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A numerical method for Stokes flow in a complex geometry coupled to dynamic rigid structures and filaments TAMAR SHINAR, University of California, Riverside, MICHAEL SHELLEY, New York University — We present a numerical method for the simulation of Stokes flow coupled to fixed and dynamic rigid bodies. The method uses an immersed boundary formulation for the fluid problem, where the problem domain is embedded in a periodic domain, and the boundary conditions are enforced through singular source terms. Rigid body generalized coordinates and velocities are used for the structures, though the method could be extended to deformable structures as well. The structure forces are nonlinear in general and we solve the coupled problem using a Newton-Krylov method, where the associated linear systems are symmetric indefinite. The coupling forces between the fluid and structures are treated in a fully implicit manner, making the choice of stable time step independent of those forces. We demonstrate the method by studying the dynamics of mitotic spindle positioning in a model of a single-celled *C. elegans* embryo.

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