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Coupling SPH with Voronoi diagrams to implement solid boundary conditions DAVID FERNANDEZ-GUTIERREZ, TAREK I. ZOHDI, University of California at Berkeley — The SPH method is well known for being able to model free surfaces undergoing large deformations. However, its consistency and implementation of boundary conditions become problematic close to solid boundaries. The new scheme presented creates a Voronoi diagram taking as cell seeds the particles within certain distance to the solid boundaries. The tessellation algorithm has been adapted to reproduce exactly planar boundaries without the need of fixed particles. Moreover, a new algorithm is presented to detect free surfaces within the Voronoi region. Following Hess & Springel [Month. Not. Royal Astronomical Society, 406(4):2289-2311, (2010)], the dynamics of the fluid system are computed in a similar fashion than SPH, using an explicit weakly-compressible formulation. There is an overlapping region where both methods are combined such that, as the particles lay further from the boundary, they smoothly transition from Voronoi to SPH. The accuracy of the coupled scheme is discussed by analyzing the results under some well-known verification benchmarks. Results show how pressure gradient problems, such as hydrostatic conditions or sound waves, are well reproduced.

David Fernandez-Gutierrez
University of California at Berkeley

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