Bayesian Analysis of Two-Phase Degradation Data Based on Change-Point Wiener Process

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ABSTRACT

In degradation test of some products, such as plasma display panels (PDPs) and organic light emitting diodes (OLEDs), observed degradation paths tend to exhibit multi-phase patterns over testing period. In this paper, we propose a change-point Wiener process (CPWP) model to fit the degradation data with two-phase patterns, mainly in Bayesian framework. Hierarchical Bayesian approach is employed to estimate the parameters in this model. Considering distinct degradation behaviors between testing items, degradation rates and change-points are specified as random variables, varying from item to item in the hierarchical Bayesian CPWP. The proposed model is illustrated by a simulation study along with real application to OLED degradation data. The simulation results show that the hierarchical Bayesian approach is superior to the maximum likelihood method. From the analysis of the OLED degradation data, the CPWP model outperforms other existing models in reliability prediction.

Key Words: Change-point; Degradation test; Gibbs Sampler; Hierarchical Bayesian; Wiener process;