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High-order fluid/structure coupled numerical model. JOSE CARLOS PEREIRA, Department of Mechanical Engineering/LASEF, Instituto Superior Tecnico, PAULO FERREIRA DE SOUSA, New Mexico State University — A coupled fluid-structure method to study the coupled nonlinear problem of flapping aero-elastic structures was developed. The fluid-dynamic solver is a finite-difference solution to the Navier-Stokes equations solved on a grid fitted to a moving thin body. Direct solution of the NavierStokes equations is carried out using a previously developed high-order 2D immersed boundary method on a moving curvilinear grid. Fluid-dynamic forcing on the body surface is calculated and used as input to a finite difference structural-dynamic solver. The structural solver is geometrically nonlinear and able to take on arbitrary configurations. Both solvers are explicit and use a Runge-Kutta 4th order time discretization scheme. Case studies that the coupled fluid/structure method was applied include flag flapping and harmonically pitching flexible membranes with different densities and rigidities.

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