

Accelerated Evaluation of Structural Reliability under Tsunami Loading

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Abstract : It is of our great interest to quantify the risk to structural dynamic systems due to earthquake-induced tsunamis in view of recent earthquake-induced tsunamis in Padang, 2004 and Tohoku, 2011 which brought huge losses of lives and properties. Despite continuous advancement in computational simulation of the tsunami and wave-structure interaction modeling, it still remains computationally challenging to evaluate the reliability of a structural dynamic system when uncertainties related to the system and its modeling are taken into account. The failure of the structure in a tsunami-wave-structural system is defined as any response quantities of the system exceeding specified thresholds during the time when the structure is subjected to dynamic wave impact due to earthquake-induced tsunamis. In this paper, an approach based on a novel integration of a recently proposed moving least squares response surface approach for stochastic sampling and the Subset Simulation algorithm is proposed. The effectiveness of the proposed approach is discussed by comparing its results with those obtained from the Subset Simulation algorithm without using the response surface approach.

Keywords : response surface, stochastic simulation, structural reliability tsunami, risk

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