Inter-area Oscillations in Power Systems
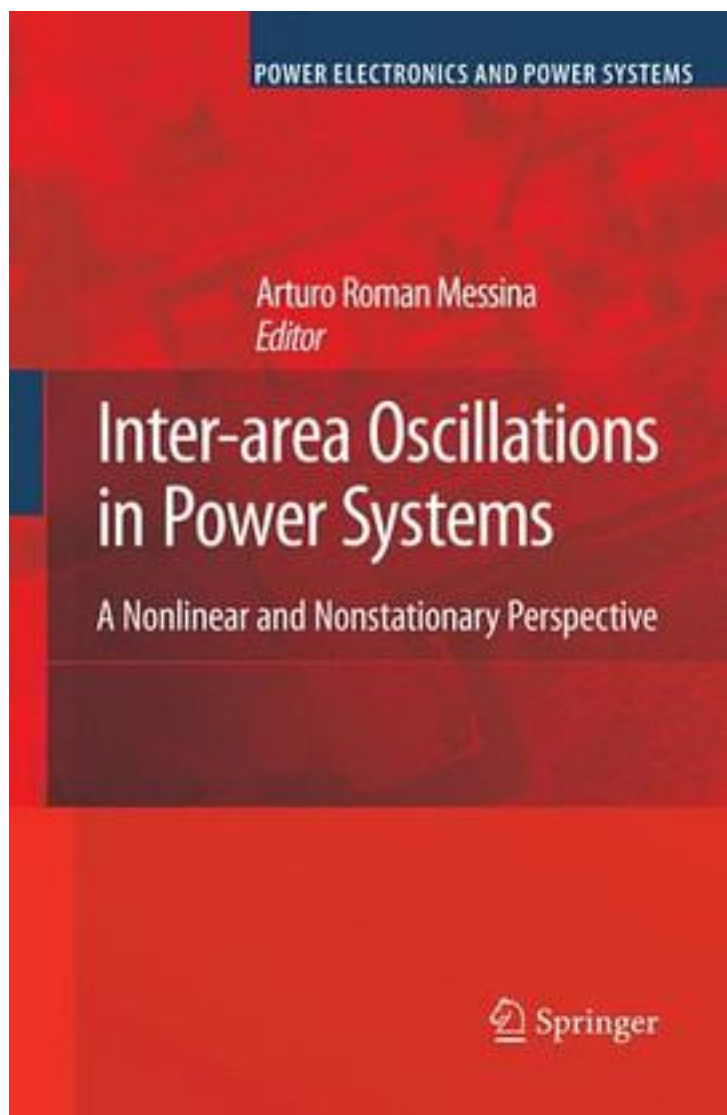

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This book deals with the application of new techniques based on time-frequency system representations and statistical approaches to the study, characterization, and control of nonlinear and non-stationary inter-area oscillations in power systems. The main focus is on the study of nonlinear, time-varying wide-area oscillatory problems associated with critical system perturbations. Techniques that explicitly address and treat nonlinearity are given and efficient methods to generate time-varying system approximations from both measured and simulated data are discussed. The theoretical basis for these methods is described as well as application properties and performance. Analysis techniques discussed include parametric methods such as Prony analysis, Yule-Walker based methods, Least-Squares methods, Wavelets and Fourier-based methods, and non-parametric methods such as Periodogram averaging and the Hilbert-Huang transform, as well as higher order statistical approaches.Emphasis is placed on the modeling and control of complex time-varying behavior which has not been present in previous work. Through case studies of synthetic and real-life test systems, the authors explain how an understanding of temporal, nonlinear behavior can be incorporated in the analysis and design process of complex control systems. Examples include computer simulations and actual system measurements from power systems in North America, Australia, India and Mexico. In this book particular attention is given to the vital new ideas of dynamic security assessment in real-time implementations and the evaluation of spatio-temporal behavior in systems with embedded Flexible AC Transmission Systems (FACTS). Future applications of these methodologies focusing on the implementation of smart wide-area monitoring, protection control systems based on methods of analysis of time series are also discussed.

作者介绍:

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