World Academy of Science, Engineering and Technology
International Journal of Structural and Construction Engineering
Vol:10, No:07, 2016

Effects of Various Wavelet Transforms in Dynamic Analysis of Structures

Authors : Seyed Sadegh Naseralavi, Sadegh Balaghi, Ehsan Khojastehfar

Abstract : Time history dynamic analysis of structures is considered as an exact method while being computationally intensive. Filtration of earthquake strong ground motions applying wavelet transform is an approach towards reduction of computational efforts, particularly in optimization of structures against seismic effects. Wavelet transforms are categorized into continuum and discrete transforms. Since earthquake strong ground motion is a discrete function, the discrete wavelet transform is applied in the present paper. Wavelet transform reduces analysis time by filtration of non-effective frequencies of strong ground motion. Filtration process may be repeated several times while the approximation induces more errors. In this paper, strong ground motion of earthquake has been filtered once applying each wavelet. Strong ground motion of Northridge earthquake is filtered applying various wavelets and dynamic analysis of sampled shear and moment frames is implemented. The error, regarding application of each wavelet, is computed based on comparison of dynamic response of sampled structures with exact responses. Exact responses are computed by dynamic analysis of structures applying non-filtered strong ground motion.

Keywords : wavelet transform, computational error, computational duration, strong ground motion data
Conference Title : ICSECM 2016 : International Conference on Structural Engineering, Construction and Management
Conference Location : Montreal, Canada
Conference Dates : July 14-15, 2016