学术报告

A finite-horizon condition-based maintenance policy for a two-unit system

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Abstract： Traditional condition-based maintenance policies are evaluated under the assumption of infinite horizon, which, however, fails to meet many real scenarios, since a machine or equipment will usually be abandoned after running a few periods. In this paper, we develop a condition-based maintenance model for degrading systems within a finite operating horizon. In addition, different from most existing studies that focus on a single-unit system, we consider a system with two heterogeneous components. The components are subject to dependent degradation processes, characterized by a bivariate Gamma process. Periodic inspection is performed upon the system and the components are preventively replaced when their degradation levels at inspection exceed the preventive replacement thresholds. We formulate the maintenance problem as a Markov decision process (MDP) and employ dynamic programming for the calculation purpose. The optimal maintenance policy is achieved via minimizing the expected maintenance cost. We explore the structure property of the optimal maintenance policy and obtain the boundaries for various maintenance actions. Unlike the infinite horizon which leads to a stationary maintenance policy, for the finite horizon, the optimal decision is non-stationary, which indicates that the optimal maintenance actions vary at each inspection epoch. A numerical example is performed to illustrate the proposed model, in which we investigate the influence of stochastic and economic dependence on the optimal maintenance policy.

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