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Geometrically-weighted Modal Analysis Technique KOUROSH SHOELE, TSOKANG WANG, Florida State University — Modal decomposition techniques have been used to analyze complex flow and explore how they can be explained with a low-dimensional model. The data-driven methods such as proper orthogonal decomposition (POD) and dynamic mode decomposition (DMD) are used to extract coherent structures in the form of spatial modes. However, the classical data-driven modal decomposition methods have no spatial recognition and are not applicable to time-dependent grids which is common in shape-changing applications. We propose a novel method, the geometrically-weighted modal analysis, utilizing differential geometry mapping techniques to solve this issue. The deforming geometries are transformed into fixed domain based on their geometric characteristics and with the use of divergence-free mapping then the modal analysis is applied. Through different examples, we demonstrate the capability of this method to accurately capture the flow feature and dynamics of complex fluid-structure interaction systems.

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