BEHAVIOR OF EARTH DAMS DUE TO DOWNSAMPLING-BASED RECORDS

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Evaluating response of earth dams to earthquake is an important issue in dynamic stability analysis of these structures. The earthquake-induced behavior of earth dams has been studied by many researchers using experimental (e.g., Kim et al., 2011), numerical (e.g., Javdanian et al., 2018) and statistical (e.g., Javdanian and Pradhan, 2019) studies.

The calculation time and accuracy of seismic analysis of earth dams have always been one of the particular concerns of engineers. Wavelet-based decomposition of earthquake records, so that the frequency content does not change significantly, is one of the strategies that considered in the previous studies (Heidari and Raeisi, 2018). In this method, in which the downsampling process is utilized, the number of earthquake record points is halved (Heidari et al., 2019).

In the current research, seismic response of earth dam under main and decomposed earthquake records were evaluated. The seismic analysis was conducted using numerical modeling. The finite element program of Plaxis was used to evaluate earthquake-induced behavior of earth dams. Earthquake records were decomposed using wavelet theory with downsampling method. For example, south coast of Honshu earthquake record and also the wavelet-based decomposition of this record are shown in Figures 1 and 2.
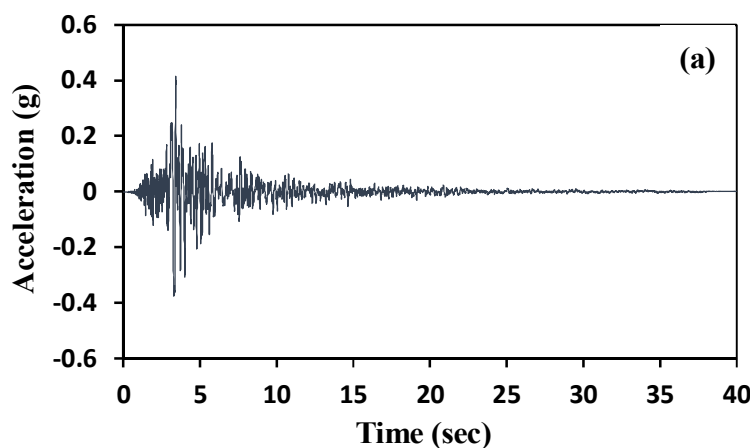

Figure 1. Acceleration time history of south coast of Honshu earthquake.

The seismic response of earth dam under main (south coast of Honshu earthquake) earthquake and decomposed of this record is depicted in Figure 2. As shown in this figure, the earth dam has the same response. The results indicated that the decomposed records can be used in dynamic analysis.
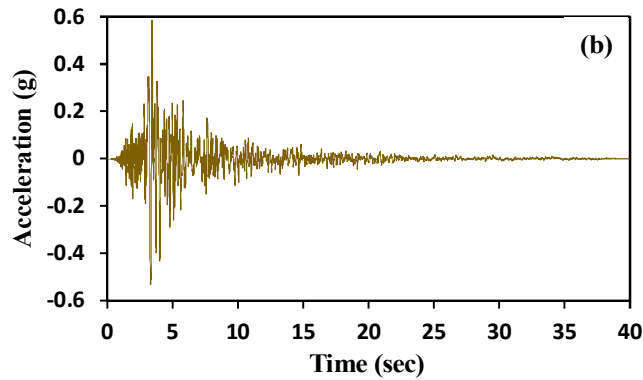
Figure 2. Acceleration time history of downsamplig-based south coast of Honshu earthquake record.
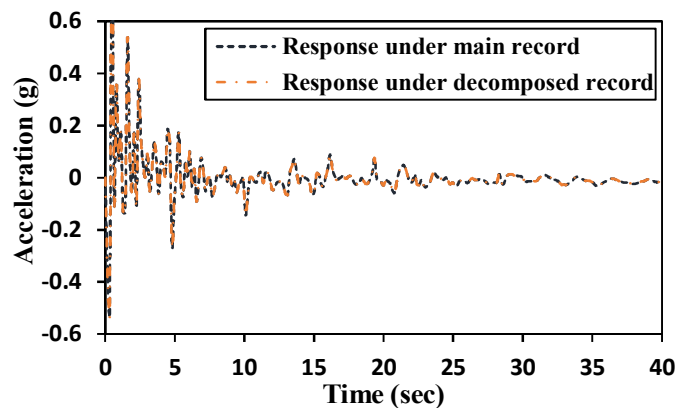

Figure 2. Comparing seismic response of earth dam for main and decomposed earthquake records.

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