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Investigation of Systolic Heart Murmurs with Computational Hemo-Acoustic Modeling JUNG HEE SEO, RAJAT MITTAL, Johns Hopkins University, THEODORE ABRAHAM, Johns Hopkins Medicine — Detection and analysis of heart murmurs generated by abnormal blood flows can be used as a low cost, non-invasive routine screening for the heart disease. Phonocardiography is an approach which combines electronic sound detection with automated signal analysis for detecting abnormal heart murmurs but the current approach relies primarily on empirical statistical correlations and ignores the underlying physics of flow-induced sound generation and propagation. In the present study, we investigate the characteristics and generation mechanism of systolic heart murmurs associated with the obstructive hypertrophic cardiomyopathy (HOCM) using the computational fluid dynamics and acoustics modelings. The hemodynamic flow field in left ventricle outflow tract is simulated with the immersed boundary, incompressible Navier-Stokes solver, and the sound generated by the blood flow is modeled by the linearized perturbed compressible equations. The propagation of the sound through the surrounding tissues is also modeled by the linear structural wave equations. The simulated murmurs are analyzed for the timing, frequency, and intensity and the correlation with the hemodynamics is closely investigated to identify the source mechanisms.

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