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Numerical study of the fluid-solid interactions in human vocal folds using finite element method XINGSHI WANG, ERICA SHERMAN, MICHAEL KRANE, TIMOTHY WEI, LUCY ZHANG — The goal of this study is to investigate the motion and deformation of human vocal folds during phonation using finite element method. The voice process is a fluid-structure interaction problem and it is also a self-oscillated system induced by the airflow with constant pressure difference. Here, the vocal folds are modeled with 2-D hyperelastic structures embedded in a channel with applied constant pressure difference at the inlet and outlet to represent the lung pressure. Our fully coupled fluid-structure interaction numerical method can capture the open/close process and the deformed shape of the vocal folds based on the given pressure. From the numerical results, we are able to capture the periodical features for the variables of interest at the throat, such as volume flow rate, velocity and pressure. These dynamic variable outputs may assist us to perform further energy balance analysis to fully understand the physical mechanisms of in normal and disordered phonation.

Xingshi Wang

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