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Comparison of Various Policies under Different Maintenance Strategies on a Multi-Component System

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Abstract : Maintenance strategies can be classified into two types, which are reactive and proactive, with respect to the time of the failure and maintenance. If the maintenance activity is done after a breakdown, it is called reactive maintenance. On the other hand, proactive maintenance, which is further divided as preventive and predictive, focuses on maintaining components before a failure occurs to prevent expensive halts. Recently, the number of interacting components in a system has increased rapidly and therefore, the structure of the systems have become more complex. This situation has made it difficult to provide the right maintenance decisions. Herewith, determining effective decisions has played a significant role. In multi-component systems, many methodologies and strategies can be applied when a component or a system has already broken down or when it is desired to identify and avoid proactively defects that could lead to future failure. This study focuses on the comparison of various maintenance strategies on a multi-component dynamic system. Components in the system are hidden, although there exists partial observability to the decision maker and they deteriorate in time. Several predefined policies under corrective, preventive and predictive maintenance strategies are considered to minimize the total maintenance cost in a planning horizon. The policies are simulated via Dynamic Bayesian Networks on a multi-component system with different policy parameters and cost scenarios, and their performances are evaluated. Results show that when the difference between the corrective and proactive maintenance cost is low, none of the proactive maintenance policies is significantly better than the corrective maintenance. However, when the difference is increased, at least one policy parameter for each proactive maintenance strategy gives significantly lower cost than the corrective maintenance.

Keywords : decision making, dynamic Bayesian networks, maintenance, multi-component systems, reliability
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