Multidisciplinary Reliability Analysis with Stationary Stochastic Processes

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Abstract

The reliability of a component in a discipline of a multidisciplinary system is affected by not only the uncertain input variables in the discipline but also those in other disciplines. When some of input variables are time-dependent stochastic processes, the reliability is defined in the period of time that the system is put into operation. Time-dependent multidisciplinary reliability methods are currently lacking. This work develops a time-dependent reliability analysis method for components in a multidisciplinary system if input variables include stationary stochastic processes and random variables. The method is based on the First and Second Order Reliability Methods (FORM and SORM). After a limit-state function is approximated by FORM or SORM, Monte Carlo simulation is used to calculate the reliability. Two example problems are used to demonstrate and evaluate the proposed method.