AN ACCEPT AND REJECTION SIMULATION METHOD TO ESTIMATE THE RELIABILITY OF DYNAMIC SYSTEMS

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For evaluating systems performance, system designers model many dynamic systems, such as telecommunication, computer, electric power, transportation, and water distribution systems into stochastic networks to estimate system reliability. In acquiring the system reliability, both the problems to find all minimal paths or cuts and to compute the system reliability with known minimal paths or cuts are NP-hard. Current simulation methods to estimate system reliability focus mainly on how to reduce the variance of estimate given that minimal paths or cuts are known in advance. However, only 2.NP-hard obstacle is solved. See Figure.1

Figure. 1

In this paper, we derive first the distribution of numbers of failure components in system, and then, designing an Accept and Rejection Monte Carlo method to determine which components in system are failure, finally, applying a search algorithm to determine the system state. Repeating above simulation procedure for numerous replications, we have the system reliability estimate and its variance. As a result, no information about minimal paths or cuts is required to estimate system reliability so that both NP-hard obstacles are overcome in a time. See Figure. 2. A network example to compare the differences between the proposed method and the crude Monte Carlo method is presented

Figure. 2