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Han-Chin Wu, received his Ph.D. degree in Solid Mechanics from Yale University, is a professor in the Department of Civil Engineering at the National Taiwan University. He is also a professor emeritus at the University of Iowa, where he taught from 1970-2007. At Iowa, he supervised 19 Ph.D. students to completion and was a Professor in Department of Civil and Environmental Engineering. He was also a Professor of Mechanical Engineering and a fellow of ASME. His research interest is in the mechanical behavior (plastic flow, damage, creep, fracture, and fatigue) of metals and porous and granular materials such as porous aluminum, concretes, ice and soils. His methods are both experimental and theoretical in the effort of constitutive modeling. He has a patent on axial-torsion extensometer for large strain testing and has written a book (684 pages): Han-Chin Wu, Continuum Mechanics and Plasticity, Chapman & Hall/CRC Press, 2005.

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Nonlinear Dynamic Response of Structure Undergoing Plastic Deformation

It is customary to install gauges on a structure and measure responses of the structure during an earthquake or when the structure is subjected to wind loads. Lots of data can be collected, but what physical causes making the data nonlinear is not straight forward and should be investigated. The nonlinearity can be due to plastic deformation, fracture of local structural elements, or other causes. This investigation should start with the dynamic analysis of a very simple structure using a realistic material model so that specific dynamic response patterns due to plastic deformation/fracture can be determined. The method can then be expanded to obtain response patterns of more complicated structures in further investigations. The challenge is two-fold. The first one is the formation of a realistic material model that accounts for plastic deformation/fracture, and the second challenge is the analysis of data collected from gauges installed on the structure. Traditional method of data analysis may not be able to successfully identify the change in the data spectrum when plastic deformation occurs and other more effective methods of data analysis may be required. The HHT (Hilbert-Huang Transformation) adaptive analysis proposed by Norden Huang is quite powerful and it has been found that it could differentiate the frequency spectra of a structural response in the elastic range from one undergoing plastic deformation.