

1. Record Nr.	UNISA996503551703316
Autore	Liu Sifeng
Titolo	Grey systems analysis : methods, models and applications / / Sifeng Liu, Yingjie Yang, and Jeffrey Yi-Lin Forrest
Pubbl/distr/stampa	Singapore : , : Springer, , [2022] ©2022
ISBN	981-19-6160-3
Descrizione fisica	1 online resource (384 pages)
Collana	Series on Grey System
Disciplina	003
Soggetti	System analysis System analysis - Mathematical models Anàlisi de sistemes Models matemàtics Llibres electrònics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Intro -- Series Preface -- Foreword by Dr. James M. Tien -- Foreword by Dr. Keith William Hipel -- Foreword by Dr. Hermann Haken -- Foreword by Dr. Robert Vallée -- Preface -- Acknowledgements -- Contents -- 1 Introduction -- 1.1 The Scientific Background of the Birth of Grey System Theory -- 1.2 The Founder of Grey System Theory -- 1.3 Development of Grey Systems Theory -- 1.3.1 Building a Basic Team -- 1.3.2 Establishment of Academic Organizations -- 1.3.3 Journals and Book Series on Grey System Theory -- 1.3.4 Grey System Theory Curriculums -- 1.3.5 Researchers of Grey System Theory Are All Over the World -- 1.3.6 Papers of Grey Systems Theory Are Growing Rapidly -- 1.4 Elementary Concepts of Grey System Theory -- 1.5 Fundamental Principles of Grey System Theory -- 1.6 Main Contents of Grey System Theory -- References -- 2 Characteristics of Grey System Theory -- 2.1 A Kind of Poor Data Analysis Method with Strong Penetration -- 2.2 Characteristics of Uncertain Systems and the Simplicity Principle in Sciences -- 2.2.1 Incomplete Information -- 2.2.2 Inaccuracies in Data -- 2.2.3 The Scientific Principle of Simplicity -- 2.2.4 Precise Models Suffer

from Inaccuracies -- 2.3 Comparison of Several Uncertainty Methods -- 2.4 Deep Applications of Grey System Theory in the Fields of Social Science, Natural Science and Engineering Technology -- 2.4.1 Successful Application of Grey System Theory in the Field of Social Sciences -- 2.4.2 Deep Application of Grey System Theory in the Field of Natural Science -- 2.4.3 A Large Number of Applications of Grey System Theory in the Field of Engineering Technology -- References -- 3 Grey Numbers and Their Operations -- 3.1 Grey Numbers -- 3.2 The Whitenization of a Grey Number and Degree of Greyness -- 3.3 Degree of Greyness Defined by Axioms -- 3.4 The Operations of Interval Grey Numbers.

3.5 General Grey Numbers and Their Operations -- 3.5.1 Reduced Form of Interval Grey Numbers -- 3.5.2 General Grey Number and Its Reduced Form -- 3.5.3 Synthesis of Degree of Greyness and Operations of General Grey Numbers -- References -- 4 Sequence Operators and Grey Data Mining -- 4.1 Introduction -- 4.2 Systems Under Shocking Disturbances and Buffer Operators -- 4.2.1 The Trap for Shocking Disturbed System Forecasting -- 4.2.2 Axioms of Buffer Operators -- 4.2.3 Properties of Buffer Operators -- 4.3 Construction of Practically Useful Buffer Operators -- 4.3.1 Weakening Buffer Operators -- 4.3.2 Strengthening Buffer Operators -- 4.3.3 The General Form of Buffer Operator -- 4.4 Average Operator -- 4.5 The Quasi-Smooth Sequence and Stepwise Ratio Operator -- 4.6 Accumulating and Inverse Accumulating Operators -- 4.7 Exponentiality of Accumulating Sequence -- References -- 5 Grey Relational Analysis Models -- 5.1 Introduction -- 5.2 Grey Relational Factors and Set of Grey Relational Operators -- 5.3 Grey Relational Axioms and Deng's Grey Relational Analysis Model -- 5.4 Grey Absolute Relational Degree -- 5.5 Grey Relative and Synthetic Relational Degree -- 5.5.1 Relative Grey Relational Degree -- 5.5.2 Grey Synthetic Relational Degree -- 5.6 Grey Similarity, Closeness and Three-Dimensional Relational Degree -- 5.6.1 Grey Relational Analysis Models Based on Similarity and Closeness -- 5.6.2 Grey Three-Dimension Degree of Relational Degree -- 5.7 Negative Grey Relational Analysis Models -- 5.8 Superiority Analysis -- 5.9 Practical Application -- References -- 6 Grey Clustering Evaluation Models -- 6.1 Introduction -- 6.2 Grey Relational Clustering Model -- 6.3 Common Possibility Functions -- 6.4 Variable Weight Grey Clustering Model -- 6.5 Fixed Weight Grey Clustering Model -- 6.6 Grey Clustering Evaluation Models Based on Mixed Possibility Functions. 6.6.1 Grey Clustering Evaluation Model Based on End-Point Mixed Possibility Functions -- 6.6.2 Grey Clustering Evaluation Model Based on Center-Point Mixed Possibility Functions -- 6.7 Practical Applications -- References -- 7 Series of GM Models -- 7.1 Introduction -- 7.2 The Four Basic Forms of GM(1,1) -- 7.2.1 The Basic Forms of Model GM(1,1) -- 7.2.2 Properties and Characteristics of the Basic Model -- 7.3 Suitable Ranges of Different GM(1,1) -- 7.3.1 Suitable Sequences of Different GM(1,1) -- 7.3.2 Applicable Ranges of EGM -- 7.4 Remnant GM(1,1) Model -- 7.5 Group of GM(1,1) Models -- 7.6 The Fractional Grey Model -- 7.7 The Models of GM(r,h) -- 7.7.1 The Model of GM(0,N) -- 7.7.2 The Model of GM(1, N) -- 7.7.3 The Grey Verhulst Model -- 7.7.4 The Self-memory Grey Model -- 7.7.5 The Models of GM(r,h) -- 7.8 Practical Applications -- References -- 8 Combined Grey Models -- 8.1 Grey Econometrics Models -- 8.1.1 Determination of Variables Using the Grey Relational Principles -- 8.1.2 Grey Econometrics Models -- 8.2 Combined Grey Linear Regression Models -- 8.3 Grey Cobb-Douglas Model -- 8.4 Grey Artificial Neural Network Models -- 8.4.1 BP Artificial Neural Model and Computational

Schemes -- 8.4.2 Steps in Grey BP Neural Network Modeling -- 8.5
Grey Markov Model -- 8.5.1 Grey Moving Probability Markov Model --
8.5.2 Grey State Markov Model -- 8.6 Combined Grey-Rough Model --
8.6.1 Rough Membership, Grey Membership and Grey Numbers --
8.6.2 Grey Rough Approximation -- 8.6.3 Combined Grey Clustering
and Rough Set Model -- 8.7 Practical Applications -- References -- 9
Techniques for Grey Systems Forecasting -- 9.1 Introduction -- 9.2
Interval Forecasting -- 9.3 Grey Distortion Forecasting -- 9.4 Wave
Form Forecasting -- 9.5 System Forecasting -- 9.5.1 The Five-Step
Modeling Process -- 9.5.2 System Models for Prediction -- 9.6 Practical
Applications.
References -- 10 Grey Models for Decision-Making -- 10.1
Introduction -- 10.2 Grey Target Decisions -- 10.3 Other Approaches
to Grey Decision -- 10.3.1 Grey Relational Decision -- 10.3.2 Grey
Development Decision -- 10.3.3 Grey Clustering Decision -- 10.4
Multi-attribute Intelligent Grey Target Decision Model -- 10.4.1 The
Uniform Effect Measure -- 10.4.2 The Weighted Synthetic Effect
Measure -- 10.5 On Paradox of Rule of Maximum Value and Its
Solution -- 10.5.1 The Weight Vector Group with Kernel -- 10.5.2 The
Weighted Comprehensive Clustering Coefficient Vector -- 10.5.3
Several Functional Weight Vector Groups with Kernel -- 10.6 Practical
Applications -- References -- 11 Grey Control Systems -- 11.1
Introduction -- 11.2 Controllability and Observability of Grey System --
11.3 Transfer Functions of Grey System -- 11.3.1 Grey Transfer
Function -- 11.3.2 Transfer Functions of Typical Links -- 11.3.3
Matrices of Grey Transfer Functions -- 11.4 Robust Stability of Grey
System -- 11.4.1 Robust Stability of Grey Linear Systems -- 11.4.2
Robust Stability of Grey Linear Time-Delay Systems -- 11.4.3 Robust
Stability of Grey Stochastic Linear Time-Delay System -- 11.5 Several
Typical Grey Control Models -- 11.5.1 Control of Redundancy Removal
-- 11.5.2 Grey Relational Control -- 11.5.3 Control of Grey Prediction
-- References -- 12 Spectrum Analysis of Sequence Operators -- 12.1
Introduction -- 12.2 Spectrum Analysis of Time Series Data -- 12.3
Filtering Effect of Mean Operator and Accumulation Operator -- 12.3.1
Filtering Effect of Mean Operator -- 12.3.2 Filtering Effect
of Accumulation Operator -- 12.3.3 Filtering Effect of Series Operator
-- 12.4 Spectrum Analysis of Buffer Operator -- References --
Appendix Introduction to Grey Systems Modeling Software -- A.1
Introduction -- A.2 Software Features and Functions -- A.3 Main
Components.
A.4 Operation Guide -- A.4.1 The Confirmation System -- A.4.2 Using
the Software Package -- Memorabilia of the Establishment
and Development of Grey System Theory (1982-2021) -- Farewell
to Our Tutor -- Bibliography -- Index.
