TEMPLE UNIVERSITY
Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

Wednesday, 25 January 2012, 4:00 p.m.
Room 617 Wachman Hall

Applications and Theory of a Continuum-Mechanics-Based Immersed Boundary Method

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Abstract. Fluid-structure interaction problems, in which the dynamics of a deformable structure is coupled to the dynamics of a fluid, are prevalent in biology. For example, the heart can be modeled as an elastic boundary that interacts with the blood circulating through it. The immersed boundary method is a popular method for simulating fluid-structure problems. The traditional immersed boundary method discretizes the elastic structure using a network of springs. This makes it difficult to use material models from continuum mechanics within the framework of the immersed boundary method. In this talk, I present a new immersed boundary method that uses continuum mechanics to discretize the elastic structure, with a finite-element-like discretization. This method is first applied to a warm-up problem, in which a viscoelastic incompressible material fills a two-dimensional periodic domain. Next, we apply the method to a three-dimensional fluid-structure interaction problem. Finally, I will present theory for this new immersed boundary method.