

Abstract Submitted
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High-Fidelity Modeling of the Biophysics of Phonation using a Coupled IBM-FEM method¹ XUDONG ZHENG, RAJAT MITTAL, HAOXIANG LUO, George Washington University — A coupled 3-D IBM-FEM method has been developed to investigate the biophysics of phonation. Phonation is a complex biological phenomenon which results from a highly coupled biomechanical interaction between glottal aerodynamics and vocal fold tissue. An accurate sharp interface immersed boundary method (IBM) is employed to simulate the glottal flow and this is coupled with a finite-element method which is designed to solve the elastodynamic equations for the vocal folds. The vocal fold structure is based on high-resolution CT scans. A three-layer finite-element anisotropic vocal fold tissue model is used for the vocal folds and a penalty-coefficient method has been employed in order to model the vocal fold collision. Self-sustained vibrations in the vocal fold are achieved and we analyze the computational results to gain insights into the the glottal jet aerodynamics as well as the dynamics and deformation of the vocal folds.

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