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Nota di contenuto	Preface; Contents; 1. Chance and Challenge: A Brief Review of Homotopy Analysis Method; 1.1. Background; 1.2. A brief history of the HAM; 1.3. Some advances of the HAM; 1.3.1. Generalized zeroth-order deformation equation; 1.3.2. Spectral HAM and complicated auxiliary operator; 1.3.3. Predictor HAM and multiple solutions; 1.3.4. Convergence condition and HAM-based software; 1.4. Relationships to other methods; 1.5. Chance and challenge: some suggested problems; 1.5.1. Periodic solutions of chaotic dynamic systems; 1.5.2. Periodic orbits of Newtonian three-body problem 1.5.3. Viscous flow past a sphere 1.5.4. Viscous flow past a cylinder; 1.5.5. Nonlinear water waves; Acknowledgment; References; 2. Predictor Homotopy Analysis Method (PHAM); 2.1. Preliminaries; 2.2. Description of the method; 2.2.1. Zeroth-order deformation equation; 2.2.2. High-order deformation equation; 2.2.3. Prediction of the multiple solutions; 2.3. Convergence analysis; 2.4. Some illustrative models; 2.4.1. Nonlinear problem arising in heat transfer; 2.4.1.1. Model and exact solutions; 2.4.1.2. Prediction of dual solutions by the rule of multiplicity of solutions 2.4.1.3. Effective calculation of the two branches of solution 2.4.2. Strongly nonlinear Bratu's equation; 2.4.2.1. Problem and exact solutions; 2.4.2.2. Prediction of multiple solutions by the rule of multiplicity of solutions; 2.4.2.3. Effective calculation of the two

branches of solution; 2.4.3. Nonlinear reaction-diffusion model; 2.4.3.1. Equation and exact solutions; 2.4.3.2. Prediction of multiple solutions by the rule of multiplicity of solutions; 2.4.3.3. Calculation of the two branches of solution; 2.4.4. Mixed convection flows in a vertical channel 2.4.4.1. Prediction of dual solutions by the rule of multiplicity of solutions 2.4.4.2. Effective calculation of the two branches of solution; 2.4.4.3. Further results; 2.5. Concluding remarks; References; 3. Spectral Homotopy Analysis Method for Nonlinear Boundary Value Problems; 3.1. Introduction; 3.2. Basic ideas of the spectral homotopy analysis method; 3.3. Some applications of the spectral homotopy analysis method; 3.3.1. Falkner-Skan boundary layer flow; 3.3.2. Eigenvalue problems; 3.3.3. Boundary value problems with multiple solutions; 3.3.4. Coupled nonlinear boundary value equations

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## Sommario/riassunto

Unlike other analytic techniques, the Homotopy Analysis Method (HAM) is independent of small/large physical parameters. Besides, it provides great freedom to choose equation type and solution expression of related linear high-order approximation equations. The HAM provides a simple way to guarantee the convergence of solution series. Such uniqueness differentiates the HAM from all other analytic approximation methods. In addition, the HAM can be applied to solve some challenging problems with high nonlinearity. This book, edited by the pioneer and founder of the HAM, describes the current adva

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