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三维弹塑性问题的有限元分析

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THREE-DIMENSIONAL ELASTOPLASTIC FINITE ELEMENT ANALYSIS

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摘要 本文用有限元法对三维弹塑性的应力与应变进行了分析,文中将非线性求解和数值积分做了改进,使计算时间缩短;三维元素的各种信息自动生成,提高了输入数据的精度和效率。用本法计算的各种实例与实验数据进行比较,二者吻合甚佳,能满足工程上所要求的精度。

关键词：

Abstract： It is important but also difficult to study three-dimensional elastoplastic finite element analysis of aeroengine structures, which have a complex configuration and various heavy loads. The stress distribution in the engine struc ture is a necessary datum for fracture mechanics and fatigue damage. For this reason the stresses in elastic and plastic zones deserve to be taken into account-in many engineering fields.In order to ensure adequate accuracy, a spatial 20-nodes isoparametric element is selected and a straightforward numerical solution method-an efficient method of Front Solver-is adopted. For saving computational time and reducing main memory space, a cubic fourteen points Gaussian integral is applied. Moreover, with the aim of economizing man-power and gaining quite high accuracy the cubic finite element meshes are automatically generated.The programming is also discussed in general, including constitutive equations, solution algorithm and strategy for solving large problems. Practice has shown that the program written by author is very advantageous to solving elastoplastic problems.Two typical specimens for experimental investgation are provided: a notched thick plate in which the local stresses are higher than the nominal applied stresses, and a thick plate with a central hole in which the stress distribution along the inside edges is also higher than that of the other place. The theoretical analyses and the experimental results coincided favourably.

Keywords：

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