MULTI-STATE NETWORK RELIABILITY EVALUATION

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ABSTRACT

A multi-state network under consideration consists of a source node, a sink node, and some independent failure prone components in between. The components can work at different levels of capacity. For such a network, we are interested in evaluating the probability that the flow from the source node to the sink node is equal to or greater than a demanded flow of d units. A general method for reliability evaluation of such multi-state networks is using minimal path (cut) vectors. A minimal path vector to system state d is called a d-MP. The reliability of such a network can be defined as the probability of the component state vector being not smaller than at least one of the d-MPs. Efficient evaluation of the reliability of such a network is essential for its reliability assurance.

In this presentation, we report our recent progress in improving algorithms for efficient evaluation of network reliability. These include methods for generating minimal path sets for binary network, generating d-MPs for multi-state networks, and network reliability evaluation using the sum of disjoint products approach and the state space decomposition approach.

BIOGRAPHY
Dr. Ming J Zuo received the Bachelor of Science degree in Agricultural Engineering in 1982 from Shandong Institute of Technology, China, and the Master of Science degree in 1986 and the Ph.D. degree in 1989 both in Industrial Engineering from Iowa State University, Ames, Iowa, U.S.A. He is currently Full Professor in the Department of Mechanical Engineering at the University of Alberta, Canada. His research interests include system reliability analysis, maintenance modeling and optimization, signal processing, and fault diagnosis. He is Associate Editor of IEEE Transactions on Reliability, Department Editor of IIE Transactions, Regional Editor of International Journal of Strategic Engineering Asset Management, Regional Editor of Chinese Journal of Mechanical Engineering, and Editorial Board Member of Reliability Engineering and System Safety, Journal of Traffic and Transportation Engineering, International Journal of Quality, Reliability and Safety Engineering, and International Journal of Performability Engineering. He is Fellow of the Institute of Industrial Engineers (IIE), Fellow of the Engineering Institute of Canada (EIC), Founding Fellow of the International Society of Engineering Asset Management (ISEAM), and Senior Member of IEEE.