

# Sampling Model in Engineering Analysis Software for Surface Cracked Structure

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## **Abstract:**

The aim of this paper is to demonstrate the accuracy of the mathematical model via computer simulation technique. The mathematical model is presented through sampling method in probabilistic fatigue surface crack growth analysis. A finite thickness plate with surface crack subjected to a fatigue load is considered for fracture analysis using the developed Probabilistic S-version Finite Element Model (ProbS-FEM). Two sampling methods, Monte Carlo and Latin Hypercube are employed in the ProbS-FEM. Two different sampling methods are used to generate the random variables in the analysis. The results from the strategies are compared to highlight the advantages of each sampling strategy. The distribution of the initial surface crack length and depth are extracted from the fatigue tests. The accuracy and consistency between the two sampling methods are evaluated. The Latin Hypercube sampling (LHS) shows advantages compared to the Monte Carlo. Then, the developed ProbS-FEM is demonstrated on a four-point bending model. The developed ProbS-FEM shows that the code is capable of modelling the uncertainty in the fatigue surface crack analysis with better accuracy and consistency of sampling process.

**Keywords:** Crack growth, Finite element model, Probabilistic, sampling model, and Monte Carlo.