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A non-conforming computational methodology for modeling coupled problems

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Abstract

A variety of engineering applications that involve coupling different physical phenomena, often require finite element analysis to be carried out over complex domains. Often such analysis, particulary the labor-intensive modeling phase, may be accomplished by dividing the global domain into several local sub-domains. These sub-domains may be constructed separately by different analysts and the global domain can then be constructed by piecing together these individually modeled subdomains. However, during the assembly, it is often too cumbersome, or even infeasible, to coordinate the meshes over separate subdomains. The mortar finite element method ([1-6]) is a non-conforming coupling technique which helps to accomplish such a modeling task. Since its development, the method has been successfully tested and implemented for a variety of applications ([7-12]). In this talk, the stability and convergence of this non-conforming technique will be discussed. The performance of the method will be demonstrated for various applications including the full Navier-Stokes system and fluid-structure applications.

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