Advances in Fuzzy Systems

Hindawi

Special Issue on

Mathematical Modeling, Analysis, and Control of Fuzzy-Model-Based Nonlinear Networked Control Systems

CALL FOR PAPERS

Modeling practical physical systems frequently results in complex nonlinear systems, which poses great difficulties regarding system analysis and synthesis. Local linearization is a typical method used for the analysis and synthesis of nonlinear systems. However, it has been well recognized that the resulting local linearization model is valid only for a certain range of operating conditions and can only guarantee the local stability of the original nonlinear system. Another approach, fuzzy control, emerged and developed following the first paper on fuzzy sets, has attracted great attention from both the academic and industrial communities. The reason lies much in its effectiveness in obtaining nonlinear control systems, especially when knowledge of the plant or even the precise control action of the situation is unknown. Thus, fuzzy logic control has even been found to have many applications in industrial systems and processes. In fact, fuzzy control has proved to be a successful control approach for complex nonlinear systems. Fuzzy control has even been suggested as an alternative approach to conventional control techniques.

On the other hand, the benefit of using wireless communication technology in large-scale industrial processes has become evident, which is also indicated by the visions of cyber-physical systems. It is noted that the utilization of wireless networks in industrial process control enables new system architectures and designs. It is also known that many industrial control processes have severe nonlinear characteristics, which make the analysis and design more difficult. Thus, the analysis and synthesis of fuzzy-model-based nonlinear networked control systems (NCSs) have received increasing attention from both scientific and industrial communities, and a number of significant results have been proposed. The analysis and design of fuzzy-model-based nonlinear NCSs includes how to deal with various network-induced limitations such as packet dropouts, time delays, and signal quantization further.

The overall aim of this special issue is to provide an up-to-date overview of the research directions and advanced methodologies in the fuzzy-model-based nonlinear networked control systems. Of particular interest the papers in this special issue are devoted to the development of mathematical modeling, analysis, and control problems of nonlinear networked control systems in fuzzy framework, including nonlinear networked control systems, nonlinear networked control systems with time-varying delays, and nonlinear networked control systems with packet losses.

Potential topics include but are not limited to the following:

- Modeling of nonlinear networked control systems via fuzzy control
- Stability analysis of fuzzy-model-based nonlinear networked control systems
- Distributed control of fuzzy-model-based nonlinear networked control systems
- Hybrid control and observer design for fuzzy-model-based nonlinear networked control systems
- Robust fault detection, diagnosis, and supervisory control for fuzzy-model-based nonlinear networked control systems
- Model approximation and model reduction of fuzzy-model-based nonlinear networked control systems
- Applications of fuzzy control systems to complex and large-scale systems

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Manuscript Due
Friday, 2 June 2017

First Round of Reviews
Friday, 25 August 2017

Publication Date
Friday, 20 October 2017