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Optimization of Imperfect Condition-Based Maintenance Based on Matrix Algebra

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Industrial systems are in general subject to deterioration, ultimately leading to failure, and therefore require maintenance. Due to increasing possibilities to monitor, store, and analyze conditions, condition-based maintenance policies are gaining popularity. We consider optimization of imperfect condition-based maintenance for a single unit that deteriorates according to a discrete-time Markov chain. The effect of a maintenance intervention is stochastic, and we provide reasonable properties for the transition matrix that models the effect of maintenance. Because maintenance does not always bring us back to the as-good-as-new state, we are dealing with a semi-regenerative process rather than a regenerative process. We provide different methods to determine the optimal maintenance policy and aim to prove that the optimal policy is of the control-limit type.

Keywords

Condition-based maintenance; matrix algebra; Markov chain

Classification

Mainly methodology

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