

GOAL: DETECT DAMAGE UNDER TEMPERATURE CHANGES

- Damage detection techniques react to any change in the structures, usually only damage is considered
- Variations in ambient temperature produce structural changes
- dynamics of structures usually proves more sensitive to temperature changes than to damage: false alarms and no detection risks

TEMPERATURE INFLUENCES STIFFNESS

Constitutive Law

$$\sigma_T = C : \varepsilon_T = \lambda \text{Tr}(\varepsilon_T) I + 2 \mu \varepsilon_T$$

Total stiffness is sum of many temperature models and damage

$$[K(p_i)] = [K(T_0)] + \sum_i p_i [K_{\sigma-T_0}] + p_k [K_{\text{damage}}]$$

TEMPERATURE CORRECTION

- Frequency prediction and reconstruction based on deformation gage measurements
- Complete temperature field reconstruction
- Analytical models and finite elements models for temperature and structure

DAMAGE DETECTION METHODS ROBUST TO TEMPERATURE CHANGES

- Reject temperature as a nuisance
- Correct a reference model by a finite element eigenvalue analysis with thermal prestress effects
- Define a reference model from many reference scenarios at different temperatures

