

SYNCHRONIZATION OF MULTI-AGENT SYSTEMS

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Abstract: There is currently great interest in the control of multi-agent networked systems. Applications include mobile sensor networks, teleoperation, synchronization of oscillators, UAV's and coordination of multiple robots. In this talk we consider the output synchronization of networked dynamic agents using passivity theory and considering the graph topology of the inter-agent communication. We provide a coupling control law that results in output synchronization and we discuss the extension to state synchronization in addition to output synchronization. We also consider the extension of these ideas to systems with time delay in communication among agents and obtain results showing synchronization for arbitrary time delay. We will present applications of our results in synchronization of Kuramoto oscillators and in bilateral teleoperators.

BRIEF BIOGRAPHY

Mark W. Spong received the B.A. degree, magna cum laude and Phi Beta Kappa, in mathematics and physics from Hiram College, Hiram, Ohio in 1975, the M.S. degree in mathematics from New Mexico State University in 1977, and the M.S. and D.Sc. degrees in systems science and mathematics in 1979 and 1981, respectively, from Washington University in St. Louis. Since 1984 he has been at the University of Illinois at Urbana-Champaign where he is currently a Donald Biggar Willett Distinguished Professor of Engineering, Professor of Electrical and Computer Engineering, and Director of the Center for Autonomous Engineering Systems and Robotics. Dr. Spong is Past President of the IEEE Control Systems Society and a Fellow of the IEEE. Dr. Spong's main research interests are in robotics, mechatronics, and nonlinear control theory. He has published more than 200 technical articles in control and robotics and is co-author of four books. His recent awards include the Senior U.S. Scientist Research Award from the Alexander von Humboldt Foundation, the Distinguished Member Award from the IEEE Control Systems Society, the John R. Ragazzini and O. Hugo Schuck Awards from the American Automatic Control Council, and the IEEE Third Millennium Medal.