

工程与应用

基于NURBS方法的气动外形优化设计

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摘要 采用NURBS曲线曲面, 对钝锥弹头和钝双锥弹体建立参数化曲面模型, 取NURBS曲线控制点作为设计参数, 应用高超声速面元法求解气动力特性, 在给定设计约束下, 采用遗传算法进行气动外形优化设计, 并对优化结果进行了比较分析。结果表明, 采用NURBS方法构造参数化外形, 并结合优化技术可方便快速地获得所需最优外形; 与应用二次曲线构造参数化外形相比, 该方法对弹体形状控制更加灵活, 并可局部修改弹头曲线形状。因此, 基于NURBS方法发展整套的系统优化设计算法很有现实意义和应用价值。

关键词 [非均匀有理B样条曲线曲面](#) [几何参数化](#) [外形优化](#) [遗传算法](#)

分类号

Aerodynamic shape optimization and design based on NURBS

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Abstract

NURBS (Non-Uniform Rational B-Splines) curves and surfaces are applied to realize shape parameterization and generate exact geometrical representation for blunt cone head and blunt double-cone missile. Using control points of NURBS curves as parameter, and computing coefficients of aerodynamic forces by hypersonic panel method, aerodynamic shape optimization is then performed with genetic algorithms under known constraints. The results indicate that: it's a rapid and convenient way to get optimal shape by combination of the methods of NURBS and optimization; compared to the way of conic shape parameter, it is more flexible to control shape, and it's able to modify the local shape of head curve by NURBS. Therefore, it's of great practical significance and applicable value to develop the system of optimization and design based on NURBS.

Key words [Non-Uniform Rational B-Splines \(NURBS\) curves and surfaces](#) [geometry parameterization](#) [shape optimization](#) [genetic algorithm](#)

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