**Motivation**
- Metal in aerospace structures are being replaced with composites. Why not the same for houses?
- A proposed design of a composite house cannot be structurally analyzed due to problems implementing multifunctional features called fiber elements

**Objective**
- Develop a method to implement the fiber elements
- Perform Finite Element Analysis on multifunctional structure

**Preparing Model for Analysis**
- Applied Loads: Gravity, Vertical Wind, Lateral Wind, Snow
- Material Properties/Composite Layup: Used properties of E-glass/Epoxy Composite with 8-Harness Satin Weave
- Lamina Orientation: 0°/45°
- Assume Quasi-isotropy due to orientation

**Implementation of Fiber Elements**
- Process for Developing Method
  1. Create and tie wires on a flat plate
  2. Create and tie wires on a curved plate
  3. Create a code that would create a wire and tie it to a surface

The code reads in points from a text file and then uses those points to create wire features, apply material properties and a mesh, and ties the wire to the specified surface.

**Parametric Studies**
- Wind Loads: Vertical Wind, Lateral Wind
- Thickness of Composite

**Experimental Verification**
- Fabricate and Prepare Composites Specimens
- Perform Tension and Bending Tests on Specimens
- Use average Young’s Modulus obtained from tension tests
- Calibrate Longitudinal and Transverse Young’s Modulus using data from tension tests
- Compare analytical results of 3-point bending in Abaqus to experimental results

**Summary/Conclusions:**
- Created finite element analysis model for design
- Successfully performed analysis of the model without fiber elements
- Code was created that implements fiber elements into design
- Performed initial analysis on model with fiber elements
- Created and tested composite specimens
- Assumption for quasi-isotropy disproven by experimental data
- Next Step: Implement actual fiber elements from design

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