Applications to continuous-time processes of computational techniques for discrete-time renewal processes

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ABSTRACT

For optimising maintenance, the total costs should be computed over a bounded or unbounded time horizon. In order to determine the expected costs of maintenance, renewal theory can be applied when we can identify renewals that bring a component back into the as-good-as-new condition. This publication presents useful computational techniques to determine the probabilistic characteristics of a renewal process. Because continuous-time renewal processes can be approximated with discrete-time renewal processes, it focusses on the latter processes. It includes methods to compute the probability distribution, expected value and variance of the number of renewals over a bounded time horizon, the asymptotic expansion for the expected value of the number of renewals over an unbounded time horizon, the approximation of a continuous renewal-time distribution with a discrete renewal-time distribution, and the extension of the discrete-time renewal model with the possibility of zero renewal times (in order to cope with an upper-bound approximation of a continuous-time renewal process).

Keywords: Discrete renewal process; Renewal function; Second-moment properties; Gamma process; Geometric distribution

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