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# An Immersed Boundary Technique with Strong Enforcement of Essential Boundary Conditions

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Several immersed boundary techniques exist that circumvent the need to create a mesh that conforms to the external boundary of the domain, including the Finite Cell Method [1] and CutFEM [2]. In this work, we use the Discontinuity-Enriched Finite Element Method (DE-FEM) as a technique to handle immersed domain problems. In a previous paper [3], the method has been shown to perform well on weak and strong discontinuities inside the domain, *i.e.*, interfaces and cracks. In DE-FEM, enrichments are placed along the discontinuity, providing several convenient properties. Most notably, because the enrichments are placed along the boundary, it is possible to impose essential boundary conditions in a strong manner. This completely eliminates the integration over the boundary, as well as the need for extra stabilization when using Nitsche's method [4]. Moreover, using DE-FEM, it is possible to analyze arbitrary configurations of external boundaries, interfaces and cracks.

In this presentation, we will demonstrate the versatility of the method. We will investigate convergence of the method in both 2D and 3D. Furthermore, we present cases where both homogeneous and non-homogeneous essential boundary condtions are strongly enforced. Cases where multiple types of discontinuities are present within a single element are also discussed. Most examples will focus on solid mechanics, although some preliminary fluid-structure interaction problems will also be shown.

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