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Editorial

Mathematical Theories and Applications for Nonlinear Control Systems

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Nonlinear control is without doubt a very popular research field in modern control theory. Compared with linear systems, nonlinear control has more applications in practice, and the related problems of nonlinear control exhibit more complexity. Although nonlinear control theory and application have made great progress in recent years, there are still a lot of new and challenging problems existing in the areas of theory analysis and applications, which cover the fields of multiobjective control, design of regulating and tracking systems, fault estimation, nonlinear robust H_∞ control and filtering, stability and stabilization, etc. These problems merit further study by using more advanced theories and tools.

This special issue will focus on nonlinear control systems together with their applications to control, filtering, communication, manufacturing, fault detection, and systems biology. The collection of papers with different areas of nonlinear systems clearly points to the need for communication between researches of these areas.

The paper entitled "A Time-Replacement Policy for Multistate Systems with Aging Components under Maintenance, from a Component Perspective" by C.-H. Huang and C.-H. Wang studies multistate systems (MSSs) with aging multistate components (MSCs) to construct a time-replacement policy and determine the optimal time. Traditional mathematics cannot acquire accurate explicit expressions. To overcome this difficulty, this paper uses Markov reward models and the bound approximation approach to assess rewards of MSSs with MSCs, including such things as total maintenance costs and the benefits of the system staying in acceptable working states.

R. Li et al. in the paper entitled "Research on Instability Boundaries of Control Force for Trajectory Correction Projectiles" propose a novel method to derive instability boundaries for the control force magnitude. By introducing the concept of angular compensation matrix, the exterior ballistic linearized equations considering control force are established. The necessary prerequisite for a stable flight under control is given by the Routh stability criterion. The instability boundaries for the control force magnitude are derived.

The paper by G. Liu et al. entitled "Dynamical Analysis and Optimal Harvesting Strategy for a Stochastic Delayed Predator-Prey Competitive System with Lévy Jumps" develops a theoretical framework to investigate optimal harvesting control for stochastic delay differential systems. The authors first propose a novel stochastic two-predator and one-prey competitive system subject to time delays and Lévy jumps. Some sufficient conditions for persistence in mean and extinction of three species are obtained by using the stochastic qualitative analysis method. The optimal harvesting effort and the maximum of expectation of sustainable yield are derived from the Hessian matrix method and optimal harvesting theory of delay differential equations.

The paper entitled "Nonlinear Hybrid Multipoint Model of High-Speed Train with Traction/Braking Dynamic and Speed Estimation Law" by C. Jia et al. establishes a nonlinear hybrid multipoint model (NHMPM) for a high-speed train (HST) with the traction/braking dynamic and speed estimation law. A full-order flux observer is designed by using regional pole assignment theory to calculate the

electromagnetic torque. The basic running resistance force is reformulated by considering the aerodynamic drag distribution characteristics, and the nonlinear coupling force is analyzed as well.

F. Ma et al. in the paper entitled "Start-Up Process Modelling of Sediment Microbial Fuel Cells Based on Data Driven" study a typical microbial fuel cell, called sediment microbial fuel cells (SMFCs). This paper uses online monitoring technology to accurately measure the temperature, pH, and voltage of the microbial fuel cell during the start-up process. Experimental results show that the purpose of rapid growth of power production can be achieved at the initial stage of SMFC. At the beginning of SMFC, when the temperature changes drastically, pH will change the same first, and then there will be a certain degree of rebound. In the middle stage of SMFC start-up, even if the temperature will return to normal after the change, a continuous temperature drop in a short time will lead to a continuous decrease in pH value.

The paper by H. Kong and B. Yu entitled "A Moving Object Indoor Tracking Model Based on Semiactive RFID" studies the weak anti-interference and low accuracy problem of moving object indoor tracking based radio frequency identification devices (RFID) and presents a moving object indoor tracking model based on semiactive RFID. This model acquires scene location information through RFID low frequency triggers preinstalled and adopts an improved particle filter algorithm, which can increase the diversity of the particles, overcome the particle impoverishment, and reduce the tracking error.

J. An et al. in the paper entitled "Iterative Learning Control for Nonlinear Weighing and Feeding Process" use a piecewise linearization method for the nonlinear problem and discuss the application of iterative learning control in the weighing and feeding process. The nonlinear problem and the repeatability are discussed based on dynamic analysis of the weighing and feeding process. A linear state space model is established with a piecewise linearization method, and iterative learning controller is presented by utilizing repetitive characteristics.

The paper by Y. Sun et al. entitled "A High-Precision Rotor Position and Displacement Prediction Method Specially for Bearingless Permanent Magnet Synchronous Motor" studies a rotor displacement and position prediction method based on a kernel extreme learning machine. The high performance sensorless performance of the bearingless permanent magnet synchronous motor (BPMSM) is the main direction to improve the reliability of the drive system and reduce the cost of the system. On the basis of the mathematical model of BPMSM, this method predicts the position and displacement of the rotor according to the current and flux linkage of suspension windings and torque windings by a kernel extreme learning machine (KELM).

E. Köse and A. Mühürcü in the paper entitled "Comparative Controlling of the Lorenz Chaotic System Using the SMC and APP Methods" provide two different controller models for the Lorenz chaotic system. Adaptive pole placement and sliding mode control (SMC) methods are proposed for the establishment of the continuous time Lorenz chaotic system. An improved controller structure is developed first theoretically for both the controller methods and then tested practically using the numerical samples. During the establishment of the adaptive pole placement method for the Lorenz chaotic system, various stages were applied. The chaotic system reached an equilibrium point by using both the SMC and adaptive pole placement methods.

The paper entitled "On an Application of the Absolute Stability Theory to Sampled-Data Stabilization" by A. N. Churilov considers a nonlinear Lur'e-type plant with a sector bound nonlinearity. The plant is stabilized by a discrete-time feedback signal with a nonperiodic uncertain sampling. The sampling control function is nonlinear and also obeys some sectoral constraints at discrete (sampling) times. The linear matrix inequality (LMI) conditions for the stability of the closed-loop system are obtained.

H.-M. Lee et al. in the paper entitled "Further Results on Sampled-Data Synchronization for Complex Dynamical Networks with Time-Varying Coupling Delay" deal with the sampled-data synchronization problem for complex dynamical networks (CDNs) with time-varying coupling delay. The two-sided free-weighting stabilization method is utilized with a novel looped functional by taking the information of the present sampled states and next sampled states, which can more precisely account for the sawtooth shape of the sampling delay. The quadratic generalized free-weighting matrix inequality (QGFWMI) is utilized to calculate the upper limit of the integral term. Based on the novel looped functional and QGFWMI, improved conditions of stability are derived from forms of linear matrix inequalities (LMIs).

The paper by G. Zhao entitled "Modeling and Stability Analysis for Markov Jump Networked Evolutionary Games" investigates the algebraic formulation and stability analysis for a class of Markov jump networked evolutionary games by using the semitensor product method and presents a number of new results. A proper algorithm is constructed to convert the given networked evolutionary games into an algebraic expression. Based on the algebraic expression, the stability of the given game is analyzed and an equivalent criterion is given.

X. Li et al. in the paper entitled "Exponential Stability of Antiperiodic Solution for BAM Neural Networks with Time-Varying Delays" consider a kind of BAM neural networks with leakage delays in the negative feedback terms and time-varying delays in activation functions. By constructing a suitable Lyapunov function and using inequality techniques, some sufficient conditions to ensure the existence and exponential stability of antiperiodic solutions of these neural networks are derived.

Y. Sun et al. entitled in the paper "Maximum Power Point Tracking of DFIG with DC-Based Converter System Using Coordinated Feedback Linearization Control" present a coordinated feedback linearization strategy (CFLS) for a DC-based doubly fed induction generator (DFIG) system to track the maximum power point. The stator and rotor of the DFIG are connected to the DC grid directly by two voltage source converters. Compared with a traditional DFIG system, the DC-based DFIG system has more system inputs

and coupling, which increases the difficulty of vector control strategy.

The paper by Y. Wang et al. entitled "Fractional-Order Adaptive Backstepping Control of a Noncommensurate Fractional-Order Ferroresonance System" applies fractional calculus to establish a novel fractional-order ferroresonance model with fractional-order magnetizing inductance and capacitance. A novel fractional-order adaptive controller is designed in terms of the fractional Lyapunov stability theorem. The proposed control strategy requires only one control input and can force the output of the chaotic system to track the reference signal asymptotically.

The paper entitled "Hot Spot Data Prediction Model Based on Wavelet Neural Network" by M. Zhang and W. Chen improves the performance of data migration between a solid-state hard disk and hard disk. The novel hybrid multilevel storage system will be popular with SSD being integrated into traditional storage systems. The hot data block prediction model based on a wavelet neural network is built and trained by using historical data. Experimental results show that the proposed model has better accuracy and faster learning speed than the BP neural network model. It has better generalization ability and robustness. This model can be applied to the data migration of distributed hybrid storage systems to improve performance.

X. Zhao et al. in the paper entitled "Optimization Problem of Insurance Investment Based on Spectral Risk Measure and RAROC Criterion" introduce spectral risk measure (SRM) into the optimization problem of insurance investment. The authors establish an optimization model aiming at maximizing risk-adjusted return of capital (RAROC) involved with spectral risk measure. The theoretical result is derived and empirical study is displayed under different risk measures and different confidence levels comparatively. The result shows that risk attitude has a significant impact on investment strategy. With the increase of risk aversion factor, the investment ratio of risk asset correspondingly reduces.

The paper entitled "Optimal Control Based on the Polynomial Least Squares Method" by C. Bota et al. presents an approach for computing an optimal control law based on the Polynomial Least Squares Method (PLSM). The initial optimal control problem is reformulated as a variational problem whose corresponding Euler-Lagrange equation is solved by using the PLSM. A couple of examples emphasize the accuracy of the method.

The paper by Y. Ren et al. entitled "Research on Time-Space Fractional Model for Gravity Waves in Baroclinic Atmosphere" derives the integer order mKdV equation to describe the gravity solitary waves which occur in the baroclinic atmosphere. By employing the semi-inverse and variational method, a new model under the Riemann-Liouville derivative definition is obtained. The symmetry analysis and the nonlinear self-adjointness of the space-time fractional mKdV (STFmKdV) equation are carried out and the conservation laws are analyzed. By adopting the $\exp(-\Phi(\xi))$ method, five different solutions of the STFmKdV equation are obtained.

S. Kong et al. in the paper entitled "Estimation and Fault Diagnosis of Lithium-Ion Batteries: A Fractional-Order System Approach" investigate the estimation and fault diagnosis of a fractional-order lithium-ion battery system. Two simple and common types of observers are designed to address the design of fault diagnosis and estimation for the fractional-order systems. Fractional-order Luenberger observers are employed to generate residuals which are used to investigate the feasibility of model based fault detection and isolation. The notion of stability in the sense of Mittag-Leffler is first introduced to discuss the state estimation error dynamics. The design of the Luenberger observer as well as the sliding mode observer can accomplish fault detection, fault isolation, and estimation. The effectiveness of the proposed strategy on a three-cell battery string system is demonstrated.

The paper by C.-Q. Ma and W.-G. Sun entitled "Bipartite Consensus for Multiagent Systems via Event-Based Control" studies bipartite consensus for first-order multiagent systems. To improve resource utilization, event-based protocols are considered for bipartite consensus. A new type of control gain is designed in the proposed protocols. By appropriate selection of control gains, the convergence rate of the closed-loop system can be adjusted. It can be found that the system will not show Zeno behavior.

The paper entitled "H_∞ Control for Nonlinear Infinite Markov Jump Systems" by Y. Liu and T. Hou discusses the infinite horizon H_∞ control problem for a class of nonlinear stochastic systems with state, control, and disturbance dependent noise. The jumping parameters are modeled as an infinite-state Markov chain. Based on the solvability of a set of coupled Hamilton-Jacobi inequalities (HJIs), the exponential mean square H_∞ controller for the considered nonlinear stochastic systems is obtained.

Y. Chen et al. in the paper entitled "A New Robust Nonfragile Controller Design Scheme for a Class of Hybrid Systems through Piecewise Affine Models" investigate the robust H_∞ nonfragile control problem for a class of discrete-time hybrid systems based on piecewise affine models. By employing a state-control augmentation methodology, some new sufficient conditions for the controller synthesis are formulated based on piecewise Lyapunov functions (PLFs). Controller gains can be obtained via solving a set of linear matrix inequalities.

W. Hu in the paper entitled "A New Stability Criterion for Neutral Stochastic Delay Differential Equations with Markovian Switching" investigates a new stability theorem for neutral stochastic delay differential equations with Markovian switching. By applying the stochastic analysis technique and Razumikhin stability approach, a novel criterion of the pth moment exponential stability is derived for the related systems. The feature of the criterion shows that the estimated upper bound for the diffusion operator of the Lyapunov function is allowed to be indefinite, even if it is unbounded, which can loosen the constraints of the existing results.

Based on the adaptive sliding mode control technique, J. Zhao et al. in the paper entitled "A Novel Nonlinear Fault Tolerant Control for Manipulator under Actuator Fault" propose a fault tolerant control (FTC) scheme for a manipulator with actuator fault. The dynamic model of the manipulator is introduced and its actuator faulty model is established. A fault

tolerant controller is designed, in which both the parameters of actuator fault and external disturbance are estimated and updated by online adaptive technology.

The paper entitled "Finite-Time Stabilization for Stochastic Inertial Neural Networks with Time-Delay via Nonlinear Delay Controller" by D. Li et al. pays close attention to the problem of finite-time stabilization related to stochastic inertial neural networks with or without time delay. By establishing a proper Lyapunov-Krasovskii functional and making use of matrix inequalities, some sufficient conditions on finite-time stabilization are obtained and the stochastic settling-time function is also estimated. In order to achieve the finite-time stabilization, both delayed and nondelayed nonlinear feedback controllers are designed, respectively.

J. A. Colunga et al. in the paper entitled "Predefined-Time Consensus of Nonlinear First-Order Systems Using a Time Base Generator" propose a couple of consensus algorithms for multiagent systems. The proposed consensus protocols are based on the so-called time base generators (TBGs), which are time-dependent functions used to build time-varying control laws. One of the proposed protocols is based on the super-twisting controller, providing robustness against disturbances while maintaining the predefined-time convergence property. It is shown that the proposed TBG protocols represent an advantage not only in the possibility to define a settling time but also in providing smoother and smaller control actions than existing finite-time, fixed-time, and predefined-time consensus.

The paper entitled "On Leaderless and Leader-Following Consensus for Heterogeneous Nonlinear Multiagent Systems via Discontinuous Distributed Control Protocol" by F. Wang and Y. Yang concerns the consensus of heterogeneous nonlinear multiagent systems via distributed control. Both the cases of leaderless and leader-following consensus are systematically investigated. Different from some existing results, completed consensus can be reached in this paper among heterogeneous multiagent network instead of bounded consensus. A novel distributed control protocol is proposed, and some general consensus criteria are derived for multiagent systems without a leader.

The paper by X. Lin et al. entitled "H_∞ Robust Tracking Control of Stochastic T-S Fuzzy Systems with Poisson Jumps" designs a robust adaptive H_∞ tracking control for nonlinear stochastic systems with both Brownian motion and Poisson jumps, which is based on Takagi-Sugeno (T-S) type fuzzy techniques. By using the fuzzy systems to approximate the nonlinear systems, an adaptive fuzzy control is employed to achieve the desired H_∞ tracking performance for stochastic systems with exogenous disturbance.

The paper by C. Guo and K. Zhang entitled "Global Output Feedback Stabilization of Nonlinear Systems with a Time-Varying Power and Unknown Output Function" studies the problem of global output feedback stabilization for a class of nonlinear systems with a time-varying power and unknown output function. For nonlinear systems with a time-varying power and unknown continuous output function, by constructing a new nonlinear reduced-order observer together with adding a power integrator method, a new function to determine the maximal open sector Ω of output function is given. As long as the output function belongs to any closed sector included in Ω, it is shown that the equilibrium point of the closed-loop system can be guaranteed to be globally uniformly asymptotically stable by an output feedback controller.

Y. Guan and X. Song in the paper entitled "Unbiased Minimum Variance Estimation for Discrete-Time Systems with Measurement Delay and Unknown Measurement Disturbance" address the state estimation problem for stochastic systems with unknown measurement disturbances any prior information of which is unknown and which has measurement delay resulting from the inherent limited bandwidth. For such complex systems, the Kalman-like one-step predictor independent of unknown measurement disturbances is designed based on the linear unbiased minimum variance criterion and the reorganized innovation analysis approach.

The paper entitled "Trajectory Design and Tracking Control for Nonlinear Underactuated Wheeled Inverted Pendulum" by S. Gong et al. studies an underactuated wheeled inverted pendulum (UWIP) system. The motion planning problem for this nonlinear system is difficult to solve because of the existence of an uncontrollable manifold in the configuration space. A method of designing motion trajectory for this underactuated system is presented. The tracking control of the UWIP for the constructed trajectory is also studied.

H. Wang and L. Zhao in the paper entitled "A Nonhomogeneous Multivariable Grey Prediction NMGM Modeling Mechanism and Its Application" propose a novel nonhomogeneous multivariable grey prediction model termed $\mathrm{NMGM}(a, m, k^\alpha)$ to deal with those data sequences that are not in accord with homogeneous index trend. Based on grey prediction theory, by the least squares method and solutions of differential equations, the modeling mechanism and time response function of the proposed model are expounded. A case study demonstrates that the novel model provides preferable prediction performance compared with the traditional $\mathrm{MGM}(1, m)$ model.

The paper by L. Wang et al. entitled "Adaptive Fuzzy Command Filtered Control for Chua's Chaotic System" proposes the command filtered adaptive fuzzy backstepping control (AFBC) approach for Chua's chaotic system with external disturbance. Based on two proposed first-order command filters, the convergence of tracking errors as well as the problem of "explosion of complexity" in the traditional backstepping design procedure is solved. Fuzzy logic systems (FLSs) are used to identify the system uncertainties in real time. The proposed controller can guarantee that all signals in the closed-loop system remain bounded, and tracking errors converge to a small region eventually.

The paper entitled "A New Approach to Adaptive Stabilization of Stochastic High-Order Nonholonomic Systems" by G. Li and K. Zhang studies the problem of adaptive stabilization for a class of stochastic high-order nonholonomic systems. Under the weaker assumptions, by constructing the appropriate Lyapunov function and combining the sign function technique, an adaptive state feedback

controller is designed to guarantee global asymptotic stability in probability of the closed-loop system. The effectiveness of the controller is demonstrated by a mechanical system.

D. Liu et al. in the paper entitled "Stochastic Stability Analysis of Coupled Viscoelastic Systems with Nonviscously Damping Driven by White Noise" investigate stochastic stability of a coupled viscoelastic system with nonviscous damping driven by white noise through moment Lyapunov exponents. By using the coordinate transformation, coupled Itô stochastic differential equations are obtained. The problem of the moment Lyapunov exponent is transformed to the eigenvalue problem, and then the second-perturbation method is used to derive the moment Lyapunov exponent of the coupled stochastic system.

The paper by X. Qin entitled "The Adaptive Neural Control for a Class of High-Order Uncertain Stochastic Nonlinear Systems" studies the problem of the adaptive neural control for a class of high-order uncertain stochastic nonlinear systems. By using some techniques such as the backstepping recursive technique, Young's inequality, and approximation capability, a novel adaptive neural control scheme is constructed. The proposed control method can guarantee that the signals of the closed-loop system are bounded in probability, and only one parameter needs to be updated online.

The paper entitled "Adaptive Parallel Simultaneous Stabilization of a Class of Nonlinear Descriptor Systems via Dissipative Matrix Method" by L. Sun and R. Yang investigates the adaptive parallel simultaneous stabilization and robust adaptive parallel simultaneous stabilization problems of a class of nonlinear descriptor systems via the dissipative matrix method. Under an output feedback law, two nonlinear descriptor systems are transformed into two nonlinear differential-algebraic systems by nonsingular transformations, and a sufficient impulse-free condition is given for the two resulting closed-loop systems. Based on the dissipative system, an adaptive parallel simultaneous stabilization controller and a robust adaptive parallel simultaneous stabilization controller are designed for the two systems.

Motivated by the quorum-sensing mechanism of bacteria, J. Zhang et al. in the paper entitled "Outer Synchronization of a Modified Quorum-Sensing Network via Adaptive Control" modify the network model by adding unknown parameters and noise disturbances. There exist three unknown parameters, and updating laws are presented to identify the unknown parameters with help of the Lyapunov stability theory. The negative effects of noise disturbances are also compensated for by designing adaptive controllers.

The paper by X. Gao et al. entitled "A Common Value Experimentation with Multiarmed Bandits" studies value common experimentation with multiarmed bandits and gives an application about the experimentation. The second derivative of value functions at cutoffs is investigated when an agent switches action with multiarmed bandits. The Markov perfect equilibrium and the socially effective allocation in K-armed markets are also discussed.

L. Wang et al. in the paper entitled "Adaptive Fuzzy Output Feedback Control for Partial State Constrained Nonlinear Pure Feedback Systems" address the adaptive fuzzy output feedback control problem for a class of pure feedback systems with partial state constraints. The fuzzy state observers are designed to estimate the unmeasured state while the fuzzy logic systems are used to approximate the unknown nonlinear functions. The proposed adaptive fuzzy output feedback controller can guarantee that the partial state constraints are not violated, and all closed-loop signals remain bounded by use of Barrier Lyapunov Functions (BLFs).

The paper entitled "Adaptive Synchronization for Uncertain Delayed Fractional-Order Hopfield Neural Networks via Fractional-Order Sliding Mode Control" by B. Meng and X. Wang studies adaptive synchronization for a class of uncertain delayed fractional-order Hopfield neural networks (FOHNNs) with external disturbances. For the unknown parameters and external disturbances of the delayed FOHNNs, some adaptive estimations are designed. A fractional-order switched sliding surface is proposed for the delayed FOHNNs. According to the fractional-order extension of the Lyapunov stability criterion, a fractional-order sliding mode controller is constructed to guarantee that the synchronization error of the two uncertain delayed FOHNNs converges to an arbitrary small region of the origin.

The paper by J. Zhao and F. Meng entitled "Stability Analysis of Solutions for a Kind of Integro-Differential Equations with a Delay" analyzes the stability of the zero solution for second-order integrodifferential equations with a delay. By constructing the Lyapunov functional, the corresponding sufficient conditions on stability of the zero solution for two integrodifferential equations are provided.

D. Zhu and C. Yin in the paper entitled "Stochastic Optimal Control of Investment and Dividend Payment Model under Debt Control with Time-Inconsistency" consider the optimal debt ratio, investment, and dividend payment policies for insurers with time-inconsistency. The asset can be invested in a financial market which contains a risky asset and a risk-free asset. The objective is to maximize the expected nonconstant discounted utility of dividend payment until a determinate time. This is a time-inconsistent control problem.

The paper entitled "Strong Solutions and Global Attractors for Kirchhoff Type Equation" by X. Chen studies the long-time behavior of the Kirchhoff type equation with linear damping and proves the existence of a strong solution and the semigroup associated with the solution possesses a global attractor in the higher phase space.

C. Guo and K. Zhang in the paper entitled "Disturbance Attenuation via Output Feedback for Nonlinear Time-Delay Systems with Input Matching Uncertainty" study the problem of output feedback disturbance attenuation for a class of uncertain nonlinear systems with input matching uncertainty and unknown multiple time-varying delays, whose nonlinearities are bounded by unmeasured states multiplying unknown polynomial-of-output growth rate. By skillfully combining the extended state observer, dynamic gain technique, and Lyapunov-Krasovskii theorem,

a delay-independent output feedback controller can be developed with only one dynamic gain to guarantee the boundedness of closed-loop system states and the achievement of global disturbance attenuation in the L_2-gain sense.

The paper by H. Wang and W.Y. Huang entitled "The Dynamic Properties of a Nonlinear Economic Model with Extreme Financial Frictions" investigates a generalized economic model with two kinds of agents (farmers and landlords). Farmers produce grains by renting lands from landlords. The economy is assumed to be with extreme frictions so that there are no markets for agents to trade grains. The rental rate is determined by the equilibrium of the supply and demand. The psychological anticipation is taken into account in the setting of this model. By using the optimal control theory, the dynamic properties of the rental rate and its influence to the endogenous volatility are analyzed.

The paper entitled "Global Output Feedback Stabilization for a Class of Nonlinear Cascade Systems" by C.-Y. Liu et al. focuses on the problem of global output feedback stabilization for a class of nonlinear cascade systems with time-varying output function. By using the double-domination approach, an output feedback controller is developed to guarantee the global asymptotic stability of the closed-loop system. The novel control strategy successfully constructs a unified Lyapunov function, which is suitable for both upper-triangular and lower-triangular systems.

Q. Wang et al. in the paper entitled "Consensus Control of Multiagent Systems with High-Order Nonlinear Inaccurate Dynamics and Dynamically Switching Undirected Topologies" investigate the consensus control of a class of high-order nonlinear multiagent systems, whose topology is dynamically switching directed graph. The high-order nonlinear dynamics is transformed into the one-order dynamics by structuring a sliding mode plane. Two consensus control protocols of the one-order dynamics are designed by feedback linearization. Under these control protocols, it is proved that the consensus of new variable only requires a weaker topology condition.

The paper by J. Yogambigai et al. entitled "Exponential Lagrange Stability for Markovian Jump Uncertain Neural Networks with Leakage Delay and Mixed Time-Varying Delays via Impulsive Control" studies the problem of exponential Lagrange stability analysis of Markovian jump neural networks with leakage delay and mixed time-varying delays. By utilizing the Lyapunov functional method, employing the free-weighting matrix approach and inequality techniques in matrix form, the novel stability criteria are established such that the suggested neural network is exponentially stable in Lagrange sense.

The paper entitled "Adaptive Tracking Control for a Class of Manipulator Systems with State Constraints and Stochastic Disturbances" by W. Sun et al. constructs an adaptive controller for a class of stochastic manipulator nonlinear systems. A tan-type Barrier Lyapunov Function (BLF) is employed to deal with state constraints. The proposed control scheme guarantees the output error convergence to a small neighborhood of zero. All the signals in the closed-loop system are bounded.

Z. Li et al. in the paper entitled "A Novel Fifth-Degree Strong Tracking Cubature Kalman Filter for Two-Dimensional Maneuvering Target Tracking" present a novel fifth-degree strong tracking cubature Kalman filter to improve the two-dimensional maneuvering target tracking accuracy. A new fifth-degree cubature rule is used to approximate the intractable nonlinear Gaussian weighted integral in the nonlinear Kalman filtering framework, and a novel fifth-degree cubature Kalman filter is proposed. The suboptimal fading factor is designed for the filter to adjust the filtering gain matrix online and force the residual sequences mutually orthogonal, thus improving the ability of the filter to track the mutation state, and the fifth-degree strong tracking cubature Kalman filter is derived. The suboptimal fading factor is calculated in a new method, which reduces the number of calculations for the cubature points from three times to twice without calculating the Jacobian matrix.

Conflicts of Interest

The editors declare that they have no conflicts of interest regarding the publication of this special issue.

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