

BUILDING CYBERINFRASTRUCTURE TO MITIGATE THE IMPACTS OF NATURAL DISASTERS

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ABSTRACT

Wind-related catastrophes inflict enormous devastation on the built environment and result in a staggering number of fatalities, which may continue to rise in the future given the increase in exposure as population migrates towards the coasts. To better manage the impact of extreme wind events, given the heavy reliance on empirical and experimental data in the design process, a new paradigm is required utilizing shared resources and global collaborations. A Virtual Organization for Reducing the Toll of EXtreme Winds (VORTEX-Winds) was recently funded by the National Science Foundation to offer real-time shared access to geographically dispersed resources for more effective research and education to achieve improved understanding and modeling of wind effects on structures. This virtual organization is based at the University of Notre Dame and includes cyberinfrastructure that enables web-access to various analysis and design modules for automated, integrated analysis and design. This virtual organization also offers an interactive knowledge base intended to aggregate and centralize the shared knowledge of the collaboratory, including a wind-wiki, damage database, help desk/FAQ, bulletin boards and curriculum tools to facilitate dissemination and education. This project focuses on the population of the wind-wiki and damage database.

The wind-wiki, an online wind encyclopedia, will serve as the primary educational tool for both professionals and students, particularly in the developing world. The project will focus on the initial population of the wind-wiki, followed by collaboration with professionals in the field of wind engineering to further enhance the quality of the information on the site. This wind-wiki provides information not only on the basics of wind and wind events, but also on experimental methods to aid in building structures that reduce the effects of extreme wind events. In addition to the wind-wiki, a damage database is being developed in this project to aid in educational purposes. The damage database will bring together photographs from wind-related disasters, such as hurricanes, tornadoes, and downbursts, taken by people who experienced the events or surveyed the aftermath. Information on the disasters and the nature of the damage cataloged using Google Earth will prove vital in the recovery and rebuilding following disasters. Thus, VORTEX-Winds will pool advanced analysis tools and knowledge bases to benefit those otherwise limited by their personal research tools allowing them to address complex problems posed by wind to protect civil infrastructure and human life.

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