Mathematical Problems in Engineering

Hindawi

Special Issue on

From Complexity to Simplicity in U-Model Enhanced Control System Design

CALL FOR PAPERS

Designing complex control systems with the least amount of information and simplest structure has been one of the main challenging research directions in both academia and potential research applications. It is not only a significant problem from a theoretical perspective but also has great impact on potential applications. This is attributed to the universality of proposed platforms and frameworks for providing more simplistic solutions to such complex problems. Compared with the two predominant control system design platforms—model-based and model-free/data driven—U-model-based control, a plant model independent design platform, is a recently developed control design methodology which aims to extend linear control system design approaches to nonlinear systems in a unified framework with guaranteed and predefined control response. This can be achieved by reformulating the original nonlinear system (in both polynomial and state space) into a U-model realization and then deriving the control law by solving the roots of the corresponding equations in terms of U-inverse. It should be noted that U-model-based control, U-control in short, is supplementary/an enhancement to both model-based and model-free control methodologies.

Owing to the salient features and simplicity of the U-model control design framework, it has attracted increasing research interest in the control community across the world, and various design and analysis methodologies have been proposed, such as modeling, parameter estimation, and control design. However, there are some open problems and challenges in the U-model-based control system designs, which deserve further investigation. For instance, the time-varying system identification, parameter estimation in the U-model formulations, U-model-based robust/adaptive control, continuous-time U-model formulation, and U-model control for nonlinear time-delay and uncertain systems, as well as industrial applications.

This Special Issue aims to provide an opportunity to review the state of the art of this emerging and cross-disciplinary field of U-control and collect the latest research results on relevant topics. Therefore, it promotes the awareness of the related research methodologies and applications by applying U-model approaches to complex systems, in terms of providing solutions from complexity to simplicity. Authors are invited to present new algorithms, frameworks, software architectures, experiments, and applications and bring new knowledge about relevant theory and techniques in designing U-model enhanced control systems. All original research articles, as well as reviews, are welcome in relation to the listed topics.

Potential topics include but are not limited to the following:

- U-model characterisation of polynomial and state space equations
- Online/offline U-model iteration algorithms and online root solving algorithms
- U-robust nonlinear dynamic control system design
- U-model enhanced optimal control and observer design
- U-model enhanced learning and adaptation
- U-self tuning/adaptive control
- U-robust and H-infinity control via adaptive and learning methods
- U-model based sliding mode control
- Robustness analysis of U-model control scheme
- U-model identification and U-model based time-varying parameter estimation
- Benchmark demonstrations and engineering applications of U-model based control

Authors can submit their manuscripts through the Manuscript Tracking System at https://mts.hindawi.com/submit/journals/mpe/umec/.

Papers are published upon acceptance, regardless of the Special Issue publication date.

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