Reliability assessment of automotive components under fatigue using numerical simulation and accelerated testing

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Mots-clés	accelerated testing [7], Monte-Carlo simulations [8], Polynomial chaos expansion [9], Stochastic response surface [10], Structural reliability [11]
Résumé en anglais	In this paper, a Stochastic Response Surface (SRS) approach based on Polynomial Chaos Expansion (PCE) is used to conduct reliability analysis of automotive components subjected to fatigue loading. The PCE coefficients have been computed by regression analysis based on a quasi-random experimental design. In addition, an efficient truncation technique, namely low-rank index sets, has been used to reduce the number of unknown coefficients to be estimated, and consequently to reduce the number of finite element model calls required for the construction of the PCE. Once the PCE is obtained, the probability of failure for a target fatigue life is estimated by applying Monte-Carlo simulations. At the same time, fatigue accelerated testing are conducted on full scale automotive component to obtain experimental predictions of the structural reliability. The estimates of the probability of failure are in good agreement with those obtained by numerical computations based on PCE and Monte-Carlo simulations.
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