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MODELING OF SEISMIC WAVES USING CHIRP SIGNALS AND SIMULATIONS

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Abstract. *A method of modeling of the seismic waves is proposed using the chirplet-based approximation incorporating with the spectral representation of the real earthquake-induced ground motion. Detail algorithm for the chirplet-based approximation is presented and three typical earthquake data are modeled. Furthermore, the seismic waves are generated artificially using the spectral representation with evolutionary power spectrum due to Priestley.*
Keywords: Modeling, Seismic wave, Chirplet, Simulation

1. **Introduction.** Random vibration of tall structures such as high-rise buildings or slender towers may cause fatal structural failures, discomfort to occupants or malfunction of equipments. So, it is particularly important to investigate the active or passive control problem of such tall structures against random vibrations. The random vibrations of structures are caused mainly by wind- and/or seismic disturbances. In order to investigate the control problem in structural design, the generation of artificial wind and seismic waves is prerequisite and has emerged as one of distinct technologies. The artificial wind and/or seismic waves are necessary to show how well the structure withstands random disturbance loads by computer simulations.

One of the authors has recently proposed a method of generating wind pressure and wind profiles along the structure, in which the wind satisfies the given power and cross spectra [1]. In this paper the authors concentrate their attention to propose a method of modeling real earthquake-induced ground motions and generating seismic waves artificially.

In the analysis of engineering structures subjected to earthquake excitation, the ground acceleration model due to Kani [2] and Tajimi [3] has been used widely and is known as the Kanai-Tajimi model [4]. In this model the ground acceleration is mathematically modeled by a stationary random process whose spectral density function comes from the response of the acceleration of a simple mass-dashpot-spring system excited by a broad-band acceleration. Though the use of this model is easy, it has such a fatal shortcoming that

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