

A Monte Carlo simulation for network reliability with component measure errors

Wei-Chang Yeh

*Integration and Collaboration Laboratory, Department of Industrial Engineering and Engineering Management, National Tsing Hua University, Taiwan
Email: yeh@iee.org*

Abstract: Errors in measurements can be caused by a variety of factors, such as apparatus failure, human error, environmental changes, and even the inherent variability of network components. The accuracy of a network reliability model is highly dependent on the component's reliability. Measurement errors in these dependabilities could significantly distort the results. By recognizing and incorporating these inaccuracies into the model, we can encourage the development of models that are both more robust and accurate in order to better understand and manage network reliability risks. Hence, a new Monte Carlo Simulation is proposed to estimate the network's reliability with component measurement errors to make more informed decisions regarding where to invest resources to increase network reliability. We demonstrate the performance of the proposed algorithm by comparing it to benchmark networks with binary states. This strategy has shown promising results, as it can reduce the error in the reliability estimate by up to 5%. This error reduction can lead to substantial cost savings and prevent significant losses.

Keywords: *Network reliability, measurement errors, Monte Carlo simulation*