IG Interactions

- What plot objects can you interact with?
  - points, bars/cells/rectangles, axes, …
- How can you interact with the objects?
  - click, drag, arrow keys, …
- What can you do with the objects through these interactions?
- What would you like to be able to do?
- What information can be found with these actions?
- What common principles are there?

Some basic plots

- Barchart
- Histogram
- Boxplot
- Scatterplot

- Missing value plot(s)
- Variable window

- Time series, Parallel coordinates plot, Splom, Mosaicplots

Data and statistical objects

- Windows (complete plots or sets of plots)
- Points (glyphs)
- Bars/rectangles/cells
- Axes
- Boxes
- Models (lines, smoothers, estimates, intervals,…)
- Background/other areas
- Graph title, variable names, …

Actions for all plots (1)

- Actions on whole plots
  - Resize, reshape, rotate
  - Organise sets of plots
    - Align (by shape, by scale, by vertical/horizontal)
    - Tile or Group (by type, by variable,…)
  - Zoom
- Actions on objects
  - Query
  - Select
  - Recolour, reshade, reshape

Actions for all plots (2)

- Actions on variables
  - Flip axes (vertical -> horizontal, horizontal -> vertical)
  - Rescale axes
  - Transform existing variables (inc. discretisation/grouping)
  - Derive new variables (e.g., selection as a binary variable)
  - Weight variables
- Actions on models
  - vary parameters
  - Add error bars, intervals to selections/models

Methods of interaction

- Click
- Drag
- Modifier keys (ctrl, alt, ...)
- Tab
- Arrow keys
- Cf GOLD ladder
- Popup menus
- Drag and drop
- Touchscreen (smartphones, iPad…) e.g., for zooming

Principles (1)

- Interactive tools should be intuitive (it should be obvious what can be done): avoid modes
- Implicit availability of actions and information
- Make data information available (immediacy of data)
- Every click must get feedback — use all the plot real estate
- Consistency: same command means same thing everywhere
- Actions should be context sensitive (respect for place)
- "Do it where it's at" (immediacy of place)
- Give immediate feedback (immediacy of time)
- Actions should be possible on groups of objects (e.g., points)

Principles (2)

- Computing should not interfere with thinking
- Redraw as little as possible
- Don't overtax the user's memory (use defaults to help users)
- Return: allow recovery: undo/redo and repeat/replicate
- Be able to record results — plot and screen saving
- Be able to record processes — video?
- Provide helpful help (be user-helpful, not user-friendly)

Types of action: querying

- Querying levels
  - default
  - extended
  - deep
- Querying objects
  - data (raw and statistics of groups)
  - variables (statistics)
  - scales
  - models (options, estimates and fit)
  - plots

Types of action: selection

- Selecting
  - points
  - bars, cells or rectangles
  - variables
  - axes
  - plots
- Selecting multiple objects
- Toggling selections
- Selections across windows (selection sequences)

Types of action: scaling

- Change minimum and maximum
  - change tickmark levels
- Transform scale
- Common scaling
  - within a small multiples plot or pcp
  - by type of plot (e.g., all histograms)
  - by variable across plots
- How might this be done interactively?

Types of action: sorting

- Ordering of categories (including ID lists)
  - count, absolute selected, relative selected, alphabetic
- Ordering of variables
  - in missing value plots, pcps, mosaicplots, trellis plots
  - by statistics of selected or all
    - min, max, median, mean, IQR, sd
    - visually compliant sorting
  - alphabetic
- Reversing orderings is useful
- Linking orderings, nesting orderings

Types of action: zooming

- Zoom as magnification (+ bird's eye view and panning)
- Logical (Semantic) zooming
  - show more detail when zooming in (cf. maps)
- Selective zooming
  - growing points
  - Quantum zooming
    - for small bars/low levels of selected/non-selected
  - Censored zooming
    - ceiling-censored
    - floor-censored

Types of action: colour/shading

- Colouring different subsets
  - by individual selection
  - by a barchart or histogram classification
- Colouring by value
  - choice of palette (heat, rainbow, sequential, …)
  - choice of mapping (cf. MANET, SEURAT)
- Invert colour coding
- Alphablending

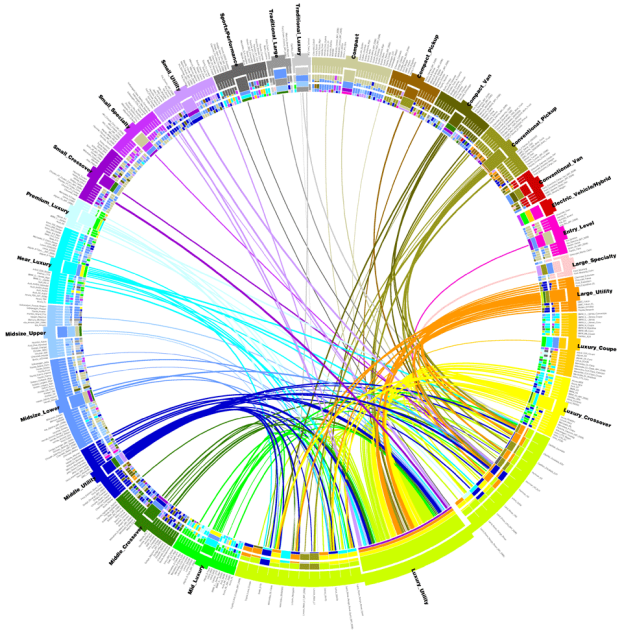
Interaction for histograms

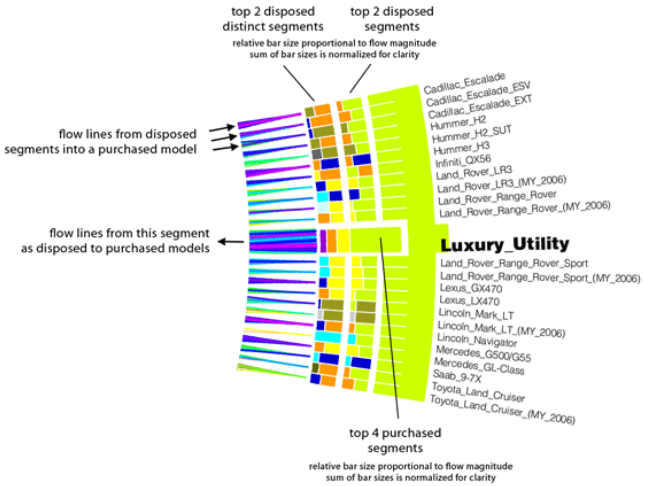
- Querying
- Selection
- Zoom: magnification/semantic
- Anchorpoint and binwidth
- Range, vertical scaling
- Density
- Spinogram, CD plot
- Weighting

Interaction for scatterplots

- Querying
- Selection
- Zoom: magnification/semantic
- Pointsize, colour, shape/glyph
- Scales
- Flip axes
- Regression line, smoothers
- Density estimates (marginals and bivariate)
- Weighting


UMFRAGE DES TAGES
Wie spielt Deutschland heute gegen Australien?
Niederlage
Sieg
16%
30%
Unent-schieden
11%
BM Infografik
1089 Stimmen




top 2 disposed distinct segments
top 2 disposed segments
relative bar size proportional to flow magnitude
sum of bar sizes is normalized for clarity
flow lines from disposed segments into a purchased model
flow lines from this segment as disposed to purchased models
Cadillac_Escalade
Cadillac_Escalade_ESV
Cadillac_Escalade_EXT
Hummer_H2
Hummer_H2_SUT
Hummer_H3
Infiniti_QX56
Land_Rover_LR3
Land_Rover_LR3_(MY_2006)
Land_Rover_Range_Rover
Land_Rover_Range_Rover_(MY_2006)
Luxury_Utility
Land_Rover_Range_Rover_Sport
Land_Rover_Range_Rover_Sport_(MY_2006)
Lexus_GX470
Lexus_LX470
Lincoln_Mark_LT
Lincoln_Mark_LT_(MY_2006)
Lincoln_Navigator
Mercedes_G500/G55
Mercedes_GL-Class
Saab_9-7X
Toyota_Land_Cruiser
Toyota_Land_Cruiser_(MY_2006)
top 4 purchased segments
relative bar size proportional to flow magnitude
sum of bar sizes is normalized for clarity