

# Resilience Assessment of Residential Buildings under Hurricane Wind Loading through Customized Interactive Structural Analysis

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## ABSTRACT

Hurricane is one of the costliest natural disasters effecting the United States. Facing the threats of hurricanes, homeowners usually have to rely on general information and instructions to understand their level of risks. The knowledge of structural resilience to hurricanes at individual residential building level is often limited, which hinders personalized disaster preparation and mitigation decision-making. To address this limitation, a new method of customized and interactive structural analysis is proposed. The proposed method includes three steps: input collection, modelling and analysis, and result presentation. First, various structure information (e.g., type of building frames and material) will be collected from individual users/homeowners based on their localized knowledge through a list of interactive questions. Second, customized finite element models (FEM) of residential buildings will be automatically built based on the collected information using Ansys Parametric Design Language (APDL). FEM analysis will be conducted under hypothetical hurricane-induced loads with randomized wind speed and direction. Finally, analysis results such as the percentage of failed sheathing components and nailed connections will be presented to the user indicating the risk level of a specific residential building under the impact of hurricanes. The proposed methodology provides a useful tool for individual homeowners to enhance their knowledge and awareness of disaster risks. In addition, the method could facilitate a better understanding of the resilience of building structures at the community level through distributed computing and crowdsourcing with less centralized effort.