



## Revision of geographically referenced data

Bossler<sup>†,‡</sup>, John D    Ramirez<sup>†</sup>, Raul    Saalfeld<sup>‡</sup>, Alan J  
A project for the  
NATIONAL IMAGERY & MAPPING AGENCY

Progress Report on Activities involving  
Conflation: Spatial Data Integration

Alan Saalfeld  
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<sup>†</sup>Center For Mapping    <sup>‡</sup>Dept of Civ&Env Eng&Geod Sci

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## Conflation in Context

- Conflation activities constitute *part* of the NIMA geo-data revision project.
- Map data revision constitutes *one* of the important conflation applications.

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**Updating Maps**  
and Spatial  
Databases

**Detecting Change**  
over Time

## Conflation

Spatial Data Integration

**Improving Quality**  
by Comparing Data  
Sets

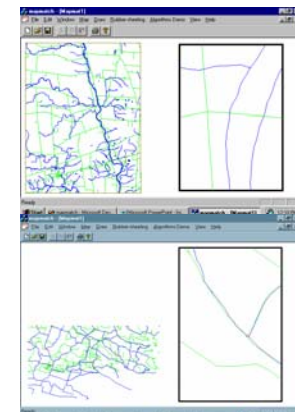
**Combining Data** for Analysis:  
A Universal Reference Frame  
for all Spatial Data

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## Conflation Activities

- Implement display tools in Microsoft C++:
  - Draw maps (DLG and VPF)
  - Improve display refresh speed
  - Dynamic inset map (fixed zoom)

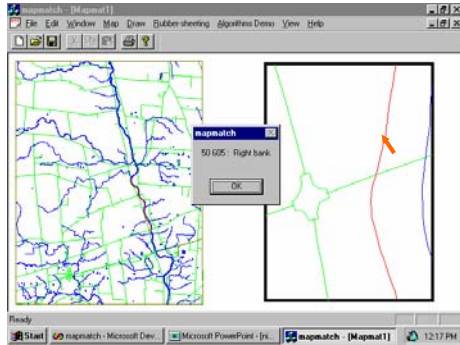


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## Conflation Activities

- Implement interactive spatial query tools



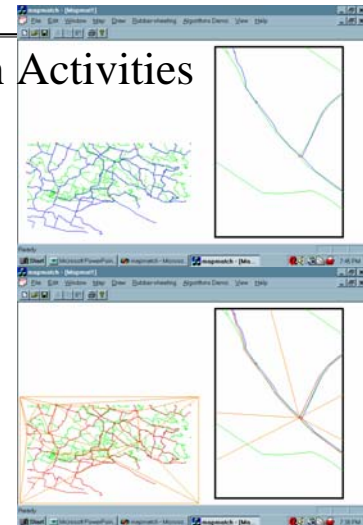
- Display attributes of “pick” selection
- Highlight “pick” features

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## Conflation Activities

- Implement global geometric manipulation routines
- Routines for finding candidate matches
- Triangulation routines
- Rubber-sheeting routines



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## Conflation Activities Just Ahead

Implement routines to handle additional spatial data

- Load and display new vector data (GPSVan)
- Load and display new vector data (TIGER)
- Load and display image data (DOQs)

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## Conflation Activities Just Ahead

Implement global geometric manipulation routines

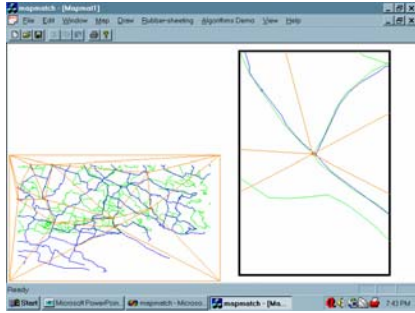
- Expand routines for finding candidate matches
- Implement edge similarity measures
- Build Constrained Triangulation routines

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## Conflation Activities Still Ahead

- Further refine exploratory analysis display tools
  - Implement a more flexible zoom tool
  - Automatically detect and highlight anomalies



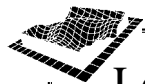
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## Conflation Activities Still Ahead

- Build interactive spatial/attribute query tools
  - Display features satisfying attribute queries
  - Report summary data for range queries

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## Long-Range Conflation Activities

- Design map adjacency structures that will be useful for matching groups (neighborhoods) of features
  - Select a provably efficient topological data structure to organize data into rapidly retrievable neighborhoods
  - Design algorithms to manage topological adjacency information
  - Establish neighborhood comparison criteria

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## Long-Range Conflation Activities

- Add a Bayesian Network structure to the topological feature network
  - Propagate probabilities through the feature network
  - Set up empirical tests to select and calibrate prior probabilities

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## Conflation Applications

- Integrating Related Inputs for Analysis
  - Environmental impacts and tradeoffs
  - Development pressures and alternatives
  - Tracking changes over time
- Updating Spatial Databases, Maps
  - Utilizing multiple resources: maps, imagery, GPS
- Reconciling Diverse Representations of Reality
  - Locating and correcting data errors and inconsistencies
  - Reinforcing and calibrating data models

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## Conflation Research Payoffs

### Consequences of Merging Data More Effectively

- Better information (more reliable, more accurate) in existing spatial databases
- Integration of new variables to permit greater analysis capabilities for better decision-making
- New and faster database update procedures
- Additional relative quality measures for data
- Better change detection techniques

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## New Information Products

- Digital Orthophoto Maps
  - Maps on top of rectified photographs
  - All entities positioned correctly with respect to others
- Better location information (more inputs)
  - More precise Digital Elevation Models
  - More precise Gravity Models
- New overlay data combinations--new analyses
- Change detection tools from fast integration

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## Conflation Research Payoffs

### Consequences of Merging Data More Effectively

- Better information (more reliable, more accurate) in existing spatial databases
- Databases with newly integrated variables to permit greater analysis capabilities for better decision-making
- New database update procedures
- Additional relative quality measures for data

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