

Immersed Finite Element Method with Sharp Interfaces

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ABSTRACT

In this presentation, a novel numerical solution technique, Immersed Finite Element Method (IFEM), is introduced for solving complex fluid-structure interaction problems in various engineering fields. The solid domain is no longer limited to just a boundary, but rather can be a deformable solid body. A sharp interface technique is implemented at the fluid-structure interface to capture the high solution accuracy near the interface. The fluid and solid domains are fully coupled and solved with finite element solvers, thus yield accurate and stable solutions. The variables in the two domains are interpolated via the traditional finite element basis function. This approach enables the use of non-uniformed grids in the fluid domain, which allows definitions of arbitrary geometry shapes and boundary conditions, and more importantly a sharp interface. This method extends the capabilities and flexibilities in solving various biomedical, traditional mechanical and nuclear engineering problems with detailed and realistic mechanics analysis. Verification problems will be shown to validate the accuracy and effectiveness of this numerical approach.

REFERENCES

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