

Title: On Mittag-Leffler function and beyond

Author: Arslan Hojat Ansari¹, Xiaolan Liu, Vishnu Narayan Mishra

Sources: *Nonlinear Science Letters A: Mathematics, Physics and Mechanics*, Vol.8, No.2, pp.187-199, June 2017 (A2)

Abstract: This paper studies the Mittag-Leffler function. Its properties are illustrated and proved, their potential applications include the generalization of sine, cosine, exponential functions and Euler's Formula. This paper is an extension to the advanced calculus, furthermore, an open problem is given for further development of the present theory.

Keywords: Mittag-Leffler function, Laplace transform, special function.

Title: Novel analytical and numerical techniques for fractional temporal SEIR measles model

Authors: F.A. Abdullah, F. Liu, P. Burrage, K. Burrage, T. Li

Sources: *Numerical Algorithms*.2017 (1) :1-22

Abstract: In this paper, a fractional temporal SEIR measles model is considered. The model consists of four coupled time fractional ordinary differential equations. The time-fractional derivative is defined in the Caputo sense. Firstly, we solve this model by solving an approximate model that linearizes the four time fractional ordinary differential equations (TFODE) at each time step. Secondly, we derive an analytical solution of the single TFODE. Then, we can obtain analytical solutions of the four coupled TFODE at each time step, respectively. Thirdly, a computationally effective fractional Predictor-Corrector method (FPCM) is proposed for simulating the single TFODE. And the error analysis for the fractional predictor-corrector method is also given. It can be shown that the fractional model provides an interesting technique to describe measles spreading dynamics. We conclude that the analytical and Predictor-Corrector schemes derived are easy to implement and can be extended to other fractional models. Fourthly, for demonstrating the accuracy of analytical solution for fractional decoupled measles model, we applied GMMP Scheme (Gorenflo-Mainardi-Moretti-Paradisi) to the original fractional equations. The comparison the numerical simulations indicates that the solution of the decoupled and linearized system is close enough to the solution of the original system. And it also indicates that the linearizing technique is correct and effective.

Keywords: Time fractional model, SEIR measles model, Analytical solution, Predictor-corrector method ,GMMP Scheme

Title: γ - ϕ - ϕ -contractive type mappings in S-metric spaces

Authors: Mi Zhou, Xiao-lan Liu, Stojan Radenovic

Sources: *Journal of Nonlinear Science and Applications, jnsaJ. Nonlinear Sci. Appl.*, 10 (2017), 1613 – 1639 (A2)

Abstract: In this paper, we introduce several types of S- γ - ϕ - ϕ -contractive mappings which are generalizations of α - ψ -contractive mappings [B. Samet, C. Vetro, P. Vetro, *Nonlinear Anal.*, 75 (2012), 2154–2165] in the structure of S-metric spaces. Furthermore, we prove existence and uniqueness of fixed points and common fixed points of such contractive mappings. Our results generalize, extend and improve the existing results in the literature. We also state some illustrative examples to support our results.

Keywords: S-metric space, S- γ - ϕ - ϕ -contractive mappings, fixed point.

Title: An Infrastructure of Testing Techniques in Juncture of SDLC Model for Software Quality Assurance

Authors: Muhammad Umair Raza, Changjiang Liu

Sources: *Journal of Simulation, VOL, 5, NO, 6, Dec. 2017* (A4)

Abstract: Testing of Software is a very important process of dealing with the inaccuracy, and the main motive of examine is to regulate the caliber of the software. Testing is the most innovative approach to make certain the quality of software. In earlier studies a ritual testing phase is to organize in every model of software development but here the purpose of this study is to petition for different testing techniques in all the phases of SDLC model. In customary SDLS models testing is applied only in one phase. If testing is braked down in the ensuing phase than developers obligation to study the previous phases with considerations. So our principal purpose of this proposed study is to explore and explain that how can we choose different testing techniques on the basis of different phases of SDLC models. It is perfectly defined which type of testing technique is more reliable for development of software.

Keywords: testing skeleton of SDLC, testing techniques of SDLC, SDLC model testing

Title: Big Data – Security and Privacy policy

Authors: Muhammad Umair Raza, Changjiang Liu

Sources: *JOURNAL OF SIMULATION, VOL. 5, NO. 6, Dec. 2017* (A4)

Abstract: This research work inaugurate in big data an plan of research for security and privacy. This paper talk about research directions and summons and about to data secretiveness, confidentiality, trust worthiness in the infrastructure of big data. Key researches issues talk about in the paper how to settle secrecy the idea of data command, and how to put into practice right to control and use in big data stores.

Keywords: big data, security and privacy policy, the Internet of Things.

Title: Sensitivity of non-autonomous discrete dynamical systems revisited

Authors: Xian-Feng Ding, Tian-Xiu Lu, Jian-Jun Wang

Sources: *Journal of Nonlinear Sciences and Applications*, 10 (2017), 5239–5244 (A2)

Abstract: In this note, we construct a transitive non-autonomous discrete system with strongly periodic density which is not sensitive. Besides, we prove that every transitive non-autonomous discrete system with almost periodic density is syndetically sensitive, provided that it converges uniformly to a map, and that a product system is multi-sensitive (resp., F -sensitive) if and only if there exists a factor system is multi-sensitive (resp., F -sensitive), where F is a filterdual.

Keywords: Non-autonomous discrete system (NADS), sensitivity, F -sensitivity, transitivity, product system.

Title: Product-type operators from Zygmund spaces to Bloch-Orlicz spaces

Authors: Zhi-jie Jiang

Sources: *COMPLEX VARIABLES AND ELLIPTIC EQUATIONS*, 2017 VOL. 62, NO. 11, 1645–1664 (A4)

Abstract: Let D be the open unit disk in the complex plane \mathbb{C} and $H(D)$ the class of all analytic functions on D . Let ϕ be an analytic self-map of D and $u \in H(D)$. In this paper, the boundedness and compactness for product-type operators from Zygmund spaces to Bloch–Orlicz spaces are characterized by constructing some new test functions in Zygmund spaces.

Keywords: Zygmund space; Bloch–Orlicz space; product-type operator; test function; boundedness; compactness

Title: Weighted superposition operators from Zygmund spaces to μ -Bloch spaces

Authors: Zhi-jie Jiang, Ting Wang, Juan Liu, Ting Song

Sources: *Journal of Computational Analysis and Applications*, Volume 23, Number 3, September 2017 (A4)

Abstract: Let $D = \{z \in \mathbb{C} : |z| < 1\}$ be the open unit disk in the complex plane \mathbb{C} and $H(D)$ the space of all analytic functions on D . Let ϕ be an entire function on \mathbb{C} and $u \in H(D)$. In this paper, the boundedness and compactness of the operators $S_{u,\phi}: f \mapsto u \cdot \phi \circ f$ from Zygmund spaces to μ -Bloch spaces are characterized.

Title: Global exponential stability of general A -monotone implicit fuzzy proximal dynamical systems in Banach spaces

Authors: Heng-you Lan, Juan J. Nieto , Yi-shun Cui

Sources: *Soft Comput* ,(2017) 21:3113–3121(**A3**)

Abstract: The purpose of this paper is to introduce the notion of general A -monotone operators in Banach spaces. Under some suitable conditions and using generalized proximal mapping technique, neural network technique and Gronwall's inequality, a new class of general A -monotone implicit fuzzy proximal dynamical systems in Banach spaces are also proposed and analyzed through a recurrent neural network with a one-layer structure, and the existence of the solutions of the proximal dynamical systems is shown. Further, the global exponential stability of these dynamical systems is proved. The results presented in this paper improve and generalize the corresponding results in the literature.

Keywords:General A -monotone operator, Generalized proximal mapping Technique ,Generalized implicit fuzzy proximal dynamical system,Neural network technique, Existence and global exponential stability

Title: Regularization Smoothing Approximation of Fuzzy Parametric Variational Inequality Constrained Stochastic Optimization

Authors: Heng-you Lan

Sources: *J. COMPUTATIONAL ANALYSIS AND APPLICATIONS*, VOL. 22, NO.5, 2017, (**A4**)

Abstract: This work is motivated by the fact that very little is known about the fuzzy parametric variational inequalities constrained stochastic optimization problems in finite dimension real numeral spaces, which are studied more difficult because of the existence of random variable and fuzzified version. Based on the notion of quasi-Monte Carlo estimate and method of centres with entropic regularization, we develop a class of new regularization smoothing approximation approaches to discretize the stochastic optimization problem with continuous random variable, and construct a centre iterative algorithm for approximating the optimal solutions of the stochastic optimization problems. Further, we give some comprehensive convergence theorems of optimal solutions for the resulting optimization problem. Finally, a numerical illustration is analyzed.

Keywords and Phrases: Regularization smoothing approximation, fuzzy parametric variational inequality, Stochastic optimization problem, centre iterative algorithm with quasi-Monte Carlo estimate, comprehensive convergence.

Title: Variational inequality theory for elliptic inequality systems with Laplacian type operators and related population models: an overview and recent advances

Authors: Heng-you Lan

Sources: *International Journal of Nonlinear Science* , Vol.23(2017) No.3, pp.157-169 (**A2**)

Abstract: Existence of nonzero positive solutions of elliptic inequality systems with Laplacian type operators and related population models of two or more species arising in mathematical biology is of great interest and challenging to study. In this paper, we deal with a survey of logistic models of biological populations and Laplacian elliptic equation, and discuss some related problems from variational equations to variational inequalities. Then, we present some works of studying elliptic variational inequalities with Laplacian type operators and related population models of one species arising in mathematical biology. Furthermore, we propose some theory of variational inequalities and the applications to study the existence of positive weak solutions for some elliptic variational inequalities and related population models. Finally, we display some remarks and open questions for researching in the further, which may help many present researchers for their numerical and computer realizations.

Keywords: Elliptic inequality system with Laplacian type operators; variational inequality theory; related population model; positive weak solution; further research question.

Title: The Structure of Departure Process and Optimal Control Strategy N^* for Geo/G/1 Discrete-Time Queue with Multiple Server Vacations and $\text{Min}(N, V)$ -Policy *

Authors: LAN Shaojun · TANG Yinghui

Sources: *J Syst Sci Complex* (2017) 30: 1382–1402 (A4)

Abstract: This paper considers the departure process and the optimal control strategy for a discrete-time Geo/G/1 queueing model in which the system operates under the control of multiple server vacations and $\text{Min}(N, V)$ -policy. Using the law of total probability decomposition, the renewal theory and the probability generating function technique, the transient and the steady-state probabilities that the server is busy at any epoch n^+ are derived. The authors also obtain the explicit expression of the probability generating function for the expected number of departures occurring in the time interval $0^+, n^+$ from any initial state. Meanwhile, the relationship among departure process, server's state process and service renewal process in server busy period is found, which shows the special structure of departure process. Especially, some corresponding results of departure process for special discrete-time queues are directly gained by our results. Furthermore, the approximate expansion for calculating the expected number of departures is presented. In addition, some other important performance measures, including the expected length of server busy period, server's actual vacation period and busy cycle period etc., are analyzed. Finally, some numerical results are provided to determine the optimum value N^* for minimizing the system cost under a given cost structure.

Keywords: Cost optimization, departure process, discrete-time queue, $\text{Min}(N, V)$ -policy, multiple server vacations.

Title: An.N-polyce discrete time Geo/G/1 queue with modified muiltipe server vacations and bernoulli feedback

Authors: Shaojun Lan, Yinghui Tang

Sources: *RAIRO Operations Research*, 10.1051/ro/2017027, (A4)

Abstract: This paper deals with a single-server discrete-time *Geo/G/1* queueing model with Bernoulli feedback and *N*-policy where the server leaves for modified multiple vacations once the system becomes empty. Applying the law of probability decomposition, the renewal theory and the probability gener-ating function technique, we explicitly derive the transient queue length distribution as well as the recursive expressions of the steady-state queue length distribution. Especially, some corresponding re-sults under special cases are directly obtained. Furthermore, some numerical results are provided for illustrative purposes. Finally, a cost optimization problem is numerically analyzed under a given cost structure.

Title: Performance Analysis of a Discrete-Time Queue with Working Breakdowns and Searching for the Optimum Service Rate in Working

Authors: Shaojun Lan, Yinghui Tan

Sources: *Journal of Systems Science and Information* ,Apr., 2017, Vol. 5, No. 2, pp. 176–192 (A4)

Abstract: This paper deals with a discrete-time *Geo/Geo/1* queueing system with working break-downs in which customers arrive at the system in variable input rates according to the states of the server. The server may be subject to breakdowns at random when it is in operation. As soon as the server fails, a repair process immediately begins. During the repair period, the defective server still pro-vides service for the waiting customers at a lower service rate rather than completely stopping service. We analyze the stability condition for the considered system. Using the probability generating function technique, we obtain the probability generating function of the steady-state queue size distribution. Also, various important performance measures are derived explicitly. Furthermore, some numerical results are provided to carry out the sensitivity analysis so as to illustrate the e fect of di erent param-eters on the system performance measures. Finally, an operating cost function is formulated to model a computer system and the parabolic method is employed to numerically find the optimum service rate in working breakdown period.

Keywords: discrete-time queue; working breakdowns; di erent arrival rates; performance measures; optimum service rate

Title: Performance and reliability analysis of a repairable discrete-time *Geo/G/1* queue with Bernoulli feedback and randomized policy

Authors: Shaojun Lan, Yinghui Tan

Sources: *Journal of Systems Science and Information, Appl. Stochastic Models Bus. Ind.* **2017**, 33 522–543 (A4)

Abstract: This paper is concerned with a discrete-time *Geo/G/1* repairable queueing system with Bernoulli feedback and randomized (p, N) -policy. The service station may be subject to failures randomly during serving customers and therefore is sent for repair immediately. The (p, N) -policy means that when the number of customers in the system reaches a given threshold value N , the deactivated server is turned on with probability p or is still left off with probability $1 - p$. Applying the law of total probability decomposition, the renewal theory and the probability generating function technique, we investigate the queueing performance measures and reliability indices simultaneously in our work. Both the transient queue length distribution and the recursive expressions of the steady-state queue length distribution at various epochs are explicitly derived. Meanwhile, the stochastic decomposition property is presented for the proposed model. Various reliability indices, including the transient and the steady-state unavailability of the service station, the expected number of the service station breakdowns during the time interval $(0^+, n^+]$ and the equilibrium failure frequency of the service station are also discussed. Finally, an operating cost function is formulated, and the direct search method is employed to numerically find the optimum value of N for minimizing the system cost. Copyright © 2017 John Wiley & Sons, Ltd.

Keywords: discrete-time queue; (p, N) -policy; unreliable server; Bernoulli feedback; cost optimization

Title: Multi-sensitivity, syndetical and the asymptotic averages shadowing property for continuous semi-flows

Authors: Risong Li, Tianxiu Lu, Yu Zhao, Hongqing Wang, Haihua Liang

Sources: *Qualitative Theory of Dynamical Systems* (A3)

Abstract: In this paper, for a continuous semi-flow θ on a compact metric space E with the asymptotic average-shadowing property (AASP), we show that if the almost periodic points of θ are dense in E then θ is multi-sensitive and syndetically sensitive. Also, we show that if θ is a Lyapunov stable semi-flow with the AASP, then the space E is trivial. Consequently, a Lyapunov stable semi-flow with the AASP is minimal. Furthermore, we prove that for a syndetically transitive continuous semi-flow on a compact metric space, sensitivity is equivalent to syndetical sensitivity. As an application, we show that for a continuous semi-flow θ on a compact metric space E with the AASP, if the almost periodic points of ϕ are dense in E then θ is syndetically sensitive. Moreover, we prove that for any continuous semi-flow θ on a compact metric space, it has the AASP if and only if so does its inverse limit $(\tilde{E}, \tilde{\theta})$, and if only if so does its lifting continuous semi-flow $(\hat{E}, \hat{\theta})$. Also, an example which contains two numerical experiments is given. Our results extend some corresponding and existing ones.

Keywords: The asymptotic average-shadowing property, strong ergodicity, minimal point, multi-sensitivity, syndetical sensitivity, Lyapunov stable.

Title: Chaos in a topologically transitive semi-flow

Authors: Risong Li, Tianxiu Lu

Sources: *Journal of Nonlinear Sciences and Applications, Appl.*, 10 (2017), 1675–1682(A2)

Abstract: In this paper, we study the chaotic phenomena in a topologically transitive, continuous semi-flow, and show that the erratic time dependence of orbits in such a semi-flow is more complicated than the one described by Li-Yorke chaos. Also, we generalize the notion of sensitive dependence on initial conditions for semi-flows and explore the chaotic phenomena for topologically transitive, continuous semi-flows with the generalized sensitivity property. Our results extend the existing results to semi-flows.

Keywords: Chaos, topological transitivity, sensitive dependence.

Title: Spatio-temporal chaos in duopoly games

Authors: Risong Li, Yu Zhao, Tianxiu Lu, Ru Jiang, Hongqing Wang, Haihua Liang

Sources: *Journal of Nonlinear Sciences and Applications, Appl.*, 10 (2017), 3784–3791(A2)

Abstract: Suppose that G and H are two given closed subintervals of \mathbf{R} , and that $q : G \rightarrow H$ and $p : H \rightarrow G$ are continuous maps. Let $\Gamma(s, t) = (p(t), q(s))$ be a Cournot map over the space $G \times H$. In this paper, we study spatio-temporal chaos of such a Cournot map. In particular, it is shown that if p and q are onto maps, then the following are equivalent:

- 1) Γ is spatio-temporally chaotic;
- 2) $\Gamma^2|_{\Lambda_1}$ is spatio-temporally chaotic;
- 3) $\Gamma^2|_{\Lambda_2}$ is spatio-temporally chaotic;
- 4) $\Gamma|_{\Lambda_1 \cup \Lambda_2}$ is spatio-temporally chaotic.

Moreover, it is proved that if p and q are onto maps, then $p \circ q$ is spatio-temporally chaotic if and only if so is $q \circ p$. Also, we give two examples which show that for the above results, it is necessary to assume that p and q are onto maps.

Keywords: Spatio-temporal chaos, Li-Yorke sensitivity, duopoly game.

Title: New approximation methods for solving elliptic boundary value problems via Picard-Mann iterative processes with mixed errors

Authors: Teng-fei Li, Heng-you Lan

Sources: *Boundary Value Problems* (2017) 2017:184(A3)

Abstract: In this paper, we introduce and study a class of new Picard-Mann iterative methods with mixed errors for common fixed points of two different nonself mappings. We also give convergence and stability analysis of the new Picard-Mann iterative approximation and propose numerical examples to show that the new Picard-Mann iteration converges more effectively than the Picard and Mann iterative processes.

iterative process, Picard-Mann iterative process due to Khan and other related iterative processes. Furthermore, as an application, we explore iterative approximation of solutions for an elliptic boundary value problem in Hilbert spaces by using the new Picard-Mann iterative methods with mixed errors for contraction operators.

Keywords: new Picard-Mann approximation; common fixed point; nonexpansion and contraction; elliptic boundary value problem; convergence and stability

Title: Stability control of fractional chaotic systems based on a simple Lyapunov function

Authors: Tianzeng Li , Yu Wang, Hongmei Li

Sources: *Journal of Nonlinear Sciences and Applications, Appl.*, 10 (2017), 4876–4889(A2)

Abstract: In this paper the stabilization of fractional-order chaotic systems and a new property of fractional derivatives are studied. Then we propose a new fractional-order extension of Lyapunov direct method and a control method based on a simple Lyapunov candidate function. The proposed control method can be applied to the stabilization of fractional-order chaotic and hyperchaotic systems. This control method is simple, universal, and theoretically rigorous. Numerical simulations are given for three fractional-order chaotic (or hyperchaotic) systems to verify the effectiveness and the universality of the proposed control method.

Keywords: Lyapunov function, fractional-order, stabilization.

Title: Synchronization of fractional chaotic systems based on a simple Lyapunov function

Authors: Tianzeng Li, Yu Wang, Chao Zhao

Sources: *Advances in Difference Equations*, (2017) 2017:304(A4)

Abstract: In this paper the synchronization of fractional-order chaotic systems and a new property of fractional derivatives are studied. Then we propose a new fractional-order extension of Lyapunov direct method to control the fractional-order chaotic systems. A new synchronization method and a linear feedback controller are given to achieve the synchronization of fractional-order chaotic systems based on a simple Lyapunov candidate function. The proposed synchronization method can be applied to the synchronization of an arbitrary fractional-order chaotic system. This method is universal, simple, and theoretically rigorous. Numerical simulations of three fractional-order chaotic systems to verify the effectiveness and the universality of the proposed method.

Keywords: Lyapunov function; fractional order; synchronization; chaos

Title: Nonlinear vibration of slightly curved pipe with conveying pulsating fluid

Authors: Yun-dong Li · Yi-ren Yang

Sources: *Nonlinear Dynamics* (A1)

Abstract: The nonlinear governing motion equation of slightly curved pipe with conveying pulsating fluid is set up by Hamilton's principle. The motion equation is discretized into a set of low dimensional system of non-linear ordinary differential equations by the Galerkin method. Linear analysis of system is performed upon this set of equations. The effect of amplitude of initial deflection and flow velocity on linear dynamic of system is analyzed. Curves of the resonance responses about $\Omega \approx \omega_1$ and $\Omega \approx 2\omega_1$ are performed by means of the pseudo-arclength continuation technique. The global nonlinear dynamic of system is analyzed by establishing the bifurcation diagrams. The dynamical behaviors are identified by the phase diagram and Poincare maps. The periodic motion, chaotic motion and quasi-periodic motion are found in this system.

Keywords: Conveying pulsating fluid, Slightly curved pipe, Quasi-periodic motion, Chaotic motion

Title: Vibration analysis of conveying fluid pipe via He's variational iteration method

Authors: Yun-dong Li, Yi-ren Yang

Sources: *Applied Mathematical Modelling* 43 (2017) 409–420(A2)

Abstract: In this paper, a recently new semi-analytical method, i.e., He's variational iteration method is developed to apply to free vibration analysis of conveying fluid pipe. The critical flow velocity and frequency of pipe conveying fluid are obtained with considering the various boundary conditions. The results are compared with the ones of different transform method, and prove VIM that has the same precision and efficient with DTM. The mode shapes of cantilevered pipe and both ends with elastic support pipe are shown under different flow velocity.

Keywords: VIM, Pipe conveying fluid, Natural frequency, Modes shape, DTM

Title: 应用同伦分析法研究 Mathieu - Duffing 振子的周期解

Author: 李云东, 杨翊仁

Sources: *Chinese Journal of Computational Mechanics*, Vol. 34, Vol. 34, No. 1 February 2017

Abstract: : 应用同伦分析法研究了 Mathieu - Duffing 振子的周期解, 展示了 Mathieu - Duffing 振子的周期 1 和周期 2 解的求解过程, 通过求解构造的非线性代数方程组而获得周期解, 应用 Floquet 理论判别了周期解的稳定性。比较了同伦分析方法得到的周期解和数值方法得到的周期解, 结果表明两者具有一致性。

Keywords: 同伦分析法; Mathieu - Duffing 振子; 周期解; Floquet 理论

Title: A Homomorphic Universal Re-encryptor for Identity-based Encryption

Authors: Liang Liu, Jun Ye

Sources: *International Journal of Network Security*, Vol.19, No.1, PP.11-19, Jan. 2017

Abstract: Re-encryption (or proxy re-encryption) is a very useful cryptographic primitive which is able to transform a ciphertext under one public key into a new ciphertext encrypting the same message but under another different public key. Re-encryption is widely used in secure communication and information exchange via various kinds of network infrastructure. In addition to traditional public-key encryption scheme, re-encryption can also come into force in other cryptosystems like Identity-Based Encryption (IBE) and more advanced Functional Encryption (FE), making the enhanced schemes more powerful as well as easy-to-use. In this work, we have proposed a novel identity-based proxy re-encryption (IBPRE) scheme which to the maximum extent reduces the workloads in the user side by delivering the re-encryption key (RK) generation work to the proxy server. Besides, it is likewise able to prevent possible bottlenecks for the users, like re-encryption key management.

Keywords: Fully homomorphic encryption, identity-based encryption, proxy re-encryption, re-encryptor

Title: A Characterization of Mathieu Groups by Their Order and Character Degree Graphs

Authors: Shitian Liu, Xianhua Li

Sources: *ITALIAN JOURNAL OF PURE AND APPLIED MATHEMATICS* – N.38–2017 (671–678)

Abstract: Let G be a finite group. The character degree graph $\Gamma(G)$ of G is the graph whose vertices are the prime divisors of character degrees of G and two vertices p and q are joined by an edge if pq divides some character degree of G . Let $SL_n(q)$ be the projective special linear group of degree n over finite field of order q . Xu et al. proved that the Mathieu groups are characterized by the order and one irreducible character degree. Recently Khosravi et al. have proven that the simple groups $L_2(p^2)$, and $L_2(p)$ where $p \in \{7, 8, 11, 13, 17, 19\}$ are characterizable by the degree graphs and their orders. In this paper, we give a new characterization of Mathieu groups by using the character degree graphs and their orders.

Keywords: Character degree graph, Mathieu group, simple group, character degree.

Title: A Characterization of Some Alternating Groups by Their Orders and Character Degree Graphs

Authors: S. Liu

Sources: *Azerbaijan Journal of Mathematics* V. 7, No 1, 2017, January

Abstract: The aim of this study was to characterize some alternating groups by their orders and character degree graphs. To achieve this, G was used as a finite group. The character degree graph $\Gamma(G)$ of G is the graph whose vertices are the prime divisors of character degrees of G , and two vertices p and q are joined by an edge if $p \cdot q$ divides some character degree of G . A_n was used as an alternating group of degree n . Khosravi et. al (2014). have shown that A_n , with $n = 5, 6, 7$ are characterizable by the character degree graphs and their orders. The results of this study achieved the conclusion of characterizing the alternating group A_n , where $n = 8, 9, 10$, by using its character degree graph and order. In particular, the alternating groups A_9 and A_{10} are not unique determined by their character degree graphs and their orders.

Keywords: character degree graph, alternating groups, simple groups, group order.

Title: OD-characterization of alternating groups $A_p C_d$

Authors: Yong Yang, Shitian Liu, Zhanghua Zhang

Sources: *Open Math.* 2017; 15: 1090–1098 (A4)

Abstract: : Let A_n be an alternating group of degree n . Some authors have proved that A_{10} , A_{147} and A_{189} cannot be OD-characterizable. On the other hand, others have shown that A_{16} , $A_{23} C_4$, and $A_{23} C_5$ are OD-characterizable. We will prove that the alternating groups $A_p C_d$ except A_{10} , are OD-characterizable, where p is a prime and d is a prime or equals to 4. This result generalizes other results.

Keywords: Order component, Element order, Alternating group, Degree pattern, Prime graph, Simple group

Title: On Mittag-Leffler function and beyond

Authors: Arslan Hojat Ansari¹, Xiaolan Liu, Vishnu Narayan Mishra⁴

Sources: *Nonlinear Sci. Lett. A*, Vol.8, No.2, pp.187-199, June 2017 (A2)

Abstract: Otential applications include the generalization of sine, cosine, exponential functions and Euler's Formula. This paper is an extension to the advanced calculus, furthermore, an open problem is given for further development of the present theory.

Keywords: Mittag-Leffler function, Laplace transform, special function.

Title: Enhancement of low visibility aerial images using histogram truncation and an explicit Retinex representation for balancing contrast and color consistency

Authors: Changjiang Liu, Irene Cheng, Yi Zhang, Anup Basu

Sources: *ISPRS Journal of Photogrammetry and Remote Sensing* 128 (2017) 16–26 (A1)

Abstract: This paper presents an improved multi-scale Retinex (MSR) based enhancement for ariel images under low visibility. For traditional multi-scale Retinex, three scales are commonly employed, which limits its application scenarios. We extend our research to a

general purpose enhanced method, and design an MSR with more than three scales. Based on the mathematical analysis and deductions, an explicit multi-scale representation is proposed that balances image contrast and color consistency. In addition, a histogram truncation technique is introduced as a post-processing strategy to remap the multi-scale Retinex output to the dynamic range of the display. Analysis of experimental results and comparisons with existing algorithms demonstrate the effectiveness and generality of the proposed method. Results on image quality assessment proves the accuracy of the proposed method with respect to both objective and subjective criteria.

Key Words: Multi-scale Retinex; Approach and landing; Image enhancement; Lagrange's mean value theorem; Histogram

Title: Robust MRI abnormality detection using background noise removal with polyfit surface evolution

Authors: Chang jiang Liu, Irene Cheng , Anup Basu, JunYe

Sources: *EURASIP Journal on Image and Video Processing* (2017) 2017:60 (A4)

Abstract: Image segmentation plays a vital role in MRI abnormality detection. This paper presents a robust MRI segmentation method to outline potential abnormality blobs. Thresholding and boundary tracing strategies are employed to remove background noises, and hence, the ROIs in the whole process are set. Subsequently, a polyfit surface evolution is proposed to approximately estimate bias field, which makes segmentation robust to image noises. Simultaneously, customized initial level set functions are devised so as to detect subtle bright and dark blobs which are highly potential abnormality regions. The proposed method improves bias field estimation and level set method to acquire fine segmentation with low computational complexities. Analysis of experimental results and comparisons with existing algorithms demonstrates that the proposed method can segment weak-edged, low-resolution MR brain images, and its performance prevails in accuracy and effectiveness.

Keywords: Magnetic resonance(MR), Segmentation, Abnormality detection, Polyfit, Bias field estimation, Level set method

Title: 关于非自治离散系统中敏感性的一些结论

Authors: 卢天秀, 辛邦颖, 毛巍

Sources: *Acta Mathematica Scientia Vol. 37 No. 5 Ser. A 2017 (Bimonthly)* (A1)

Abstract: 该文在一类非自治离散系统中定义了对初值敏感依赖, Li-Yorke 敏感和稠 Li-Yorke 敏感, 给出了三者之间的关系. 然后得到了复合系统的敏感性的充要条件.

Keywords: 非自治离散系统; 对初值敏感依赖; Li-Yorke敏感; 稠Li-Yorke敏感; 复合系统.

Title: Chaos in a topologically transitive semi-flow

Authors: Risong Lia, Tianxiu Lu

Sources: *Nonlinear Sci. Appl.*, 10 (2017), 1675–1682 (A2)

Abstract: In this paper, we study the chaotic phenomena in a topologically transitive, continuous semi-flow, and show that the erratic time dependence of orbits in such a semi-flow is more complicated than the one described by Li-Yorke chaos. Also, we generalize the notion of sensitive dependence on initial conditions for semi-flows and explore the chaotic phenomena for topologically transitive, continuous semi-flows with the generalized sensitivity property. Our results extend the existing results to semi-flows.

Key Words and Phrases: Chaos, topological transitivity, sensitive dependence.

Title: Proximal and Syndetical Properties Nonautonomous Discrete Systems

Authors: Tianxiu Lu, Guangrong Chen

Sources: *Journal of Applied and Computation* Volume 7, Number 1, February 2017, 92-101 (A2)

Abstract: This paper is mainly concerned with a class of nonautonomous discrete systems (x, f_1, ∞) . New definition of proximity relation and sensitivity in nonautonomous discrete system are given. Some relations among $P(f_1, \infty)$, $L(f_1, \infty)$, $R(f_1, \infty)$, $S(f_1, \infty)$, and $P(f_1, \infty)(x)$ are derived. And some chaotic properties of f_1, ∞ are proved.

Keywords: Nonautonomous discrete system, proximity, syndeticity, sensitivity.

Title: 城市宜居程度的一个评价模型

Author: 卢天秀, 唐浩, 刘美君, 刘玲, 杨勇

Sources: *Journal of Sichuan University of Science & Engineering(National Science Editioin)*, Vol.30, No.5, Oct. 2017

Abstract: 针对宜居城市评价指标问题, 在合理的假设条件下, 采用理论分析法和频度统计法筛选出主要指标(包括5个一级指标和8个二级指标), 利用熵值法建立了评价宜居城市的数学模型。然后以8个城市为例, 计算出一级指标和二级指标的权重, 以及每个二级指标的熵值, 从而给出8个城市综合得分排名, 最后, 得出生态环境和文化教育这两个指标的变化会对宜居城市排名产生显著的影响。

Keywords: 频度统计法; 熵值法; 主成分分析法; KMO值(Kaiser-Meyer-Olkin值); 模糊物元模型

Title: Livable City Ranking Problem

Authors: Senping Wang, Ran Yang, Xinru Zeng, Haiyan Zhang

Sources: *Journal of Scientific and Engineering Research*, 2017, 4(11):52-61

Abstract: Livable city ranking problem is studied in this paper. Through the literature material broad selection of Qingdao, Beijing, Shanghai and other five indicators, livable city using rough

set theory and grey incidence clustering method of combining the index reasonable classification, screening for related indicators. The evaluation model of multistage fuzzy composite ranking was established by using the improved AHP index weighting. In huaihai economic zone in the eight cities, for example the livability, according to the established urban livability rankings evaluation model, using matlab to calculate, eight city livability rankings are obtained. Finally, the practical significance and application promotion of this paper are illustrated in the conclusion.

Keywords: Evaluation; Grey rough sets; Fuzzy comprehensive evaluation

Title: A Parallel Iterative Algorithm for Differential Linear Complementarity Problems

Authors: SHU-LIN WU,XIAOJUN CHEN

Sources: *SIAM J. SCI.COMPUT*, Vol. 39, No. 6, pp. A3040–A3066 (A2)

Abstract: We propose a parallel iterative algorithm for solving the differential linear complementarity problems consisting of two systems, a linear ODE system and a linear complementarity system (LCS). At each iteration we proceed in a system decoupling way: by using a rough approximation of the state variable obtained from the previous iteration, we solve the LCS; then we solve the ODE system and update the state variable for preparing for the next iteration, by using the obtained constraint variable as a known source term. The algorithm is highly parallelizable, because at each iteration the computations of both the LCS and the ODE system at all the time points of interest can start simultaneously. The parallelism for solving the LCS is natural and for the ODE system it is achieved by using the Laplace inversion technique. For the P-matrix LCS, we prove that the algorithm converges superlinearly with arbitrarily chosen initial iterate and for the Z-matrix LCS the algorithm still converges superlinearly if we use the initial value as the initial iterate. We show that this algorithm is superior to the widely used time-stepping method, with respect to robustness, flexibility, and computation time.

Keywords: dynamic complementarity problems, parallel computation, iterations, convergence analysis

Title: Convergence Analysis of Schwarz Waveform Relaxation with Convolution Transmission Conditions

Authors: SHU-LIN WU, YINGXIANG XU

Sources: *SIAM J. SCI.COMPUT*, Vol. 39, No. 3, pp. A890–A921 (A2)

Abstract: It is well known that the optimal transmission conditions (TCs) give (in theory) the best convergence for the Schwarz waveform relaxation (SWR) algorithm. These TCs are of convolution type and are not systematically explored yet, partly because numerical computation of convolutions is expensive. However, if the governing equation is also of

convolution type, such as the Volterra integro-partial differential equations with singular kernels studied in this paper, this kind of TCs seems a very natural choice. For a class of convolution TCs including the optimal one derived from the space-time continuous analysis, we perform a convergence analysis for the SWR algorithm at the fully discretized level in the framework of convolution quadratures, which permits us to precisely capture the effects of the discretization on the parameter in the TCs, we show that the convergence factor can be reduced to a value around 0.0730 if an A-stable convolution quadrature is used. This result is independent of the mesh parameters Δt and Δx and is the worst estimate of the convergence factor. In some situations, for example, the case that an L-stable convolution quadrature is used and $\Delta t = O(\Delta x)$, the convergence factor tends to zero as $\Delta x \rightarrow 0$. Numerical results are given to support our theoretical analysis.

Keywords: Schwarz waveform relaxation, fractional differential equations, parameter optimization, asymptotic analysis

Title: Laplace inversion for the solution of an abstract heat equation without the forward transform of the source term

Authors: Shu-Lin Wu

Sources: *Journal of Numerical Mathematics*, DOI 10.1515/jnma-2016-1014 (A2)

Abstract: We consider the discretization in time of inhomogeneous parabolic equations, using the technique of Laplace inversion along a contour located in the complex left halfplane which, after transformation to a finite interval, is then evaluated to high accuracy by a contour quadrature rule. This reduces the problem to a finite set of elliptic equations with complex coefficients, which may be solved in parallel. A serious problem is how to treat the source term $f(t)$, because at each quadrature node along the contour we need its Laplace forward transform, which unfortunately is often unavailable. In this paper, we propose a new contour quadrature which does not require direct use of the Laplace forward transform of $f(t)$. Compared to the existing contour quadratures, error analysis shows that the new quadrature possesses competitive asymptotic order of accuracy and numerical results show that when regularity of the initial term and/or differentiability of $f(t)$ is not satisfied, the new quadrature is more accurate.

Key Words: Laplace inversion, Contour integral, Laplace forward transform.

Title: Parameter Optimization in Waveform Relaxation for Fractional-Order RC Circuits

Authors: Shu-Lin Wu, Mohammad Al-Khaleel

Sources: *IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS–I: REGULAR PAPERS*, VOL. 64, NO. 7, JULY 2017 (A2)

Abstract: The longitudinal waveform relaxation (WR) proposed by Gander and Ruehli

converges faster than the classical WR method. For the former, a free parameter α is contained, which has a significant effect on the convergence rate. The optimization of this parameter is thus an important issue in practice. Here, we apply this new WR method to the fractional-order RC circuits, and optimize such a parameter at the continuous and discrete levels (this gives two parameters α_{opt} and α_{dopt}). We consider three simple but widely used convolution quadrature for discretization, based on the implicitEuler method, the two-step backward difference formula, and the trapezoidal rule, and we derive the parameter α_{dopt} for each quadrature. Interestingly, it is found that for the former two quadratures, the optimized parameter α_{dopt} results in a much better convergence rate than α_{opt} , while for the quadrature based on the trapezoidal rule, α_{dopt} and α_{opt} result in the same convergence rate.

Key Words: Waveform relaxation, fractional RC circuits, parameter optimization, circuit simulation.

Title: An efficient parareal algorithm for a class of time-dependent problems with fractional Laplacian

Authors: Shulin Wu

Sources: *Applied Mathematics and Computation* 307(2017)329-341 (A2)

Abstract: Time-dependent diffusion equations with fractional Laplacian have received

considerable attention in recent years, for which numerical methods play an important role because a simple and analytic solution is often unavailable. We analyze in this paper a parareal algorithm for this kind of problem, which realizes parallel-in-time computation. The algorithm is iterative and uses the 3rd-order SDIRK (singly diagonally implicit Runge-Kutta) method with a small step-size τ as the F-propagator and the implicit-explicit Euler method with a large step-size T as the G-propagator. The two step-sizes satisfy $T / \tau = J$ with $J \geq 2$ being an integer. Using the implicit-explicit Euler method as the G-propagator potentially improves the parallel efficiency but complicates the analysis. By employing some technical analysis, we provide a sharp estimate of the convergence rate, which is independent of the mesh ratio J and the distribution of the eigenvalues of the coefficient matrix. The convergence rate for the time-periodic conditions is also given. Several numerical experiments are carried out to verify the theoretical results.

Keywords: Parareal algorithm, Fractional Laplacian, Implicit-explicit Euler method 3rd-order SDIRK method, Convergence analysis

Title: Fast parareal iterations for fractional diffusion equations

Authors: Shu-Lin Wu, Tao Zhou

Sources: *Journal of Computational Physics* 329 (2017) 210–226(A1)

Abstract: Numerical methods for fractional PDEs is a hot topic recently. This work is concerned with the parareal algorithm for system of ODEs $u'(t) + Au(t) = f$ that arising from semi-discretizations of time-dependent fractional diffusion equations with nonsymmetric Riemann–Liouville fractional derivatives. The spatial semi-discretization of this kind of fractional derivatives often results in a coefficient matrix A with spectrum $\sigma(A)$ satisfying $\sigma(A) \subseteq \{ \lambda \in \mathbb{C} : \Re(\lambda) \leq -\eta \}$, where $\eta > 0$ is a measure of dissipativity of the differential equations. To accelerate the parareal algorithm, we propose a scaled model $u'(t) + \alpha A u(t) = f$ (with $\alpha > 0$) to serve the coarse grid correction, which is an important component of our parareal algorithm. Given η and α , we derive a sharp bound of the convergence factor of the parareal iterations. Moreover, by minimizing such a bound we get optimized scaling factor α_{opt} . It is shown that, compared to $\alpha = 1$ (i.e., the classical implementation pattern of the coarse grid correction), the optimized scaling factor significantly improves the convergence rate. Numerical examples are presented to support the theoretical finding.

Keywords : Parareal algorithm , Fractional PDEs , Convergence analysis , Parameter optimization

Title: Nonoverlapping Schwarz Waveform Relaxation Algorithm for a Class of Time-Fractional Heat Equations

Authors: Shu-Lin Wu

Sources: *Fundamenta Informaticae* 151 (2017) 231–240, DOI 10.3233/FI-2017-1489 (A4)

Abstract: In this paper, we analyze the convergence properties of the Schwarz waveform relaxation (SWR) algorithm with Robin transmission conditions (TCs) for a class of heat equations with Riemann–Liouville fractional derivative. The Robin TCs contain a free parameter, which has a significant effect on the convergence rate of the SWR algorithm, and optimizing this parameter is an important step for the convergence analysis of the SWR algorithm. By studying the monotonic properties of the convergence factor obtained by applying the Fourier transform to the error functions, we provide a reliable choice of the Robin parameter in the nonoverlapping case. Numerical results are provided, which show that the analyzed Robin parameter results in satisfactory convergence rate.

Keywords: Schwarz waveform relaxation, fractional heat equations, parameter optimization

Title: Optimized Overlapping Schwarz Waveform Relaxation for a Class of Time-Fractional Diffusion Problems

Author: Shu-Lin Wu

Sources: *J Sci Comput* (2017) 72:842–862 DOI 10.1007/s10915-017-0379-x (A2)

Abstract: For parabolic PDEs with integer-order temporal derivative, if we use the Schwarz waveform relaxation (SWR) algorithm with Robin transmission conditions as the solver, the so-called *equioscillation* principle is an important concept to get a good Robin parameter, which has a significant effect on the convergence rate of the algorithm. Surprisingly, as we show in this paper such a principle may result in rather disappointing Robin parameter for the SWR algorithm when we use it to solve time-fractional PDEs. For a class of time-fractional diffusion equations, by analyzing a new min–max problem we get much better Robin parameter, which is found very close to the best one that we can make through numerical optimizations and numerical experiments. To use the SWR algorithm in practice, we apply the kernel reduction technique proposed recently by Baffet and Hesthaven to treat the convolutions with kernel function of the form $K_\gamma(t) = t^{-\gamma}/\Gamma(1-\gamma)$, where $\gamma \in (0, 1)$. For time-fractional PDEs with this kind of kernel function, the kernel reduction technique results in efficient *one-step* numerical schemes. Numerical results obtained by using this technique confirm our theoretical conclusions very well.

Keywords: Schwarz waveform relaxation · Time-fractional diffusion · Parameter optimization · Convergence analysis

Title: Three rapidly convergent parareal solvers with application to time-dependent PDEs with fractional Laplacian

Authors: Shu-Lin Wu

Sources: *Mathematical Methods in the Applied Sciences* (A3)

Abstract: Time-dependent PDEs with fractional Laplacian play a fundamental role in many fields and approximating usually leads to ODEs' system like $u'(t) = -A u(t) + g(t)$ with $A \in \mathbb{R}^{m \times m}$, where $A \in \mathbb{R}^{m \times m}$ is a sparse symmetric positive definite matrix and $\alpha > 0$ denotes the fractional order. The parareal algorithm is an ideal solver for this kind of problems, which is iterative and is characterized by two propagators G and F . The propagators G and F are respectively associated with large step size T and small step size t , where $T = Jt$ and $J \geq 2$ is an integer. If we fix the G -propagator to the Implicit-Euler method and choose for F some proper Runge–Kutta (RK) methods, such as the second-order and third-order singly diagonally implicit RK methods, previous studies show that the convergence factors of the corresponding parareal solvers can satisfy $\frac{1}{3}$, $\frac{8}{J+2}$ and $\frac{8}{J+1}$, where λ is the spectrum of the matrix A . In this paper, we show that by choosing these two RK methods as the F -propagator, the convergence factors can reach $\frac{1}{12}$, provided the one-stage complex Rosenbrock method is used as the G -propagator. If we choose for both G and F , the complex Rosenbrock method, we show that the convergence factor of the resulting parareal

solver can also reach 10^{-12} . Numerical results are given to support our theoretical conclusions. Copyright © 2017 John Wiley & Sons, Ltd.

Keywords: Parareal; fractional Laplacian; complex Rosenbrock method; convergence analysis

Title: Topological Dynamics of Zadeh's Extension on Upper Semi-Continuous Fuzzy Sets

Authors: Xinxing Wu, Xianfeng Ding, Tianxiu Lu, Jianjun Wang

Sources: *International Journal of Bifurcation and Chaos*, Vol. 27, No. 10 (2017) 1750165 (13 pages) (A2)

Abstract: In this paper, some characterizations are obtained on the transitivity, mildly mixing property, α -transitivity, equicontinuity, uniform rigidity and proximality of Zadeh's extensions restricted on some invariant closed subsets of all upper semi-continuous fuzzy sets in the level-wise metric. In particular, it is proved that a dynamical system is weakly mixing (resp., mildly mixing, weakly mixing and α -transitive, equicontinuous, uniformly rigid) if and only if the corresponding Zadeh's extension is transitive (resp., mildly mixing, α -transitive, equicontinuous, uniformly rigid).

Keywords: Zadeh's extension; transitivity; mildly mixing; equicontinuous; rigidity.

Title: A feasible flow-based iterative algorithm for the two-level hierarchical time minimization transportation problem

Authors: Fanrong Xie, Muhammad Munir Butt, Zuoan Li

Sources: *Computers and Operations Research* 86 (2017) 124–139 (A2)

Abstract: The THTMTP (two-level hierarchical time minimization transportation problem) is an important problem arising in industries. In literature, there are only two approaches with shortcomings to solve the problem. In this paper, the THTMTP is formulated as a mathematical model applicable to the case in which the total available supply at the sources is no less than the total demand at the destinations. A feasible flow-based iterative algorithm named THTMTP-A is proposed to solve the THTMTP by constructing network with lower and upper arc capacities. It is proved that the THTMTP-A algorithm can find the optimal solution to the THTMTP in a polynomial time. The proposed THTMTP-A algorithm has good performance in terms of computer implementation, computational time and required memory for computation, and hence overcomes successfully the shortcomings of the two existing approaches. Computational experiments validate that the THTMTP-A algorithm is an efficient and other related optimization problems.

Keywords: Transportation problem Hierarchical optimization Polynomial algorithm Network with lower and upper arc capacities

Title: An upper bound on the minimal total cost of the transportation problem with varying demands and supplies

Authors: Fanrong Xie , Muhammad Munir Butt , Zuoan Li , Linzhi Zhu

Sources: *Omega* ,68 (2017) 105–118 (A1)

Abstract: In general cases, to find the exact upper bound on the minimal total cost of the transportation problem with varying demands and supplies is an NP-hard problem. In literature, there are only two approaches with several shortcomings to solve the problem. In this paper, the problem is formulated as a bi-level programming model, and proven to be solvable in a polynomial time if the sum of the lower bounds for all the supplies is no less than the sum of the upper bounds for all the demands; and a heuristic algorithm named TPVDS-A based on genetic algorithm is developed as an efficient and robust solution method of the model. Computational experiments on benchmark and new randomly generated instances show that the TPVDS-A algorithm outperforms the two existing approaches.

Keywords: Genetic algorithms Transportation problem Transportation problem with varying demands and supplies Bounds on the minimal total cost Upper bound on the minimal total cost

Title: A Class of New General Iteration Approximation of Common Fixed Points for Total Asymptotically Nonexpansive Mappings in Hyperbolic Spaces

Authors: Ting-jian Xiong and Heng-you Lan

Sources: *J. COMPUTATIONAL ANALYSIS AND APPLICATIONS*, VOL. 23, NO.6, 2017, COPYRIGHT 2017 EUDOXUS PRESS, LLC (A4)

Abstract: In this paper, we introduce and study a class of new general iteration processes for two finite families of total asymptotically nonexpansive mappings in hyperbolic spaces, which includes asymptotically nonexpansive mapping, (general-ized) nonexpansive mapping of all normed linear spaces, Hadamard manifolds and CAT(0) spaces as special cases. Some important related properties to the new general iterative processes are also given and analyzed, and Δ -convergence and strong convergence of the iteration in hyperbolic spaces are proved. Furthermore, some meaningful illustrations for clarifying our results and two open questions are proposed. The results presented in this paper extend and improve the corresponding results announced in the current literature.

Keywords: common fixed point, new general iterative approximation, Δ -convergence and strong convergence, total asymptotically nonexpansive mapping, hyperbolic space.

Title: Group signature scheme based on verifiable random number

Authors: Jun Ye , Liufen Li

Sources: *Journal of Discrete Mathematical Sciences & Cryptography* Vol. 20 No. 2, pp. 525–533

Abstract: With linear equations on finite field, a method to generate verifiable random number is presented. Further, a novel group signature scheme based on that method is designed, which is the first scheme of the application of the verifiable random number on group signature. Member adding and removing can be expediently realized in this scheme. And private keys of members are not needed to be reset in different stages. Finally, comparisons with other schemes related are made to show advantages of ours’.

Keywords: Group Signature, Verifiable Random Number, Linear Equations

Title: Optimal replacement policy based on maximum repair time for a random shock and wear model

Authors: Miaomiao Yu, Yinghui Tang

Sources: *Author's personal copy TOP* (2017) 25:80–94 (A4)

Abstract: We study a δ shock and wear model in which the system can fail due to the frequency of the shocks caused by external conditions, or aging and accumulated wear caused by intrinsic factors. The external shocks occur according to a Bernoulli process, i.e., the inter-arrival times between two consecutive shocks follow a geometric distribution. Once the system fails, it can be repaired immediately. If the system is not repairable in a pre-specific time D , it can be replaced by a new one to avoid the unnecessary expenses on repair. On the other hand, the system can also be replaced whenever its number of repairs exceeds N . Given that infinite operating and repair times are not commonly encountered in practical situations, both of these two random variables are supposed to obey general discrete distribution with finite support. Replacing the finite support renewal distributions with appropriate phase-type (PH) distributions and using the closure property associated with PH distribution, we formulate the maximum repair time replacement policy and obtain analytically the long-run average cost rate. Meanwhile, the optimal replacement policy is also numerically determined by implementing a two-dimensional-search process.

Keywords: Phase-type distribution · Finite support · δ shock and wear model · Maximum repair time · Average cost rate

Title: The Application of Fragmentation Learning Method in Mathematics Curriculum in the University

Authors: Haiyan Zhang , Mengxue Li

Sources: *International Education & Research Journal* / Volume : 3 / Issue : 11 / Nov 2017

Abstract: The arrival of the mobile Internet era, promoting the "fragmentation" of information acquisition and information consumption, "fragmentation" has become one of the main features through mobile media. The information of fragmentation brought by mobile media is too unfocused, and could specifically interact after regular integration. Mathematics is a subject that contents are multifarious and disorderly, at the same time, having logical and well-structured feature .Classroom learning has been unable to meet the individual, community and society needs. As response to the development of society in the future, everyone should be a self-directed or lifelong learner. With autonomous learning research framework of Zimmerman, according to the six core issues, create special pieces of independent learning framework based on the method of fragmentation learning. In this paper, the process of the establishment of independent learning framework, first set up a semantic diagram model based on system learning, according to the model, knowing what you're learning, so as to carry out the fragmented learning of University Mathematics Curriculum.

Keywords: Fragmentation; Mathematics; Autonomic learning; Semantic diagram model.

Title: Discrete-time projection neural network methods for computing the solution of variational inequalities

Authors: Liping Zhang, Shu-Lin Wu

Sources: *J. Nonlinear Sci. Appl.* 10(2017), 1896-1907(A2)

Abstract: Neural networks are useful tools to solve mathematical and engineering problems. By using the implicit-explicit- θ method and the method proposed recently by Mohamad to discretize the continuous-time neural networks, we formulate two classes of discrete-time analogues to solve a system of variational inequalities. By adopting suitable Lyapunov functions and Razumikhintype techniques, exponential stability of the discrete neural networks are established in terms of linear matrix inequalities (LMIs). Several numerical experiments are performed to compare the convergence rates of the proposed discrete neural networks and it is shown that:

- (a) all of the discrete neural networks converge faster as the step size becomes larger;
- (b) the discrete neural networks derived by the semi-implicit Euler method performs best.

Keywords: Neural networks, linear matrix inequalities (LMIs), variational inequalities, discretization.

Title: A quantitative approach to syndetic transitivity and topological ergodicity

Authors: Yu Zhao, Risong Li, Tianxiu Lu, Ru Jiang, Hongqing Wang, Haihua Liang

Sources: *J. Nonlinear Sci. Appl.*, 10 (2017), 4680–4686(A2)

Abstract: In this paper, we give new quantitative characteristics of degrees of syndetical transitivity and topological ergodicity for a given discrete dynamical system, which are nonnegative real numbers and are not more than 1. For selfmaps of many compact metric spaces it is proved that a given selfmap is syndetically transitive if and only if its degree of syndetical transitivity is 1, and that it is topologically ergodic if and only if its degree of topological ergodicity is one. Moreover, there exists a selfmap of $[0, 1]$ having all degrees positive.

Keywords: Sensitivity, syndetically sensitive, ergodically sensitive, multi-sensitive, cofinitely sensitive, Furstenberg families.

Title: Ulam-Hyers stability, well-posedness and limit shadowing property of the fixed point problems for some contractive mappings in M_s -metric spaces

Authors: Mi Zhoua, Xiao-lan Liu, Yeol Je Chod., Bořsko Damjanovi

Sources: *J. Nonlinear Sci. Appl.*, 10 (2017), 2296–2308(A2)

Abstract: In this paper, first, we introduce several types of the Ulam-Hyers stability, the well-posedness and the limit shadowing property of fixed point problems in M_s -metric spaces. Second, we give such results for fixed point problems of Banach and Kannan contractive mappings in M_s -metric spaces. Finally, we give some examples to illustrate the validity of our main results. .

Keywords: Fixed point problem, Ulam-Hyers stability, well-posedness, limit shadowing property, M_s -metric spaces.

Title: Pond Water Purification Model

Authors: Qin Wang, Wenwen Tan, Qianjin Wang and Liufen L

Sources: *International Journal of Artificial Intelligence and Mechatronics*, Volume 5, Issue 6

Abstract: The pollution problem of freshwater aquaculture is becoming more and more serious. In order to control the pollution, in this paper, the idea of biological inhibition is used. First, the growth of fish is analyzed. Then, based on the curve fitting and linear programming, the number of fish that manage algal bloom is solved. Not only the farming production is improved, but also environmental pollution is reduced, and the benefits of freshwater aquaculture are improved. This technique is a realistic significance to fresh water aquaculture industry.

Keywords: Freshwater Fish Farming, Time and Weight Models, Time and Body Model, Water Purification.

Title: Exact traveling wave solutions and L^1 stability for the shallow water wave model of moderate amplitude

Authors: Ying Wang, Yunxi Guo

Sources: *Analysis and Mathematical Physics*, September 2017, Volume 7, Issue 3, pp 245–254 (A4)

Abstract: In this paper, we developed, for the first time, the exact expressions of several periodic travelling wave solutions and a solitary wave solution for a shallow water wave model of moderate amplitude. Then, we present the existence theorem of the global weak solutions. Finally, we prove the stability of solution in $L^1(\mathbb{R})$ space for the Cauchy problem of the equation.

Keywords: Travelling wave · Existence · L^1 stability · The model equation for shallow water of moderate amplitude