



Reducing Visual Clutter with Semantic Lenses

MITRE IR&D

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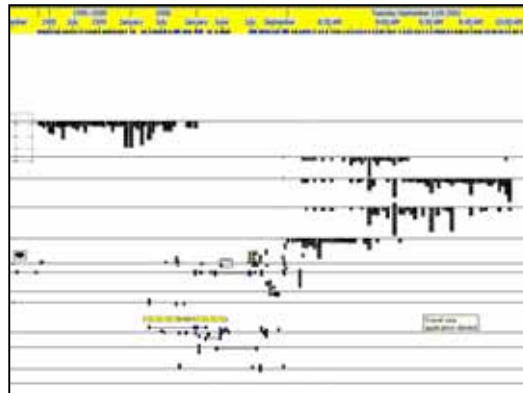
What is Nonlinear Visualization?

Simultaneously being able to obtain detailed information while preserving the necessary context

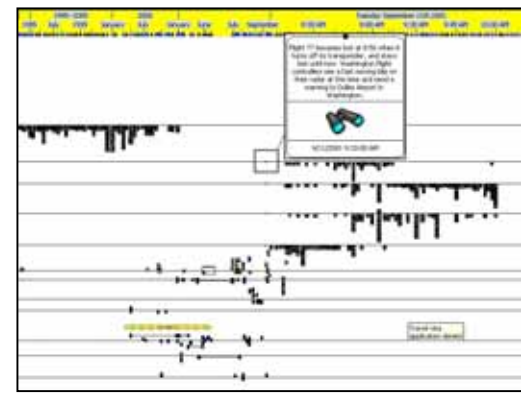
detail

Flight 77 becomes lost at 8:56 when it turns off its transponder, and stays lost until now. Washington flight controllers see a fast moving blip on their radar at this time and send a warning to Dulles Airport in Washington.

9/11/2001 9:33:00 AM

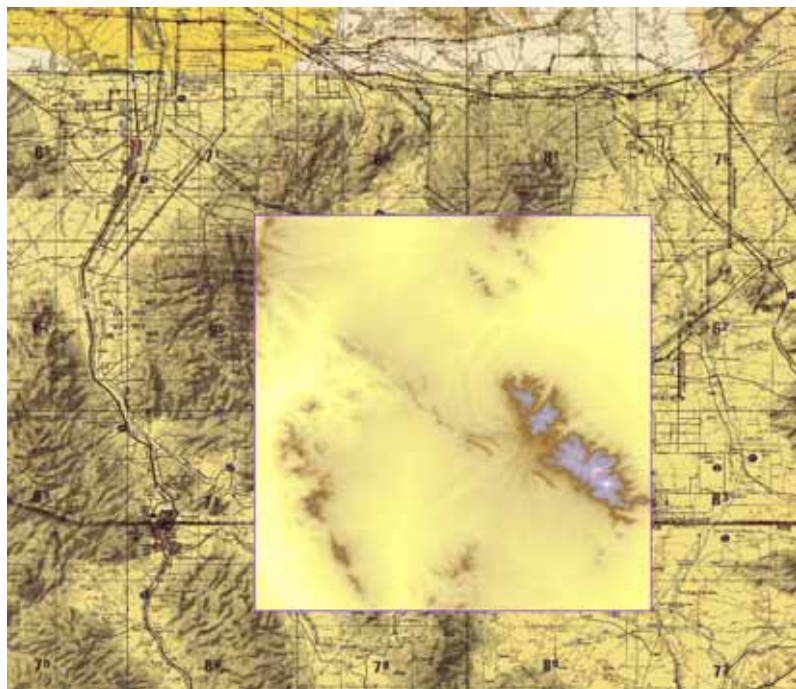
overview



NLVis: detail+overview



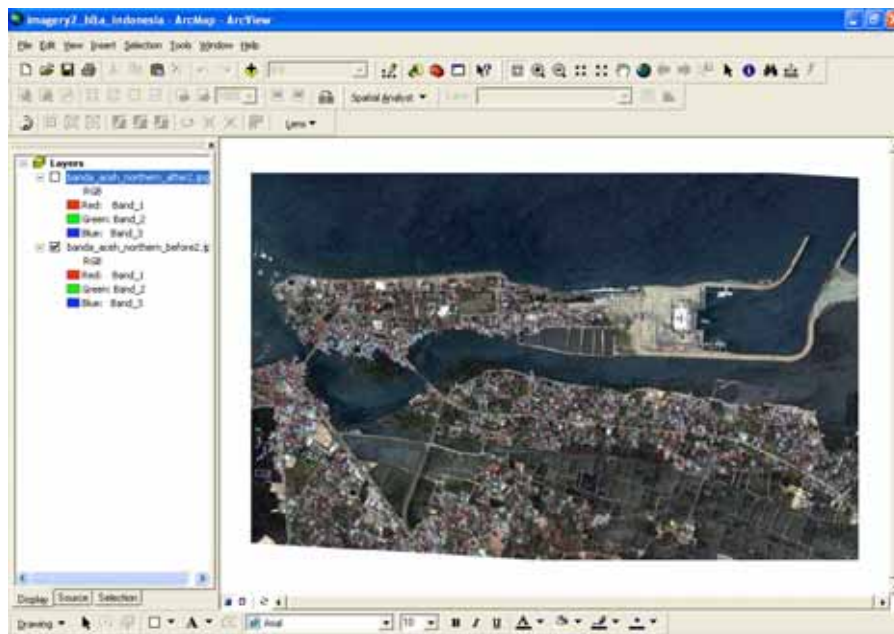
Research Question



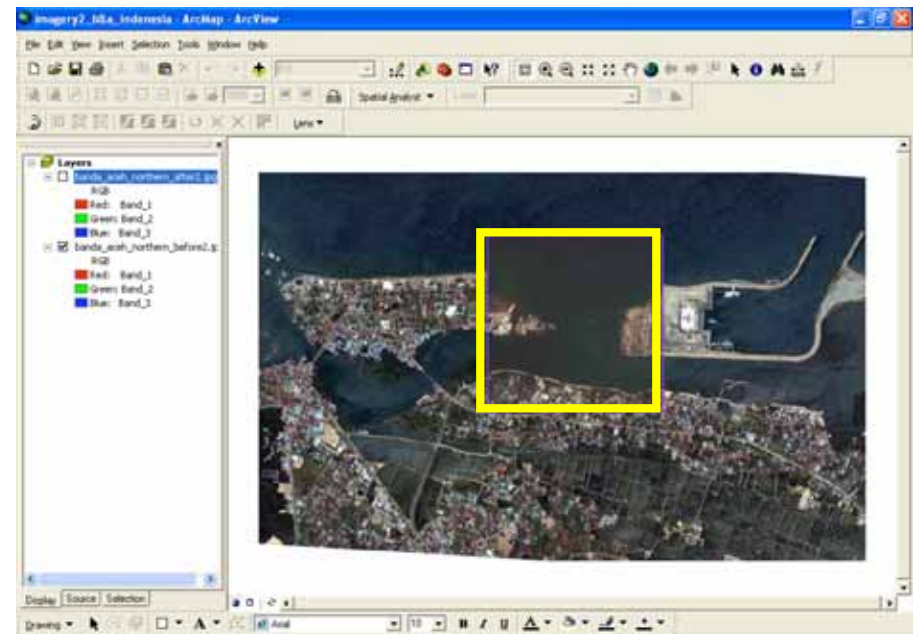
Do nonlinear visualization techniques of graphical data, specifically “semantic lensing” techniques, enable decision-makers in a real-time environment to complete tasks with greater speed and accuracy than standard visualization techniques (e.g., pan, zoom, global filters)?

Demonstration – Imagery Analysis

Imagery taken *before* the tsunami disaster.



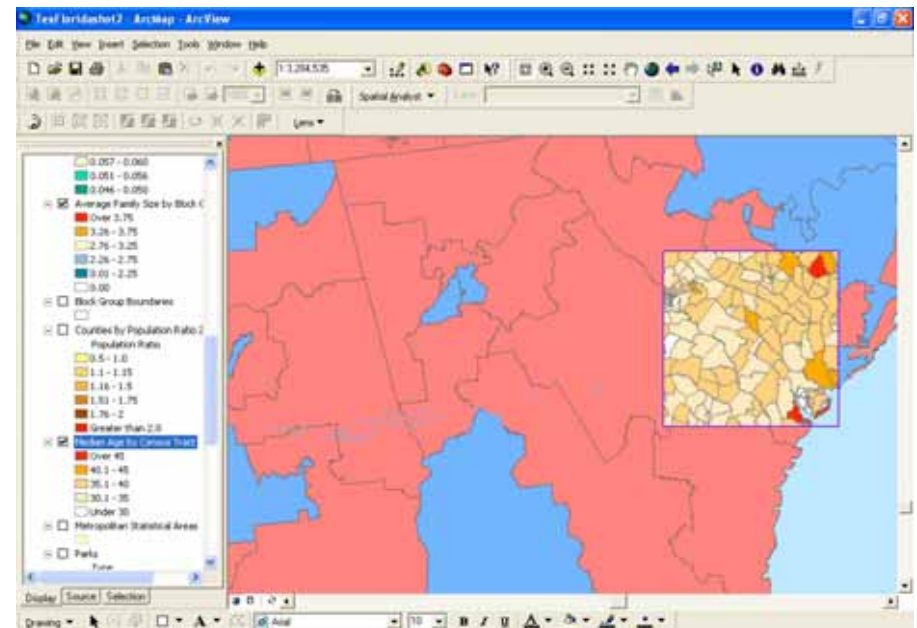
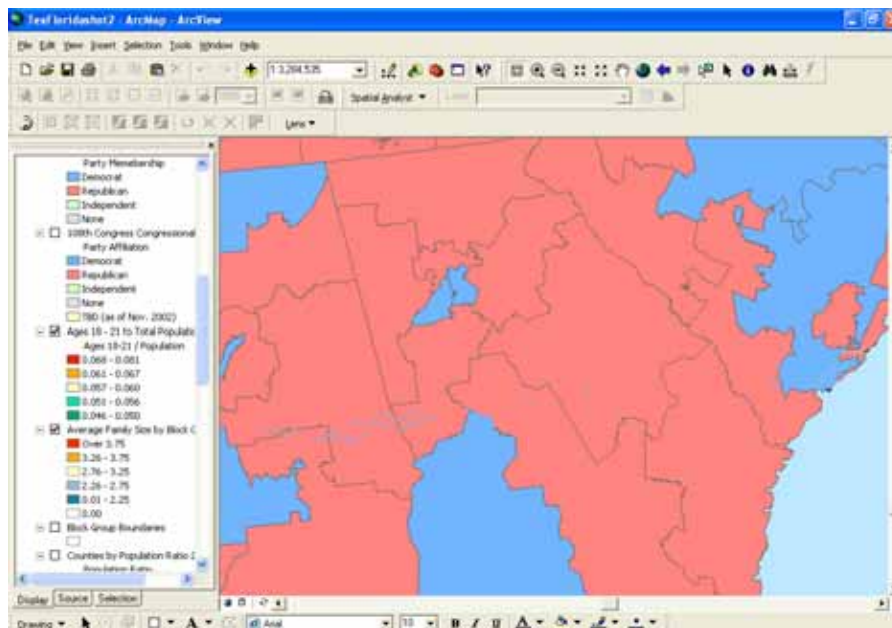
A semantic lens reveals imagery *after* the disaster.



Demonstration – Census

Political party membership

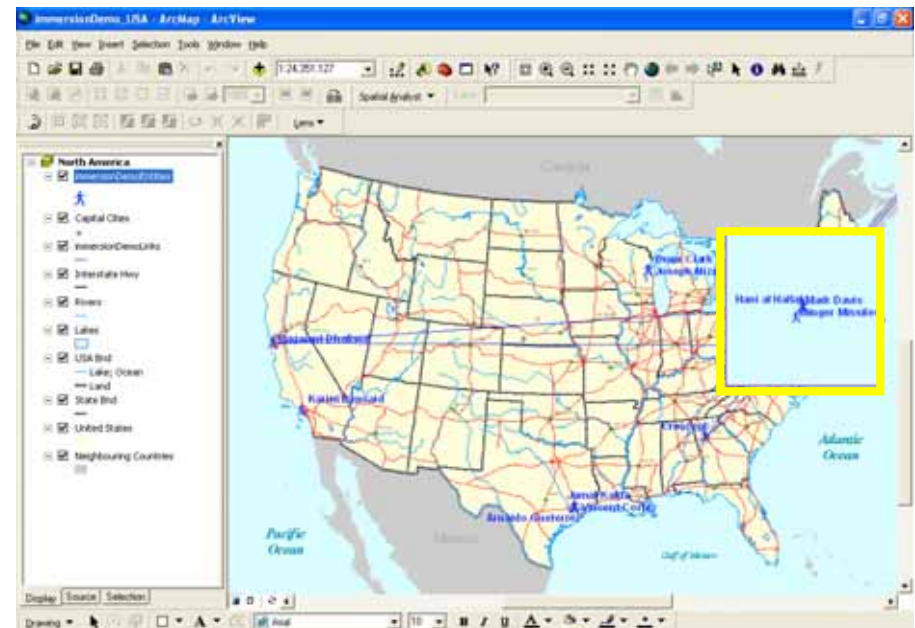
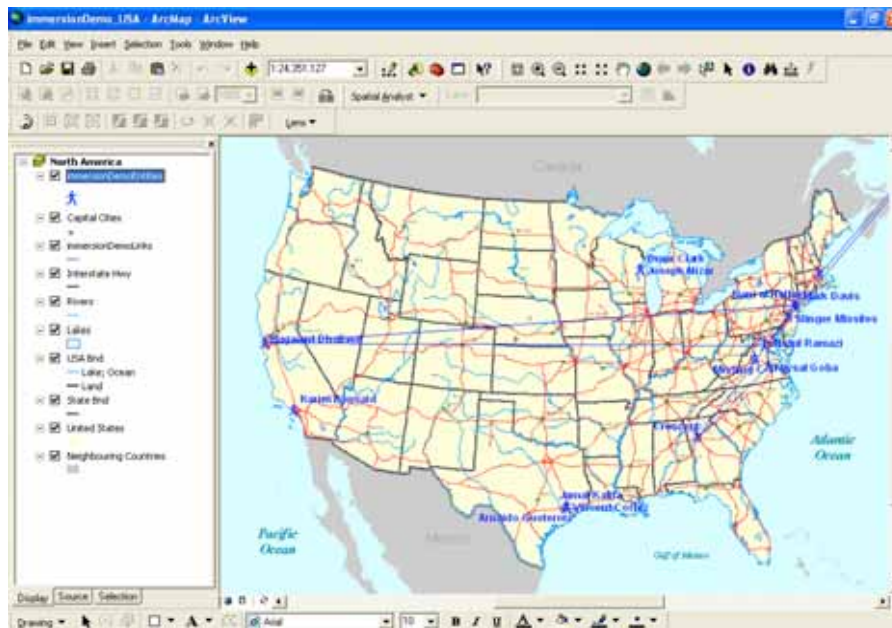
A lens reveals median age (a raster layer occluded by the political party layer).



Demonstration – Intelligence Analysis

Link analysis data of (notional) suspicious people placed on a map.

A lens contains the results of a query for people with explosives training.





Semantic Lensing Impacts

- **De-cluttering overloaded displays**
 - Transitioned the lens plug-in to Defense Intelligence Agency and Office of Naval Intelligence
 - Working with Air Force Weather Weapon System
- **Viewing multiple raster images simultaneously**
 - Transitioned the lens plug-in to National Geospatial-Intelligence Agency
- **Sense-making of vast amounts of collected sensor data**
 - Collaborating with a number of internal research projects
- **Aggregating different data types (e.g., link analysis charts and GIS)**
 - Working with Joint Information Operations Center



Next Steps

- Collect qualitative and quantitative data on the impacts of the semantic lenses on decision-making
 - Feedback from the analysts that have received the lensing plug-in
 - Empirical study
- We welcome your thoughts and suggestions
- For more information - <http://www.mitre.org/tech/nlvis>