VAWS – Vulnerability and Adaptation to Wind Simulation

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Vulnerability and Adaptation to Wind Simulation (VAWS) is a software package that can be used to model the vulnerability of small buildings such as houses and industrial sheds to severe wind events. The primary aim of VAWS is the examination of the change in vulnerability afforded by mitigation measures to upgrade a building's resilience to wind hazard.

The Cyclone Testing Station at James Cook University and Geoscience Australia are collaborating on the Bushfires and Natural Hazards CRC project: Improving the Resilience of Existing Housing to Severe Wind Events.

A key part of the project is to develop a software package that provides a measure of the vulnerability of several Australian house types to inform the cost benefit of carrying out practical structural retrofits. The software package, known as Vulnerability and Wind Simulation (VAWS), is currently under development. The program is built around the following high level sequence as shown in Figure 1

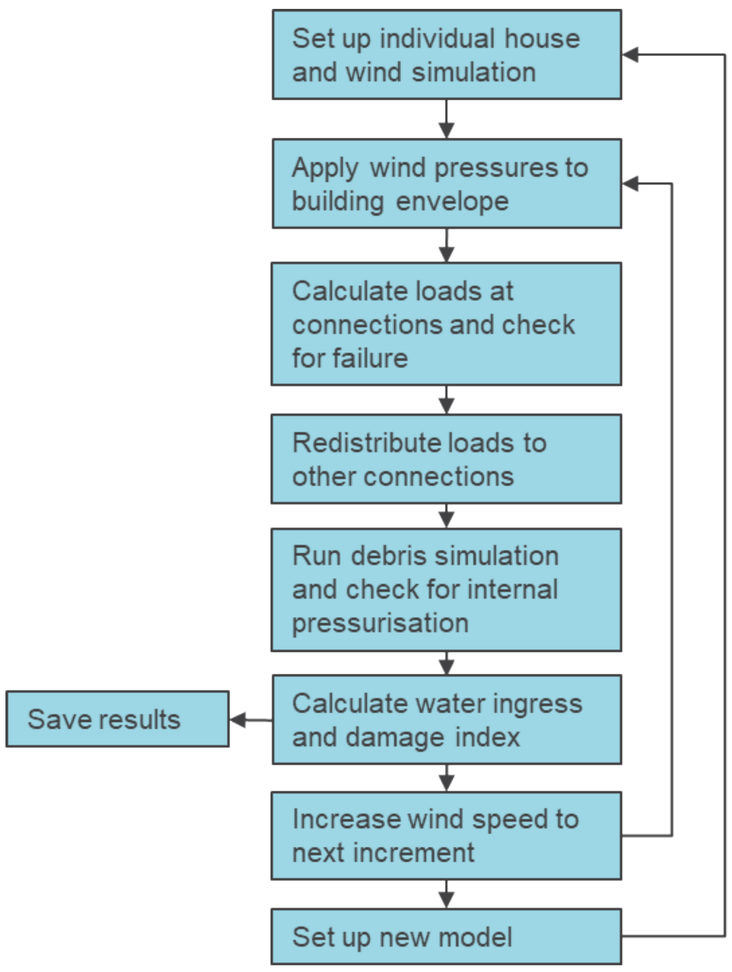

Figure 1: Program logic

FEATURES

VAWS is a sophisticated program that models several complex features that previously have not been accounted for in vulnerability models. These features include:

- Progressive failures of connections
- Modelling of debris Impact
- Water Ingress
- Internal pressurisation

MONTE-CARLO PROCESS

The program generates a building model by randomly selecting parameter values from predetermined probability distributions. Using a Monte Carlo process, hundreds of realisations of a house type can be subject to increasing wind speeds and damage indices determined at each wind increment.

Figure 2: An Example of the high-set Queensland House

CASE STUDY

The VAWS software was used to model the vulnerability of a high-set Queensland house, shown in Figure 2. The house is 12.6 m long, 7.3m wide and 4.4 m tall including 2.0m stumps and a 10° roof pitch. Rafters and battens are spaced at 900mm centres. Preliminary results correspond to observations during post windstorm damage surveys, as shown in Figure 3.

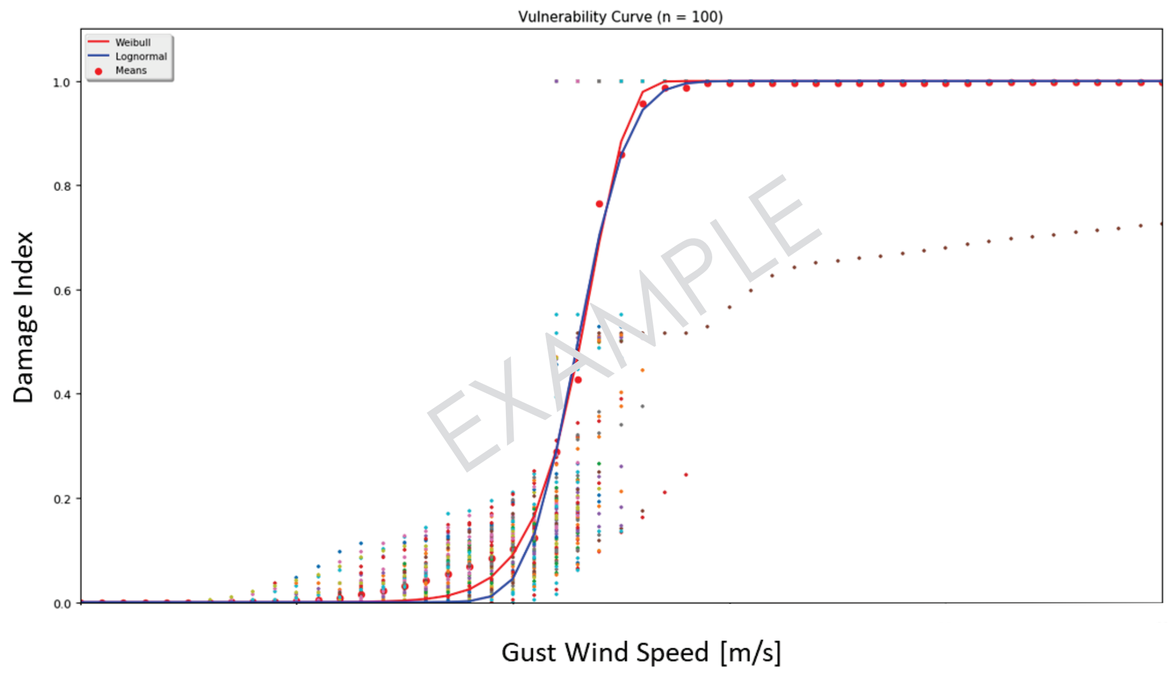

Figure 3: Preliminary vulnerability functions for 100 realization of the high-set house

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