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An adaptive multiresolution gradient-augmented level set method for advection problems KAI SCHNEIDER, M2P2-CNRS & CMI Aix-Marseille University, Marseille, France, DMITRY KOLOMENSKIY, JEAN-CHTRISTOPHE NAVE, The Department of Mathematics and Statistics, McGill University, Montreal, QC, Canada — Advection problems are encountered in many applications, such as transport of passive scalars modeling pollution or mixing in chemical engineering. In some problems, the solution develops small-scale features localized in a part of the computational domain. If the location of these features changes in time, the efficiency of the numerical method can be significantly improved by adapting the partition dynamically to the solution. We present a space-time adaptive scheme for solving advection equations in two space dimensions [1]. The third order accurate gradient-augmented level set method using a semi-Lagrangian formulation with backward time integration is coupled with a point value multiresolution analysis using Hermite interpolation. Thus locally refined dyadic spatial grids are introduced which are efficiently implemented with dynamic quad-tree data structures. For adaptive time integration, an embedded Runge-Kutta method is employed. The precision of the new fully adaptive method is analysed and speed up of CPU time and memory compression with respect to the uniform grid discretization are reported.

[1] D. Kolomenskiy, J.-C. Nave and K. Schneider, arXiv:1401.7294, 2014

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