Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Large-Scale Numerical Simulation of Fluid Structure Interactions in Low Reynolds Number Flows ALI EKEN, MEHMET SAHIN, Istanbul Technical University — A fully coupled numerical algorithm has been developed for the numerical simulation of large-scale fluid structure interaction problems. The incompressible Navier-Stokes equations are discretized using an Arbitrary Lagrangian-Eulerian (ALE) formulation based on the side-centered unstructured finite volume method. A special attention is given to satisfy the discrete continuity equation within each element at discrete level as well as the Geometric Conservation Law (GCL). The linear elasticity equations are discretized within the structure domain using the Galerkin finite element method. The resulting algebraic linear equations are solved in a fully coupled form using a monolitic multigrid method. The implementation of the fully coupled iterative solvers is based on the PETSc library for improving the efficiency of the parallel code. The present numerical algorithm is initially validated for a beam in cross flow and then it is used to simulate the fluid structure interaction of a membrane-wing micro aerial vehicle (MAV).

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Date submitted: 08 Aug 2011 Electronic form version 1.4