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Modeling of fatigue crack propagation of multiple site using deterministic and probabilistic method

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Modeling of fatigue crack propagation on a multiple site crack of finite plate has been developed by using deterministic and probabilistic method. The study is conducted to identify the effects of life cycle to the multiple site fatigue crack propagation. Analysis of stress intensity factor is performed using the deterministic approach via the boundary element method. The boundary element method is used for modeling the crack through the numerical calculation approach. The complex problems have been solved using the boundary condition without knowing the domain of the model. The probabilistic analysis based on Monte Carlo method is incorporated to simulate the random process of the fatigue crack propagation. The initial crack and life cycle of the structure have been predicted by using this method. The crack size and fatigue life are computed until failure of the structure. The failure analysis is performed by a linear elastic fracture mechanics. The scenario of the fatigue crack propagation is given by an integration of both deterministic and probability method. The specimen is analyzed by this method, which is fourteen holes aluminum alloy 2024-T3 in finite plate with a thickness of 1.6 mm. The fatigue life scenarios for each specimen are compared. Life prediction and the standard deviation of the specimens are performed. These predicted life are then compared with the experiment result from literature. The Monte Carlo results obtained are in good agreement with the experiment result. The analysis is followed for a center member bar of a car. It is found that, the random of the crack process affect the characteristic of fatigue crack propagation. Therefore, fatigue life of multiple site crack specimen can be predicted.