算法、机器人、数据、人工智能、软件/编码

授课和科研 于 第一线

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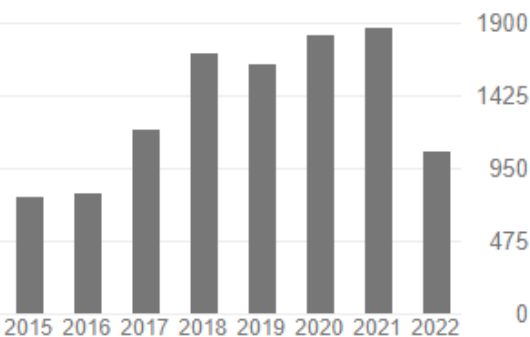| 标题	引用次数	年份
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A recurrent neural network for solving Sylvester equation with time-varying coefficients Y Zhang, D Jiang, J Wang IEEE Transactions on Neural Networks 13 (5), 1053-1063	439	2002
A unified quadratic-programming-based dynamical system approach to joint torque optimization of physically constrained redundant manipulators Y Zhang, SS Ge, TH Lee IEEE Transactions on Systems, Man, and Cybernetics, Part B (Cybernetics) 34 ...	303	2004

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Resume

■ Educational background

- 1992-1996   Huazhong University of Science and Technology, B.E.

- 1996-1999   South China University of Technology, M.E.

- 1999-2002   Chinese University of Hong Kong, Ph. D

■ Research career

- 2003-2003   National University of Singapore, Postdoctoral

- 2003-2004   University of Strathclyde, Research Fellow

- 2004-2006   National University of Ireland, Research Scientist/Fellow

- 2006--   Sun Yat-sen University, **Professor**

Numerical Methods (数值 计算方法 / 算法)

Matrix inversion *AX=I*

Newton iteration

Linear system *Ax=b*

Gauss elimination
Jacobi iteration
Gauss-Seidel iteration

Nonlinear equation *f(x)=0*

Newton iteration

...

Our researches：时变问题求解… …

Time-varying matrix inversion $A(t)X(t)=I$
　　　Zeroing (or say, Zhang) neural network

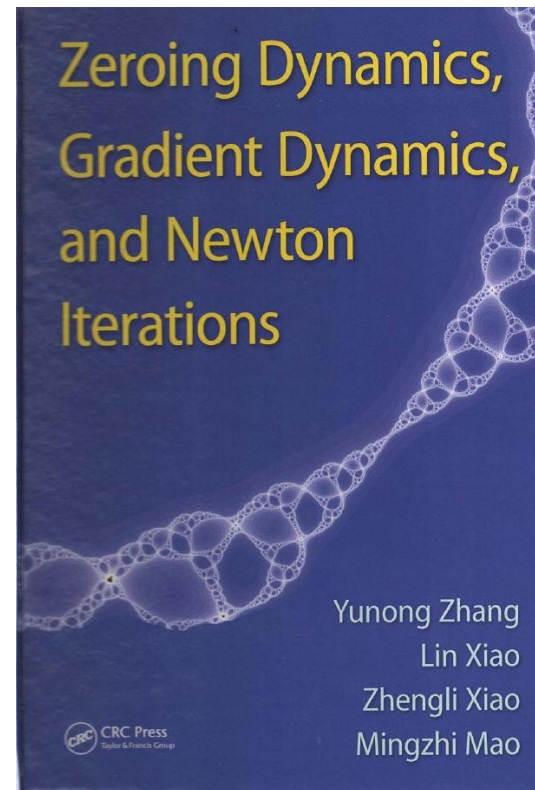Time-varying linear system $A(t)x(t)=b(t)$
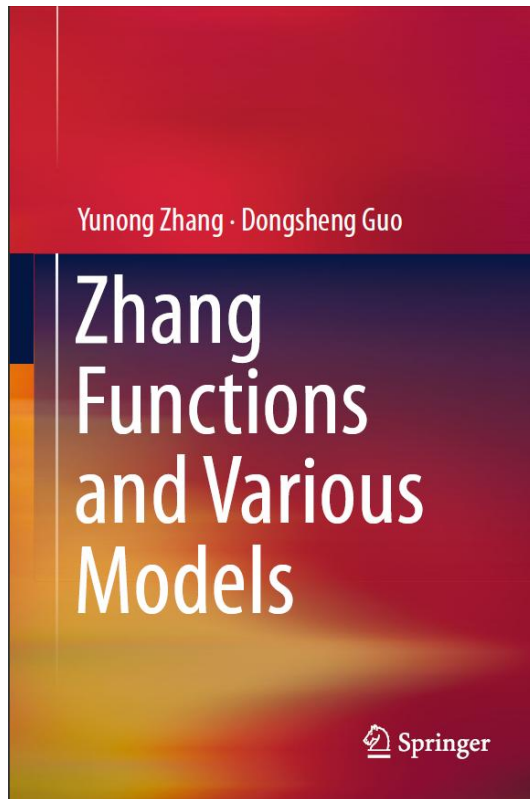　　　Zeroing neural network (ZNN)

Time-varying nonlinear equation $f(x,t)=0$
　　　Zeroing neural network (ZNN)
　　　Zeroing dynamics (ZD)
　　　or say, Zhang dynamics

…

Time-varying problems solving

Two English academic monographs on ZNN have been published

Yunong Zhang · Dongsheng Guo

Zhang Functions and Various Models

Springer

2015

Zeroing Dynamics, Gradient Dynamics, and Newton Iterations

Yunong Zhang
Lin Xiao
Zhengli Xiao
Mingzhi Mao

CRC Press
Taylor & Francis Group

Teaching and students training

Distinguished doctor graduates:

Long Jin, Professor
Lanzhou University
(In 2016, he was employed as a professor half year later after he was awarded Ph. D, and presented 2018 Excellent Doctor of AI)

Dongsheng Guo, Associate Professor
Huaqiao University
(In 2015, he was employed as an associate professor immediately after he was awarded his Ph. D)

Zhijun Zhang, Professor
South China University of Technology
(He was presented the **Outstanding Youth** as well as **Young Tip-Top Talent of Guangdong Province**)

2022: Dr. Min Yang, Hunan University, Associate Professor

（22年6月毕业的）杨敏同学博士期间主要研究成果

[1] **YANG Min**, ZHANG Yunong, TAN Ning, HU Haifeng. Concise discrete ZNN controllers for end-effector tracking and obstacle avoidance of redundant manipulators. IEEE Transactions on Industrial Informatics, 2022, 18(5): 3193–3202.（SCI IF 10.215）

[2] **YANG Min**, ZHANG Yunong, ZHANG Zhijun, HU Haifeng. Adaptive discrete ZND models for tracking control of redundant manipulator. IEEE Transactions on Industrial Informatics, 2020, 16(12): 7360–7368.（SCI IF 10.215）

[3] **YANG Min**, ZHANG Yunong, ZHANG Zhijun, HU Haifeng. 6-step discrete ZNN model for repetitive motion control of redundant manipulator. IEEE Transactions on Systems, Man, and Cybernetics: Systems, 2022, 52(8): 4969-4980.（SCI IF 13.451）

[4] **YANG Min**, ZHANG Yunong, TAN Ning, MAO Mingzhi, HU Haifeng. 7-instant discrete-time synthesis model solving future different-level linear matrix system via equivalency of zeroing neural network. IEEE Transactions on Cybernetics, 2022, 52(8): 8366-8375.（SCI IF 11.448）

[5] **YANG Min**, ZHANG Yunong, HU Haifeng, QIU Binbin. General 7-instant DCZNN model solving future different-level system of nonlinear inequality and linear equation. IEEE Transactions on Neural Networks and Learning Systems, 2020, 31(9): 3204–3214.（SCI IF 10.451）

（22年6月毕业的）杨敏同学博士期间主要研究成果

[6] **YANG Min**, ZHANG Yunong, TAN Ning, HU Haifeng. Explicit linear left-and-right 5-step formulas with zeroing neural network for time-varying applications. IEEE Transactions on Cybernetics, doi: 10.1109/TCYB.2021.3104138.（已录用，SCI IF 11.448）

[7] **YANG Min**, ZHANG Yunong, ZHOU Xuefeng, HU Haifeng. Pose control of constrained redundant arm using recurrent neural networks and one-iteration computing algorithm. Applied Soft Computing, 2021, 113: 108007.（SCI IF 6.725）

[8] **YANG Min**, ZHANG Yunong, HU Haifeng. Posture coordination control of two-manipulator system using projection neural network. Neurocomputing, 2021, 427: 179–190.（SCI IF 5.719）

[9] **YANG Min**, ZHANG Yunong, HU Haifeng. Discrete ZNN models of Adams-Bashforth (AB) type solving various future problems with motion control of mobile manipulator. Neurocomputing, 2020, 384: 84–93.（SCI IF 5.719）

[10] **YANG Min**, ZHANG Yunong, HU Haifeng. Relationship between time-instant number and precision of ZeaD formulas with proofs. Numerical Algorithms, 2021, 88: 883–902.（SCI IF 3.041）

Teaching and students training

More than 30 graduates have successfully gone abroad to study or work.
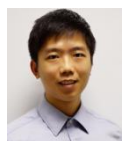
Mingming Li, Singapore National University, 2013

Jinrong Liu, University of Hong Kong, 2013

Weibing Li, University of Leeds, 2014

Zhen Li, University of Hong Kong, 2014

Yinyan Zhang, Hong Kong Polytechnic University, 2016

Bingguo Mu, City University of Hong Kong, 2016

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Teaching and students training

Bachelor students published papers in IEEE or SCI journals:

[1] Yunong Zhang, **Yinyan Zhang (later, Hong Kong Polytechnic University),** Dechao Chen, Zhengli Xiao, Xiaogang Yan, From Davidenko Method to Zhang Dynamics for Nonlinear Equation Systems Solving, **IEEE Transactions on Systems, Man, and Cybernetics: Systems**, Vol. 47, No. 11, pp. 2817-2830, 2017

[2] Yunong Zhang, **Lu Qu (later, Carnegie Mellon University)**, Jinrong Liu, Dongsheng Guo, Mingming Li, Sine neural network (SNN) with double- stage weights and structure determination (DS-WASD), Soft Computing, Vol. 20, No. 1, pp. 211-221, 2016

[3] Yunong Zhang, **Keke Zhai (later, University of Florida)**, Dechao Chen, Long Jin, Chaowei Hu, Challenging simulation practice (failure and success) on implicit tracking control of double-integrator system via Zhang-gradient method, Mathematics and Computers in Simulation 120 (2016) 104-119

[4] Yunong Zhang, **Yao Chou (later, Brigham Young University)**, Jinhao Chen, Zhijun Zhang, Lin Xiao, Presentation, error analysis and numerical experiments on a group of 1-step-ahead numerical differentiation formulas, Journal of Computational and Applied Mathematics 239 (2013) 406-414 …
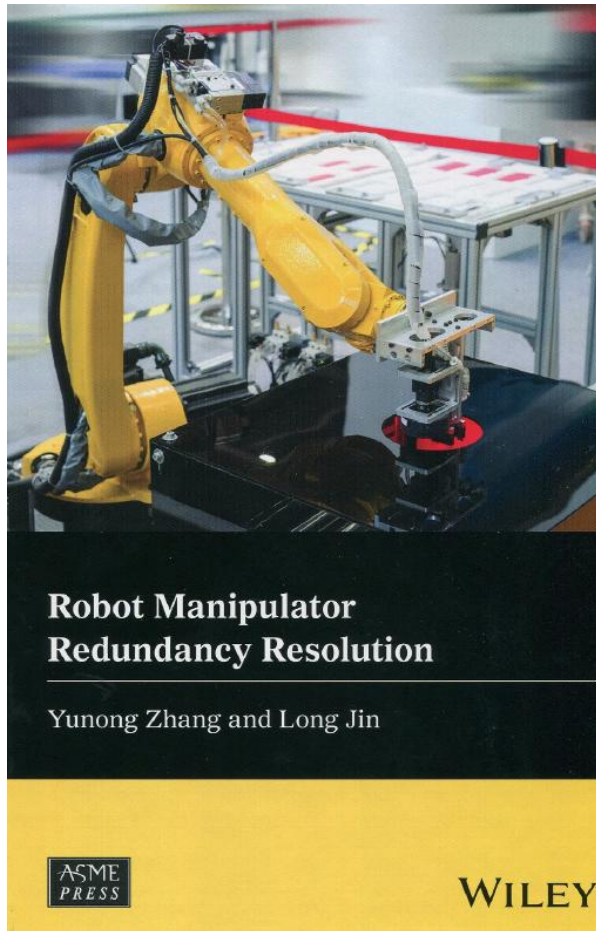
Application 1: Redundant manipulator

Unified motion planning and control (UMPC) theory for redundant manipulators
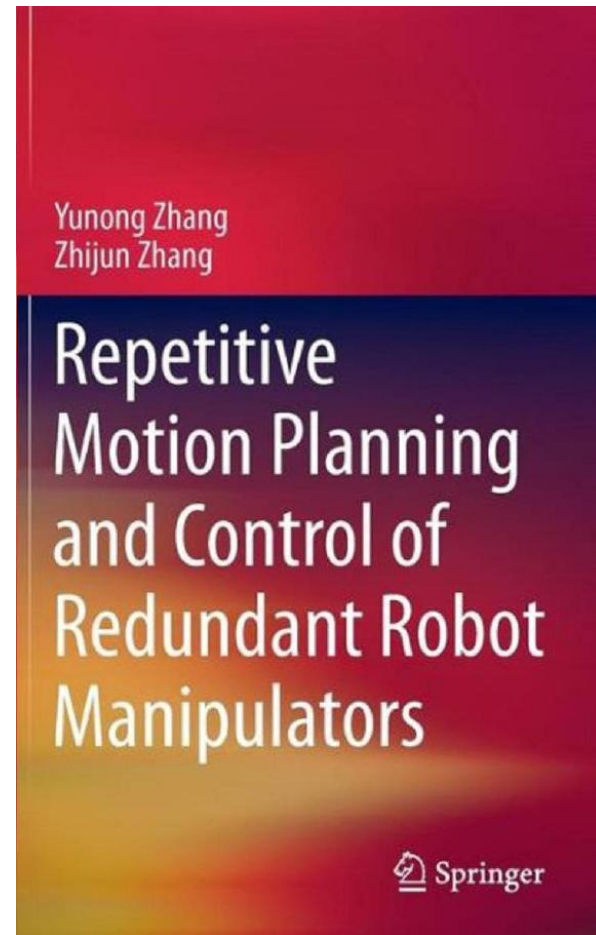
Application 1

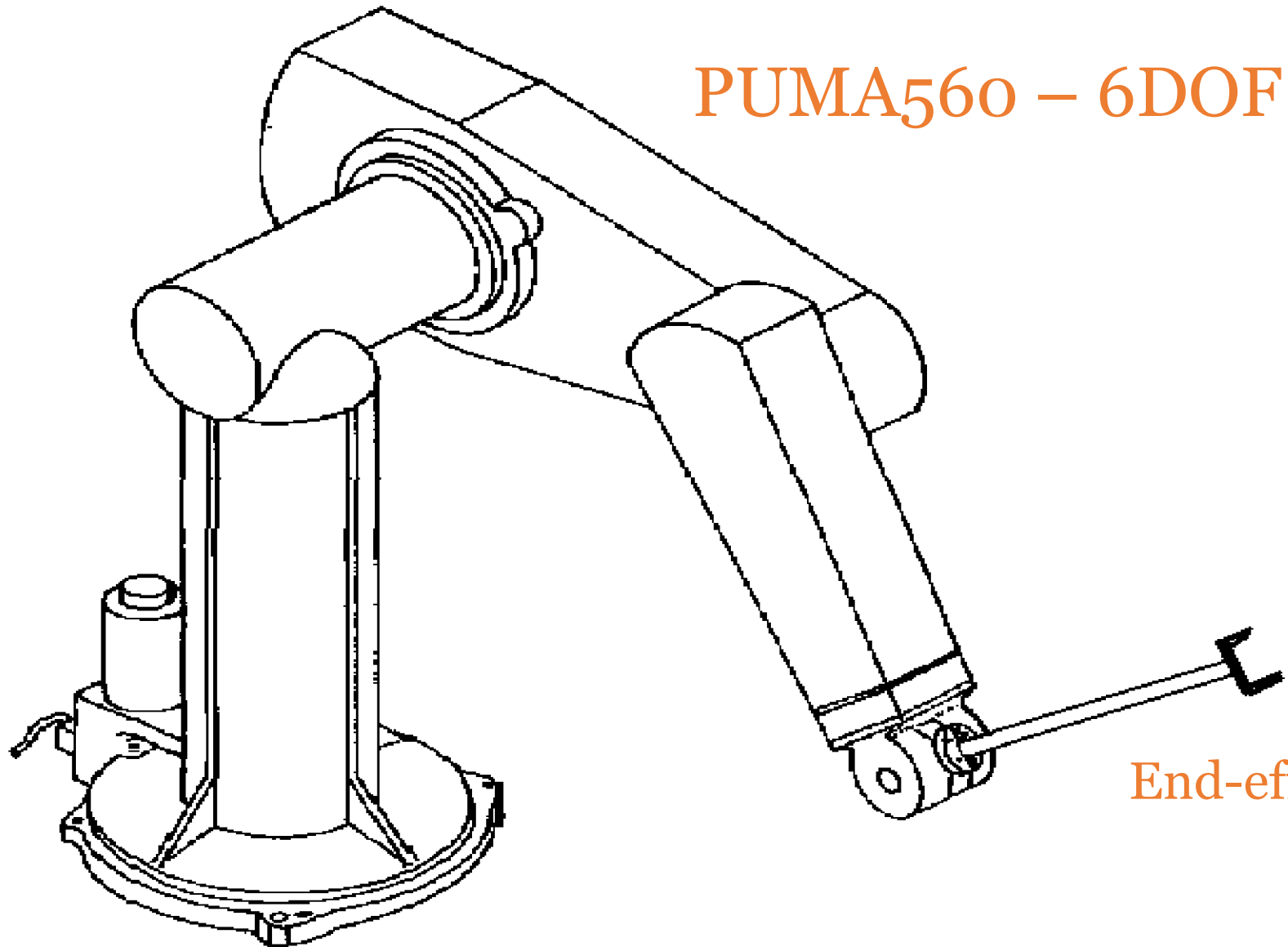Two English academic monographs on robotics have been published

2017

Robot Manipulator Redundancy Resolution

Yunong Zhang and Long Jin

ASME PRESS   WILEY

Yunong Zhang
Zhijun Zhang

Repetitive Motion Planning and Control of Redundant Robot Manipulators

Springer

2013

What is a robotic arm?

PUMA560 – 6DOF

End-effector

[29] Yunong Zhang, Binbin Qiu, Xiaodong Li, Zhang-Gradient Control, Singapore: Springer-Verlag, 2021

数据预测资料

Yunong Zhang, Zhongxian Xue, Wan Li, Yingbiao Ling and Chengxu Ye, A Short-Term Projection for Japanese Central Government Debt via WASD Neuronet, Proceedings of the 4th International Conference on Information, Cybernetics and Computational Social Systems (ICCSS), pp. 614-618, Dalian, China, July 24-26, 2017

日本财务省官方数据：https://www.mof.go.jp/english/jgbs/reference/gbb/index.htm

表 2-3　最佳模型预测结果与真实国债规模数值的相对误差

日期	真实值（万亿日元）	预测值（万亿日元）	相对误差
2017/03	1071.5594	1072.1042	-0.05%
2017/06	1078.9664	1075.9688	0.28%
2017/09	1080.4405	1079.7144	0.06%
2017/12	1085.7537	1083.3415	0.22%
2018/03	1087.813	1086.8505	0.09%
2018/06	1088.9851	1090.2418	-0.11%
2018/09	1091.7685	1093.5158	-0.16%
2018/12	1100.5266	1096.673	0.35%

TABLE I: Pr

Date	03/31/2017	06/30/2
TCGD (trillion Yen)	1072.1042	1075.96
Date	03/31/2019	06/30/2
TCGD (trillion Yen)	1099.7138	1102.63
Date	03/31/2021	06/30/2
TCGD (trillion Yen)	1119.9007	1121.9

USPD Doubling or Declining in Next Decade Estimated by WASD Neuronet Using Data as of October 2013

Yunong Zhang[1,2,3](✉), Zhengli Xiao[1,2,3], Dongsheng Guo[1,2,3], Mingzhi Mao[1], and Hongzhou Tan[1,2]

[1] School of Information Science and Technology, Sun Yat-sen University, Guangzhou 510006, China
zhynong@mail.sysu.edu.cn, ynzhang@ieee.org, jallonzyn@sina.com
http://sist.sysu.edu.cn/~zhynong/indexe.htm
[2] SYSU-CMU Shunde International Joint Research Institute, Shunde 528300, China
[3] Key Laboratory of Autonomous Systems and Networked Control, Ministry of Education, Guangzhou 510640, China

Abstract. Recently, the total public debt outstanding (TPDO) of the United States has increased rapidly, and to more than \$17 trillion on October 18, 2013. It is important and necessary to conduct the TPDO projection for better policies making and more effective measurements taken. In this paper, we present the ten-year projection for the public debt of the United States (termed also the US public debt, USPD) via a 3-layer feed-forward neuronet. Specifically, using the calendar year data on the USPD from the Department of the Treasury, the neuronet is trained, and then is applied to projection. Via a series of numerical tests, we find that there are several possibilities of the change of the USPD in the future, which are classified into two categories in terms of projection trend: the continuous-increase trend and the increase-peak-decline trend. In the most possible situation, the neuronet indicates that the TPDO of the United States is projected to increase, and it will double in 2019 and double again in 2024.

Yunong Zhang, Zhengli Xiao, Dongsheng Guo, Mingzhi Mao, Hongzhou Tan, USPD Doubling or Declining in Next Decade Estimated by WASD Neuronet Using Data as of October 2013, The 7th International Symposium on Intelligence Computation and Applications (ISICA), November 21-22, 2015, Guangzhou, China

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Toward Deep Neural Networks: WASD Neuronet Models, Algorithms, and Applications introduces the outlook and extension toward deep neural networks, with a focus on the weights-and-structure determination (WASD) algorithm. Based on the authors' 20 years of research experience on neuronets, the book explores the models, algorithms, and applications of the WASD neuronet, and allows readers to extend the techniques in the book to solve scientific and engineering problems. The book will be of interest to engineers, senior undergraduates, postgraduates, and researchers in the fields of neuronets, computer mathematics, computer science, artificial intelligence, numerical algorithms, optimization, simulation and modeling, deep learning, and data mining.

Features

- Focuses on neuronet models, algorithms, and applications

- Designs, constructs, develops, analyzes, simulates and compares various WASD neuronet models, such as single-input WASD neuronet models, two-input WASD neuronet models, three-input WASD neuronet models, and general multi-input WASD neuronet models for function data approximations

- Includes real-world applications, such as population prediction

- Provides complete mathematical foundations, such as Weierstrass approximation, Bernstein polynomial approximation, Taylor polynomial approximation, and multivariate function approximation, exploring the close integration of mathematics (i.e., function approximation theories) and computers (e.g., computer algorithms)

Yunong Zhang received a BSc from Huazhong University of Science and Technology, Wuhan, China, in 1996, an MSc from South China University of Technology, Guangzhou, China, in 1999, and a PhD from Chinese University of Hong Kong, Shatin, Hong Kong, China, in 2003. He is currently a professor at the School of Information Science and Technology, Sun Yat-sen University, Guangzhou, China. Yunong Zhang was supported by the Program for New Century Excellent Talents in Universities in 2007, was presented the Best Paper Award of ISSCAA in 2008 and the Best Paper Award of ICAL in 2011, and was among the Highly Cited Scholars of China selected and published by Elsevier from 2014-2017. His webpage is now available at http://sdcs.sysu.edu.cn/content/2477.

Dechao Chen received a BSc from Guangdong University of Technology, Guangzhou, China, in 2013. He is currently pursuing his PhD in Communication and Information Systems at School of Information Science and Technology, Sun Yat-sen University, Guangzhou, China, under the direction of Professor Yunong Zhang. His research interests include: robotics, neuronets, and nonlinear dynamics systems.

Chengxu Ye received a BSc from Shanxi Normal University, Xian, China, in 1991, an MSc from Qinghai Normal University, Xining, China, in 2008, and a PhD from Sun Yat-sen University, Guangzhou, China, in 2015. He is currently a professor at the School of Computer Science, Qinghai Normal University, Xining, China. His main research interests include: machine learning, neuronets, computation, and optimization. He has published over 30 scientific papers in journals and conferences.
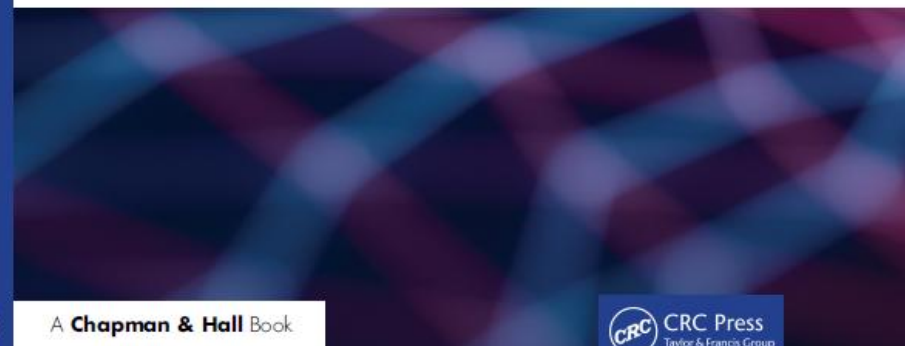
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WASD NEURONET MODELS, ALGORITHMS, AND APPLICATIONS

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A **Chapman & Hall** Book

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数据预测资料 （ASF几乎无数学）

这是一次成功的预测。网上多篇新闻已经报道了2019（2020）年厄尔尼诺现象带来的重大影响，新闻联播今年（2019年）也播报了厄尔尼诺现象对全球不同地区造成的影响。

Using Full-Traversal Addition-Subtraction Frequency (ASF) Method to Predict Possible El Nino Events in 2019, 2020 and so forth

Yunong Zhang[1], Ruifeng Wang[1], Min Yang[1], Mingjie Zhu[1], Chengxu Ye[2]

1. School of Information...

2. School...

[2] Yunong Zhang, Ruifeng Wang, Min Yang, Mingjie Zhu, Chengxu Ye, Using Full-Traversal Addition-Subtraction Frequency (ASF) Method to Predict Possible El Nino Events in 2019, 2020 and so forth, Proceedings of Chinese Control and Decision Conference (CCDC), pp. 2653-2658, June 9-11, 2018，Shenyang, China
该文完成并投稿于2017年12月1号，提前14个月预测到厄尔尼诺到来。

厄尔尼诺 - 搜狗搜索 × 2019年注定"不平凡"？厄尔尼诺已确... × +

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环球科学猫

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在科学中，我们对厄尔尼诺的描述可能已不是一两天的事情了，对于厄尔尼诺的出现也总算是确定了。根据科学预报显示，自从2018年6月起，位于赤道中东太平洋海表温度一直处于异常状态，由于温度的偏高，科学家们一致认为我们将会迎来厄尔尼诺的影响。直到2019年2月底的监测报告显示，海洋区域酝酿的厄尔尼诺已经达到了标准，所以已经正式形成了厄尔尼诺事件。

0 ⊙

(ASF几乎无数学)

Predicting Potential Years of Most Costly War Involving USA via ASF Approach

Yunong Zhang, Guanqun Yang, Ruifeng Wang & Liangjie Ming

Conference paper | First Online: 07 November 2019

928 Accesses

Part of the Advances in Intelligent Systems and Computing book series (AISC, volume 1074)

Abstract

In this paper, the addition-subtraction frequency (ASF) approach is used to predict the years of potentially costly war, which may erupt with the United States of America in the future. In the numerical experiments involved in this paper, we select the years of historic 10 most expensive wars as input data, using three-variable, full-traversal ASF approach to predict the potential years of most costly war that may occur in the future. By using different 9-input data (removing one each year datum) to test the robustness of the experimental results, the final conclusion is that there is a relatively high possibility of most costly war occurring in 2021 or 2036–2038.

Sections | Figures

Abstract
Introduction
Preliminaries
Numerics with Ten War Da
Numerics with Nine War D
Consistency Analysis
Conclusion
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The International Conference on Natural Computation, Fuzzy Systems and Knowledge Discovery
↳ ICNC-FSKD 2019: **Advances in Natural Computation, Fuzzy Systems and Knowledge Discovery** pp 481–490

Yunong Zhang, Guanqun Yang, Ruifeng Wang, Liangjie Ming, Predicting Potential Years of Most Costly War Involving USA via ASF Approach, Proceedings of the International Conference on Natural Computation, Fuzzy Systems and Knowledge Discovery (ICNC-FSKD), July 20-22, 2019, Kunming, China

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Current/future research directions

- Robot algorithms (**time-discretization**, different-level **equivalency**)

- Neural-network **forecasting** algorithms
- **Division by zero** (DBZ) / singularity / exception processing algorithms
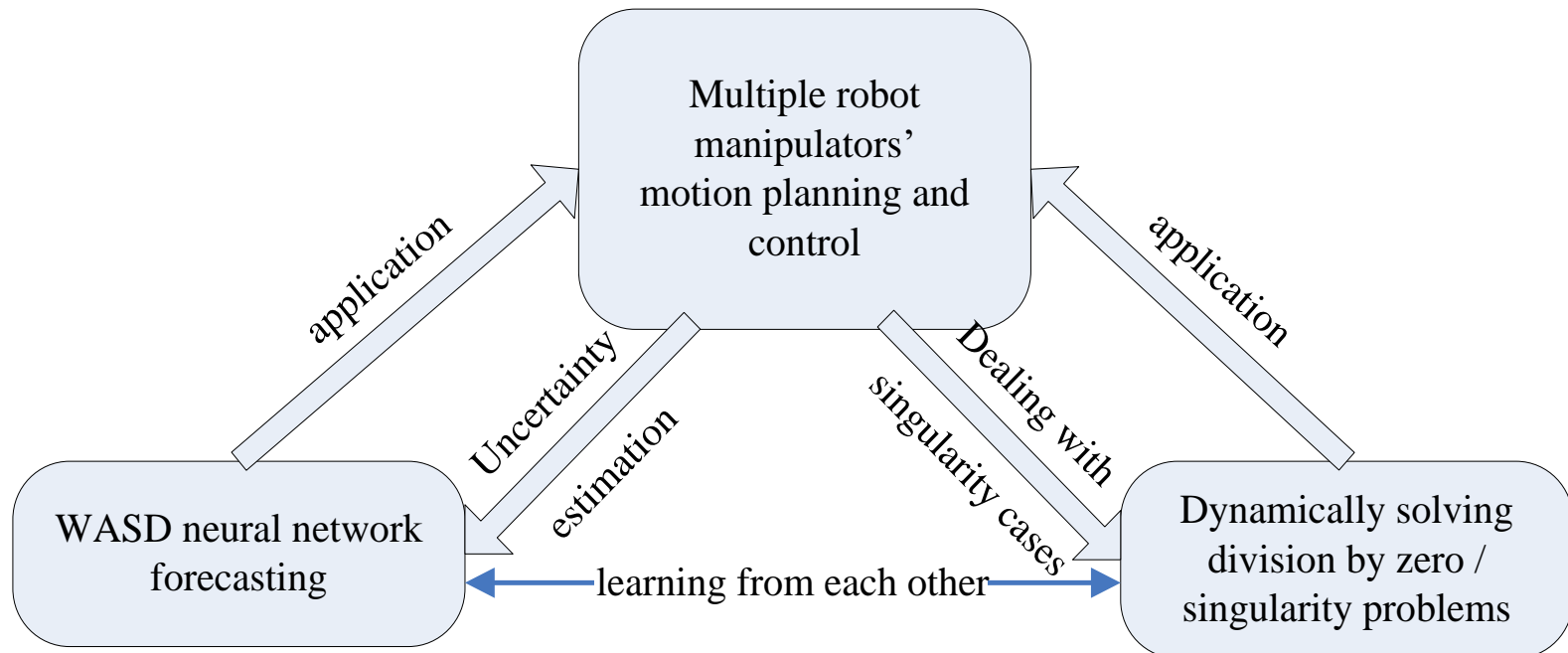
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[3] 求解矩阵常微分方程的MatrixODE接口软件, 计算机软件著作权, 2013年7月

[2] 快速求解二次规划问题的94LVI系统, 计算机软件著作权, 2013年3月

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