

Interface model for the interaction between smooth particles and finite elements

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We developed an interface model for the interaction of particles in the smooth particle hydrodynamics with tetrahedral elements in the finite element method. This model is based on the introduction of virtual particles at the contact boundary describing the corresponding Lagrangian mesh elements. For problems in which the mesh region undergoes strong deformations we proposed a mesh adaptation algorithm that dynamically converts highly deformed elements into smooth particles. The algorithm also converts the mesh domain to match an arbitrary physical criterion. For example, such a physical criterion could be spallation of the material which leads to the formation of holes. Several examples are included to demonstrate the work of the developed algorithm—simulation of high-velocity impact fragmentation, damage of metals after irradiation by short laser pulses.