A survey of the application of gamma processes in maintenance

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ABSTRACT

This article surveys the application of gamma processes in maintenance. Since the introduction of the gamma process in the area of reliability in 1975, it has been increasingly used to model stochastic deterioration for optimising maintenance. Because gamma processes are well suited for modelling the temporal variability of deterioration, they have proven to be useful in determining optimal inspection and maintenance decisions. An overview is given of the rich theoretical aspects as well as the successful maintenance applications of gamma processes. The statistical properties of the gamma process as a probabilistic stress–strength model are given and put in a historic perspective. Furthermore, methods for estimation, approximation, and simulation of gamma processes are reviewed. Finally, an extensive catalogue of inspection and maintenance models under gamma-process deterioration is presented with the emphasis on engineering applications.

Keywords: Gamma process; Deterioration; Maintenance; Renewal theory; Inspection; Markov process; Compound Poisson process; Risk; Brownian motion with drift

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