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Height-function method for curvature estimation on two- and three-dimensional non-uniform Cartesian grids FABIEN EVRARD, FABIAN DENNER, BEREND VAN WACHEM, Otto-von-Guericke University Magdeburg — Estimating the curvature of an interface from the corresponding discrete indicator function field is known as one of the main challenges associated with the simulation of interfacial flows with surface tension. The sharpness of the discrete indicator function renders classical differenciation approaches ineffective (understand: divergent) as the mesh resolution is increased. Out of all the methods available in the literature, the height-function (HF) method is the sole example of a curvature estimation technique that converges with mesh refinement and has been shown to exhibit performances that are superior to other approaches when coupled to a multiphase flow solver. Although a second-order accurate general formulation for non-uniform Cartesian grids has been derived for the two-dimensional case, the three-dimensional HF formulas have so far been limited to uniform Cartesian grid configurations, where they correspond to classical finite difference formulas. This work presents an extension of the well-known height-function curvature estimation method to non-uniform Cartesian grids, both for the two- and three-dimensional cases. The convergence of the method is studied throughout its application to known analytical surfaces, and ways to improve its order are discussed.

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