Estimating the Cost-Effective Checking Request Policies

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Abstract: Consider a one-unit system, where the system failure can be detected only by checking. Without any loss of generality, it is assumed that the checking is perfect, i.e. the system does not deteriarete/fail by checking. Suppose that the inspector is requested to check the condition of system at any time after the unit begins operating, and that the constant time period, called waiting time is needed to arrive at the facility in which the system is equipped. Checking is carried out as soon as the inspector arrives there and the time for checking itself can be negligible. If the system fails up to the inspector's arrival time point, the corrective replacement is made at the arrival time point. On the other hand, if the system does not fail during the checking request period and/or the waiting time period, we can consider two cases: In Model 1, the preventive replacement is performed immediately at the arrival time point. In Model 2 the inspector continues monitoring the condition of system and waits until it fails.

Yamada and Osaki (1981) consider the above two models and derive the optimal checking request policies maxmizing the cost effectiveness criteria, which is proposed by Trott (1965) and Winlund (1965). We further extend Yamada and Osaki's results in terms of statistical inferrence. That is to say, we develop statistically non-parametric algorithms to estimate the optimal checking request policies from the complete system failure time data. More precisely, we introduce the concept of total time on test (TTT) and apply the graphical idea by Bergman and B. Klefsjö (1984) to the checking request problems. Finally, a simulation study is carried out to investigate the asymptotic properties of the proposed estimators of the oprimal checking request policy.

Keywords: Preventive maintenance, Checking request policies, Cost effectiveness, Total time on test statistics, Non-parametric estimation.

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