Development and Application of the Real-Time Structural Damage Assessment and Warning System

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Abstract

The identification of structural damage is an important objective of health monitoring for civil infrastructures. In order to develop a Real-Time Structural Damage Assessment and Warning System (RTSDAWS) running in parallel with the existing building arrays installed by the Central Weather Bureau in Taiwan, a few on-line damage assessment tools such as the model-reference adaptive identification technique (MRAIT) and the on-line recursive least-squares (RLS) identification technique are developed to be implemented in the RTSDAWS. For the purpose of providing required information apart from measured accelerations, a Real-Time Structural Response Integrator (RTSRI) is equipped in the RTSDAWS to perform the on-line integration processes. The real-time monitoring and automatic triggering function is verified through the recorded measurements of Yun-Ping Building located at NCKU from the 2006 Heng-Chun earthquake series. Some pre-implementation investigations are conducted through the damage assessment on a three-floor shaking table benchmark model tested at NCREE in Taiwan and on the recorded strong-motion data of Tai-Tung Fire Bureau Building located at Tai-Tung City in Taiwan, which had been demolished due to severe damage after a magnitude 6.2 earthquake in 2006. By observing the variations of the identified time-varying modal properties of both benchmark model and real building, global damage behavior due to weak element or failure of components can be revealed.

Bibliography

Dr. Shih-Yu Chu is an assistant professor in the Department of Civil Engineering at the National Cheng Kung University. He received his B.S. and M.S. degrees in Civil Engineering from National Chung Hsing University in 1990 and 1992, and his Ph.D. degree in Civil, Structural and Environmental Engineering from State University of New York at Buffalo in 2001. His research interests are in the area of structural health monitoring, structural damage identification and assessment, adaptive structural control, and the application of control techniques toward real-time hybrid testing.