Department of Civil Engineering and Engineering Mechanics
Columbia University

A Simulation-Based Model of Post–Earthquake Fire Spread

Selina W. Lee, Ph.D.

Cornell University

This seminar presents a new post-earthquake fire spread simulation model that estimates the extent of fire damage in an urban area, given a set of ignition locations and times. This physics-based model takes as input actual building footprints and heights to accurately capture the areas and relative orientations of buildings that are important for spread modeling. A room-specific time-temperature curve describes the evolution of fire within each room. Room-to-room fire spread can occur through doorways to adjacent rooms, by burn-through to adjacent rooms or a room or roof above, or by leapfrogging through windows to a room above. Radiation flux from room gas, flames ejected out windows, and roof flames are all calculated to determine if fire spreads to neighboring buildings. Fire brand size and traveling distance are estimated to determine if fire spreads to neighboring buildings farther away. Each of these modes of spread is represented explicitly, including randomness in the process. Using a base case study area in Los Angeles, results such as the percentage of area burned in a building or region, distribution of the modes of spread, and time to fully burned for a building are calculated. Sensitivity analyses for varying parameters were studied and multiple t-test with the Hochberg correction was used to determine the significance of each sensitivity study. The results of this base case were compared with that of the widely used Hamada model. This study is part of a Multidisciplinary Center for Earthquake Engineering Research effort to assess community resilience.

February 10, 2009 (Tuesday)

3:00 - 4:00 p.m.
Room 627, Mudd

`http://www.civil.columbia.edu/~ling/seminar`