Seismic design of structures requires using design response spectrum. Typically, dynamic structural analysis is carried out by a modal analysis without direct consideration of ground motion time-histories. However, utilization of acceleration time-histories for dynamic analysis of critical facilities, base isolated-structures or complex structures with nonlinear behavior has grown recently. Selection and scaling of increasingly available real ground motions for a given site is given more attentions now than ever before. Deaggregation of seismic hazard is often employed for record selection from a processed database. The goal is modifying a real ground motion from a past event so that its response spectrum be compatible with a pre-defined smooth design spectrum.

Spectrum matching in the frequency domain by alteration of spectral Fourier amplitude and keeping the spectral phase angle of real record unchanged is one of the common procedures that have been developed and employed. Unlike the method that makes a correction on time-history in time domain, phase properties of the ground motion are maintained in frequency domain matching procedure. Studies have shown that the phase angles of a ground motion in different frequencies are not independent random variables and contain characteristics of ground motion.

The purpose of this paper is to extend the current matching procedures in frequency domain to have more control on shape and time variation of the record. It is neither necessary nor recommended to match a ground motion to be absolutely consistent with a smooth target spectrum. Keeping peaks and valleys of response spectra of a suite of design ground motions in the proximity of the target response spectrum naturally includes variability in structural analysis results and prevents unnecessary weakening of ground motion in nonlinear dynamic analyses. If the ground motion has rupture directivity effect, pulse-like characteristic of motion in time-history which represents most significant impact on structure, would be mostly preserved with only a limited change of time-history.

The strength and weaknesses of the proposed procedure is illustrated through several examples. Comparison of the proposed procedure is made with those obtained from the published methods in frequency domain.