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Prediction of Pounding between Two SDOF Systems by Using Link Element Based On Mathematic Relations and Suggestion of New Equation for Impact Damping Ratio

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Abstract : Many previous studies have been carried out to calculate the impact force and the dissipated energy between two neighboring buildings during seismic excitation, when they collide with each other. Numerical studies are an important part of impact, which several researchers have tried to simulate the impact by using different formulas. Estimation of the impact force and the dissipated energy depends significantly on some parameters of impact. Mass of bodies, stiffness of spring, coefficient of restitution, damping ratio of dashpot and impact velocity are some known and unknown parameters to simulate the impact and measure dissipated energy during collision. Collision is usually shown by force-displacement hysteresis curve. The enclosed area of the hysteresis loop explains the dissipated energy during impact. In this paper, the effect of using different types of impact models is investigated in order to calculate the impact force. To increase the accuracy of impact model and to optimize the results of simulations, a new damping equation is assumed and is validated to get the best results of impact force and dissipated energy, which can show the accuracy of suggested equation of motion in comparison with other formulas. This relation is called "n-m". Based on mathematical relation, an initial value is selected for the mentioned coefficients and kinetic energy loss is calculated. After each simulation, kinetic energy loss and energy dissipation are compared with each other. If they are equal, selected parameters are true and, if not, the constant of parameters are modified and a new analysis is performed. Finally, two unknown parameters are suggested to estimate the impact force and calculate the dissipated energy.

Keywords : impact force, dissipated energy, kinetic energy loss, damping relation
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