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An Embedded Boundary Method for Solving the Elliptic And Parabolic Interface Problems and Its application to the Stefan Problem
SHUQIANG WANG, ROMAN SAMULYAK, JAMES GLIMM, XIAOLIN LI, Stony Brook University — The embedded boundary method (EBM) on a Cartesian grid developed by Johansen and Colella has been extended to solve the elliptic/parabolic problems in 2D with an interior boundary (also called elliptic interface, parabolic interface problem). The method is a finite volume method. 2nd order accuracy in L_∞ norm is achieved. As its application, a Stefan problem is solved. Problems with multiple components (3 or 4 components) meeting at a single Cartesian cell was also solved by using this method. The algorithm is implemented in C++. The computational domain is partitioned using Cartesian grid. To reduce the computational memory needed, each cell of the Cartesian grid could change itself to be different type for cells with at most 2 components or more complex cells with 3 or 4 components. Test results for 3D elliptic interface problems also show that it is 2nd order accurate in L_∞ norm.

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