromagnetic particle simulations, we present here a class of geometric particle methods that use a spectral discretization for the field. In some instances the method amounts to a gridless Particle-in-Fourier method [7], while in others it can be seen as a spectral Particle-in-Cell method with antialiasing filter [3, 6, 1]. A priori error estimates allow us to unify the analysis of these methods and their conservation properties, extending the results established in [4] for the electrostatic case.

References

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