

TORSIONAL RESPONSE OF SHORT SPAN TRUSS TYPE DECK SUSPENSION BRIDGE UNDER APPROXIMATION CLOSED FORM OF PULSE TYPE GROUND MOTION

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Near-field ground motions recorded in vicinity of the fault cause more and intense damages to the structures. The main reason of these damages is the existence of a long period and large amplitude velocity pulse that transfers the kinetic energy of the ground motions to the structures abruptly. Therefore, simulation of the mentioned pulse can help the engineers to produce artificial pulse type ground motions. In this paper, the response of the suspension bridge under pulse type ground motions and their fitted model was addressed. The Vincent Thomas suspension bridge as a relatively short span suspension bridge was chosen for case study, also six strong records from the three major world-wide earthquakes that have wide range of pulse periods and peak velocity amplitudes were selected to fit by closed form approximation. After evaluation, the response under real and fitted model records, the result indicated that with increasing or decreasing the real pulse period to fitted pulse period ratio, the accuracy of the response will be declined, and the suitable overlap between fitted model and its real record cannot sure the precise response. Besides, the placement of the period ratio in the certain range and appropriate overlap of the energy spectra will be provided the most accurate responses.

After simulating the pulse of Newhall station velocity time history and comparison, the energy spectra bridge response was evaluated under its real and model fitted record, as seen in Figure 1.

CONCLUSION

The most important results are as follows:

1. Existence of more spaced mode in the suspension bridge will be caused the most accurate response when the real record period to fitted model period ratio lies between 1 up 1.5, or mathematically $\frac{3}{2} \geq \frac{T_r}{T_f} \geq 1$.
2. Pulse type B is not suitable for the fitting records that have different peak velocity in their summits.
3. If the period ratio which mentioned in case 1 locates in the certain range and energy spectra has appropriate consistency, the ultimate response will have applicable accuracy, and so on.

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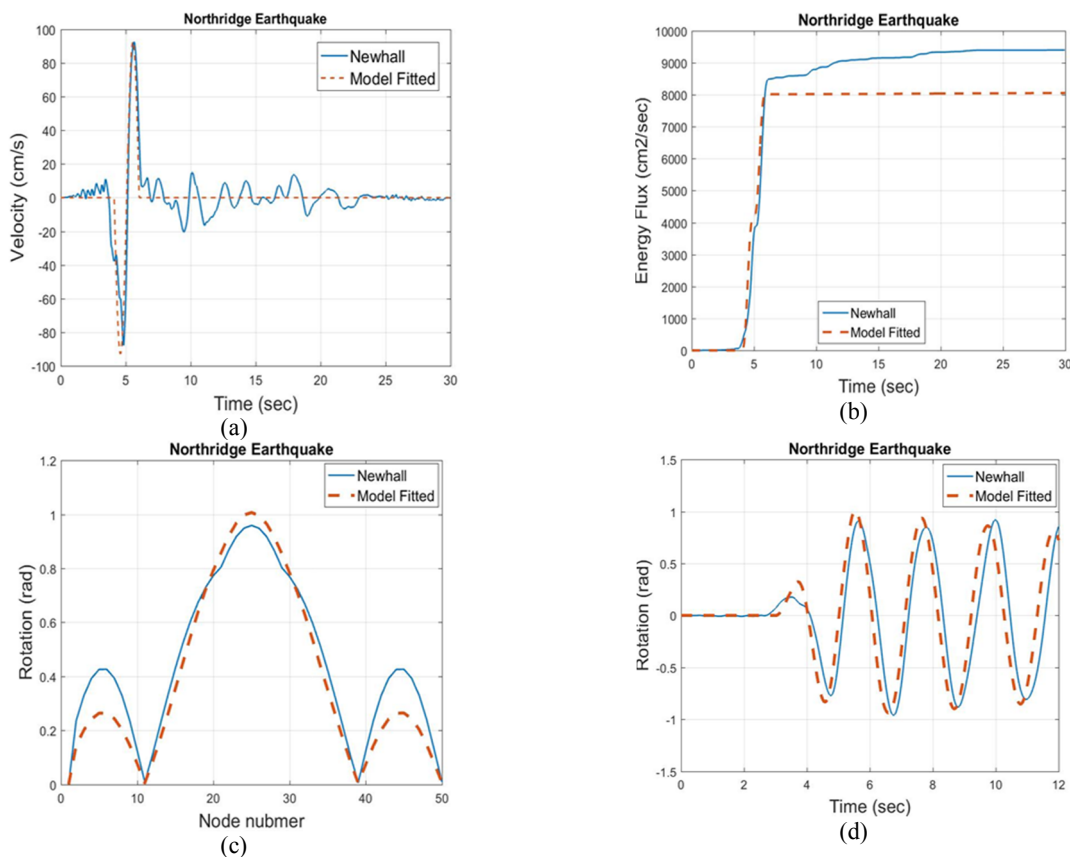


Figure 1. (a) Velocity time history and fitted model, (b) Energy spectra, (c) Total response of bridge, (d) Time history of the middle point response.