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Mangey Ram
Hoang Pham *Editors*

Advances in Reliability Analysis and its Applications

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Preface

Nowadays, in system reliability engineering, advances in reliability analysis is perhaps one of the most multidimensional topics. This quick development has truly changed the environment of system engineering and this global design. Now with the help of simulations and virtual reality technologies, we can start more of the modeling task.

The aspects dealt in chapter "Time Varying Communication Networks: Modelling, Reliability Evaluation and Optimization" are (i) TVCN models for representing features like mobility, links, and topology, (ii) description of the notion of Time-Stamped-Minimal Path Sets (TS-MPS) and Time-stamped-minimal Cut Sets (TS-MCS) for TVCNs as an extension of MPS and MCS, respectively, that are widely used in static networks, (iii) techniques for enumerating TS-MPS and TS-MCS, and evaluating reliability measure(s)—particularly two-terminal reliability, expected hop, and slot counts along with some other related metrics, and (iv) discussion on several recent optimization problems in TVCNs.

In chapter "Methods for Prognosis and Optimization of Energy Plants Efficiency in Starting Step of Life Cycle", appropriate methods are provided for prognosis and optimizing the effectiveness based on the quality of design, production and testing, assembly and trial release, exploitation, and development of procedures for prognosis of the complex systems behavior based on the characteristics of certain constituent elements of the system and the possible impact of human factors and environment itself on the system.

In chapter "Planning Methods for Production Systems Development in the Energy Sector and Energy Efficiency", methods used in planning the development of the electric power system differ with respect to optimization technique (linear programming, nonlinear programming, etc.), type of approximation (linear, nonlinear), and economic valorization (with inflation, without inflation).

In chapter "The Integral Method of Hazard and Risk Assessment for the Production Facilities Operations", problems of creation of integrated index within the development of control methods of HPF industrial safety condition are designated and the problem of such object's management modeling because of precedents, based on classes of states, is solved (there is an event/there is no event).

Chapter "Multi-level Hierarchical Reliability Model of Technical Systems: Theory and Application" describes an assessment methodology for various sustainability indicators of technical systems, such as reliability, availability, fault tolerance, and reliability-associated cost of technical safety-critical systems, based on Multi-Level Hierarchical Reliability Model (MLHRM).

Chapter "Graph Theory Based Reliability Assessment Software Program for Complex Systems" presents the reliability of the theoretical background and graph theory. After that, the developed MATLAB GUI application based on graph theory for the reliability assessment of complex systems has been discussed.

In chapter "Reliability and Vacation: The Critical Issue", a comparative study of different vacation policies on the reliability characteristics of the machining system is presented. For that purpose, the queueing-theoretic approach is employed and the Markovian models are developed for various types of vacation policies, namely, N-policy, single vacation, multiple vacations, Bernoulli vacation, working vacation, vacation interruption, etc.

In chapter "Software Multi Up-Gradation Modeling Based on Different Scenarios", it has been checked out which release performs best for a particular type of real-life scenario using the unified modeling approach. The intent of this chapter is to consider the increasingly ambitious requirements of the customers and the benefits of situating new features in the software.

In Chapter "A Hidden Markov Model for a Day-Ahead Prediction of Half-Hourly Energy Demand in Romanian Electricity Market", Mathematica code, which relies on the maximum likelihood principle in Hidden Markov Model (HMM) environment, has been developed. Also, HMM approach is an efficient way in modeling short-term/day-ahead energy demand prediction, especially during peak period(s), and in accounting for the inherent stochastic nature of demand conditions which has been discussed.

Chapter "A General (Universal) Form of Multivariate Survival Functions in Theoretical and Modeling Aspect of Multicomponent System Reliability Analysis" presents particular bivariate and k-variate new models and also a general method for their construction competitive to the copula methodology. The method follows the invented universal representation of any bivariate and k-variate survival function different from the corresponding copula representation.

Chapter "An Exact Method for Solving a Least-Cost Attack on Networks" focuses on treating a particular problem of intelligent threats. This chapter attempts to identify the optimal attack strategy on a network that completely prevents the flow from reaching its destination.

In chapter "Reliability Analysis of Complex Repairable System in Thermal Power Plant", the performance of the cooling tower of a coal-fired thermal power was analyzed under fuzzy environment. TFM was used to consider the vagueness of the failure and repair time data. The results are useful in framing the optimum maintenance interval for the considered system for improving plant availability.

Chapter "Performance Analysis of Suspension Bridge: A Reliability Approach" investigates the ability to use the Markov process for degradation modeling of suspension bridges by taking some of its important sections, namely, tower

foundation, tower, anchor, cable, and deck along with human error. Here, we also identify various factors responsible for the deterioration of the major components of the bridge, which further affects the working of the mainframe structure.

The engineers and the academicians will definitely gain great knowledge with the help of this book entitled "Advances in Reliability Analysis and its Applications". This book also helps them in the analysis of reliability and its applications. The book is meant for those students who have taken reliability engineering as a subject to study. The material is proposed for postgraduate or senior undergraduate level students.

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