Synthesis of Ground Acceleration and Site Specific Response Spectra using Semi-empirical Green's Function Approach

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The paper discusses the simulation of various types of earthquake design response spectra for various types of rock and soil deposits corresponding to a single degree of freedom (SDOF) structures with synthetic accelerograms. First, a sample accelerogram is generated as a product of the stationary random sequence by a deterministic shape function. An empirically derived envelope function directly related to the amplitude and duration of ground motion is developed for use in the stochastic simulation of earthquake ground motion. The envelope from each sub-fault from a fault plane are lagged and summed at the receiver to get the resultant envelope of a large earthquake. The resultant envelope is multiplied with filtered white Gaussian noise to synthesize the acceleration at a given site. Synthesis of ground motion and response spectra for structures conditioned by earthquake records in India are presented. We examine the effects of geological conditions on the response spectra. The analysis shows clear differences in spectral shapes for different soil and geological conditions indicating their effects in selecting earthquake-resistant design criteria. The results show that the shape and the magnitude of response spectra for rock sites are different from those of soil sites.