Cross-dimensional Visual Queries for Interactive+Animated Analysis of Movement

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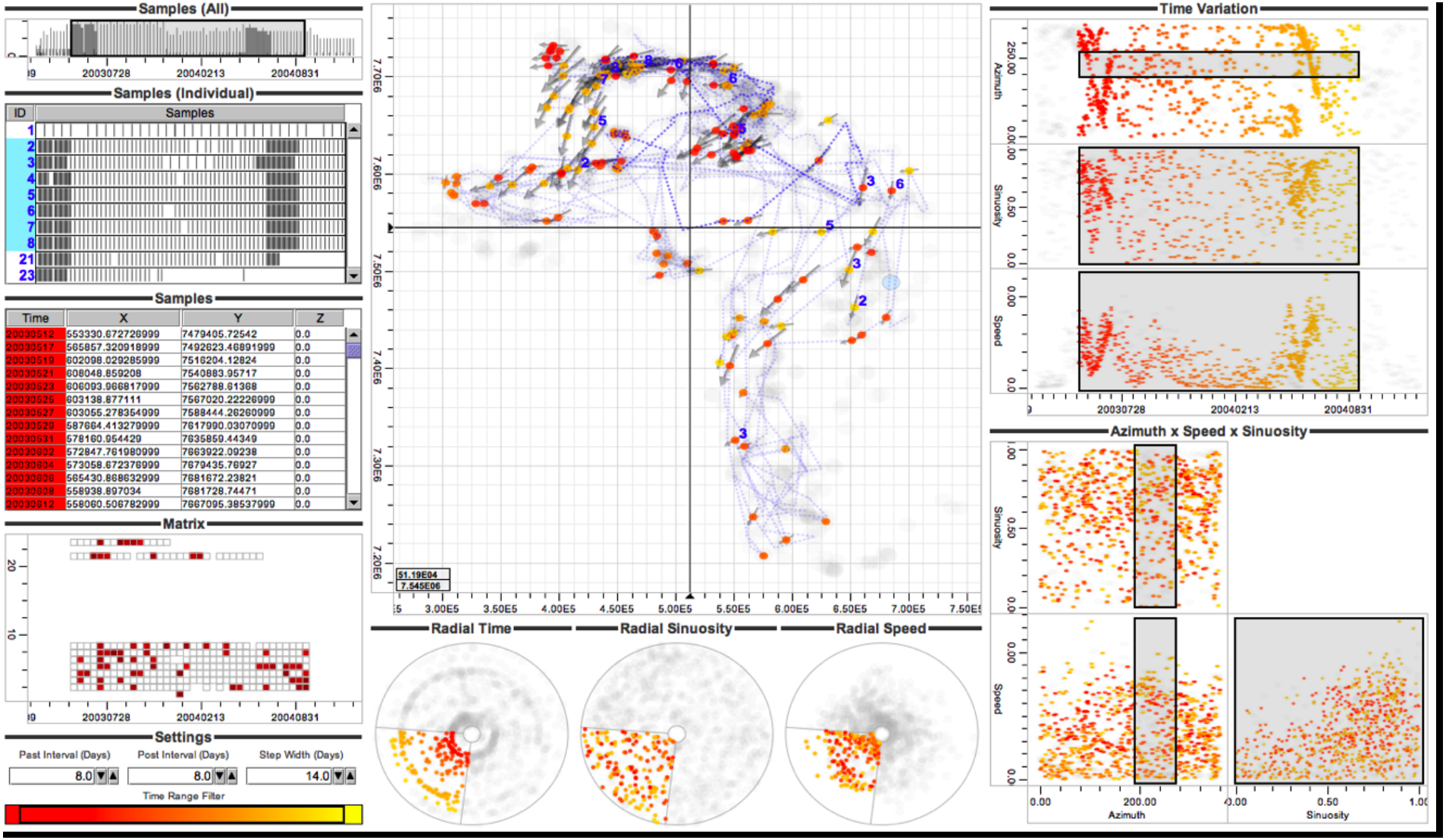
REMO

- Relative motion patterns in geospatial data
- Algorithms for calculating derived motion attributes

- Developed by Patrick Laube (dissertation, etc.)
- Visited GeoVISTA Center for Fall 2006

- Adapted as a data query module in Improvise
- Can process batch-style or on-demand

- Inputs: entity, location, time
- Outputs: velocity, sinuosity, azimuth, others possible



herd movement

a visualization of movements of individuals in a herd of radio-tagged caribou

Data Source: Patrick Laube
Visualization Design: Chris Weaver and Patrick Laube

What Worked and What Didn't

- Filtering with conjunctive combination of range filters over
  1. each raw and derived point dimension
  2. set containment in brushed group of individuals
- Peripheral views filtered on
  1. each others' range selections
  2. the spatial extent of the map itself
- The visualization **overall** embodies Shneiderman's mantra in a (nearly) symmetric, multi-D manner
  - A kind of "overview+detail mesh"
  - Every view is a detail view
  - Zoom and filter the "map" through interaction in other views

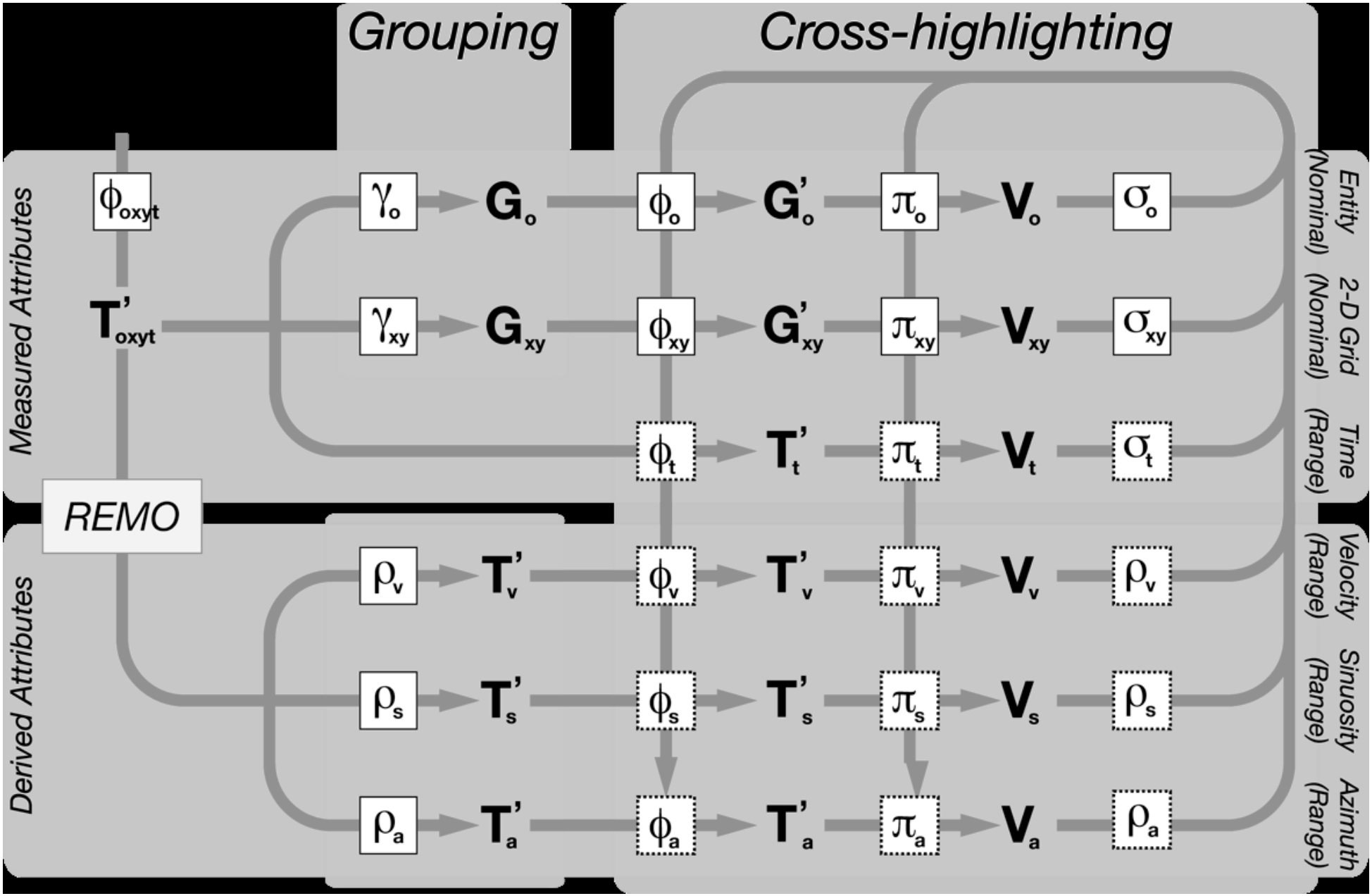
- Conjunctive semantics of interaction forces drill-down in multiple dimensions to follow a single path up/down; no "sideways" queries
- Reduces analytic utility by limiting space of possible questions/queries

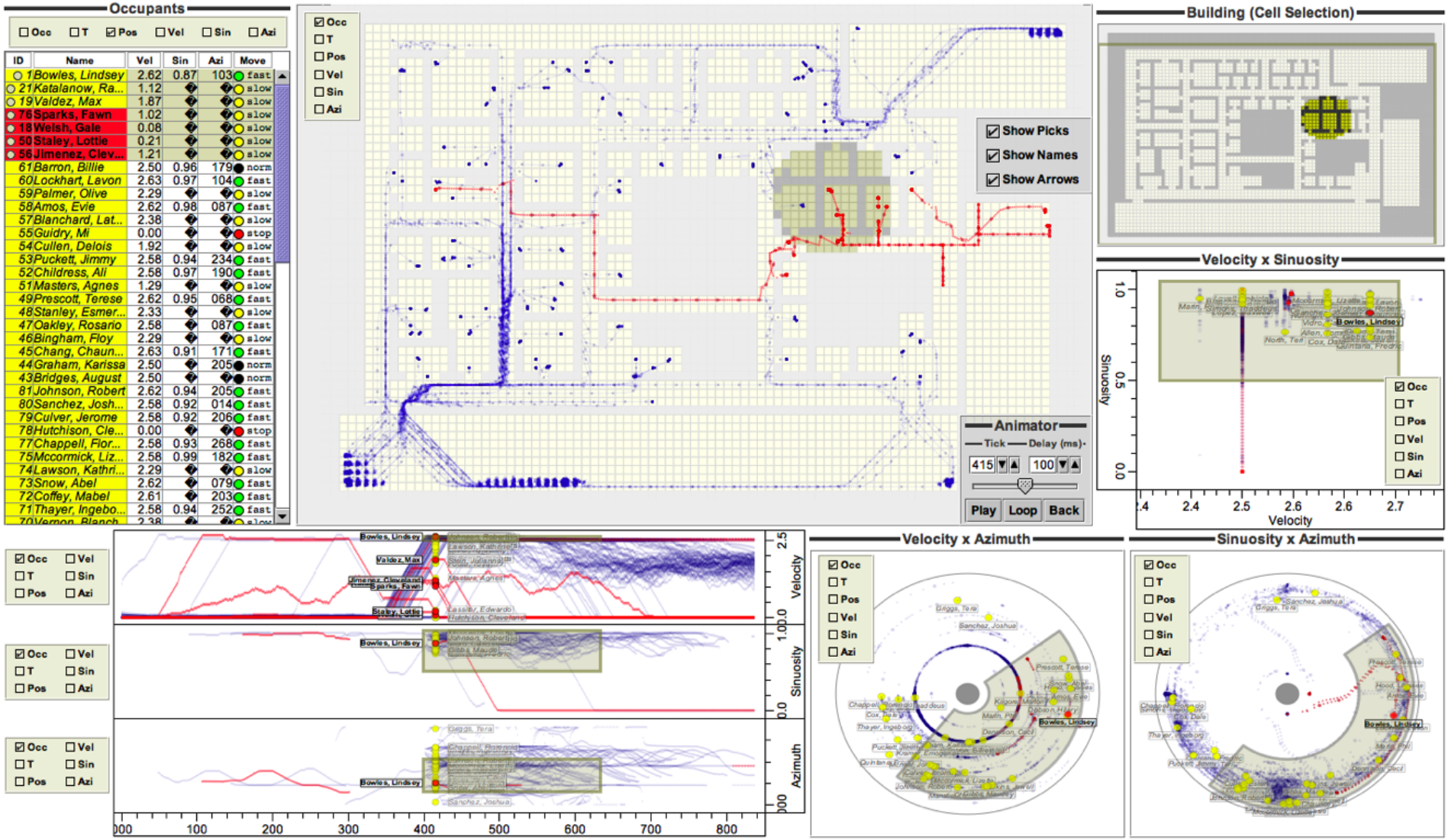
Cross-Highlighting, Approach

- Multiple views support selection over sets or ranges of attribute values in multiple raw or derived data columns, across one or more tables.
- Attributes map into appropriate multi-D views, possibly on a many-to-many basis.
- Each view supports binary categorization of values (*selected or not*) by selection or navigation.

- Users can rapidly toggle highlighting between pairs of views to pose complex focus+context set queries.
- Analysts can form hypotheses and follow chains of evidence by successive selection/deselection and highlighting/unhighlighting of values.

Cross-Highlighting, Queries





health clinic evacuation

a visualization of movements of RDIF-carrying health care workers and visitors

Data Source: VAST 2008 Challenge, Evacuation Mini-Challenge (synthetic)
Visualization Design: Chris Weaver and Anthony Robinson

Demo

Acknowledgments

- Patrick Laube
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  - Deryck Holdsworth (Penn State/GeoVISTA)
  - David Fyfe (Penn State/GeoVISTA)
  - Phil Schrodt (U. Kansas/Polisci)

... with ma and source code

... and as a Java NLP) application

... at http://www.personal.psu.edu/cew15/improvise/