Structural safety under near-fault and/or multiple hazards (earthquake, wind, flood, fire, etc.) threat, and disaster mitigation technologies for improving resilience

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With the grand opening of the NCREE Tainan Lab, two potential future research directions are proposed as follows:

1. **Real time structural response prediction based on earthquake early warning system**: Recently, earthquake early warning system (EEWS) has been prosperously developed and implemented worldwide. Through the deployment of EEWS, early warning information including the earthquake magnitude and the peak ground acceleration (PGA) can be promptly provided. However, due to the diversity of structure type and material, the structural response under the specific earthquake can only be roughly estimated by utilizing empirical or regression equations, which may cause huge loss on life and property. With the support of the long-stroke shaking tables, full-scale experiment of typical structures can be conducted and integrated with sophisticated finite element model, and the trend of the structural response under the major earthquake can be predicted and released by the designated processing module right after the detection of the earthquake for prompt measure on disaster prevention.

2. **Information-theoretic structural health monitoring:** As structural health monitoring has become an important issue among structural/earthquake engineering, research has been focusing on the improvement of accuracy and reliability. Unlike the conventional SHM system, which mainly considers the variation on natural frequency and mode shape of the structure, a novel perspective is proposed in this study. By utilizing advanced sensors, the ambient signals measured from the major components of the structure are treated as information flows among different sections. The correlation between each sections can be evaluated by the Information-theoretic SHM algorithms following the dynamic flow direction to precisely illustrate the possible damage condition and locations, and the health condition of the structure can be reliably quantified and demonstrated by the of the proposed method.