Recent Development of On-Site Earthquake Early Warning System for Taiwan

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Abstract

An on-site earthquake early warning system (EEWS) has been developed to provide a time related information including magnitude, the arrival time of strong shaking, the intensity of the shaking, and the estimation of structure response, etc. The mechanism of the earthquake wave propagation is complicated, due to the interaction of different ground motions and variety in the elastic properties of geological media, and therefore results in a highly nonlinear function. The first part of this study uses the neural networks and other methods to model these nonlinearities and learn to predict the characteristics of the sensed earthquake accelerogram. By analyzing the three components of the on-site earthquake signal, the proposed methods instantaneously provide a profile of the arrival ground motion, after the shaking is felt at the sensors. The first part use the sensed P-wave data from the sensor and predict the magnitude, the intensity, the arrival time and dominate frequency of the following earthquake. To enhance the functionality of the EEWS, this study proposes the second part, the rapid-estimation of structural responses. Two different approaches are used to satisfy the different demands. Both modulus can estimate the structure response rapidly with the output of the first part. The general modulus, which only used the common data of the structure (Height, Structure type, Floor, Address …etc), is proposed to provide the low-cost and rapid estimation of structure responses. In the other hand, the customized modulus provides the more accurate and detail structural responses estimation. The first part provides the basic prediction of the earthquake; the second part estimates the response of the structure. Combining the two parts, the proposed on-site early warning system can provide more detail earthquake warning messages, and minimize the hazards of earthquake.

Keyword: Earthquake Early Warning, Structural Response Estimation

Bibliography

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