

Intelligent Integrated System for Optimal Decision-making and Control Based on End-edge-cloud Collaboration

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Abstract

To address the challenges that online optimization of operational decision-making and control in complex industrial systems cannot be realized, this talk proposes a unified structure and algorithm for integrated operational optimal decision-making and control, by combining control, optimization, and prediction with AI technology. It also proposed a parameter self-learning and self-optimizing algorithm for operational optimal decision-making and control integrating systems, by combining mechanism analysis with deep learning, and digital twin with reinforcement learning. An intelligent integrated system for optimal decision-making and control based on end-edge-cloud collaboration is developed, by combining the proposed method and the end-edge-cloud collaboration technology of Industrial Internet. The system includes the end-optimal decision-making and control system under actual operation, as well as the cloud-edge collaborative parameter self-learning and self-optimizing system for decision-making and control system. The parameter self-learning and self-optimizing system in digital space collaborates with the optimal decision-making and control system under actual operation. Thus, the end-operational optimal decision-making and control system realizes self-learning and self-optimization. The system has been successfully applied in the energy intensive equipment—fused magnesium furnace and achieved remarkable results in the reduction of carbon emission.

Tianyou Chai received the Ph.D. degree in control theory and engineering in 1985 from Northeastern University, Shenyang, China, where he became a Professor in 1988. He is the founder and Director of the Center of Automation, which became a National Engineering and Technology Research Center and a State Key Laboratory. He is a member of Chinese Academy of Engineering, IFAC Fellow and IEEE Fellow. He has served as director of Department of Information Science of National Natural Science Foundation of China from 2010 to 2018. His current research interests include modeling, control, optimization and integrated automation and intelligence of complex industrial processes.



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