

Failure potential evaluation in engineering experiments Using Load/Unload Response Ratio Method

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The Load/Unload Response Ratio (LURR) method is proposed for prediction of the failure of brittle heterogeneous materials. Application of the method typically involves with evaluating the external loads act on materials or structures, differentiating its loading and unloading periods, determining the response occurred during both periods from data input, and calculating the ratio between the two response rates. According to the method, the LURR time series usually climb to an anomalously high peak prior to the macro-fracture. To show the validity of the approach in engineering practice, we applied the approach to the loading and unloading experimental data associated with a two floors concrete-brick structure. Results show that the LURR time series of the two floors consist with the damage evolution of the structure: they are at low level for most of the time, and reach the maxima prior to the final fracture. We then attempt to combine the LURR values with damage variable (D) to provide the health assessment of the structure. The relationship between LURR and D , defined as a function of Weibull stochastic distribution, is set up to provide more detailed underlying physical means to study damage evolution of the structure. The fact that the damage evolution of the structure correlates well with the variation of LURR time series may suggest that the LURR approach can be served as a useful tool to provide the health assessment to big scale structures or ancient buildings.