

Jing Na, Kunming University of Science and Technology

Title: High Precision Motion Control for Nonlinear Robotics with Unknown Dynamics

Abstract:

Unknown nonlinear dynamics, e.g., frictions, modeling uncertainties, sensor noise and external disturbances, are inherent difficulties encountered in the robotic control system synthesis, which could deteriorate the control performance. In this talk, we will introduce two recently developed methods to handle unknown nonlinear dynamics for robotic motion control designs: adaptive control with guaranteed estimation convergence and unknown system dynamics estimator (USDE). First, a new adaptive learning framework driven by estimation error is presented, which can be incorporated into the adaptive control for robotics to remedy the use of acceleration measurement and retain the finite-time convergence of tracking error and estimation error simultaneously. Moreover, the design of USDE with simple low-pass filter operations and algebraic calculations is introduced to handle the lumped unknown dynamics in the robotic systems. Those developed ideas are also extended to flexible manipulators and bilateral teleoperations.



那靖，昆明理工大学教授，博士生导师，教育部长江学者特聘教授，国家优秀青年科学基金、云南省杰出青年科学基金获得者，欧盟“玛丽居里学者”、云南省中青年学术技术带头人等。现为云南省先进装备智能控制及应用国际联合实验室主任。主要从事机电系统建模及智能控制、自适应参数估计、非线性控制及应用等研究。在 Elsevier 出版英文专著 1 部，在国际重要期刊和学术会议发表论文 100 余篇，2020 年起连续入选爱思唯尔中国高被引学者榜单，2022 年科睿唯安全球高被引学者榜单。获霍英东青年科学家奖、自动化学报“钱学森论文奖”、云南省青年科技奖等奖励。现为 IEEE TIE、Neurocomputing 等 3 个国际期刊编委，并任 DDCLS2019 会议共同主席、CCDC 2021 组委会副主席等。获“中国青年五四奖章”、“全国优秀教师”、“云南省先进工作者”等表彰。

Dr Jing Na is currently a Professor with the Faculty of Electrical & Mechanical Engineering at Kunming University of Science & Technology. He received the B.S. and Ph.D. degrees from the School of Automation, Beijing Institute of Technology, China, in 2004 and 2010, respectively. From January 2011 to December 2012, he was a Monaco/ITER Postdoctoral Fellow with the ITER Organization, France. From January 2015 to December 2016, he was a Marie Curie Fellow with the University of Bristol, UK. Since 2010, he has been with the Kunming University of Science & Technology, where he was promoted to be a full Professor in 2013. He has hold also visiting positions with the Universitat Politècnica de Catalunya, Spain. His current research interests include parameter estimation, adaptive control, and nonlinear control with application to vehicle systems, servo mechanisms and energy conversion plants (e.g., engine, wave energy convertors, etc.). He has authored/co-

authored more than 100 peer reviewed journal and conference papers. Dr Na has been awarded the 2017 Hsue-shen Tsien Paper Award. He is currently an Associate Editor of the IEEE Transactions on Industrial Engineering, and Neurocomputing. He has also served as an international program committee Chair of ICMIC 2017 and DDCLS 2019 and IPC member of many prestigious international conferences.