

# Multivariate trajectory selection

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Trajectories are often measured with multiple sensors, resulting in various attributes along a path. Typical analysis tasks for trajectory data are finding correlations between attributes, and comparison of scenarios. We assume a scenario to be a filtered view on the data. Choosing the right filter is difficult. We show early results for a graphical user interface that helps the user to select these scenarios.

## How to select scenarios in multivariate trajectory data?

### Context

Recently, professional vessels started broadcasting their status using an advanced GPS tracker (AIS), resulting in data such as time, position, speed, and draught. Using the trajectory data, surveillance operators have the opportunity to both get insights in vessel behaviour and to ensure safety and security. With our method operators can select specific scenarios for comparison with normal scenarios in order to detect anomalous behaviour.

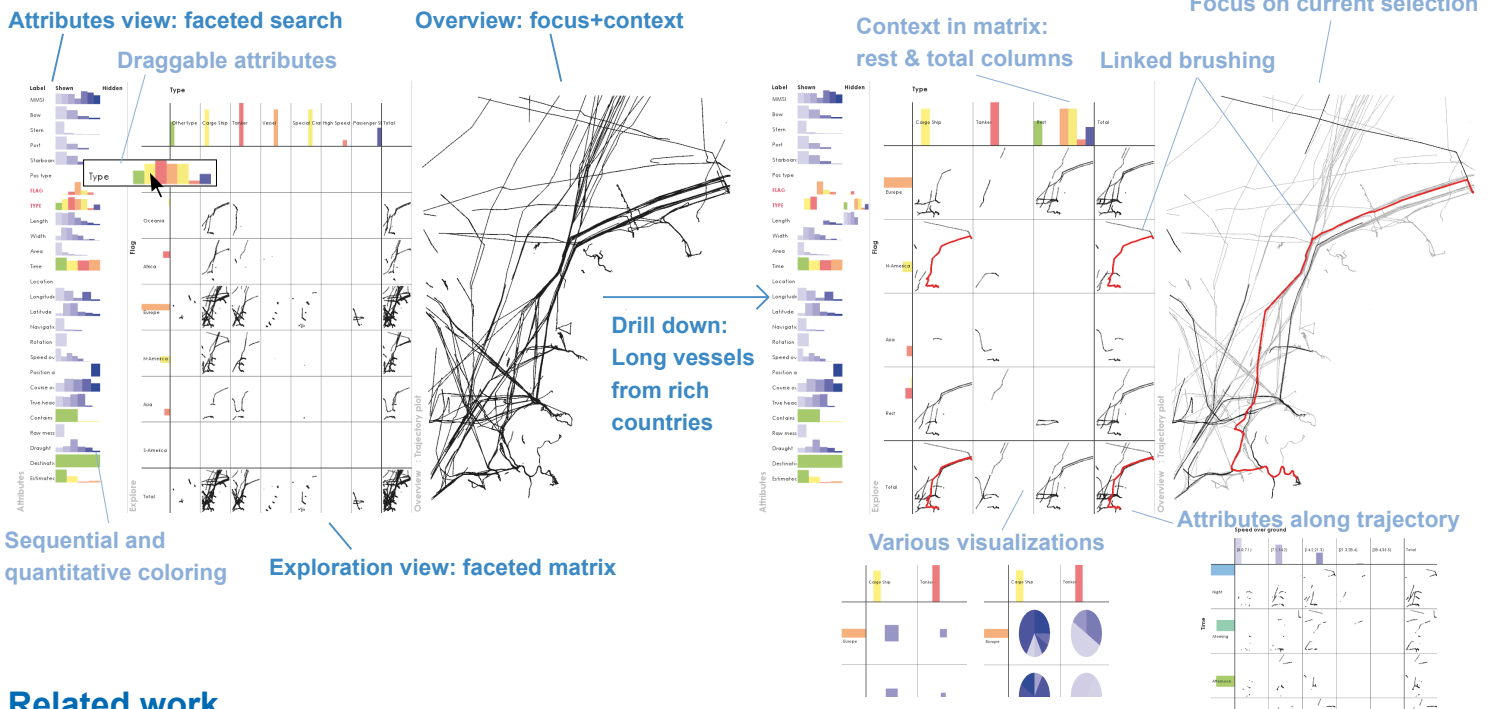
Faceted search applications (e.g., Flamenco [2]) are popular because of the *fast drill* down in multivariate data. A matrix (e.g., Polaris/Tableaux [3]), where attributes are put against each other *shows correlations* and allows a *composite selection*, e.g., both 'slow tugs' and 'fast tankers'.

### Visual analytics tool

We visually explore trajectory data with three linked views: an attribute view, an exploration view, and an overview. In the attribute view a faceted search drills down in the attributes. The overview shows the drilled down items with respect to all data. A matrix shows correlations in the explore view, and selection in individual cells enables to select items that cannot be expressed with a single faceted search, such as both 'European tankers' and 'Asian cargo ships'.

### Future work

We will include a data flow model for attaching attributes to visual parameters in visualizations, incorporate statistics, and increase the performance using graphics hardware. Our final goal is to support comparison of various scenarios selected with this tool.



### Related work

Hurter *et al.* propose an interactive method for selecting full trajectories of airplanes. For a scenario more *specific selection* is needed. Suppose the scenario is: "All trajectories of ferries that enter a harbour", then only the entering part of a ferry trajectory is of interest.

[1] Christophe Hurter, Benjamin Tissoires, and Stéphane Conversy, FromDaDy: Spreading Aircraft Trajectories Across Views to Support Iterative Queries, IEEE Trans. Visualization and Computer Graphics, vol. 15, no. 6, p. 1017-1024, 2009  
[2] Flamenco, <http://flamenco.berkeley.edu/>  
[3] Chris Stolte, Diane Tang, and Pat Hanrahan, Polaris: A System for Query, Analysis and Visualization of Multidimensional Relational Databases, IEEE Trans. Visualization and Computer Graphics, vol.8, no.1, p.52-65, 2002