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*Editorial*

## Special Issue “Uncertainties in large-scale networked control systems”

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Uncertain system analysis is an important topic for a class of dynamic systems as the uncertainties are widely used to describe un-modelled parts of practical systems. In classical control theory, robust control was presented to overcome the effects of the systematic uncertainties. In particular, uncertainties can be classified into two groups: 1) model structure uncertainty and 2) parametric uncertainty. However, the complexity of the control design considering the uncertainty will increase along with the scale of the system which leads to the difficulty of the implementation.

With the developments of the modern complex networked systems, such as wireless communication, industry 4.0, internet of things, etc., the traditional robust design should be extended in view of data analysis as the models of the complex networked control systems are difficult to be obtained. Thus, the new challenge has been raised where data uncertainties or communication uncertainties become important factors which should be considered into the system design.

The related topics of uncertainty analysis in the field of networked control systems are stimulating interest, as proved by this Special Issues “Uncertainties in large-scale networked control systems” in AIMS Electronics and Electrical Engineering. This special issue aims to cover recent advancements as well as future perspectives in this field. The topics addressed in this special issue include theoretical analysis, data-based modelling, system monitoring, cyber security, communication, etc.

In total, 5 papers were published with open accessing. In particular, the data-learning-based system monitoring strategy has been given in [1] where the energy network has been investigated using k-NN classifier. The uncertainties have been described as the abnormal changes of household appliance usage. Robust non-linear modelling has been achieved in [2] using a modified method with deep belief networks (DBN), where the uncertainties are reflected by system data. A chemical process has been given as a validation of the proposed modelling algorithm. The distributed stochastic systems have been investigated in [3] using full probabilistic control design where the uncertainties have been analysed theoretically using stochastic distributions. In [4], the protocol design methods for underwater

condition have been reviewed. As a specified scheme, underwater communication has been considered as a special case of the system design in extreme environment. Another survey paper [5] completes this special issue. This survey summarises the recent cyber security problems for iOS devices.

With the diverse contributions, it has been shown that the uncertainty analysis of the complexity systems will continue to flourish as a significant research topic. Although there are many fundamental questions which have not been answered at this stage, the effort on promising a future study has been demonstrated as a great starting point in this field. Finally, the Guest Editors would like to sincerely thank all the authors and editorial team for their valuable contributions.

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### Conflict of interest

The Authors declare that there is no conflict of interest.

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