Module #6:
Taxonomy of User Interactions (cont.)

Interaction Techniques

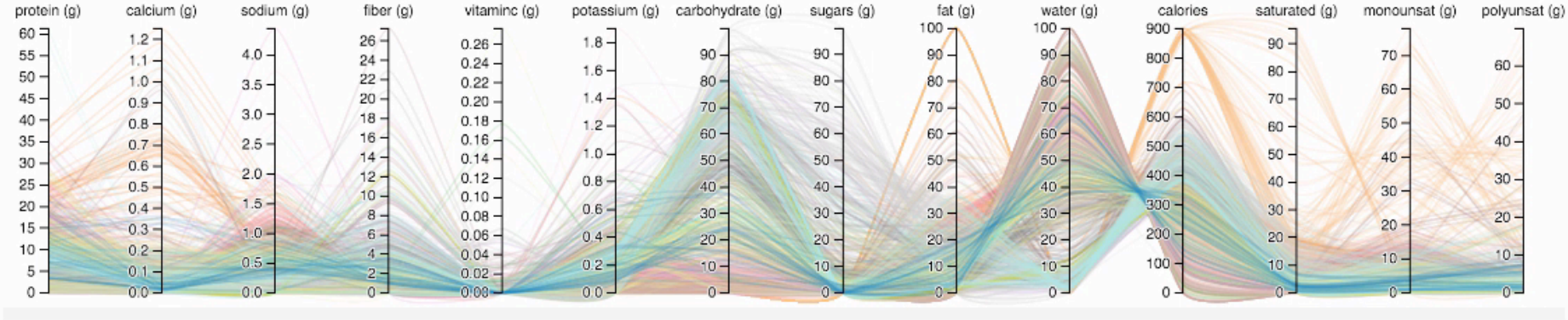
1. Filtering
2. Dynamic query
3. Selecting
4. Direct manipulation
5. Brushing
6. Details on demand
7. Zoom

BRUSHING

Brushing

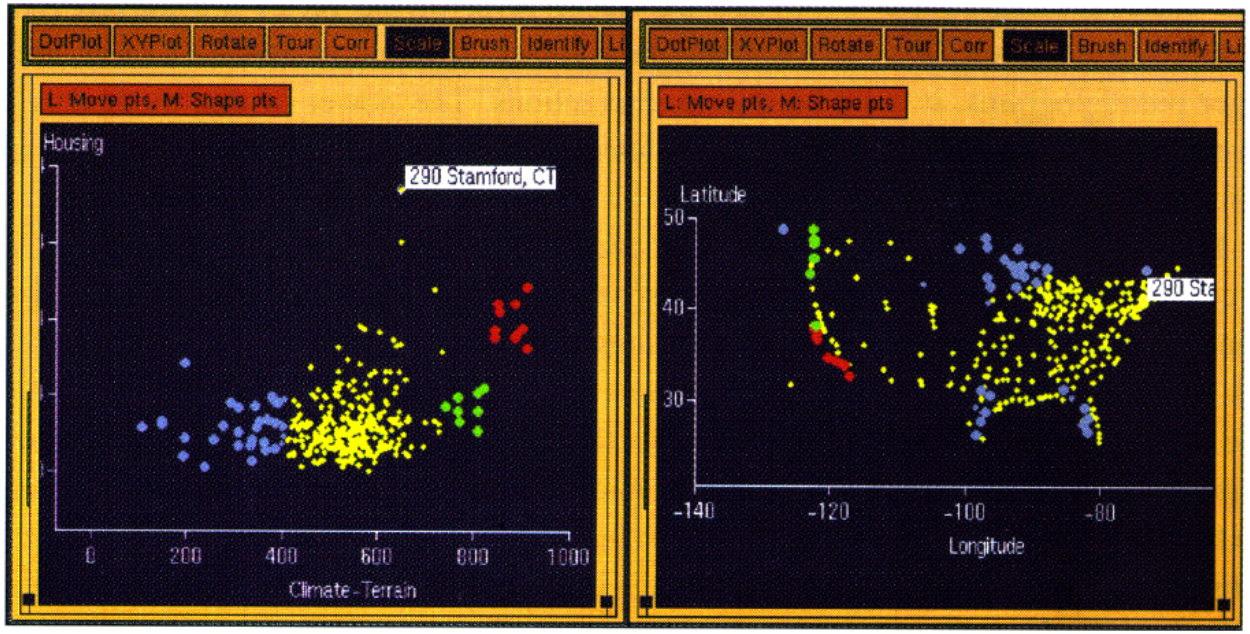
- Brushing
  - process of interactively selecting data items
  - the original intention of brushing is to highlight brushed data items in different views of a visualization

Brushing


protein (g)
calcium (g)
sodium (g)
fiber (g)
vitaminc (g)
potassium (g)
carbohydrate (g)
sugars (g)
fat (g)
water (g)
calories
saturated (g)
monounsat (g)
polyunsat (g)

Linking & Brushing

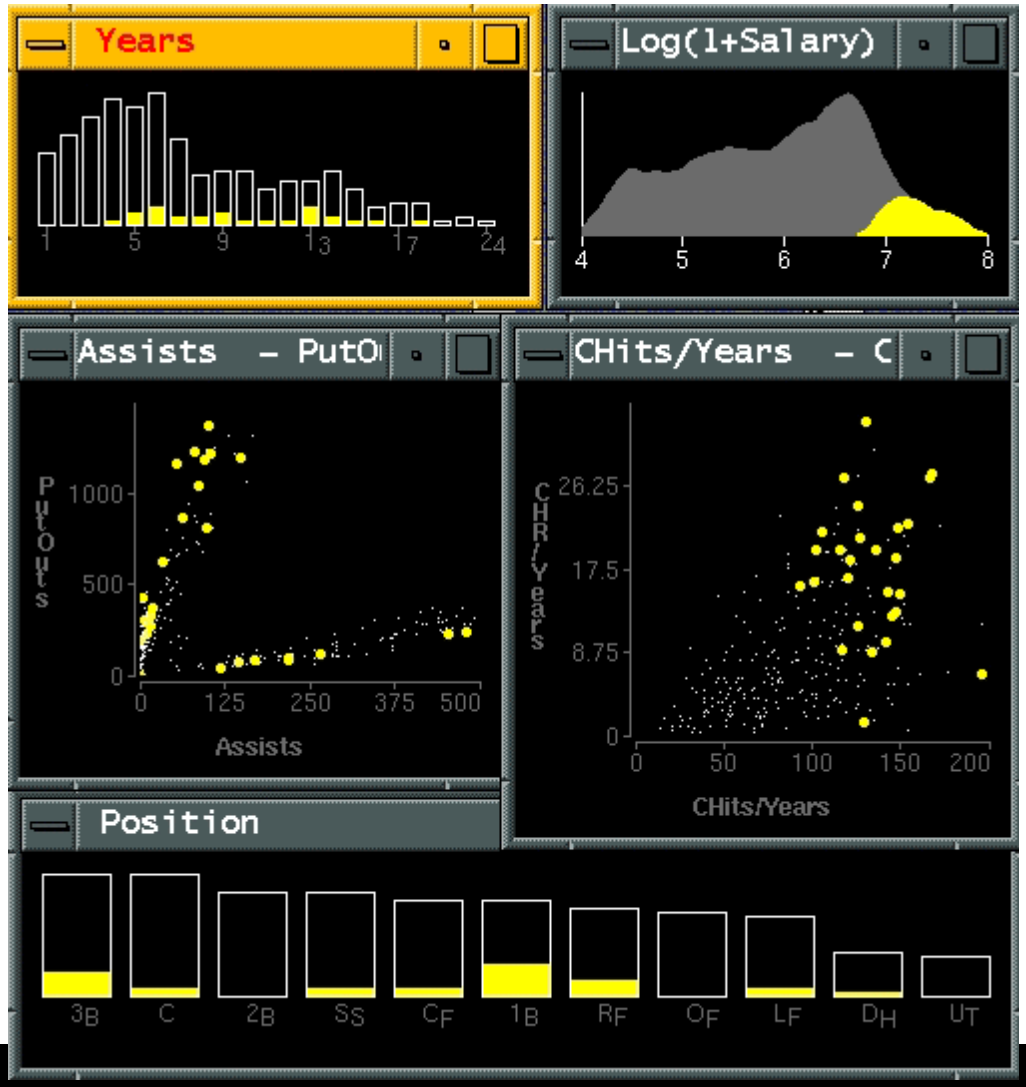
- Prerequisite: multiple visualizations of the same data (e.g., visualizations of different projections)
- Interactive changes made in one visualization are automatically reflected in the other visualizations



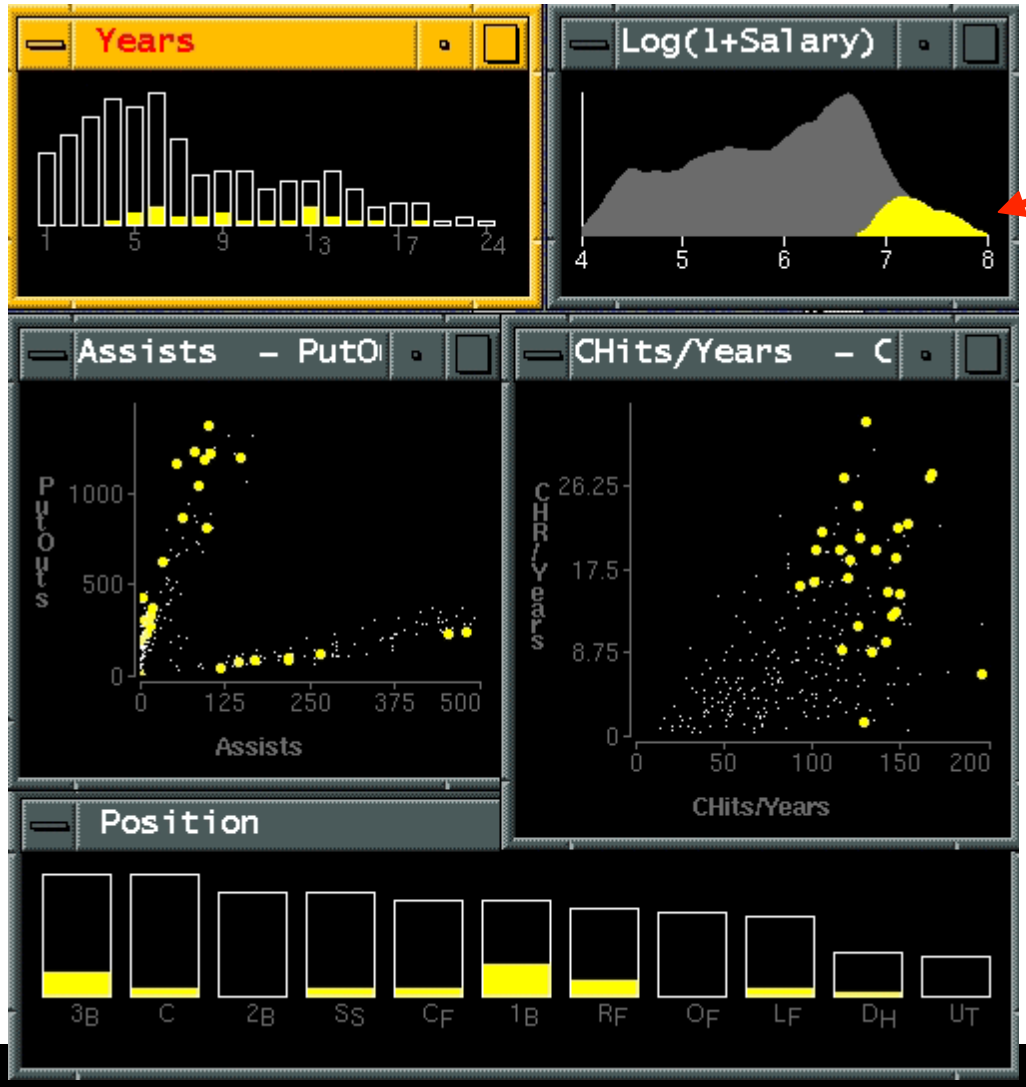
climate and housing data of the US

taken from [BSC 96]

Baseball Statistics [Wills 95]

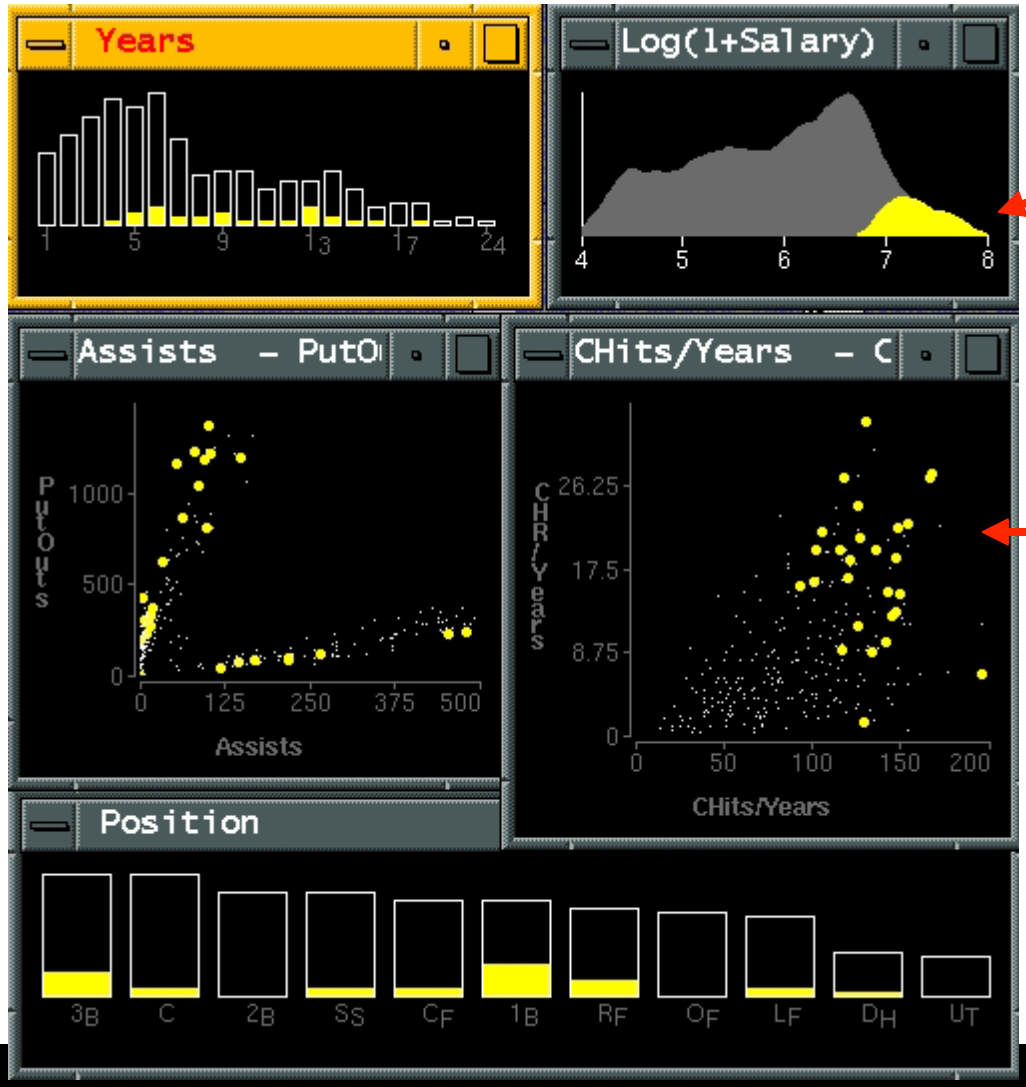


Baseball Statistics [Wills 95]



select high salaries

Baseball Statistics [Wills 95]

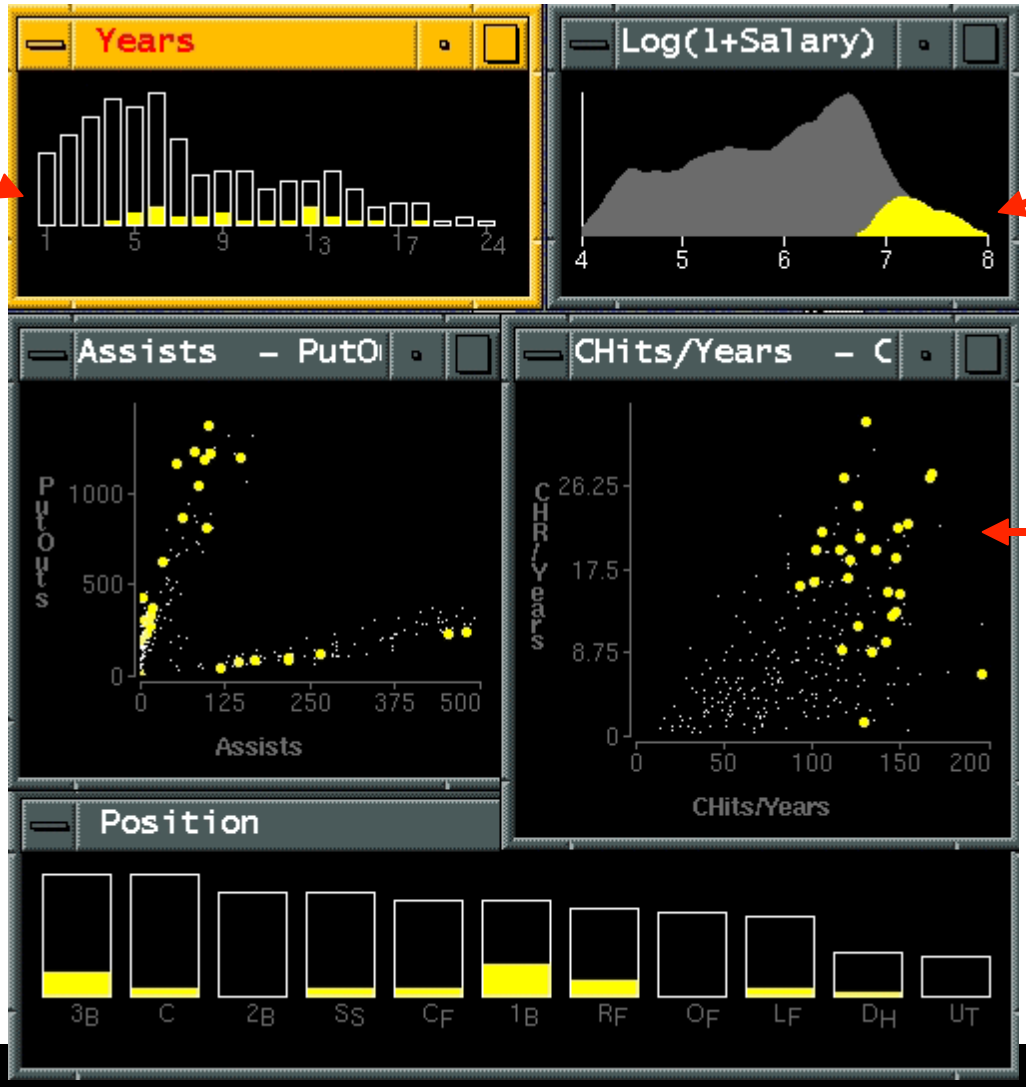


select high salaries

avg career HRs vs avg career hits (batting ability)

Baseball Statistics [Wills 95]

how long in majors



select high salaries

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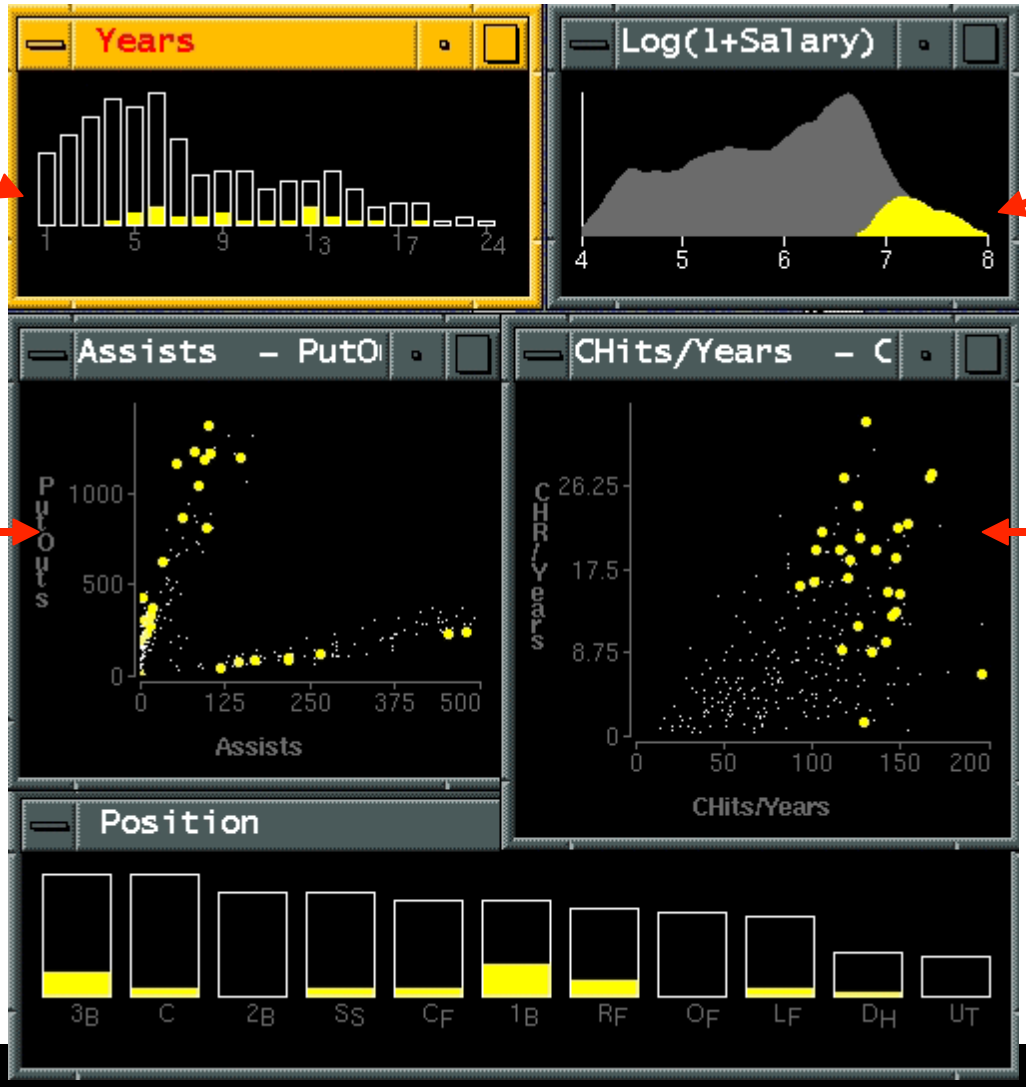
Baseball Statistics [Wills 95]

how long in majors



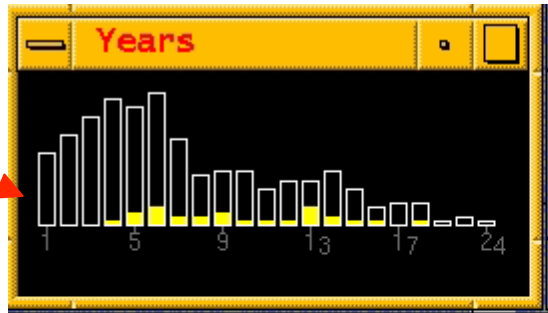
select high salaries

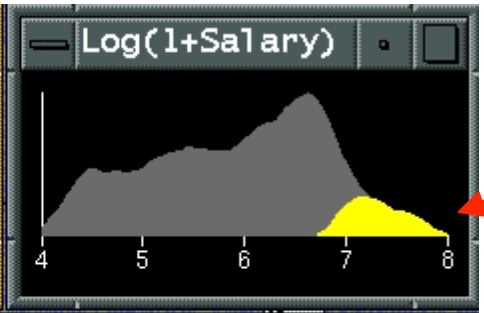
avg assists vs avg putouts (fielding ability)

avg career HRs vs avg career hits (batting ability)

Baseball Statistics [Wills 95]

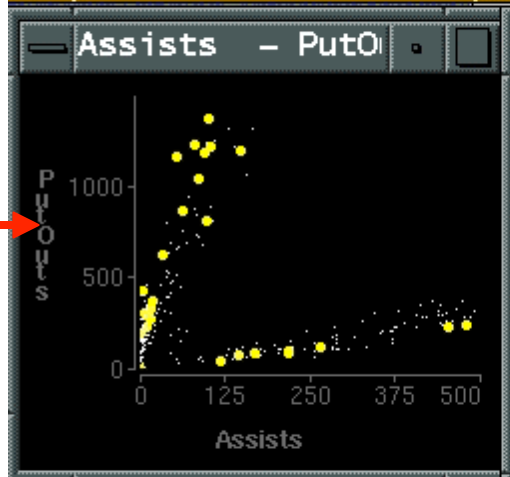
how long in majors

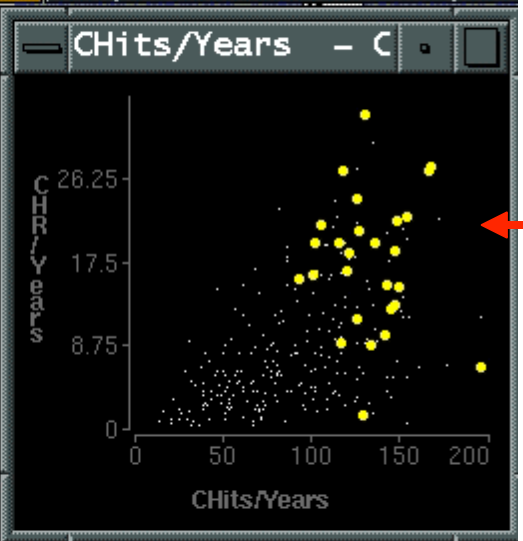




select high salaries

avg assists vs avg putouts (fielding ability)

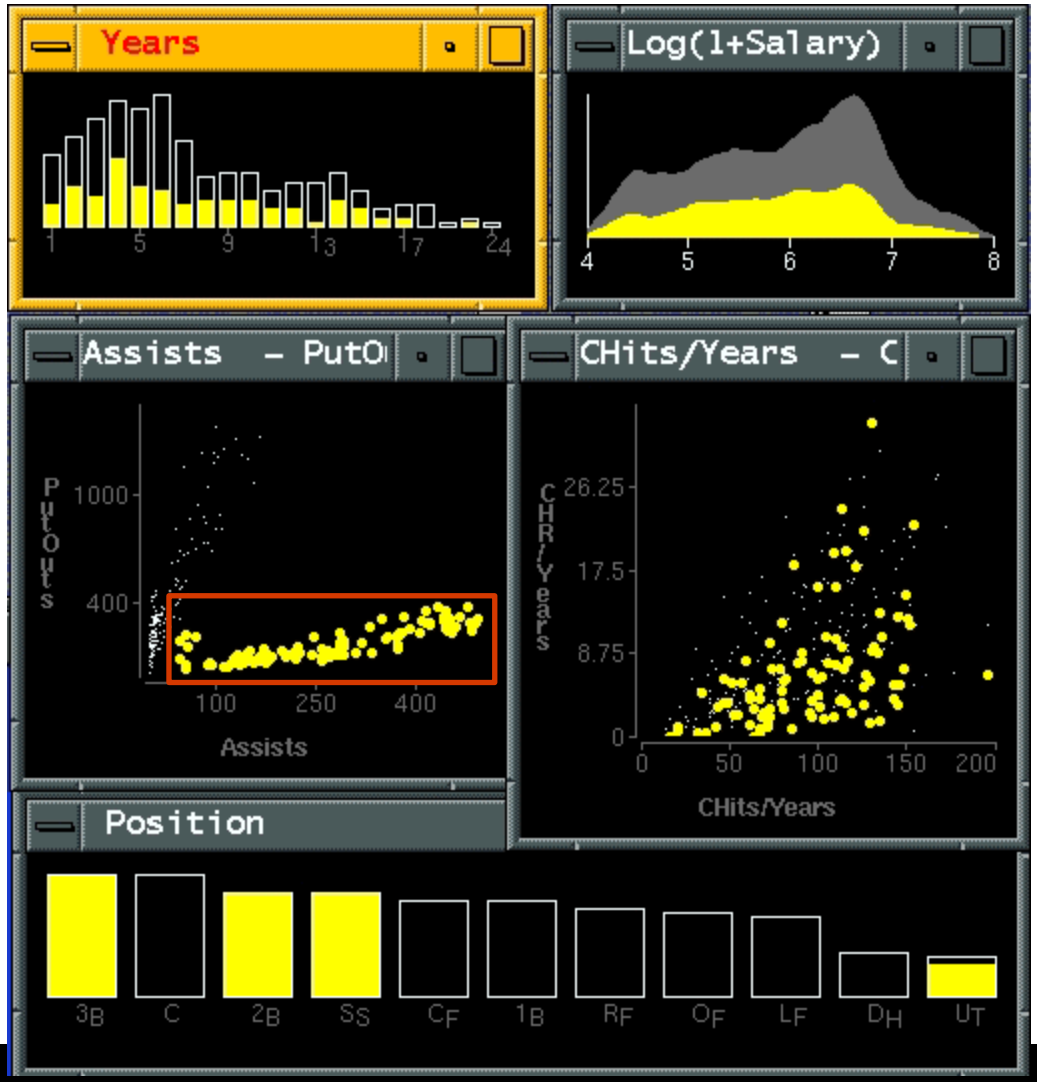




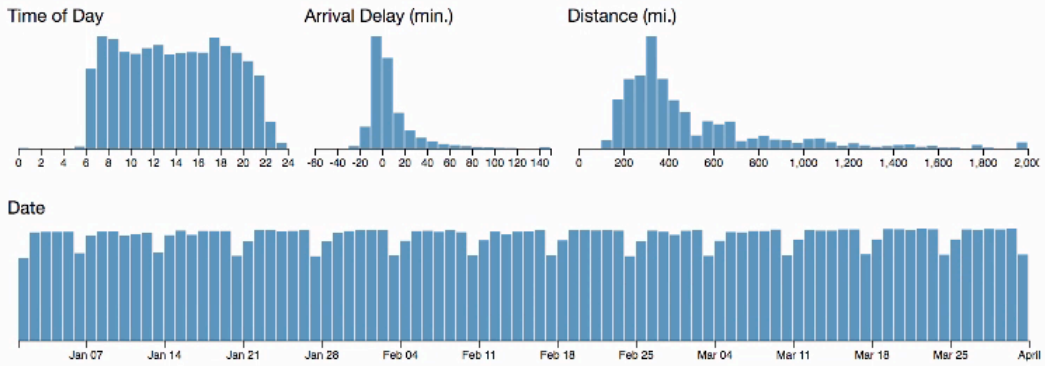
avg career HRs vs avg career hits (batting ability)

distribution of positions played

Baseball Statistics [Wills 95]



Linking & Brushing

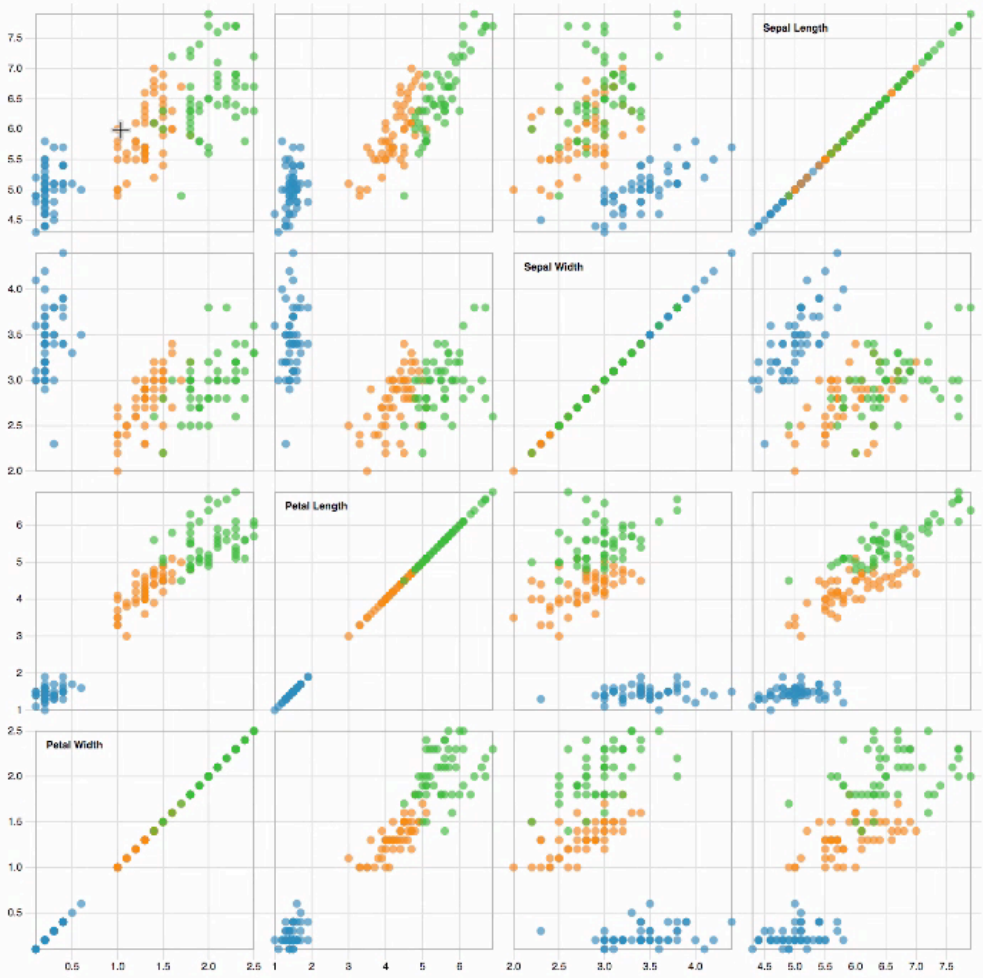


March 31, 2001

231,083 of 231,083 flights selected.

10:57 PM	MSY	HOU	303 mi.	+29 min.
10:48 PM	STL	MCO	880 mi.	+125 min.
10:37 PM	BNA	RDU	443 mi.	+106 min.
10:30 PM	HOU	MSY	303 mi.	-8 min.
10:10 PM	OMA	MDW	423 mi.	-7 min.
10:00 PM	HOU	MSY	303 mi.	-7 min.
09:55 PM	MSY	MCO	550 mi.	-16 min.
09:51 PM	MCO	MSY	550 mi.	+70 min.
09:45 PM	BNA	BWI	588 mi.	-5 min.
09:35 PM	OMA	STL	342 mi.	+153 min.
09:35 PM	CMH	MDW	284 mi.	-7 min.
09:33 PM	BWI	PVD	328 mi.	+64 min.
09:30 PM	IND	BWI	515 mi.	+80 min.
09:30 PM	TPA	MSY	487 mi.	+8 min.

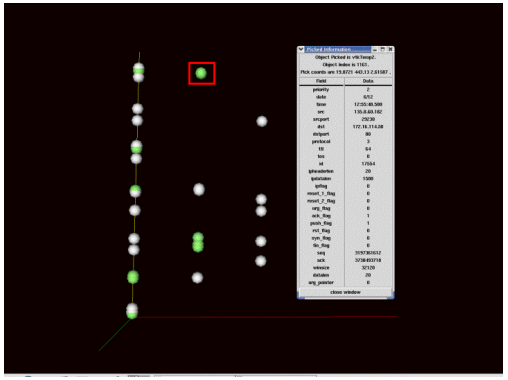
Linking and Brushing Scatter Matrix



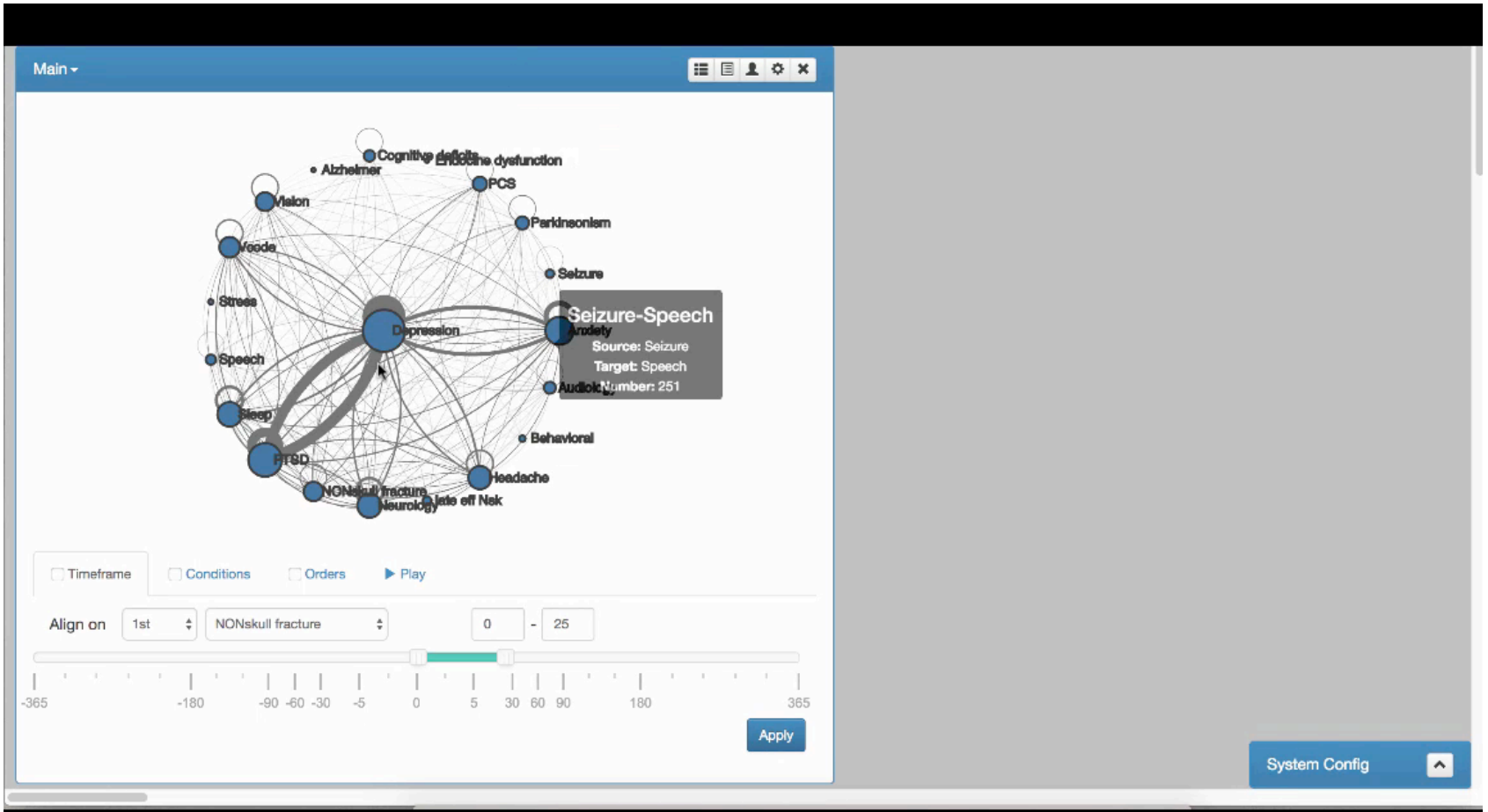
DETAILS ON DEMAND

Details on Demand

- The details on demand
  - allows users to interactively select parts of data to obtain more details
  - shows additional details while keeping an overview
  - usually that gives the user a better overview on the data set



Details on Demand

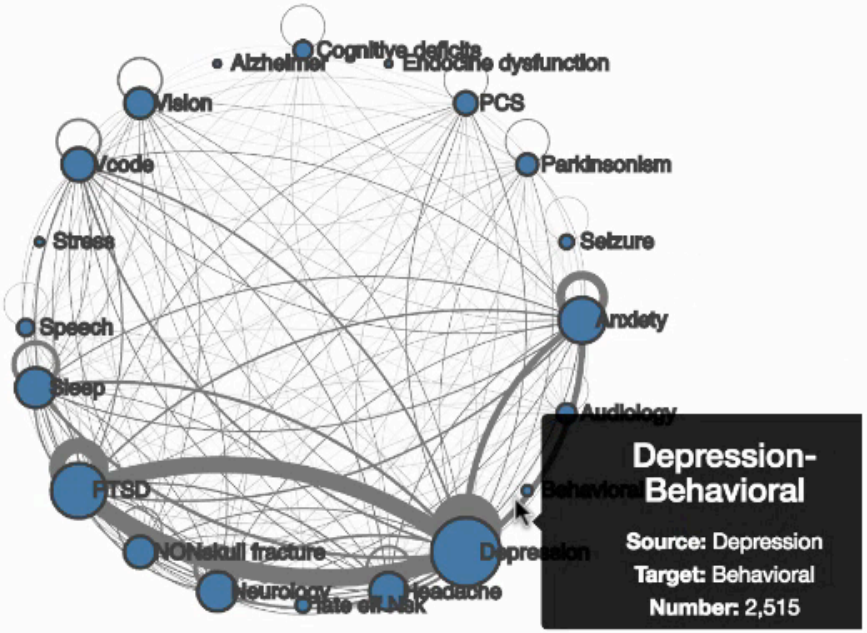


ZOOM

Zooming

- Geometric (standard) zooming:
  - The view depends on the physical properties of what is being viewed
- Semantic Zooming:
  - When zooming away, instead of seeing a scaled-down version of an object, see a different representation
  - The representation shown depends on the meaning to be imparted.

Standard Zooming



Examples of Semantic Zoom

- Information Maps
  - zoom into restaurant
    - see the interior
    - see what is served there
  - maybe zoom based on price instead!
    - see expensive restaurants first
    - keep zooming till you get to your price range

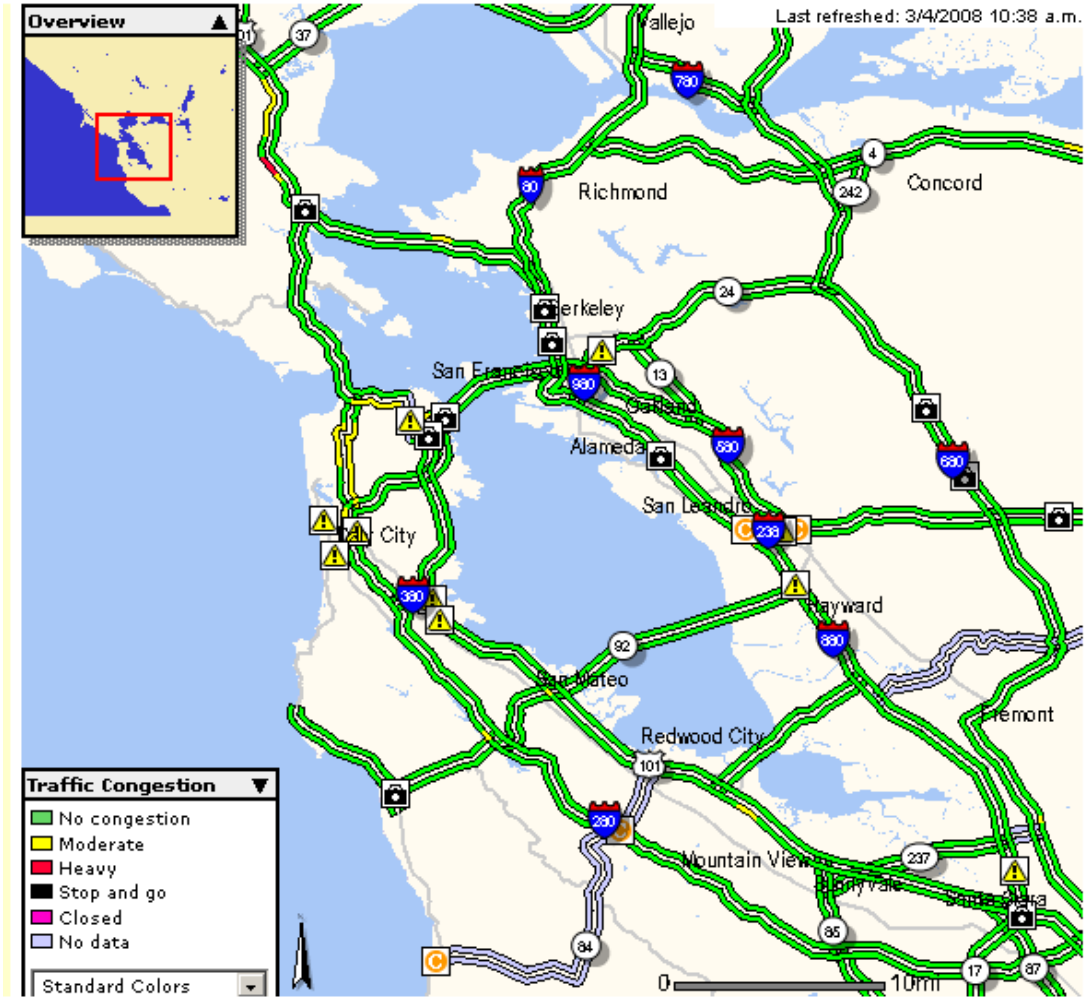
- Browsing an information service
  - Charge user successively higher rates for successively more detailed information

Focus + Context

- A single view shows information in context
  - Contextual info is near to focal point
  - Distortion may make some parts hard to interpret
  - Distortion may obscure structure in data

- Examples from Xerox PARC:
  - TableLens
  - Perspective Wall
  - Hyperbolic Tree Browser

Example: traffic.511.org

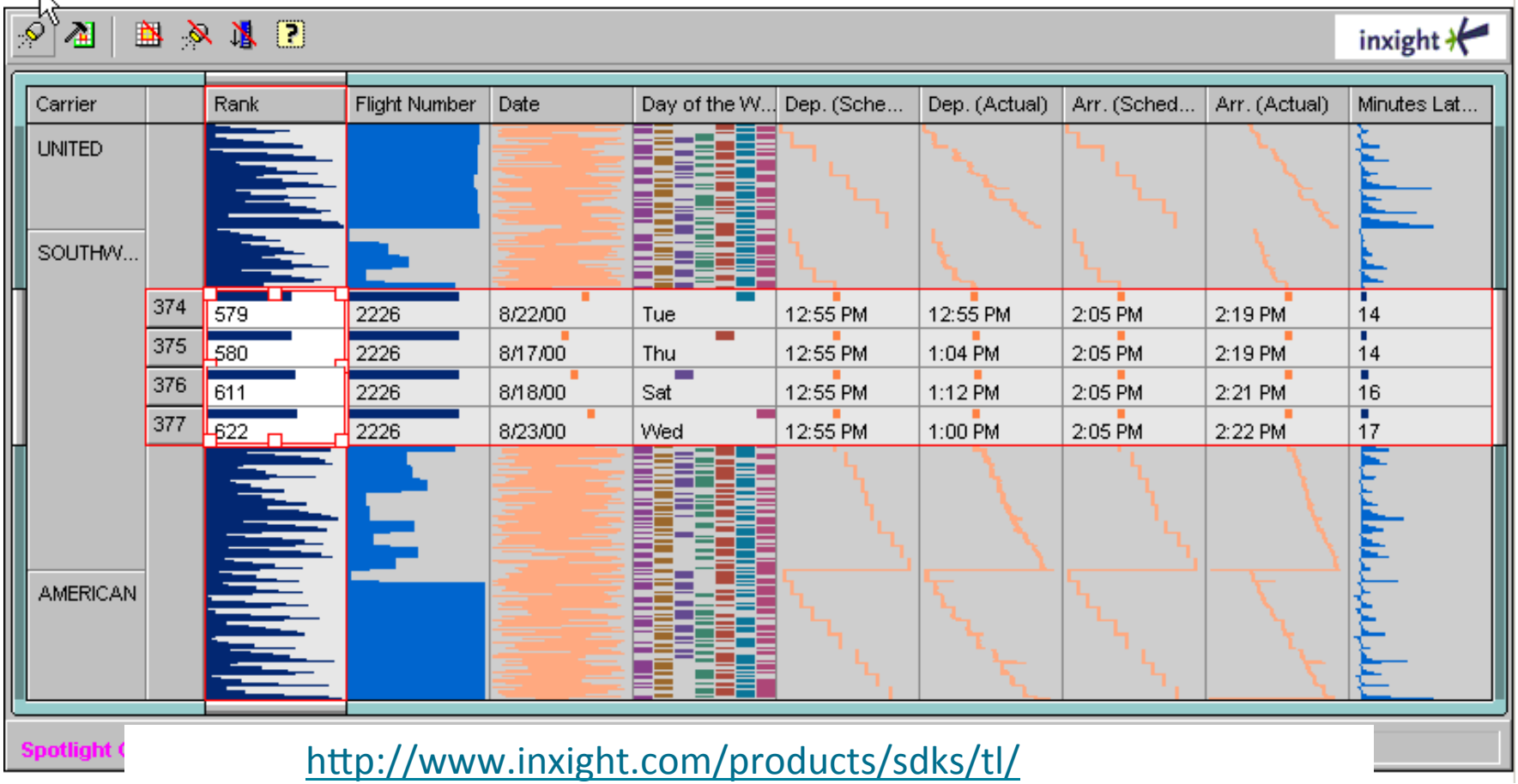


Focus + Context: TableLens from PARC/Inxight

Flight Delays

This table shows arrival times of flights from San Jose to Los Angeles, California, in the month of August 2000.

1) What can you discover about the comparison of on-time results for these carriers?
2) What day of the week has the most delays? least delays?
3) Can you see that United flights tended to get later and later as the day went on?

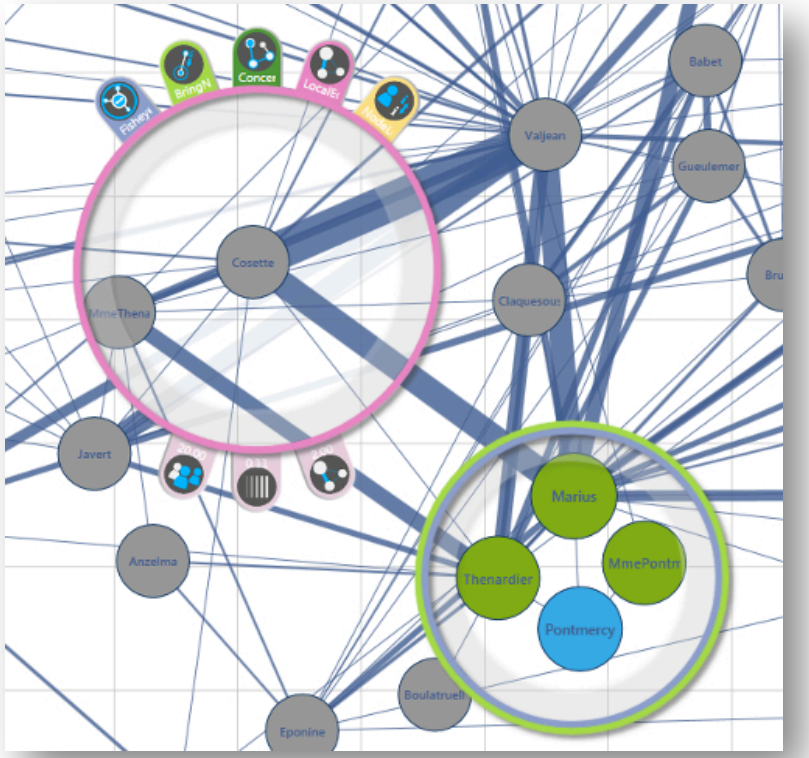


http://www.inxight.com/products/sdks/tl/
http://www.inxight.com/demos/tl_calcrisis/tl_calcrisis.html

Magic Lenses/Moveable Filter

- interactive selection using lens-like tools which selectively filter the data in the considered areas

- multiple lenses/moveable filters can be used for a multi-level filtering (allowing complex conditions)



Magic Lens

MultiLens

Fluent Interaction with Multi-Functional Multi-Touch Lenses for InfoVis

Ulrike Kister, Patrick Reipschläger, Raimund Dachselt

ISS 2016

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Summary

- Most visualizations are interactive
- Good visualizations are task dependent, pick the right interaction technique
- Consider the semantics of the data domain
- Fundamental interaction techniques
  - Filtering
  - Dynamic query
  - Selecting
  - Direct manipulation
  - Brushing
  - Details on demand
  - Zooming

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