Center for Environmental & Applied Fluid Mechanics

"Numerical Coupling Workflow of Multiphysics Interactions using Immersed Methods"

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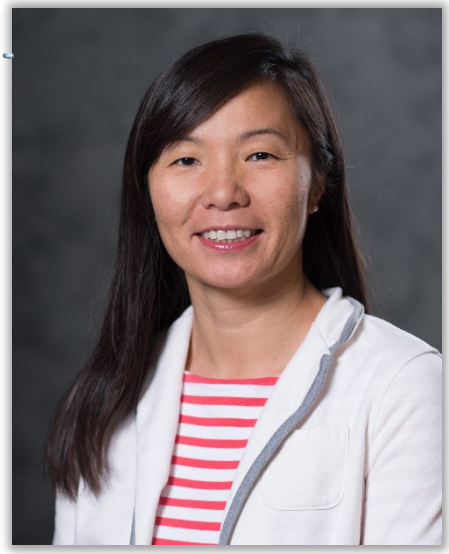

Multiphysics and multiscale problems exist in many aspects of nature and practical engineering applications. Multiphysics involve multiple physical behaviors to be coupled for an inter-related response. Multiscale problems are to couple physical models at different length or time scales to achieve more precise and accurate description of physical behaviors. To obtain stable, effective, and accurate coupled solutions is not trivial. Traditional methods that are available in commercial software often generate numerical instabilities. To simulate and analyze engineering applications involving multiphysics and multiscales require robust simulation strategy and computational tool. In this talk, I will present the non-boundary-fitted mesh technique used initially in the Immersed Finite Element Method (IFEM) for fluid-structure interactions. I will discuss the evolvement of the immersed finite element method over the years and demonstrate its robustness as a numerical framework and how it can easily couple the physics of any co-existing phases and scales with overlapping meshing or grids represented with different frame of references and written in different numerical codes. The immersed framework has been packaged into an open-source software, OpenIFEM, with cross-platform build, standard testing with modularity, and user documentations. Finally, I will demonstrate its capability by show casing several biomedical and defense applications involving fluid-structure interactions, acoustics-fluid-structure interactions, and solid-solid impacts.

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https://wse.zoom.us/j/93762992307

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