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Original Article

Stochastic methodology for prognostics under continuously varying environmental profiles

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Abstract

We present a stochastic modeling framework for sensor - based degradation signals that predicts, in real time, the residual lifetime of individual components subjected to a time - varying environment. We investigate the future environmental profile that is deterministic and evolves continuously. Unique to our model is the union of historical data with real - time sensor - based data to update the degradation model and the residual life distribution (RLD) of the component within a Bayesian framework. The performance of our model is evaluated on the basis of degradation signals from both numerical experiments and a case study using real bearing data. The results show that our approach accurately estimates the RLD by incorporating the environmental effects and utilizing the real - time observations. © 2012 Wiley Periodicals, Inc. Statistical Analysis and Data Mining 6: 260–270, 2013

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