ADVANCED MESH UPDATE METHODS FOR FLUID–OBJECT AND FLUID–STRUCTURE INTERACTIONS

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We describe the advanced mesh update methods we developed for computation of flow problems with fluid–object and fluid–structure interactions. These methods are based on mesh-moving and remeshing-as-needed. For problems with complex geometries and large object motions or structural displacements, it is essential to have mesh moving techniques that reduce the frequency of remeshing. Furthermore, in some cases, we prefer to have semi-structured layers of elements near solid surfaces. In the mesh moving methods we developed, the motion of the nodes is governed by the equations of elasticity, with selective treatment of mesh deformation based on element sizes as well as deformation modes in terms of shape and volume changes. In particular, for fluid–structure interactions, we developed the Solid-Extension Mesh Moving Technique (SEMMT) to handle effectively mesh moving in thin layers of elements near the fluid–structure interface.