

## Pod and Wavelets Application for Aerodynamic Design Optimization

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**Abstract :** The research attempts to evaluate the accuracy and efficiency of a design optimization procedure which combines wavelets-based solution algorithm and proper orthogonal decomposition (POD) database management technique. Aerodynamic design procedure calls for high fidelity computational fluid dynamic (CFD) simulations and the consideration of large number of flow conditions and design constraints. Even with significant computing power advancement, current level of integrated design process requires substantial computing time and resources. POD reduces the degree of freedom of full system through conducting singular value decomposition for various field simulations. For additional efficiency improvement of the procedure, adaptive wavelet technique is also being employed during POD training period. The proposed design procedure was applied to the optimization of wing aerodynamic performance. Throughout the research, it was confirmed that the POD/wavelets design procedure could significantly reduce the total design turnaround time and is also able to capture all detailed complex flow features as in full order analysis.

**Keywords :** POD (Proper Orthogonal Decomposition), wavelets, CFD, design optimization, ROM (Reduced Order Model)

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