



航空学报 » 2001, Vol. 22 » Issue (5) :451-453 DOI:

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基于非概率模型的结构稳健可靠性设计方法

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PROCEDURE FOR THE ROBUST RELIABILITY DESIGN OF STRUCTURES

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摘要

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摘要 基于非概率可靠性理论,将稳健设计和稳健可靠性的思想和方法用于结构设计,提出了结构的稳健可靠性设计方法。把结构设计归结为满足可靠性要求的多目标优化。其中,以非概率可靠性指标为约束,以极小化结构重量(或造价)和极大化对不确定因素的稳健性为目标。目的在于使结构在满足可靠性要求的前提下,其重量(或造价)和对不确定因素的稳健性达到协调最优。在不确定参量的已知数据很少的情况下,本方法为结构的可靠性设计提供了一种可能的选择。数值算例说明了文中方法的应用

关键词: 稳健设计 可靠性设计 优化设计 结构可靠性 稳健可靠性

Abstract: Structural design is subjected to uncertainties in material and geometrical properties, loads and other variables. Robust design approach and reliability method are the two advanced and efficient methods to handle the uncertainties. In this paper, based on the non probabilistic reliability theory and robust design approach, a procedure for the robust reliability design of structures is presented. The design of the structure is described as a multi objective optimization, in which the minimization of the weight or cost of structure and the maximization of the robustness to uncertainties are taken as objectives, and constrained by the reliability requirements. The purpose of it is to get a coordinate optimization between the weight or cost of the structure and the robustness to uncertainties and satisfy the requirements for reliability. When the available data on the uncertainties are lacking or limited, the proposed method can be used to develop a set of satisfying solutions that may get a balance between the weight or cost and the robustness to uncertainties in different degrees. A numerical example illustrates the application of the proposed method.

Keywords: robust design reliability design optimal design structural reliability robust reliability.

Received 2000-07-04; published 2001-10-25

引用本文:

郭书祥;吕震宙. 基于非概率模型的结构稳健可靠性设计方法[J]. 航空学报, 2001, 22(5): 451-453.

GUO Shu-xiang; LU Zhen-zhou. PROCEDURE FOR THE ROBUST RELIABILITY DESIGN OF STRUCTURES[J]. Acta Aeronautica et Astronautica Sinica, 2001, 22(5): 451-453.

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