Analysis of Strong Motion Data from Buildings

By

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Motions of buildings recorded during earthquakes provide a unique opportunity to evaluate and improve current analytical procedures – nonlinear static pushover analysis and nonlinear response history analysis – for seismic analysis and evaluation of building structures. Needed for this purpose are accurate estimates of various engineering demand parameters – floor displacements, inter-story drift ratio, floor accelerations, story and base shears, and story and base overturning moments – derived from recorded motions. For most buildings, which are instrumented at limited number of floors, these engineering demand parameters are estimated from recorded motions at instrumented floors and interpolated motions at non-instrumented floors. Motions at non-instrumented floors are estimated by simple interpolation schemes, such as cubic polynomial interpolation or a combination of linear and piece-wise cubic interpolation. A recent investigation found that such simple interpolation schemes may not provide accurate estimates of inter-story drift ratio and that base shear estimated from motions interpolated from cubic polynomial procedure may be questionable because it significantly exceeded the base shear capacity from pushover analysis. This paper presents development of an enhanced scheme for accurate and reliable estimation of all engineering demand parameters from recorded strong-motion data of buildings with limited number of instrumented floors.