

## ABSTRACT

This study investigates the application of a hybrid numerical simulation by coupling two different programming softwares, MATLAB and OpenSees to analyze the seismic response of a 10-story building equipped with a Tuned Mass Damper (TMD) on top of the floor. In this application, the main structure is modeled in OpenSees, while the TMD is modeled in MATLAB, with data exchanged for each analysis step is done through a TCP/IP socket. The effectiveness of the TMD in reducing structural responses can be observed by comparing the top floor response when it is equipped and unequipped with TMD. Although the hybrid simulation framework successfully established closed-loop data exchange interaction between both softwares, the hybrid model result showed significant amplitude deviation from the reference full numerical model. This discrepancy is likely due to data synchronization issues or integration step mismatches between the two different software during the coupling analysis. Despite these issues and limitation, this research implements the fundamental application of multi-platform hybrid numerical simulation and provides valuable insights for future improvement and development in the field of earthquake engineering.

Keywords: Coupling analysis, hybrid numerical simulation, unidirectional dynamic analysis, virtual experiment substructure, numerical substructure, MATLAB, OpenSees, Tuned Mass Damper, 10-Story Building.