

2017 International Conference on Grey Systems and Intelligent Services (GSIS 2017)

**Stockholm, Sweden
8 – 11 August 2017**



**IEEE Catalog Number: CFP17GSI-POD
ISBN: 978-1-5090-6669-8**

**Copyright © 2017 by the Institute of Electrical and Electronics Engineers, Inc.
All Rights Reserved**

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP17GSI-POD
ISBN (Print-On-Demand):	978-1-5090-6669-8
ISBN (Online):	978-1-5090-6668-1
ISSN:	2166-9430

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings
.com

Contents

Several Problems Need to be Studied in Grey System Theory	1
<i>Sifeng Liu, Changhai Lin, Yingjie Yang</i>	

A Grey Number and Buffer Operator

Study on the Strengthening Buffer Operator Based on the Interpolating Function	5
<i>Xinyan Yu, Zhengpeng Wu</i>	
The Interval Grey Numbers Ranking Based on Risk Preferences	8
<i>Zhaobin Li, Jian Liu, Zhuo Zhang, Shuai Zhang</i>	
Regional Differences of Chinese Environmental Protection Institutional System's Operation	14
<i>Wenping Wang, Dang Luo, Wenxin Mao</i>	
Profit Distribution Mechanism of Industrial Innovation Platform Research	15
<i>Lei Wang, Qingmei Tan, Xiaoning Lu</i>	
On General Standard Grey Number Representation and Operations for Multi-type Uncertain Data	19
<i>Zhigeng Fang, Qin Zhang, Jiajia Cai, Qian Hu, Sifeng Liu</i>	
Dynamic Analysis of Industry-University-Research Cooperation Conflict Based on Interval Grey Number Preference	27
<i>Ying Zhu, Yeqing Guan, Haiyan Xu</i>	
Linear space based grey number linear operations	33
<i>Nanlei Chen, Naiming Xie, Bentao Su</i>	
A Novel Linguistic Representative Model Based on Discrete Fuzzy Numbers for Multi-granularity Linguistic Decision-making	37
<i>Mei Cai, Zaiwu Gong</i>	
Distance measuring and sorting method of general grey number based on kernel and grey degree	43
<i>Shiquan Jiang, Sifeng Liu, Zhigeng Fang, Zhongxia Liu</i>	

B Grey Relation

Disease Cost Estimation Model Based on Improved Grey Relational Analysis and Case-based Reasoning	46
<i>Qishan Zhang, Xinhuan Huang, Hong Liu, Jinli Duan</i>	
Rough Decision Model Based on A New Grey Dominance Relation	53
<i>Mingli Hu, Lei Ding</i>	
Applying Principal Component Analysis and Grey Relation Analysis to Analyze the Influence Factors of Quality and Safety of Dairy Products in China	58
<i>Dafang Li, Qingchun Wu</i>	
A Three Dimensional Packing Vehicle Routing Problem Based on Grey Relation Analysis	64
<i>Hong Liu, Qishan Zhang, Kuaisheng Zheng, Xiaoxiao Wang, Chuyue Lin</i>	
The Urban Employment Matching Decision-making of Rural Migrant Workers Based on Grey Incidence Analysis	70
<i>Yong Liu, Hui Li, Xi Chen, Bingru Cao</i>	
A Grey Relational Analysis based Evaluation Metric for Image Captioning and Video Captioning	76
<i>Miao Ma, Bolong Wang</i>	
Grey Relational Analysis of Factors Affecting IPO Pricing in China A-share market	82
<i>Chuiyong Zheng, Jun Zhu</i>	

Deciding Switching Angles and Voltage Levels for a Multilevel Inverter using Grey Relational Approach	87
<i>Sulata Bhandari, Dr. Tilak Thakur, Dr. Jagdish Kumar</i>	
Image Watermarking Algorithm Based on Grey Relational Analysis and Singular Value Decomposition in Wavelet Domain	94
<i>Qiuping Wang, Junwen Ma, Xiaofeng Wang, Fengqun Zhao</i>	
Quantitative Analysis of the Influence of Meteorological Factors at Different Growth Stages on Yield of Winter Wheat Based on Grey Relational Analysis	99
<i>Tianhui Wang, Bingjun Li, Fanlin Meng</i>	
Uniform Incidence Degree and Its Properties	100
<i>Yong Wei, Kefang Zeng</i>	
Grey Relational Analysis Model of Classified Variables and Its Application in Jiangsu Universities' Entrepreneurship Education Achievements	105
<i>Jing Xu, Yaping Li</i>	
Grey Relational Analysis on the Relation Between China's GDP and Defense Expenditure	106
<i>Chaoqing Yuan, Yanan Zhang, Nuo Xu, Jun Xu</i>	
The Applied Research of Grey Relational Analysis Based on Entropy Weight	111
<i>Xiaojian Yuan, Qishan Zhang</i>	
Absolute Degree of Grey Incidences for Matrix Sequence	118
<i>Ke Zhang, Qiuping Zhong</i>	
Grey Maximum Distance to Average Vector Based on Quasi Identifier Attribute	119
<i>Qishan Zhang, Hong Liu, Yingyi Wu, Chuyue Lin, Gongcheng Lin</i>	
Evaluation of Project Management Knowledge Areas using Grey Incidence Model and AHP	120
<i>Saad Ahmed Javed, Sifeng Liu</i>	
Grey Relation Analysis And Trend Predication for Agricultural Mechanization Development Levels in Major Granary Provinces in China	121
<i>Sheng Wang, Chen Yang, Xue An, Hongyan Duan, Yongchang Yu</i>	
Analysis on the Contribution Rate of University Education to China's Manufacturing Based on the Grey System Theory	127
<i>Wei Sun, Xiang Yu</i>	
Grey Incidence Analysis on Location Choice Determinants of China's OFDI in Major Countries of "the Belt and Road"	133
<i>Jing Tao, Ying Wang, Yuhang Zhang</i>	
Storm Surge Economic Losses of China's Typical Provinces Based on Grey Relational Analysis	138
<i>Ziqi Yin, Xuemei Li, Xue Jin, Zhan Chen</i>	

C Grey Prediction

Research on Stock Price Forecast Based on Gray Relational Analysis and ARMAX Model	145
<i>Chuiyong Zheng, Jun Zhu</i>	
Control and Optimization of Quality Cost Based on Discrete Grey Forecasting Model	149
<i>Wenjie Dong, Sifeng Liu, Zhigeng Fang, Xiaoyu Yang, Qian Hu, Liangyan Tao</i>	
On the Improved GM(1, 1) Model Based on Concave Sequences	150
<i>Xinhai Kong, Xin Ma</i>	
Application Grey System Theory on Prediction of Chinese Social Donation	152
<i>Qing Li</i>	

The Improved GM(1,1) Based on PSO with Stochastic Weight	154
<i>Fanlin Meng, Tianhui Wang, Bingjun Li</i>	
Forecasting of Sulfur Dioxide Emissions in China Based on Optimized DGM(1,1)	159
<i>Wei Meng, Bo Zeng, Hui Huang</i>	
Forecasting NO _x Emissions in Beijing Considering the Size of Car Ownership	165
<i>Bin Fu, Lifeng Wu</i>	
Using Opposite-direction Average Generating Operator to Construct Grey Forecasting Model	170
<i>Baohua Yang, Jinshuai Zhao</i>	
Application of the Grey System Theory to Predict the Chloride Ion Capacity of Concrete Subjected to Salt Lake Environment	175
<i>Liming Zhang, Hongfa Yu</i>	
Properties of Buffer Operators Based on Discrete GM(1,1) Model	179
<i>Tianxiang Yao, Hong Gao</i>	
The Forecast of Development Prospects of China's Cross-border E-commerce Based on Grey System Theory	182
<i>Yige Su, Yijing Wang, Chuanmin Mi</i>	
Flood Loss Prediction of Coastal City Based on GM-ANN	187
<i>Pengzhan Cui, Yeqing Guan, Ying Zhu</i>	
Application of DGM(1,1) and Linear Regression Based on Entropy Weight Method	191
<i>Weiming Yang, Xiaolu Li, Bingjun Li</i>	
Multivariate Grey Disaster Prediction Model	192
<i>Kedong Yin, Jing Liu, Xue Jin, Xuemei Li</i>	
Modelling and Forecasting of Jiangsu's Total Electricity Consumption Using the Novel Grey Multivariable Model	193
<i>Yaoguo Dang, Song Ding, Kai Zhao</i>	

D Grey Decision

Grey Decision Model Based on Three-Parameter Interval Grey Number	200
<i>Xiaolu Li, Weiming Yang, Bingjun Li</i>	
Dynamic Grey Stochastic Decision-making Method Based on Markov Chain and "matching" Thought	205
<i>Dang Luo, Min Liu</i>	
Grey-incidence Clustering Decision-making method with Three-parameter interval grey number based on Regret theory	211
<i>Ye Li, Yufei Niu, Wenliang Wang, Bingjun Li</i>	
Standard Grey Potential Degree and its Application in Multiple Attribute Grey Target Decision	219
<i>Aiqing Ruan</i>	
Grey Random Dynamic Multiple-attribute Decision-making Method	221
<i>Haitao Li, Jiefang Wang, Dang Luo, Dongyang Pang</i>	
A Decision Model of Three - Endpoint Interval Method Based on Grey Theory	230
<i>Fenglin Zhang, Xingming Gao</i>	
Standard Grey Potential Degree and its Application on Uncertain Decision-making	235
<i>Aiqing Ruan, Yinao Wang</i>	
Study on the Improved Grey Decision-making Model and its Application	242

E Grey Evaluation

- Application of Grey Clustering Evaluation Model to Construction of University Excellent Courses 247
Huibin Zhan, Sifeng Liu
- Kernel-based Fuzzy C-means Clustering Based on Fruit Fly Optimization Algorithm 251
Qiuping Wang, Yiran Zhang, Yanting Xiao, Jidong Li
- Research on Assessment of the Economic and Social Development Based on a Two-stage Grey Cluster Method 257
Xiaqing Liu, Na Zhang, Zhigeng Fang
- Research on the Evaluation of the Level of Social Security of Floating Population in China Based on the Two Stage Grey Clustering Method 263
Yifan Wang, Yu Zhang
- Research on The Construction of Independent Innovation Capability in China Based on Grey Comprehensive Evaluation 269
Na Zhang, Bo Li, Lin Liu
- Evaluation of College Curriculum's Teaching Effect in the Context of Flipped Classrooms Based on Grey Cluster Model 273
Ziyun Zhao, Huibin Zhan

F Indeterminate System

- Grey Game Research about Customer Preference, International Competition and the Choice of Industrial Type 278
Yuhang Zhang, Ying Wang, Qixin Liu
- Grey Sentiment Analysis using SentiWordNet 284
Liviu Adrian Cotfas, Camelia Delcea, Irina Raicu, Ioana Alexandra Bradea, Emil Scarlet
- Grey Bayesian Network Model for Reliability Analysis of Complex System 289
Yingsai Cao, Sifeng Liu, Zhigeng Fang, Wenjie Dong
- Lifetime Evaluation Grey GERT Network Model of Equipment Based on Small Sample Data 295
Xiaoyu Yang, Zhigeng Fang, Liangyan Tao

G Management of Science and Other

- A Smart Meteorological Service Model Based on Big Data: A Value Creation Perspective 299
Lin Ma, Fengying Nie
- Evolutionary Game Analysis of Online Travel Agency and Hotels' Pricing Strategy 306
Shan Li, Yehui Yao, Lanjing Xu
- Sufficient and Necessary Conditions of Optimal Solutions of Semi-Infinite Convex Programing 312
Changwen Zhang
- Recycling Pricing of Valuable WEEE Based on Hotelling Model 317
Yuyu Chen, Bangyi Li
- Study on the Incentive Mechanism of Crowdsourcing Considering Participator's Fairness Preference 323
Yanfeng Chu, Huijuan Cao
- Considering Machine Health Condition in Jointly Optimizing Predictive Maintenance Policy and X-bar Control Chart 328
Yaping Li, Ershun Pan, Zhen Chen,
- Construction and Application of Performance Evaluation System for Chinese Pharmaceutical Manufacturing Industry 338

from Stakeholders' Perspective

Xianglian Zhao, Juan Du

A Diffusion Model of the Multi-generations Products Competition by System Dynamics Analyzing 344

Huan Guo, Sifeng Liu

Opinion Influence in Online Social Media Environments 349

Camelia Delcea, Ioana Alexandra Bradea, Liviu Adrian Cotfas, Emil Scarlat

Nonlinear Time-delay System Identification Based on Multi-dimensional Taylor Network and IPSO 356

Chenlong Li, Hongsen Yan

Patent Co-citation Networks for High-tech Industrial Clusters 360

Weiwei Pan, Lirong Jian, Daaao Wang, Tao Liu

The Analysis of the Constitution and Structure of China's Civil-Military Integration Industrial Policy System 367

Qingmei Tan, Lingbo Yang

Coordinating O2O Fresh Agricultural Supply Chain Considering Information Asymmetry when Disruption Occurs offline 372

Leizhou Zhao, Qing Zhang

Optimization of Logistics Service Supply Chain Based On Bi-Level Programming and the Hierarchical Wind Driven Algorithm for Solution 378

Lan Xu, Jingxin Wang

The Optimal Pricing Strategy of the Reward-based Crowdfunding Product Facing Strategic Consumers 379

Yuting Chen, Bin Liu

Collaborative Development of Complex Equipment: A Network Perspective 385

Zhuo Zhang, Min Xu

Study of the Impact of TMT Characteristics on the Technology Diversification and Performance Relationship of High-tech Enterprise 393

Fuchao Fan, Beiyu Li, Yubo Yang

Predictive Modeling of the Severity/Progression of Alzheimer's Diseases 400

Robin G. Qiu, Jason L. Qiu, Youakim Badr