

Mathematically and knowledge based methods for analyzing geo-seismic related problems

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FORWARD: The papers included herein revise recent analysis approaches used in geo-seismic related problems throughout four independent contributions. The first work traces the evolution of non-linear dynamic analysis in geotechnical earthquake engineering from its beginning in 1952 to the present. Reliability of dynamic analysis is essential for performance-based design (PBD). Therefore, the paper describes major studies undertaken to validate dynamic analysis. The second work examines the influence that cracks can have over the seismic response of a hypothetical soil profile using a bidimensional finite difference model. The soil is considered to be representative of the soil materials found in most areas of Aguascalientes, and having a bilinear behavior conforming a Mohr-Coulomb model. The third work presented herein gives an outline of the advantages of applying Soft Computing, SC, techniques (neural networks, genetic algorithms and regression trees) and in particular the synergy derived from the use of hybrid SC systems (fuzzy systems tuned by neural networks and neurogenetic models), to solve geotechnical problems. Finally, the last work deals with the development of a system for the analysis of the seismic response of rockfill dams, showing that in some cases, neurogenetic techniques are a better option than analytically-based procedures. To buttress this assertion, the study of the seismic response of El Infiernillo dam, which has an ample history of being shaken by a great variety of seismic events, is conducted.