

Department of Mathematics and Statistics Colloquium

Recent Progress on Immersed Finite Element Methods for Interface Problems

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Abstract: Many simulations in science and engineering involve multiple materials. If partial differential equations are used to model these simulations, it usually leads to the so-called interface problems. Classic finite elements methods can solve interface problems satisfactorily if meshes are aligned with interfaces; otherwise the convergence cannot be guaranteed. Immersed finite element (IFE) methods, on the other hand, allow interface to be immersed in elements so that their solution mesh is independent of material interface.

Due to the discontinuity of IFE functions on interface edges, traditional IFE methods are usually less accurate around the interface than the rest of simulation domain. In this talk, we will introduce a new class of IFE methods for solving the second order elliptic interface problem. The new methods contain either partial stabilization terms on interface edges or full stabilization on all interior edges. Our numerical simulations demonstrate that new IFE methods outperform classic IFE methods in vicinity of interface.

If time permits, we will briefly talk about the application of these IFE methods to more complicated interface models such as elasticity system, and time dependent PDEs with moving interfaces.

Monday, March 23 at 3:45 in Roop 103
refreshments at 3:30