Aircraft Wing Optimization using B-spline Models and Panel Methods

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Abstract

This research investigates shape optimization process, using b-spline models and panel methods, to achieve a high lift to drag ratio for an aerodynamic structure. This research is a proof of concept for further research in aerodynamic shape optimization. The coupled process, involving the design and optimization of a random shape, is outlined in three major steps that include the construction of a clamped-closed b-spline curve, locational point data transfer to a panel code analysis, and optimization implementation to refine the solutions. This is an iterative process, one that utilizes a genetic algorithm in which the shape is determined by the b-spline control points. This method is unique in the use of a clamped-closed b-spline curve coupled with a vortex panel method. After many verification tests, the process was considered to be applicable for validation testing to mission specific profiles under more constrains, as it has shown to successfully transform random shapes to attain higher lift to drag ratios.

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