

Advanced Monte Carlo Methods for Reliability Estimation and Failure Prognostics

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Monte Carlo Simulation (MCS) offers a powerful means for modelling the stochastic failure behaviour of engineered structures, systems and components (SSC), indifferently of the type and dimension of the problem addressed. This lecture illustrates some research developments on advanced MCS methods for reliability estimation and failure prognostics. With respect to the estimation of the reliability of SSC by MCS, the challenge is due to the small failure probabilities involved. With respect to failure prognosis, a Monte Carlo simulation method which is becoming popular is the so called particle filtering which approximates the state distributions of interest by discrete sets of weighed 'particles' representing random trajectories of system evolution in the state space and whose weights are estimates of the probabilities of the trajectories.