# <<振荡微分方程的保结构算法>>

## 图书基本信息

书名：<<振荡微分方程的保结构算法>>

13位ISBN编号：9787030355201

10位ISBN编号：7030355202

出版时间：2013-4

出版时间：科学出版社

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## 内容概要

《振荡微分方程的保结构算法(英文版)》内容简介：Structure-Preserving Algorithms for Oscillatory Differential Equations describes a large number of highly effective and efficient structure-preserving algorithms for secondorder oscillatory differential equations by using theoretical analysis and numerical validation.Structure-preserving algorithms for differential equations,especially for oscillatory differential equations,play an important role in the accurate simulation of oscillatory problems in applied sciences and engineering.The book discusses novel advances in the ARKN,ERKN,two-step ERKN,Falkner-type and energy-preserving methods,etc.for oscillatory differential equations.

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书籍目录

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## 章节摘录

Chapter 1 RungeKutta (Nystr.m) Methods for Oscillatory Differential EquationsIn this chapter we .rst survey Runge Kutta (RK) methods for initial value prob-lems of .rst-order ordinary differential equations. For the purpose of deriving order conditions, the rooted tree theory is set up. For second-order differential equations, Runge Kutta Nystr.m (RKN) methods are formulated, and their order conditions are obtained based on the Nystr.m tree theory. For oscillatory differential equations, the dispersion and dissipation of classical numerical methods are examined. We also recall the symplectic RK and RKN methods for Hamiltonian systems. Finally, we make some comments on structure-preserving methods for solving oscillatory prob-lems.1.1 RK Methods, Rooted Trees, B-Series and Order ConditionsWe start with an initial value problem of ordinary differential equations de.ned on the interval [x0,xend]:y=f(x,y),y(x0)=y0,(1.1)where y∈Rdand f:R×Rd→Rd. From the existence theory of ordinary differ-ential equations, the problem (1.1) has a unique solution on [x0,xend]if the function f(x,y)is continuous in its .rst variable and satis.es a Lipschitz condition in its second variable (see Butcher [3]). However, on most occasions, the true solution to the initial value problem (1.1) arising in applications, is not accessible even though it exists. Therefore it becomes common practice to solve the initial value problem(1.1) by numerical approaches, among which the classical RK methods are most popular.RK methods were developed by Runge [17], Heun [12] and Kutta [14]. Although a number of different approaches have been employed in the analysis of RK meth-ods, the one used in this chapter is that established by Butcher [1, 2], following on from the work of Gill [5] and Merson [15].

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## 编辑推荐

Xinyuan Wu、Xiong You、Bin Wang所著的《振荡微分方程的保结构算法(英文版)(精)》反映了二阶振荡微分方程保结构数值解法研究的最近进展和发展动向，系统阐述了作者及其合作者近五年在常微分方程的ARKN方法、ERKN方法、两步ERKN方法、Falkner型方法、辛方法、对称方法、保能量方法以及偏微分方程多辛方法等方面的重要研究成果。
从经典的普适性方法到面向于振荡问题的拟合型方法；从单步法到多步法；从常微分方程的数值解法到偏微分方程的多辛算法。

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