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SPACE–TIME COMPUTATIONAL FLUID–STRUCTURE INTERACTION TECHNIQUES

Tayfun E. Tezduyar[a] and Kenji Takizawa[b]

[a]*Mechanical Engineering, Rice University Houston, Texas, USA, http://www.tafsm.org/*

[b]*Department of Modern Mechanical Engineering and Waseda Institute for Advanced Study, Waseda University Tokyo, Japan, http://www.jp.tafsm.org/*

Abstract. Since its introduction in 1991 for computation of flow problems with moving boundaries and interfaces, the Deforming-Spatial-Domain/Stabilized Space–Time (DSD/SST) formulation has been applied to a diverse set of challenging problems. The classes of problems computed include free-surface and two-fluid flows, fluid–object, fluid–particle and fluid–structure interaction (FSI), and flows with mechanical components in fast, linear or rotational relative motion. The DSD/SST formulation, as a core technology, is being used for some of the most challenging FSI problems, including parachute modeling and arterial FSI. Versions of the DSD/SST formulation introduced in recent years serve as lower-cost alternatives, and more recent variational multiscale (VMS) version, which is called DSD/SST-VMST, has brought better computational accuracy and serves as a reliable turbulence model. Special space–time FSI techniques introduced for specific classes of problems, such as parachute modeling and arterial FSI, have increased the scope and accuracy of the FSI modeling in those classes of computations. The lecture will provide an overview of the core space–time FSI technique, its recent versions, and the special space–time FSI techniques. It will also provide examples from parachute FSI, arterial FSI, and aerodynamics of flapping wings.