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Response Analysis and Control of Structures to Multi-dimensional Seismic Motions

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ABSTRACT

In recent years, much attention has been paid to research and development of structural aseismic analyses and control techniques with particular emphasis on the alleviation of seismic response of buildings and bridges. In this paper, the effect of distributing of the S wave velocity along depth to surface underground the wave dispersion are discussed base on the elastodynamic theory to calculate the velocity of the Rayleigh wave and Love wave. A simplified dispersion curve, a bilinear curve with a horizontal line in higher frequency region and bias in the lower frequency region, is suggested. A modal combination method is presented for the earthquake-resistant design of structures to multidimensional seismic excitations. With the assumption that an earthquake is a stationary random vibration, the correlation among the input components is considered in the proposed method. The relationship coefficients between the translational component and rotational component is then derived in the frequency domain. The combination method of response spectrum for structural response to multidimensional earthquakes is proposed based on the random vibration theory. With the help of the derived modal correlation coefficients, the formulation for structural response to the two-dimensional earthquake excitations can be obtained. Numerical examples demonstrate the effectiveness and high precision of the proposed methods.

Structural control has been developed from the concept into a workable technology and applied into practical engineering structures. The aim of this paper is to review a state-of-the-art of researches and applications of structural control in civil engineering, which includes the passive control, active control, hybrid control, and semi-active control. The researches on the structural vibration control have made great achievements and some control devices have been applied to practice in recent years.

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