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Nota di contenuto	APPLIED NUMERICAL METHODS USING MATLAB®; CONTENTS; Preface; 1 MATLAB Usage and Computational Errors; 1.1 Basic Operations of MATLAB; 1.1.1 Input/Output of Data from MATLAB Command Window; 1.1.2 Input/Output of Data Through Files; 1.1.3 Input/Output of Data Using Keyboard; 1.1.4 2-D Graphic Input/Output; 1.1.5 3-D Graphic Output; 1.1.6 Mathematical Functions; 1.1.7 Operations on Vectors and Matrices; 1.1.8 Random Number Generators; 1.1.9 Flow Control; 1.2 Computer Errors Versus Human Mistakes; 1.2.1 IEEE 64-bit Floating-Point Number Representation; 1.2.2 Various Kinds of Computing Errors 1.2.3 Absolute/Relative Computing Errors1.2.4 Error Propagation; 1.2.5 Tips for Avoiding Large Errors; 1.3 Toward Good Program; 1.3.1 Nested Computing for Computational Efficiency; 1.3.2 Vector Operation Versus Loop Iteration; 1.3.3 Iterative Routine Versus Nested Routine; 1.3.4 To Avoid Runtime Error; 1.3.5 Parameter Sharing via Global Variables; 1.3.6 Parameter Passing Through Varargin; 1.3.7 Adaptive Input Argument List; Problems; 2 System of Linear Equations; 2.1 Solution for a System of Linear Equations; 2.1.1 The Nonsingular Case (M = N) 2.1.2 The Underdetermined Case (M N): Least-Squares Error Solution;

2.1.4 RLSE (Recursive Least-Squares Estimation); 2.2 Solving a System of Linear Equations; 2.2.1 Gauss Elimination; 2.2.2 Partial Pivoting; 2.2.3 Gauss-Jordan Elimination; 2.3 Inverse Matrix; 2.4 Decomposition (Factorization); 2.4.1 LU Decomposition (Factorization): Triangularization; 2.4.2 Other Decomposition (Factorization): Cholesky, QR, and SVD; 2.5 Iterative Methods to Solve Equations; 2.5.1 Jacobi Iteration; 2.5.2 Gauss-Seidel Iteration
2.5.3 The Convergence of Jacobi and Gauss-Seidel IterationsProblems; 3 Interpolation and Curve Fitting; 3.1 Interpolation by Lagrange Polynomial; 3.2 Interpolation by Newton Polynomial; 3.3 Approximation by Chebyshev Polynomial; 3.4 Pade Approximation by Rational Function; 3.5 Interpolation by Cubic Spline; 3.6 Hermite Interpolating Polynomial; 3.7 Two-dimensional Interpolation; 3.8 Curve Fitting; 3.8.1 Straight Line Fit: A Polynomial Function of First Degree; 3.8.2 Polynomial Curve Fit: A Polynomial Function of Higher Degree; 3.8.3 Exponential Curve Fit and Other Functions
3.9 Fourier Transform3.9.1 FFT Versus DFT; 3.9.2 Physical Meaning of DFT; 3.9.3 Interpolation by Using DFS; Problems; 4 Nonlinear Equations; 4.1 Iterative Method Toward Fixed Point; 4.2 Bisection Method; 4.3 False Position or Regula Falsi Method; 4.4 Newton(-Raphson) Method; 4.5 Secant Method; 4.6 Newton Method for a System of Nonlinear Equations; 4.7 Symbolic Solution for Equations; 4.8 A Real-World Problem; Problems; 5 Numerical Differentiation/Integration; 5.1 Difference Approximation for First Derivative; 5.2 Approximation Error of First Derivative
5.3 Difference Approximation for Second and Higher Derivative

Sommario/riassunto

In recent years, with the introduction of new media products, there has been a shift in the use of programming languages from FORTRAN or C to MATLAB for implementing numerical methods. This book makes use of the powerful MATLAB software to avoid complex derivations, and to teach the fundamental concepts using the software to solve practical problems. Over the years, many textbooks have been written on the subject of numerical methods. Based on their course experience, the authors use a more practical approach and link every method to real engineering and/or science problems. The main benefit i