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Calendar-based Age Replacement Policy with Dependent Renewal Cycles

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Abstract

In this talk, I introduce an age-based replacement policy in which the preventive replacements are restricted to specific calendar times. Under the new policy, the assets are renewed at failure or if their ages are greater than or equal to a replacement age at given calendar times, whichever occurs first. This policy is logistically applicable in industries such as utilities where there are large and geographically diverse populations of deteriorating assets with different installation times. Since preventive replacements are performed at fixed times, the renewal cycles are dependent random variables. Therefore, the classical renewal reward theorem cannot be directly applied. Using the theory of Markov chains with general state space and a suitably defined ergodic measure, I analyze the problem to find the optimal replacement age, minimizing the long-run expected cost per time unit. I further find the limiting distributions of the backward and forward recurrence times for this policy and show how the ergodic measure can be used to analyze more complicated policies. Finally, using a real data set of utility wood poles' maintenance records, I numerically illustrate some of the results including the importance of defining an appropriate ergodic measure in reducing the computational expense.

Biography

Maliheh Aramon is a lecturer at the Department of Mechanical & Industrial Engineering at the University of Toronto, and a postdoctoral associate in the Centre for Maintenance Optimization and Reliability Engineering (C-MORE) at the University of Toronto. She completed her PhD in Operations Research at the University of Toronto. Her primary research interests are optimization under uncertainty and the probabilistic analysis of systems in the application area of engineering asset management.