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题 目: Identification of uncertain nonlinear systems: Constructing belief rule-based models

时 间: 6月29日(周一) 16:00

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邀请人: 杨根科教授

Abstract: The objective of this presentation is to construct reliable belief rule-based (BRB) models for the identification of uncertain nonlinear systems. The BRB methodology is developed from the evidential reasoning (ER) approach and traditional IF - THEN rule based system. It can be used to model complicated nonlinear causal relationships between antecedent attributes and consequents under different types of uncertainty. In a BRB model, various types of information and knowledge with uncertainties can be represented using belief structures, and a belief rule is designed with belief degrees embedded in its possible consequents. We first introduce the BRB methodology for modelling uncertain nonlinear systems. Then we present a comparative analysis of three BRB identification models through combining the BRB methodology with nonlinear optimisation techniques. The novel BRB identification models using l1-norm and minimising mean uncertainties in belief rules (MUBR) show remarkable capabilities of capturing the lower and upper bounds of the interval outputs of uncertain nonlinear systems simultaneously. Trade off analysis between identification accuracy and interval credibility are briefly discussed. Finally, a numerical study of a simplified car dynamics is conducted to demonstrate the capability and effectiveness of the BRB identification models for the modelling and identification of uncertain nonlinear systems.

Biography:

Dr. Yu-Wang Chen is lecturer (tenure) in decision sciences at the University of Manchester. Prior to his current appointment, he was a postdoctoral research associate at the Decision and Cognitive Sciences (DCS) research centre of the University of Manchester, and a postdoctoral research fellow at the Department of Computer Science, Hong Kong Baptist University. He received the PhD degree in control and system engineering from the Department of Automation, Shanghai Jiao Tong University in 2008. He has published over 30 papers in journals and conferences, such as European Journal of Operational Research, Computers & Operation Research, Information Sciences and IEEE T-SMC. He holds and has completed as PI/Co-I several research projects funded by ERC, UK EPSRC, NSFC, etc. He is serving and served as associate editor of Web Intelligence and Agent Systems: An International Journal, editorial board member of International Journal of Productivity and Performance Management, special session organiser or programme committee member of a series of conferences, and UK ESPRC peer review member. His current research interests are mainly in the areas of multiple criteria decision analysis under uncertainties, modelling and optimization of complex systems, and risk analysis in supply chains.