

Importance Sampling for the Reliability Evaluation with a Stochastic Computer Model

Youngjun Choe

University of Michigan, Ann Arbor, Michigan USA yjchoe@umich.edu

Eunshin Byon*

University of Michigan, Ann Arbor, Michigan USA ebyon@umich.edu

Vijay Nair

University of Michigan, Ann Arbor, Michigan USA ynn@umich.edu

Nan Chen

National University of Singapore, Singapore isecn@nus.edu.sg

We extend the theory of importance sampling to estimate a system's reliability with a stochastic computer simulation. The proposed method aims to minimize the variance of failure probability estimator in a complex stochastic system. The method is applied to evaluate the reliability of a wind turbine based on computationally expensive aerodynamic simulations. The implementation results show that significant computational gains can be obtained, as compared with other methods.

Key Words: Energy statistics, electricity, industrial engineering