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A Fast, Portable Computational Framework for Aerodynamic Simulations

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Abstract : We develop a fast, user-friendly implementation of a potential flow solver based on the unsteady vortex lattice method (UVLM). The computational framework uses the Python programming language which has easy integration with the scripts requiring computationally-expensive operations written in Fortran. The mixed-language approach enables high performance in terms of solution time and high flexibility in terms of easiness of code adaptation to different system configurations and applications. This computational tool is intended to predict the unsteady aerodynamic behavior of multiple moving bodies (e.g., flapping wings, rotating blades, suspension bridges...) subject to an incoming air. We simulate different aerodynamic problems to validate and illustrate the usefulness and effectiveness of the developed computational tool.

Keywords : unsteady aerodynamics, numerical simulations, mixed-language approach, potential flow
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