

Editorial

Dynamics of Delay Differential Equations with Its Applications 2014

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Delay differential equations have attracted a rapidly growing attention in the field of nonlinear dynamics and have become a powerful tool for investigating the complexities of the real-world problems such as infectious diseases, biotic population, neuronal networks, and even economics and finance. When employing delay differential equations to solve practical problems, it is very crucial to be able to completely characterize the dynamical properties of the delay differential equations. In spite of the amount of published results recently focused on such systems, there remain many challenging open questions.

The aim of this special issue is to gather recent research efforts on the development and applications of delay differential equations and to see the latest developments. This special issue contains twenty-five research articles. The original papers explored in this special issue include a wide variety of topics such as the following.

Asymptotic Analysis and Synchronization. Y. Yuan and Z. Guo proposed a fluctuation method to investigate the global asymptotic stability of a very general class of delayed reaction-diffusion equations. L. Zuo and M. Liu investigated the asymptotical stability for an epidemic model with time delay. Z. Zhang et al. investigated a nonlinear viscoelastic equation with interior time-varying delay and nonlinear dissipative boundary feedback and proved the global existence of weak solutions and asymptotic behavior of the energy by using the

Faedo-Galerkin method and the perturbed energy method. J. Zhang et al. used the Lyapunov function method and Lurè system approach to study the quas synchronization in a communication system.

Invariant Sets and Attractor. W. Wu used the theory of exponential dichotomy on time scales and fixed point theory based on monotone operator to the global attractivity of the almost periodic solution for a predator-prey system with Beddington-DeAngelis functional response on time scales.

Stability Analysis. P. Wang et al. established a criterion on integral ϕ_0 -stability in terms of two measures for impulsive differential equations with “supremum” by using the cone-valued piecewise continuous Lyapunov functions, Razumikhin method, and comparative method. C. Liu and Y. Li investigated the global stability of a nonautonomous two-species competitive system with stage structure and double time delays. L. He and X. Wang proposed a novel method for studying the stability of a macroeconomic system with fractional derivative. H. Peng and Z. Guo proposed a viral infection model with delay and obtained some necessary and sufficient conditions to ensure the global stability of the model.

Bifurcation Analysis. Y. Zhai et al. investigated an avian influenza virus propagation model with nonlinear incidence

rate and delay based on SIR epidemic model and established the global existence of periodic solutions by using a global Hopf bifurcation theory. Y. Dai et al. investigated the local stability of the equilibria and the existence of Hopf bifurcation for a predator-prey system with Michaelis-Menten type functional response and two delays.

Oscillation and Boundary Value Analysis. S. Guo et al. were concerned with oscillation of the first order neutral delay differential equation with constant coefficients and obtained some necessary and sufficient conditions of oscillation for all the solutions in respective cases. Z. Ouyang and H. Liu investigated a class of fractional order three-point boundary value system with resonance. J. Liu and L. Yan used the variational method to investigate the solutions of damped impulsive differential equations with mixed boundary conditions.

Periodic Solutions Analysis. R. Hu used the Lyapunov-Schmidt reduction method and computations of critical groups to study a higher order difference equation and proved that the equation has four M -periodic solutions. G. Lin and Z. Zhou used the critical point theory to obtain a new sufficient condition on the existence of homoclinic solutions of a class of nonperiodic discrete nonlinear systems in infinite lattices. T. Zhang et al. investigated the existence and global attractivity of the “infection-free” periodic solution for a new epidemic disease model governed by system of impulsive delay differential equations.

Numerical Computation Analysis. D. Olvera et al. expanded the application of the enhanced multistage homotopy perturbation method (EMHPM) to solve delay differential equations (DDEs) with constant and variable coefficients.

The response to this special issue was beyond our expectation. We received 46 papers in the interdisciplinary research fields. This special issue includes twenty-five high-quality peer-reviewed papers. These papers contain several new, novel, and innovative techniques and ideas that may stimulate further research in every branch of pure and applied sciences.

Acknowledgments

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