Gunilla Kreiss
Uppsala University

Cut Finite Element methods and immersed boundary Finite Difference methods

Much effort has been directed towards constructing stable and high order accurate finite difference methods that can solve time-dependent PDEs on a computational grid that does not align with the boundary. We are particularly interested in methods that fit in the Summation-By-Parts framework, and will specialize to second order wave equations. There are recent advances in creating stable, immersed finite element methods for solving partial differential equations using the Cut Fem approach, see [1]. In particular, when applied to the wave equation small cuts do not lead to correspondingly severe time step limitations, [2]. The methodology involves imposing boundary conditions weakly and adding special stabilization at cut elements. In this talk we shall explore the connection between finite difference methods and these Cut Fem methods.

REFERENCES

[1] E. Burman, S. Claus, P. Hansbo, M. G. Larson, A. Massing, CutFEM: Discretizing geometry and partial differential equations, Int. J. Num Meth Eng 104(7),472–501, 2015.

[2] S. Sticko, G. Kreiss, A stabilized Nitsche cut element method for the wave equation, Comput Meth in App Mech and Eng 309, 364–387, 2016.