

FLORIDA HURRICANE ALLIANCE QUARTERLY REPORT FORM

PROJECT TITLE: Hurricane Visualization

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PERFORMANCE PERIOD: July 1, 2005 through September 30, 2005

Percentage of Work Completed: 60%

Project Proceeding on Schedule: Yes No

Cost Status: Cost Unchanged Under Budget Over Budget

Describe milestones achieved during this quarter: During this quarter we have concentrated on three tasks.

1. *Subcontract to Kinetics Analysis Corporation* (KAC) is in well under way in developing useful hurricane visualization tools by the end of the 2005 hurricane season. The objective of the project (which has several sponsors including the Hurricane Alliance) has been to develop a web based platform (<http://hurricane.methaz.org/>) to display innovative real time hurricane impact forecasts suitable for general audiences. The graphics of wind and flood damage areas are easy to understand and include areas impacted and to what extent. These forecast tracks are based on data provided by the [US National Hurricane Center](#) (NHC) as well as other sources. The forecast track is then run using the [TAOS Hazard Model System](#).

The figure below shows their visualization of the track of Hurricane Katrina as well as wind damage bands indicated by colors.

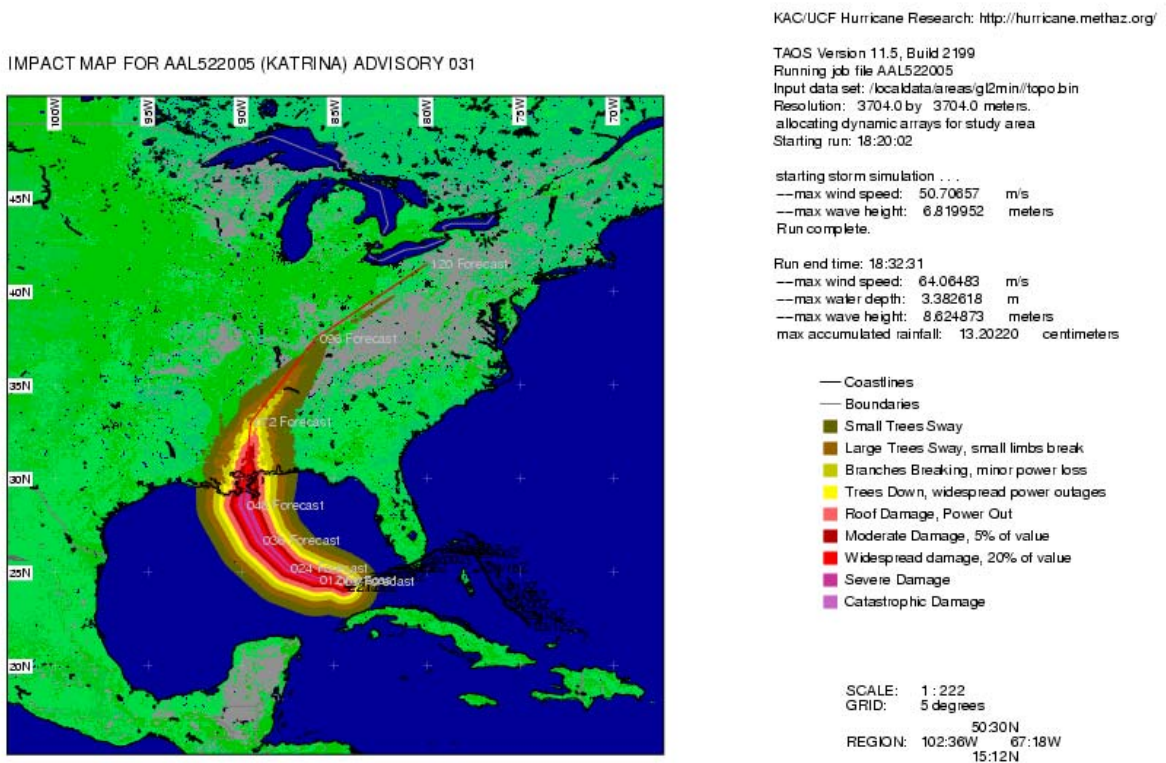


Figure 1. Track of Hurricane Katrina Showing Wind Damage Bands.

2. Framework of Hurricane Visualization Database. The main reason for building the database is to use information from it for instruction programs and other applications to inform the public about hurricane effects. A good portion of the database is now populated and we continue with this process. We are concentrating our effort on hurricane-force wind effects on residential buildings and other components of visual scenes, such as weather effects (clouds and rain), and trees. The framework for the visual database is shown in Figure 2

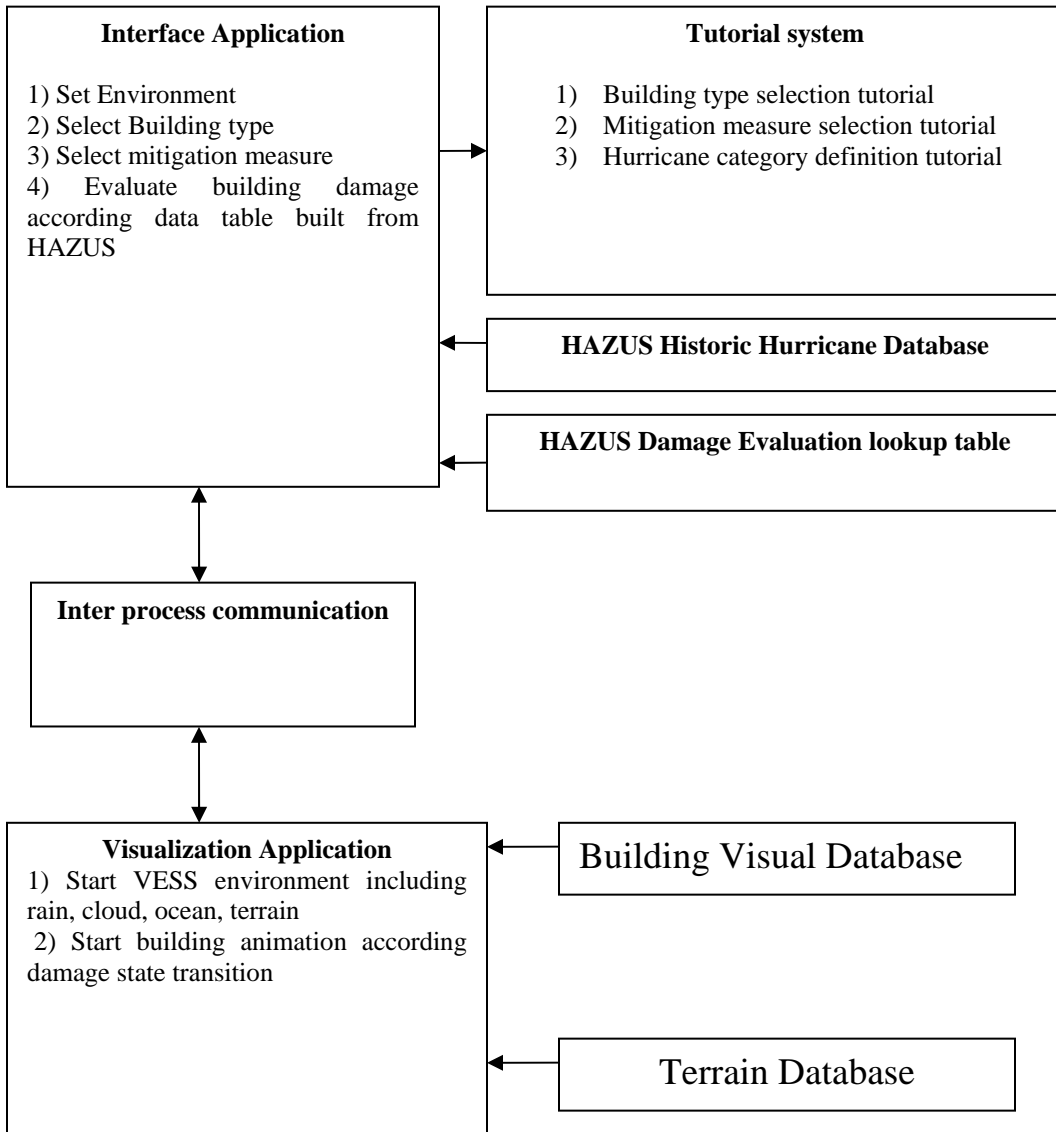


Figure 2. Framework of Hurricane Visualization Database.

To improve the public awareness of the damage brought by the hurricane, we need to make the application interface intuitive and interesting to use. One important way to achieve this goal is to enable the capability of using different advanced interface design technology. By designing interface module and the visualization module as two different processes, the interface can be designed using technology without the limitation of Operating Systems, developing tools and programming languages.

Visualization is based on environment models and animation of buildings as they undergo wind damage from high winds. The visual database shown in Figure 1 is integrated using the Virtual Environment Software Sandbox (VESS) developed by UCF’s Institute for Simulation and Training. We have already developed environment models for rain, clouds, ocean, and terrain model. Wind field and tree models are under development. The framework for the visual database is shown below. Figure 3 shows the same building but with different degrees of damage caused by winds of different velocities.

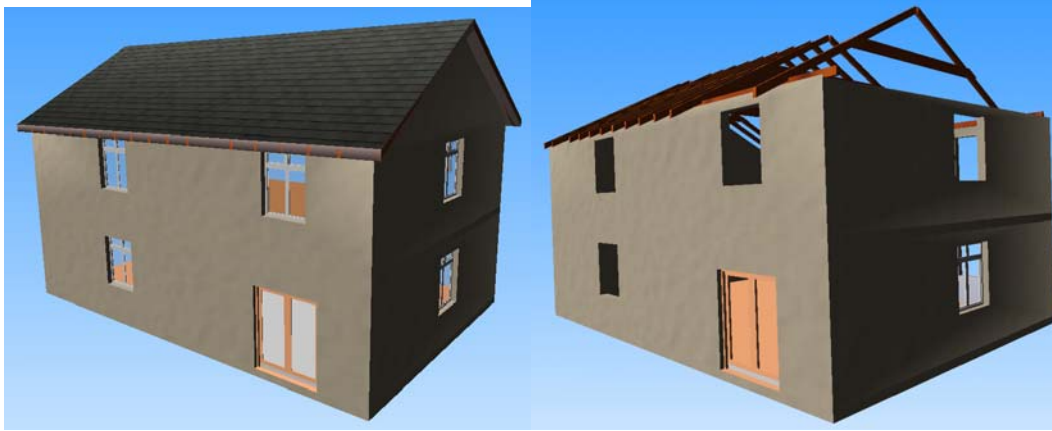


Figure 3. Same Building Shown with No Damage and Severe wind Damage.

Damage states for buildings are defined according to HAZUS as shown in Table 1 below.

Damage State	Qualitative Damage Description	Roof Cover Failure	Window Door Failures	Roof Deck	Missile Impacts on Walls	Roof Structure Failure	Wall Structure Failure
0	No Damage or Very Minor Damage Little or no visible damage from the outside. No broken windows, or failed roof deck. Minimal loss of roof over, with no or very limited water penetration.	≤2%	No	No	No	No	No
1	Minor Damage Maximum of one broken window, door or garage door. Moderate roof cover loss that can be covered to prevent additional water entering the building. Marks or dents on walls requiring painting or patching for repair.	>2% and ≤15%	One window, door, or garage door failure	No	<5 impacts	No	No
2	Moderate Damage Major roof cover damage, moderate window breakage. Minor roof sheathing failure. Some resulting damage to interior of building from water	>15% and ≤50%	> one and ≤ the larger of 20% & 3	1 to 3 panels	Typically 5 to 10 impacts	No	No
3	Severe Damage Major window damage or roof sheathing loss. Major roof cover loss. Extensive damage to interior from water.	>50%	> the larger of 20% & 3 and ≤50%	>3 and ≤25%	Typically 10 to 20 impacts	No	No
4	Destruction Complete roof failure and/or, failure of wall frame. Loss of more than 50% of roof sheathing.	Typically >50%	>50%	>25%	Typically >20 impacts	Yes	Yes

Table 1. Damage state for residential buildings defined in HAZUS

3. Instructional package development for visualization of residential building hurricane damage. The main goal for the instructional package is to let the audience be aware of the damage states caused by the hurricanes under different conditions. The target audience will mainly be focused on K-12 students.

Below is a preliminary outline of modules:

- General Aspects of Hurricanes (what is a hurricane?, how hurricanes form, categories of hurricane)
- Building Attributes Affecting Damage State (building material, roof type, roof cover connection, roof to

- wall connection, window type, etc.)
- Building codes that will have effects on damage state (e.g., “pre-Andrew”, latest Florida building code)
- Advisory instructions before and during a hurricane
- Specific hurricane events (e.g., damage in a particular area, such as Punta Gorda for Hurricane Charlie, damage to houses close to shore caused in Pensacola by Hurricane Ivan)

Main learning objectives were also generated based upon the content. After finishing the modules, students are expected to be able to:

- What is a hurricane and how does it form.
- Different hurricane categories.
- Identify different environment types and describe their effects on buildings during a hurricane.
- Identify different roof types.
- Understand the different effects caused by different building codes during a hurricane.
- List proper acts before or during a hurricane

The whole instructional materials are to be developed with Macromedia Flash. According to the nature of the audience, various animations and interactive activities will be incorporated. One example is shown in Figure 4 below.

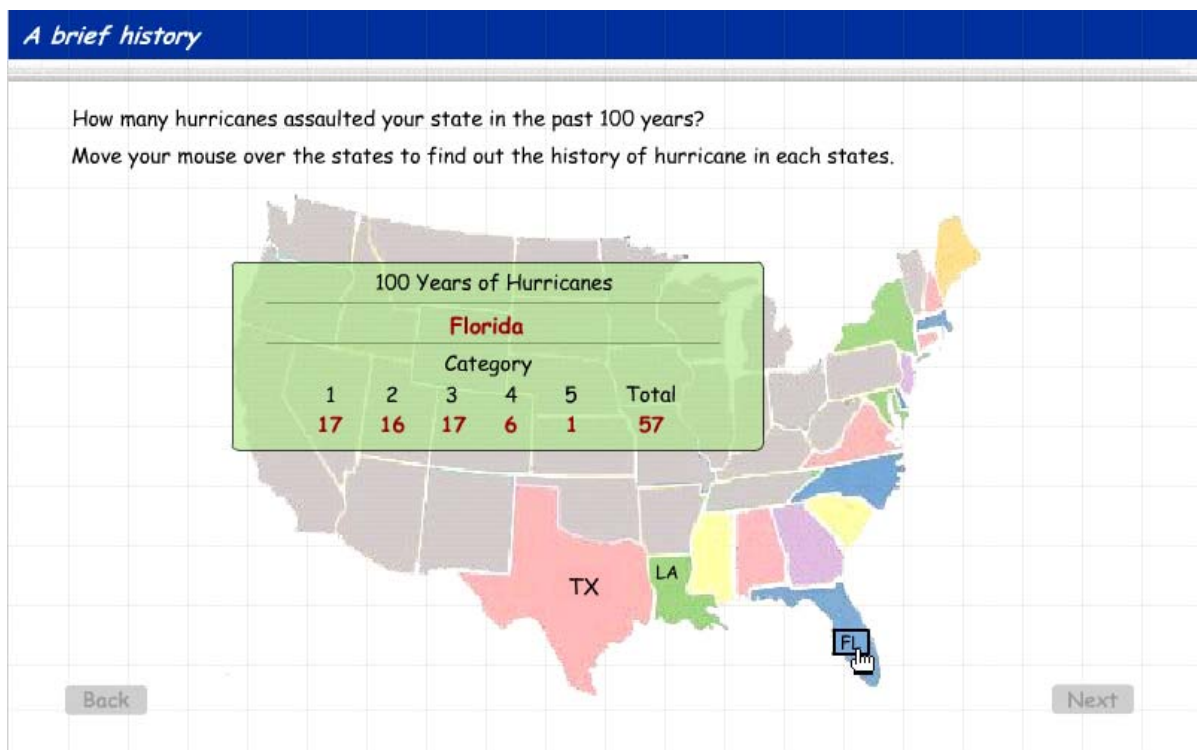


Figure 4. Screen from Hurricane Visualization Courseware Program (under development).