Keynote talk info for AIAAT2019

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Makoto Iwasaki received the B.S., M.S., and Dr. Eng. degrees in electrical and computer engineering from Nagoya Institute of Technology, Nagoya, Japan, in 1986, 1988, and 1991, respectively. Since 1991, he has been with the Department of Computer Science and Engineering, Nagoya Institute of Technology, where he is currently a Professor at the Department of Electrical and Mechanical Engineering. As professional contributions of the IEEE, he has been an AdCom member of IEEE Industrial Electronics Society (IES) in term of 2010 to 2019, a Technical Editor for IEEE/ASME TMech from 2010 to 2014, an Associate Editor for IEEE TIE since 2014, a Management Committee member of IEEE/ASME TMech (Secretary in 2016 and Treasurer in 2017), a Co-Editors-in-Chief for IEEE TIE since 2016, a Vice President for Planning and Development in term of 2018 to 2019, respectively. He is IEEE fellow class 2015 for "contributions to fast and precise positioning in motion controller design". He has received the Best Paper Award of Trans of IEE Japan in 2013, the Best Paper Award of Fanuc FA Robot Foundation in 2011, the Technical Development Award of IEE Japan in 2017, the Nagamori Awards in 2017, the Ichimura Prize in Industry for Excellent Achievement of Ichimura Foundation for New Technology in 2018, and the Technology Award of the Japan Society for Precision Engineering in 2018, respectively. His current research interests are the applications of control theories to linear/nonlinear modeling and precision positioning, through various collaborative research activities with industries.

Title of Keynote Talk:

“Robust Vibration Suppression Control for Positioning Devices with Strain Wave Gearing”

Abstract:

The keynote talk presents a practical robust compensator design technique for precision positioning devices including strain wave gearing. Since HarmonicDrive® gears (HDGs), typical strain wave gearing, inherently possess nonlinear properties known as Angular Transmission Errors (ATEs) due to structural errors and flexibility in the mechanisms, the ideal positioning static accuracy corresponding to the apparent resolution cannot be essentially attained at the output of gearing in the devices. In addition, mechanisms with HDGs generally excite resonant vibrations due to the periodical disturbance by ATEs, especially in the

condition that the frequency of synchronous components of ATE corresponds to the critical mechanical resonant frequency. The keynote, therefore, focuses on the vibration suppression in positioning, in order to improve the performance deteriorations by applying a robust full-closed control. In the compensator design, under the assumption that full-feedback positioning systems can be constructed using load-side (i.e. output of the gearing) sensors, an H_inf compensator design has been adopting to shape frequency characteristics on the mechanical vibration, with robust control properties against parameter variations. The proposed approach has been applied to precision motion control of actual devices as servo actuators, and verified through numerical simulations and experiments.