

SEMINAR ANNOUNCEMENT

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

Faculty of Engineering

Website: <https://www.eng.nus.edu.sg/ece/>

Area: Control, Intelligent Systems & Robotics

Host: Prof. Lee Tong Heng

TOPIC	:	iSTA: A Learning-Based Model-Free Control Methodology for Precision Mechatronic Systems with Unknown Dynamics
SPEAKER	:	Mr. Wang Wenxin Graduate Student, ECE Dept, NUS
DATE	:	Thursday, 8 April 2021
TIME	:	6.15PM to 6.45PM
WEBINAR	:	Join Zoom Meeting https://nus-sg.zoom.us/j/88488719261?pwd=dE1wUGxBVTV0eHdKazgzQ1VBWBTuUT09 Meeting ID: 884 8871 9261 Password: 502977

ABSTRACT

Mechatronic systems are commonly used in the industry, where fast and accurate motion performance is always required to guarantee the manufacturing precision and efficiency. However, as a commonly encountered challenge, several factors make accurate system identification here to be rather difficult; such as the existence of flexible modes and other unmodeled dynamics in the system model, including the deadzone and backlash caused by the friction, etc. Due to these unknown dynamics, the system performance (when system identification is not suitably accurate) could be diminished when traditional model-based controllers are used. To overcome the above-mentioned problems arising from these uncertainties/perturbations and further improve the motion performance, this work investigates the design of an intelligent model-free controller based on iSTA (iterative super-twisting algorithm). The proposed method solely makes use of the input-output data obtained during iterative experiments such that the system is driven towards proper satisfactory performance without any prior knowledge of the system parameters. Also, in our work here, rigorous proof is furnished on the convergence properties of the method; both simulation and real-time experiments are conducted on an industrial timing-belt tray-indexing stage and a biaxial H-gantry robotic system to validate the effectiveness and the practical appeal of the proposed approach. It is pertinent to note that applications of the proposed iSTA-based controller can be further deployed advantageously to other appropriate mechatronic systems with similar difficulties involving such existence of uncertainties/perturbations.

BIOGRAPHY

Mr. Wang Wenxin received the B.Eng. degree in Measuring and Control Technology and Instruments from the Tianjin University, China, in 2017, and the M.Sc degree in electrical and computer engineering, National University of Singapore, Singapore, in 2018. He is currently working towards the Ph.D. degree with the Department of Electrical and Computer Engineering, National University of Singapore, Singapore. His research interests include intelligent control, robust control, optimal control, and precision mechatronics.

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