TIME DELAY SYSTEMS
Webinar
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When is a Time-Delay System Stable and Stabilizable?
A Third-Eye View

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Event will take place via Zoom

ABSTRACT: Time delays are a prevailing scene in natural and engineered systems. While a recurring subject in classical studies, modern interconnected networks are especially prone and indeed, are vulnerable to long and variable delays; systems and networks in this category are many, ranging from communication networks, sensor networks, cyber-physical systems, to biological systems. A time-delay system may or may not be stable for different lengths of delay, and further, may or may not be stabilized under a conventional feedback mechanism. When will then a delay system be stable or unstable, and for what values of delay? When can an unstable delay system be stabilized? What range of delay can a feedback system tolerate to maintain stability? Fundamental questions of this kind have long eluded engineers and mathematicians alike, yet ceaselessly invite new thoughts and solutions. In this talk I shall present a nontraditional perspective on the stability and stabilization of time-delay systems, wherein we attempt to develop tools and techniques that answer to the questions alluded to above, seeking to provide exact and efficient computational solutions to stability and stabilization problems of time-delay systems. We develop in full an operator-theoretic approach that departs from both the classical algebraic and the omnipresent LMI solution approaches, notable for both its conceptual appeal and its computational efficiency. Preceding this development we shall also develop the necessary mathematical foundation centered at operator perturbation series, which characterize the analytical and asymptotic properties of eigenvalues of matrix-valued functions or operators. Extensions to contemporary topics such as networked control and multi-agent systems may also be addressed.

BIO: Jie Chen holds the appointment of Chair Professor with the Department of Electrical Engineering, City University of Hong Kong, Hong Kong, China. He received the B.S. degree in aerospace engineering from Northwestern Polytechnic University, Xian, China in 1982, the M.S.E. degree in electrical engineering, the M.A. degree in mathematics, and the Ph.D. degree in electrical engineering, all from The University of Michigan, Ann Arbor, Michigan, in 1985, 1987, and 1990, respectively. Prior to joining City University, he was with The University of California, Riverside, California from 1994 to 2014, where he was a Professor and served as Professor and Chair for the Department of Electrical Engineering. He has also held guest positions and visiting appointments with institutions in Australia, Chile, China, France, Germany, Japan, and Sweden. His main research interests are in the areas of linear multivariable systems theory, system identification, robust control, optimization, time-delay systems, networked control, and multi-agent systems. He is the author of several books, on subjects ranging from system identification to time delay systems, and to information-theoretic control and fundamental control limitations.

An elected Fellow of IEEE, Fellow of AAAS, Fellow of IFAC and a Yangtze Scholar/Chair Professor of China, Dr. Chen received US National Science Foundation CAREER Award, SICE International Award, and Natural Science Foundation of China Outstanding Overseas Young Scholar Award. He was an IEEE Control Systems Society (CSS) Distinguished Lecturer. He served the IEEE and IFAC communities in various capacities, including, as a member on the CSS Board of Governors and a CSS Chapter Activities Chair, and a member of the IFAC Technical Board. He also served on a number of journal editorial boards, as an Associate Editor and a Guest Editor for the IEEE Transactions on Automatic Control, a Guest Editor for IEEE Control Systems Magazine, an Associate Editor for Automatica, an Associate Editor and a Guest Editor for International Journal of Robust and Nonlinear Control, and the founding Editor-in-Chief for Journal of Control Science and Engineering. He presently serves on the editorial boards of International Journal of Robust and Nonlinear Control, and SIAM Journal on Control and Optimization. He routinely serves on program and organizing committees of international conferences, most recently as the General Chair of the 3rd IEEE Conference on Control Technology and Applications, and the International Program Committee Chair of the 16th IFAC Workshop on Time Delay Systems.

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