Chapter 1

Interactivity
Queries

- Graphics are good at communicating qualitative information but fail to give exact quantities ⇒ need queries to get exact values
- Gridlines can help (only) for the variables within the plot
- Interactive graphics often display very little scale information (cf. Tufte’s “data-ink-ratio”)
- Examples:
Levels of Queries

• The level of detail of a query should have optional granularities:
  – **orientation**, “what are the coordinates at the mouse pointer” (interactive grid)
  – **standard**, “what are the coordinates of a particular value”
  – **extended**, “what are the values for an object beyond the variables in the plot”

• Example: scatterplot
Selections

• Selections as such are not really interesting – but they are the necessary step to specify subsets of interest

• In an exploratory set-up we often want to look at the properties of specific subgroups, like

“Find all customers, who paid less than 15% tip, at night, except on weekdays!”

• The flexibility with which we can select data directly determines the how successful we may solve the exploratory analysis.

• Obviously we need different selection tools and selection modes
Selections: Tools

- **Pointer**
The Pointer is used to select single points.

- **Drag-Box**
The Drag-Box selects rectangular regions in a graphics window.

- **Brush**
Brushing allows a dynamic change (movement) of the selected region – usually a rectangle.

- **Slicer**
The slicer selects intervals along an axis dynamically.

- **Lasso**
The lasso allows the most flexible definition of the selection area. Startpoint and endpoint are always connected.
Selections: Modes

• Simple / Standard / Default
  – Only points in the selected region are selected.

• Intersection / AND / \( \cap \)
  – Only points that already were selected and are within the new selection stay selected.

• Union / OR / \( \cup \)
  – The newly selected points are added to the current selection.

• Toggle / XOR / \( \oplus \)
  – Selected points are deselected, unselected are selected.

• Negation / NOT / \( \neg \)
  – Points in the selection region are taken out of the current selection set.
Selections Sequences

• Why do we need Selection-Sequences?
  – A selection usually only exists as a set of selected points
    ⇒ no formal description of this set
  – Setting up complex selection sets is hard
    ⇒ errors are fatal, i.e. can not be re-done.
  – Alteration of the selection set is usually impossible
    ⇒ the complete selection must be repeated

• Tech. Solution
  – For each selection we store:
    ■ id
    ■ plot
    ■ coordinates
    ■ selection mode
Selections Sequences

- Selection-Sequences are directed, i.e. for any three selection sets A, B, C

  \[ A \text{ OR } B \text{ AND } C = A \text{ OR } (B \text{ AND } C) \neq (A \text{ OR } B) \text{ AND } C \]

  and

  \[ A \cup B \cap C = A \cup (B \cap C) \neq (A \cup B) \cap C \]

  holds, i.e. explicit left-parenthesis!

- Usually this is what the user was thinking about!

- Selection-Sequences can easily be translated into SQL. (Again, mind the left to right order of operators!)