Editorial

New Developments on Robust Nonlinear Control and Its Applications 2016

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The aim of this special issue is to encourage the development of analysis and design techniques for uncertain or disturbed nonlinear systems. Although the problems of achieving robustness with respect to disturbances and model uncertainties are as old as feedback control itself, effective systematic methods for the robust design of nonlinear systems are still a challenging topic, especially for the potential of robust nonlinear controllers in engineering applications. In the last two decades, many interesting control design techniques including nonlinear control schemes have been proposed, such as feedback linearization control method [1], sliding mode control method [2], adaptive control approach [3], neural network approach [4], and operator based right coprime factorization method [5] (see the references in [5]). Robustness of nonlinear systems can be guaranteed by sliding mode control for parameter uncertainties and internal and external disturbances. Also, neural network is applied to deal with robust nonlinear control by using the ability of its adaptive learning.

Particularly, operator based robust right coprime factorization method has been proved to be a new and effective method to solve the robust control design problem of the nonlinear systems [6–8]. The main focus of the issue is on interdisciplinary theoretical studies, computational algorithm development, and applications of uncertain or disturbed nonlinear systems, but also related areas such as nonlinear modeling, simulation, and estimation are included.

Seven papers on the new developments have been discussed for uncertain or disturbed nonlinear systems in this special issue. Some of the works provide specific solutions for challenging robust nonlinear control problems, and some interdisciplinary theoretical studies of the robust nonlinear control combining with other approaches are shown. Optimal control of holding motion by nonprehensile two-cooperative-arm robot is considered. Multiobjective trajectory optimization for hypersonic glide vehicle is given based on normal boundary intersection method. Denoising and trend terms elimination algorithm of accelerometer signals is included. Adaptive robust backstepping control of permanent magnet synchronous motor chaotic system with fully unknown parameters and external disturbances is discussed. Further, speed control based on ESO is reported for pitching axis of satellite cameras. Robust stability, stabilization, and H infinity control of a class of nonlinear discrete time stochastic systems are also studied. Moreover, dynamic output feedback robust MPC with input saturation based on zonotopic set-membership estimation is reported.

However, fault often occurs in modern industrial control systems. In the future special issue, topics will also contain robust nonlinear safety control algorithm developments

related to the above fault. Meanwhile, fault-tolerant control is also an interesting topic.

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