ELIMINATING ADDED MASS INSTABILITIES FOR PARTITIONED SIMULATION OF FLUID STRUCTURE INTERACTION PROBLEMS

J. W. Banks

Department of Matehmcatical Sciences
Rensselaer Polytechnic Institute
Troy, NY 12180
banksj3@rpi.edu
http://www.rpi.edu/dept/math

In this talk, I will discuss recent work concerning the development and analysis of a new class of stable, partitioned solvers for fluid-structure interaction (FSI) problems. In a partitioned approach, the solvers for each fluid and solid domain are isolated from each other and coupled through common interfaces. The discrete formulation of this interface coupling conditions has a strong influence on the overall stability of the approach, and partitioned solvers are historically found to suffer from added-mass instabilities [5]. Here I will outline our newly developed Added-Mass Partitioned (AMP) approach to FSI coupling [1, 4, 2, 3]. These AMP schemes are provably stable partitioned FSI solvers that avoid added-mass instabilities. The approach is based on embedding evolutionary characteristics of the fully coupled fluid-structure operator into the discretization. Results will be presented for both compressible and incompressible flow regimes, and the stability of the FSI coupling will be discussed using normal-mode stability theory.

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