

Visualization of Storm Surge Time-Varying Data

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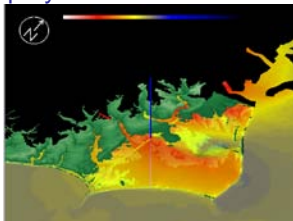
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Introduction

This model uses information on Hurricane Isabel and its effects on the Outer Banks of North Carolina. The dataset used in this program is the ADCIRC storm surge model which has been approved by FEMA. The dataset contains 792 time steps, 520,000 triangles, and 260,000 vertices. Our goal was to simulate a combination of timesteps in a way that effectively demonstrated relationships of time varying data. We hope to contribute something new to the existing temporal data display methods.



Background

Illustration-inspired techniques for visualizing time-varying data

Alark Joshi Penny Rheingans

Illustration techniques such as speedlines, flow ribbons, and strobe silhouettes can be used to facilitate understanding of change across time.

Chronovolumes: A Direct Rendering Technique for Visualizing Time-Varying Data

Jonathan Woodring and Han-Wei Shen

Time varying data is displayed in the order xytz with time as the third dimension and graphics hardware is used to speed up visualization.

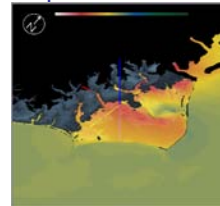
Depicting Time Evolving Flow with Illustrative Visualization Techniques

Wei-Hsien Hsu, Jianqiang Mei, Carlos D. Correa, and Kwan-Liu Ma

Illustrative techniques with no animation, feature based tracking, non-photorealistic rendering are all ways time varying data can be expressed.

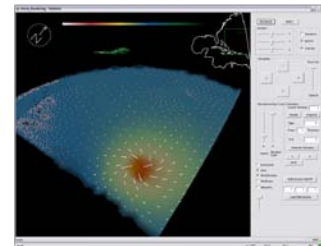
Research

3. Aesthetics in Open GL



- Color:
 - used a new set of colors based on Homeland Security Advisory System
 - * not only an aesthetic aspect, but can also be used to show information based on a scale.
- Lighting:
 - * visualization became darker after color change
 - * changed the properties of light and materials within the program
 - * brightened visualization

4. Visualization



- Wind Direction:
 - * added color to lines to also show wind speed
 - * Different information is more effectively presented in single visualization
 - * because they are lines, you can show other things in the background such as water elevation
- Timesteps:
 - * program can display three different timesteps

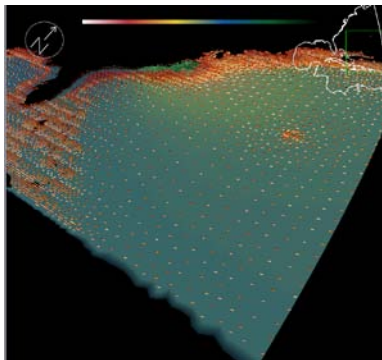
* experimented with blend functions and transparency
* transparency used to suggest older timesteps in sequence

- a. Compare Elevation
* function would compare two timesteps and draw a range of the maximum and minimum values.

2. Implementation
* used Open GL.
* creates 3D applications, hardware independent interfaces, and uses C++.

Impact

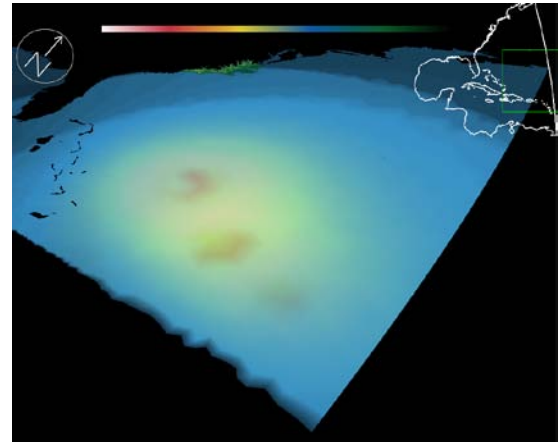
- **Helps scientists to visualize temporal datasets**
 - Instead of adding time as a fourth dimension, it can be added into the existing three dimensional framework for easier comprehension
 - Transparency and illustration techniques can be used
- **Improves comparative visualization**
 - timesteps are shown simultaneously, easier to make comparisons.
 - More details
- **Introduces more aesthetics and design into scientific visualization.**



Conclusions

Our method of showing multiple timesteps within the three dimensional framework is a much more effective technique than using the original animation scheme. Because of the movement of the hurricane, it is easy to compare timesteps side by side. With future work, illustration techniques, more details, or feature based tracking may be added to the system.

Future Work



This picture shows three different timesteps projected onto the visualization. A transparency filter is used to show the oldest timesteps as the most transparent, and the newest timesteps as the most saturated.

Future work in this program will add more creative visualizations to show combined timesteps with other methods besides transparency. It is hoped that this project will add something new to the existing temporal data display methods.