IMMERSED FINITE ELEMENT METHOD

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The Immersed Finite Element Method (IFEM) is proposed for the solution of complex fluid-structure interaction problems. The fundamental concept of the IFEM is derived from the Immersed Boundary Method (IB) and its recent extension the Extended Immersed Boundary Method (EIBM). The IFEM provides a robust and versatile approach in which both the fluids and the submerged structures are solved using finite element methods. This extension allows the automatic treatment of flexible geometry shapes and boundary conditions without identification of the fluid-structure interfaces. This essential feature is much needed in treating typical bioengineering problems that often involve large motions of both solids and fluids. The interpolations of the velocity and the distribution of the force are calculated via the Reproducing Kernel Particle Method (RKPM) shape function. The employment of the RKPM delta function enables the use of non-uniform spatial meshes for both fluids and solids. Moreover, the adaptivity algorithm can be used for the region that needs to be refined. Such extensions in the IFEM significantly improve the computational accuracy and efficiency.

References

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