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Space–Time FSI Computation: It’s Worth It

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Abstract:

Computational analysis of fluid–structure interactions (FSI) and flows with moving boundaries and interfaces (MBI) quite often requires high-resolution representation of boundary layers near solid surfaces. Moving-mesh methods, such as the ALE and space–time (ST) methods, where the mesh moves to follow the fluid–solid interface, enables that high-resolution representation. However, moving-mesh methods are quite often thought of as being not practical in computation of complex FSI and MBI problems. Actually, they are practical in more classes of complex FSI and MBI problems than commonly thought of. We show what a good moving-mesh method can now do, and what a good ST method can do beyond that, which now includes being able to maintain high-resolution representation of boundary layers near moving solid surfaces even when there is contact between the solid surfaces. We show how these advanced ST FSI methods we have developed enable accurate computational analysis in many classes of FSI and MBI problems, ranging from spacecraft parachute FSI to wind-turbine aerodynamics, from flapping-wing aerodynamics of an actual locust to fluid mechanics of a heart valve model. This is a joint work with Professor Kenji Takizawa, Department of Modern Mechanical Engineering, Waseda University, Tokyo.

主催：

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