MODELLING SEISMIC RECORD AND SOIL TEST RESULT BY NEURAL COMPUTING WITH GENETIC ALGORITHM

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Keywords: Neural Network, Genetic Algorithm, Peak Ground Acceleration, Unchecked Site, Prediction

ABSTRACT

Earthquakes are natural hazards which occur quite often worldwide every year, and the recorded data sets can be used to analyse the characteristics of seismic response in a specified region. In this study, a genetic algorithm based neural network model is developed to improve the reliability of predicting peak ground acceleration, the key element to evaluate earthquake response and to setup seismic design standard. Three seismic parameters including local magnitude, epicentre distance, and epicenter depth, are taken in the input layer for developing the fundamental estimation model. Then, two geological conditions including standard penetration test value and shear wave velocity, are added for developing a new model to reflect the site response more adequately. Based on the earthquake records and soil test data from 86 checking stations within 24 seismic subdivision zones in Taiwan area, the computational results show that the combination of using neural network and genetic algorithm can achieve a better performance than that of using neural network model solely. This preferred model can be extended to predict peak ground acceleration at unchecked sites, and can be applied to check the design standard in building code. This study may provide a new approach to solve this type of earthquake related nonlinear problem.

1. INTRODUCTION

For an event of severe strong ground motion, it may cause a large scale of structural damages and result in tremendous casualties and property losses directly and indirectly. Accumulated results have shown that earthquakes accounting for nearly 60% of all disaster-related mortality in the past decade (Bartels and VanRooyen, 2012). To reduce various negative impacts from this natural disaster, a wide range of relating research topics, such as earthquake mechanism and potency investigation, prediction and warning system development, instrumental measurement and data analysis, have been extensively reported (Bailey et al., 2009; Rhoades and Evision, 2004; Zobin et al., 2014) in the field of applied geophysics as well as in the community of earthquake engineering.