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Sparse grid techniques for particle-in-cell schemes LEE RICKET-SON, ANTOINE CERFON, Courant Institute / NYU — The particle-in-cell (PIC) method has long been the standard technique for kinetic plasma simulation across many applications. The downside, though, is that quantitatively accurate, 3-D simulations require vast computing resource. A prominent reason for this complexity is that the statistical figure of merit is the number of particles per cell. In 3-D, the number of cells grows rapidly with grid resolution, necessitating an astronomical number of particles. This is what we may call the curse of dimensionality. To address this challenge, we propose the use of sparse grids: by a clever combination of the results from a variety of grids, each of which is well resolved in at most one coordinate direction, we achieve similar accuracy to that of a full grid, with with many few grid cells, thereby dramatically reducing the statistical error. We present results from test cases that demonstrate the new scheme's accuracy and efficiency.

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