<Title>
Harmony with Environments via Glocal (Global/Local) Control

<Abstract>
There are a variety of hierarchically networked dynamical systems, where the purpose of control is to achieve the global tasks by cooperation of multiple subsystems having their local objectives. One of the ideas to handle such systems is so called "Glocal (Global/Local) Control," meaning that the global objective is achieved by local actions of sensing and control in a cooperative manner. There are a couple of important issues for the analysis and the synthesis. This talk starts with the background of the research direction and mainly focuses on two topics related to “Harmony” among them, namely (i) how to realize harmony with environments, (ii) how to compromise the global and local control objectives. Several new control theories based on powerful existing theories in classical, modern, and robust control are provided. These enable us to develop scalable analysis and synthesis methodologies for glocal control by cooperation of subsystems. The effectiveness of the proposed methods is verified through practical applications including a type of electric vehicle with multiple locally controlled wheels and a multi-rotor system. As future research directions, (i) harmony of sensing, prediction, and control, (ii) harmony of advanced control theory and AI/Learning/Data Sciences, and (iii) harmony with environments and human activities are addressed.

<Short Bio>
Shinji Hara received the B.S., M.S., and Ph.D. in engineering from Tokyo Institute of Technology (TITech), Japan, in 1974, 1976, and 1981, respectively. In 1984, he joined TITech as an Associate Professor and served as a Full Professor for ten years. From 2002 to 2017 he was a Full Professor in the Department of Information Physics and Computing at the University of Tokyo (U Tokyo). He is Professor Emeritus of TITech and U Tokyo. His current research interests include robust control and glocal control. Dr. Hara has received many awards in control including the George S. Axelby Outstanding Paper Award from the IEEE Control System Society (CSS) in 2006. He was the President of SICE, Japan in 2009, a Vice President of the IEEE CSS in 2009 to 2010, and an IFAC Council member from 2011 to 2017. He is a Fellow of IFAC, IEEE, ACA, and SICE.