

Monitoring Irreversible Changes in Burning Structures

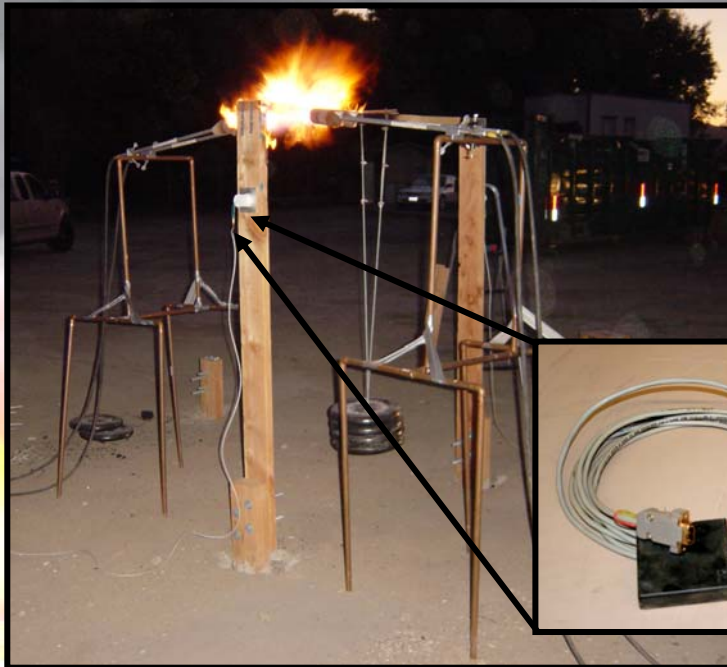
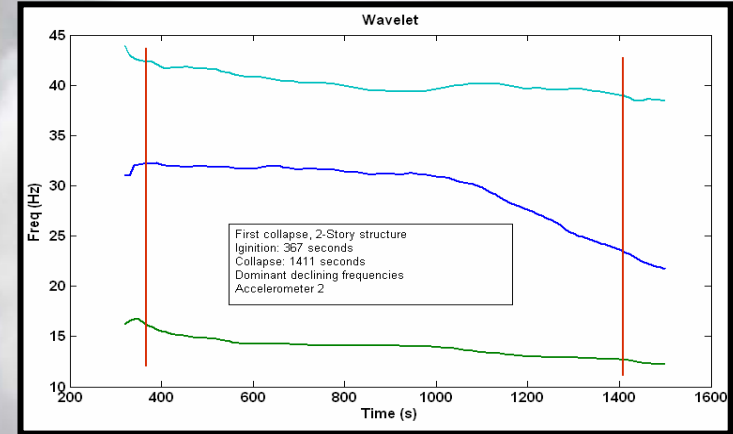
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Research has continued this summer on the structural stability of burning buildings. New analysis techniques have been developed (right) and field testing (below) was performed.

Frequency tracking algorithms were the teams newest analysis techniques examined this summer. Three methods were used:

- 1.) Wavelet transform decomposition
- 2.) Empirical mode decomposition
- 3.) Instantaneous frequency.

The plot to the right is the wavelet transform decomposition of a field test from this summer. The three decreasing horizontal lines represent three dominant frequencies in the data set, and the red vertical lines represent ignition and collapse. The decreasing frequency trend was seen in many of the field tests and in all three frequency tracking methods.



A total of 11 frames were constructed this summer (left). Two frames extended to two stories and the final frame consisted of a 3D frame structure. All frames were loaded and ignited until a collapse event occurred. These frames provided a means to test our new accelerometers outside the lab. Seen in the inset, the new accelerometer is 5mm and is set in a castable ceramic that withstands heat and flame. These new accelerometers are a fraction of the cost of the previous accelerometers, which helps in the long run to make the product marketable.

These field tests provided the team with valuable data to analyze. The field testing and analysis performed this summer revealed that visible trends occurred at higher frequencies than were previously expected. Acting on this new development, future field testing of larger structures will measure frequency responses over a broader range.