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MULTI-OBJECTIVE OPTIMIZATION OF AERODYNAMIC DESIGN ON COUPLING NASH GAME AND IMPLICIT ADJOINT METHOD

Abstract

In the modern world, the increasing need for safer aircrafts which can deliver larger payloads at lower costs has set great challenges for creative design of aerospace systems, which often require tradeoff between competing and conflicting objectives. With the rapid development of computer technology, studies have shown that significant vehicle mass and cost savings are possible with the use of Multi-objective Optimization, which can be described as a methodology for the design of systems where the interaction between several objectives is considered, and where the designer is more free to significantly affect the systems' performance for more than one objective. This paper approaches the question of Multi-objective Optimization for optimum shape design in aerodynamics on coupling the adjoint method with implicit constraint and Nash Game strategy. The Game theory is a mathematical tool to describe and solve the problems under conflicts. The main content of the modern Game theory is non-cooperative game. In this paper, the game theory is applied to solve a conflicting problem of multi-objective optimum in aerodynamic design, in order to search a tradeoff solution in these conflicting objectives. Finally, the design results suggest that this method is validated and efficient for aerodynamic shape optimization, furthermore, it can be used in distributed computing on multiple workstations.