<<流动非线性及其同伦分析>>

图书基本信息

书名：<<流动非线性及其同伦分析>>

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内容概要

科学工程中的很多问题是非线性的，难以解决。
传统的解析近似方法只对弱非线性问题有效，但无法很好地解决强非线性问题。
同伦分析方法是近20年发展起来的一种有效的求解强非线性问题的解析近似方法。
《流动非线性及其同伦分析：流体力学和传热（英文版）》介绍了同伦分析方法的最新理论进展，但不局限于方法的理论架构，也给出了大量的流体力学和传热中的非线性问题实例，来体现同伦分析方法的应用性。
《流动非线性及其同伦分析：流体力学和传热（英文版）》适合于物理、应用数学、非线性力学、金融和工程等领域对强非线性问题解析近似解感兴趣的科研人员和研究生。

作者简介

作者：（美国）瓦捷拉维鲁（ Kuppalapalle Vajravelu） （美国）隔德（Robert A.Van Gorder） 瓦捷拉维鲁，为美国中佛罗里达大学数学系教授，机械、材料与航空和航天工程教授，Differential Equations and Nonlinear Mechanics的创刊主编。
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书籍目录

章节摘录

版权页： 插图： Thus, while arbitrary functions H (x) which vanish over portions of the relevantdomain are not useful in the homotopy analysis method, one has the option to employ such functions provided they only vanish over a set of measure zero. One maylook at this in another way. In the homotopy given in (3.22), we introduce the newauxiliary operator (3.23) which depends on 1/H (x). If we do the same here, we seethat if H (x) vanishes over a set of measure zero, then the auxiliary linear operatorconstructed via (3.23) will have singularities at all members of this set of measurezero. Such singularities greatly complicate the problem of solving the linear operator to obtain the terms gm (x) in the mth order deformation equations. In practice,these vanishing auxiliary functions will modify the particular solutions obtainedwhen solving for the gm (X)'S, which may complicate the recursive solution process.As such, it is usually best to avoid auxiliary functions H (x) which vanish at anypoint over the domain of the problem, unless one has a good reason to use them. Yet, if we are to avoid all such H (x) which vanish over any portion of the domain, we can just as well elect to solve the modified homotopy (3.22) using themodified auxiliary linear operator (3.23). This is why, in many cases, one simplytakes H (x) = 1 and then attempts to obtain the appropriate initial guess and auxiliary linear operator. In those cases where a different, yet nonvanishing auxiliaryfunction is used, one may simply modify the auxiliary linear operator to arrive atthe same results (i.e., the same series solutions). However, one should point out that the solution expression is determined by thechoice of auxiliary linear operator, L, the initial approximation and the functionH (x). When one does not know, a priori, the expression of solution, then one cansimply choose H (x) = 1. However, we should point out that simple and elegant solutions may be obtained in many cases by properly choosing an appropriate functionalform for H (x) = 1. 3.3 Selection of the convergence control parameter The convergence control parameter, h ≠ 0, was introduced by Liao in order to control the manner of convergence in the series solutions obtained via homotopy analysis. As a consequence, once the initial approximation, auxiliary linear operator,and auxiliary function are selected, the homotopy analysis method still provides onewith a family of solutions, dependent upon the convergence control parameter. Sincewe are free to select a member of this family as the approximate solution to a nonlinear equation, we find that the convergence region and the convergence rate of theseries solutions obtained via the homotopy analysis method depend on the convergence control parameter. As a consequence, we are free to enhance the convergenceregion and the convergence rate of a series solution via an appropriate choice of theconvergence control parameter h even for fixed choices of the initial approximation,auxiliary linear operator, and auxiliary function. Such a property makes the homotopy analysis method unique among analytical techniques and provides us with avery powerful tool to study nonlinear differential equations.

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