

学术报告会

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Adaptive Estimation of Grid Voltage Parameters under Unbalanced Faults and Harmonic Disturbances

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Abstract:

This talk presents a unified framework for estimation of single-phase or three-phase voltage parameters under grid unbalanced faults and harmonic disturbances. By treating the grid voltage as a dynamic system with unknown parameters related to the system fundamental and harmonic frequencies, we build parameterized dynamic models and then develop an adaptive observer-based approach to estimate single- and/or three-phase grid voltage parameters such as frequencies, amplitudes and phase angles with zero steady state error. The contributions of the talk are two-fold: 1) when the grid involves only fundamental voltage, a third-order adaptive estimator is derived by observer design combined with the notion of passivity. It is shown that the third-order adaptive observer can estimate the grid voltage parameters without steady state error; 2) when the grid voltage involves harmonic disturbances, a higher-order adaptive observer is designed to estimate the grid voltage parameters. Passivity and Lyapunov-based arguments ensure that the proposed method also achieves zero steady state estimation error. Both MATLAB simulations and dSPACE-based experiments are conducted to validate the effectiveness of our estimation strategies.

Biography:

Dr. Wei Lin received the D.Sc. degree in Systems Science and Math. from Washington University, St. Louis (1993). During 1986-89, he was a lecturer in the Dept. of Mathematics at Fudan University, Shanghai. Since 1/1996, he has been a Professor in the Dept. EECS at Case Western Reserve University. Dr. Lin's research interests include nonlinear control, estimation and adaptive control, power systems and smart grids, where he has published more than 200 papers. He gave several Plenary Lectures including the 7th IFAC Symp. on Nonlinear Control Systems and the 8th Asia-Pacific Power and Energy Eng. Conference (APPEC). Dr. Lin was a recipient of the NSF CAREER Award, the JSPS Fellow from Japan Society for the Promotion Science, the Warren E. Rupp Endowed Professorship, and the Robert Herbold Faculty Fellow Award. He has been an Associate Editor of the IEEE TAC, Automatica, Int. J. of Robust and Nonlinear Control. He also served as a reviewer for the NSF, AFRL, NRO, NSF of Romania, Czech, and Hong Kong RGC. He has been a panel member for the Thousand-Talent Program, Chang Jiang Professor, the State Natural Science Award and Key Lab Project of China.