

Department of Applied Computational Mathematics and Statistics Colloquium

Bill Henshaw

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Lawrence Livermore National Laboratory

will give a lecture entitled:

Solving Fluid Structure Interaction Problems on Overlapping Grids

Abstract

This talk will discuss the numerical solution of fluid structure interaction (FSI) problems on overlapping grids. Overlapping grids are an efficient, flexible and accurate way to represent complex, possibly moving, geometry using a collection of overlapping structured grids. For incompressible flows with moving geometry we have been developing a scheme that is based on an approximate-factored compact scheme for the momentum equations together with a multigrid solver for the pressure equation. The overall scheme is fourth-order accurate in space and (currently) second-order accurate in time. The scheme will be described and results will be presented for some three-dimensional (parallel) computations of flows with moving rigid-bodies. In recent work, we have also been developing an FSI scheme based on the use of deforming composite grids (DCG). In the DCG approach, moving boundary-fitted grids are used near the deforming solid interfaces and these overlap non-moving grids which cover the majority of the domain. For compressible flows and elastic solids we have derived a new interface projection scheme, based on the solution of a fluid-solid Riemann problem, that overcomes the well known “added-mass” instability for light solids. The FSI-DCG approach is described and validated for some fluid structure problems involving high speed compressible flows coupled to rigid and elastic solids. The interesting case of a shock hitting an ellipse of zero mass is also presented.



**Thursday, November 15, 2012
4:00 p.m. to 5:00 p.m.
127 Hayes-Healy Center**