Information Visualization
Interactive Views

Tamara Munzner
Department of Computer Science
University of British Columbia

Lect 8/9/10, 30 Jan & 4/6 Feb 2020

Manipulate
• Change over time
• Navigate
• Slice
• Pan/Translate
• Constrained

Idiom: Re-encode
System: Tableau

Idiom: Change parameters
• widgets and controls
  – sliders, buttons, radio buttons, checkboxes, dropdowns/comboboxes
• pros
  – clear affordances, self-documenting (with labels)
• cons
  – use screen space
• design choices
  – separated vs interleaved

Idiom: Change order/arrangement
• what: table with many attributes
• how: data-driven reordering by selecting column
• why: find correlations between attributes

System: DataStripes
[http://carlmanaster.github.io/datastripes/]

Idiom: Animated transitions
• smooth interpolation from one state to another
  – alternative to jump cuts, supports item tracking
  – best case for animation
  – staging to reduce cognitive load
• example: animated transitions in statistical data graphics

Idiom: Animated transitions - visual encoding change
• smooth transition from one state to another
  – alternative to jump cuts, supports item tracking
  – best case for animation
  – staging to reduce cognitive load

Idiom: Analyzed transitions - tree detail
• animated transition
  – network drilldown/rollup

Idiom: Animated transition - bar detail
• example: hierarchical bar chart
  – add detail during transition to new level of detail

[Hierarchical Tree](https://bl.ocks.org/mbostock/1895648)

[Collapsible Tree](https://bl.ocks.org/mbostock/4339083)

[Sortable Bar Chart](https://bl.ocks.org/mbostock/3885705)

[Stacked to Grouped Bars](http://bl.ocks.org/mbostock/3943967)

[Growth of a Nation](http://laurenwood.github.io/)

Idiom: Animated transition - bar detail
• example: hierarchical bar chart
  – add detail during transition to new level of detail

[Hierarchical Tree](https://bl.ocks.org/mbostock/1895648)

[Collapsible Tree](https://bl.ocks.org/mbostock/4339083)

[Sortable Bar Chart](https://bl.ocks.org/mbostock/3885705)

[Stacked to Grouped Bars](http://bl.ocks.org/mbostock/3943967)

[Growth of a Nation](http://laurenwood.github.io/)
Interactive transitions quiz: Ways Budget

Manipulate
Change View Over Time
Select
Navigate
Item Reduction
Zoom
Pan/Translate
Constrained
Geometric or Semantic
Attribute Reduction
Slice
Cut
Project

Selection

- selection: basic operation for most interaction
- design choices
  - how many selection types?
  - interaction modalities
  - mouse vs. keyboard
  - multiple click types (with or without click)
  - hovering vs. preselecting
  - application semantics
  - adding vs. replacing
  - selecting vs. choosing
  - selection feedback
  - visual feedback closely tied to but separable from selection
  - can support overview!
  - group membership (for items, some groups)

Highlighting

- highlight: change visual encoding for selection targets
- visual feedback closely tied to but separable from selection
- design choices: typical visual channels
- change item color
- animation: subtle or exaggerated
- add outline mark
- change size (ex: increase outline mark linewidth)
- change shape (ex: from solid to dashed line for link mark)
- unusual channel: motion
- motion usually avoid for single view
- with multiple views, could justify to draw attention to other views

Idiom: Scrollytelling

- how: navigate page by scrolling (panning down)
- pros:
  - familiar, intuitive, from standard web browsing
  - linear (only up & down) vs possible overhead of click-based interface choices
- cons:
  - full-screen mode may takeaffordances
  - scrolling, no direct access
  - unexpected behaviour
  - continuous control for discrete steps

Idiom: Animated transition + constrained navigation

- example: isle plot
- transition into containing map causes aspect ratio (shape) change
- new map shows more details

Rule of thumb: Responsiveness is required

- visual feedback: three rough categories
  - 0.1 second: immediate response
  - 1 second: immediate response
  - >10 seconds: brief tasks
  - bounded response after dialog box: mental model of what happens after button click
  - stability considerations
    - highlight selection without removing items from parent view
    - show hourglass for long operations (process in background thread)
    - add outline mark

Interaction limitations

- interaction has a time cost
  - sometimes minor, sometimes significant
  - degenerates to gesture-based inteface where
  - at times may not interact as planned by designer
  - NYTimes logs show ~90% don't interact beyond scrollytelling - Aisch, 2016

Idiom: Animated transition + constrained navigation

- example: isle plot
- transition into containing map causes aspect ratio (shape) change
  - new map shows more details

Data visualization and the news - Gregor Aisch (37 min)
https://www.bloomberg.com/graphics/
https://www.youtube.com/watch?v=QXLfT9sFcbc

Top tools
- tooltips: popup information for selection
  - hover or click
  - can provide useful additional detail on demand
  - should always consider if there's a way to visually encode directly to provide overview
  - “If you make a rollover or tooltip, assume nobody will see it. If it's important, make it explicit.”
  - Gregor Aisch, NYTimes

Tooltips

- show progress bar for long operations (process in background thread)
- change shape (ex: from solid to dashed line for link mark)
- move up/down/sideways
- change shape/color/opacity

Data visualization and the news - Gregor Aisch (37 min)
https://www.bloomberg.com/graphics/
https://www.youtube.com/watch?v=QXLfT9sFcbc

Idiom: Scrollytelling

- how: navigate page by scrolling (panning down)
- pros:
  - familiar, intuitive, from standard web browsing
  - linear (only up & down) vs possible overhead of click-based interface choices
- cons:
  - full-screen mode may take afforances
  - scrolling, no direct access
  - unexpected behaviour
  - continuous control for discrete steps

Data visualization and the news - Gregor Aisch (37 min)
https://www.bloomberg.com/graphics/
https://www.youtube.com/watch?v=QXLfT9sFcbc

Idiom: Animated transition + constrained navigation

- example: isle plot
- transition into containing map causes aspect ratio (shape) change
  - new map shows more details

Data visualization and the news - Gregor Aisch (37 min)
https://www.bloomberg.com/graphics/
https://www.youtube.com/watch?v=QXLfT9sFcbc

Idiom: Scrollytelling

- how: navigate page by scrolling (panning down)
- pros:
  - familiar, intuitive, from standard web browsing
  - linear (only up & down) vs possible overhead of click-based interface choices
- cons:
  - full-screen mode may take afforances
  - scrolling, no direct access
  - unexpected behaviour
  - continuous control for discrete steps

Data visualization and the news - Gregor Aisch (37 min)
https://www.bloomberg.com/graphics/
https://www.youtube.com/watch?v=QXLfT9sFcbc

Idiom: Animated transition + constrained navigation

- example: isle plot
- transition into containing map causes aspect ratio (shape) change
  - new map shows more details

Data visualization and the news - Gregor Aisch (37 min)
https://www.bloomberg.com/graphics/
https://www.youtube.com/watch?v=QXLfT9sFcbc

Idiom: Scrollytelling

- how: navigate page by scrolling (panning down)
- pros:
  - familiar, intuitive, from standard web browsing
  - linear (only up & down) vs possible overhead of click-based interface choices
- cons:
  - full-screen mode may take afforances
  - scrolling, no direct access
  - unexpected behaviour
  - continuous control for discrete steps

Data visualization and the news - Gregor Aisch (37 min)
https://www.bloomberg.com/graphics/
https://www.youtube.com/watch?v=QXLfT9sFcbc

Idiom: Animated transition + constrained navigation

- example: isle plot
- transition into containing map causes aspect ratio (shape) change
  - new map shows more details

Data visualization and the news - Gregor Aisch (37 min)
https://www.bloomberg.com/graphics/
https://www.youtube.com/watch?v=QXLfT9sFcbc

Idiom: Scrollytelling

- how: navigate page by scrolling (panning down)
- pros:
  - familiar, intuitive, from standard web browsing
  - linear (only up & down) vs possible overhead of click-based interface choices
- cons:
  - full-screen mode may take afforances
  - scrolling, no direct access
  - unexpected behaviour
  - continuous control for discrete steps

Data visualization and the news - Gregor Aisch (37 min)
https://www.bloomberg.com/graphics/
https://www.youtube.com/watch?v=QXLfT9sFcbc

Idiom: Animated transition + constrained navigation

- example: isle plot
- transition into containing map causes aspect ratio (shape) change
  - new map shows more details

Data visualization and the news - Gregor Aisch (37 min)
https://www.bloomberg.com/graphics/
https://www.youtube.com/watch?v=QXLfT9sFcbc

Idiom: Scrollytelling

- how: navigate page by scrolling (panning down)
- pros:
  - familiar, intuitive, from standard web browsing
  - linear (only up & down) vs possible overhead of click-based interface choices
- cons:
  - full-screen mode may take afforances
  - scrolling, no direct access
  - unexpected behaviour
  - continuous control for discrete steps

Data visualization and the news - Gregor Aisch (37 min)
https://www.bloomberg.com/graphics/
https://www.youtube.com/watch?v=QXLfT9sFcbc

Idiom: Animated transition + constrained navigation

- example: isle plot
- transition into containing map causes aspect ratio (shape) change
  - new map shows more details

Data visualization and the news - Gregor Aisch (37 min)
https://www.bloomberg.com/graphics/
https://www.youtube.com/watch?v=QXLfT9sFcbc
Dynamic visual layering

- Interactive based on selection
- One-hop neighbour highlighting demos: click vs hover (lightweight)

Credit: [Visualization Analysis and Design (Ch 11, 12)](http://dataviscourse.net/)

- Alex Lex & Miriah Meyer, [http://dataviscourse.net/](http://dataviscourse.net/)

Idiom: Trellis plots

- Superimpose within same frame
  - color code by year
- Partitioning
  - split by site, rows are wheat varieties
- Main-effects ordering
  - derive value of median for group; use to order
  - order rows within view by variety median
  - order views themselves by site median

Credit: [http://dataviscourse.net/](http://dataviscourse.net/)