

Estimation of Input Earthquake Motion Based on Nonlinear Time Domain Analysis

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In this research, the authors propose a method of estimating the earthquake motion at seismic bedrock using seismic observation records at the surface by employing a nonlinear time domain analysis. In the proposed method, a general optimization method is used. In addition to the general optimization method, the perturbation waveform incorporating in a forward analysis is proposed to drastically improve the convergence of calculation. Furthermore, the equivalent single-degree-of-freedom model of the ground is used when performing the nonlinear analysis in the time domain. As a result, the calculation time decreases small enough to estimate the seismic motion with an economical cost while considering complex soil nonlinearity. The proposed method is applicable for estimating the strong ground motion at bedrock from surface records, considering the nonlinear behavior of the surface soil layers.