Information Visualization
Marks & Channels, Rules of Thumb
Design Study Methodology
Ex: Decoding

Tamara Munzner
Department of Computer Science
University of British Columbia

Week 3, 22 Sep 2021

https://www.cs.ubc.ca/~tmm/courses/547-21
Logistics

• new room! (FSC 2330)
  – if door isn't unlocked, DFP admins on 3rd floor can open (FSC 3641)
  – to hear about Designing for People seminars
    • [https://dfp.ubc.ca/about/contact](https://dfp.ubc.ca/about/contact) for signups
    • next seminar is from new-ish BC visualization prof!
      Oct 13 12-1
      Charles Perrin, UVic
      *The case for more flexible data visualization interfaces*
Plan for today

• 45 min: Marks & Channels
  – mini-lecture
  – examples & discussion
  – further Q&A

• 30 min: Rules of Thumb, Design Study Methodology
  – further Q&A

• 5 min: upcoming
  – next week: async reading, sync project pitches

• (break)

• 75 min small groups exercise: Decoding
  – 45 min: breakout groups
  – 30 min: reportbacks
Mini-Lecture
Marks and channels

• marks
  – basic geometric elements

• channels
  – control appearance of marks
### Channels: Rankings

#### Magnitude Channels: Ordered Attributes

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Expressiveness</th>
<th>Effectiveness</th>
<th>Distinguishability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position on common scale</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position on unaligned scale</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length (1D size)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tilt/angle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area (2D size)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth (3D position)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Color luminance</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Color saturation</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Curvature</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volume (3D size)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Redundant encoding

• multiple channels
  – sends stronger message
  – but uses up channels

Length, Position, and Value
Marks: Constrained vs encodable

• math view: geometric primitives have dimensions
  – Points: 0D
  – Lines: 1D
  – Areas: 2D

• constraint view: mark type constrains what else can be encoded
  – Points: 0 constraints on size, can encode more attributes w/ size & shape
  – Lines: 1 constraint on size (length), can still size code other way (width)
  – Areas: 2 constraints on size (length/width), cannot size code or shape code
    • interlocking: size, shape, position

• quick check: can you size-code another attribute, or is size/shape in use?
Grouping

- containment
- connection

Marks as Links

- Containment
- Connection

Identity Channels: Categorical Attributes

- Spatial region
- Color hue
- Motion
- Shape

- same spatial region
- same values as other categorical channels
Marks for links

Connection

Containment

Containment can be nested

[Untangling Euler Diagrams, Riche and Dwyer, 2010]
Examples
Quiz: Name those marks & channels

- A: Shooting Media Coverage

https://twitter.com/MonaChalabi/status/1158779046693679106?s=20
Quiz: Name those marks & channels

• B: Tax Rates

Quiz: Name those marks & channels

• C: Sunsqatch

https://flowingdata.com/2017/08/20/sunsquatch-the-only-eclipse-map-you-need/
Quiz: Name those marks & channels

- D: UFC fights

Analyzing marks

• what type of mark?
  – line?
    • no, not length coded
  – point mark with rectangular shape?
    • yes!
  – area?
    • no, area/shape does not convey meaning

Quiz: Name those marks & channels

- E: Alpen Forest Fires

Burned area in hectares on the southern side of the Alps

Source: Swiss fire forest database

Quiz: Name those channels

• F: Netherlands Commuters

Quiz: Name that mark

• G: Yet More Alpen Forest Fires

Most forest fires in Switzerland occur on the southern side of the Alps.

Annual number of forest fires between 1990 and 2014

- < 1 Waldbrand
- 1-2
- 2-3
- 3-5
- 5-15
- > 15

Source: Climate Change Forest, Proença et al. 2010

NZZ (art.

Quiz: Name those marks & channels

• H: More Alpen Forest Fires

Monthly distribution of forest fires in the Alpine regions caused by,

- den Menschen
- Blitzschläge
- unbekannt

Alpensüdseite

Andere Alpengebiete

Average numbers in the period 2000-2018
Source: Swissfire forest fire database

Q&A/Backup Slides
Marks and Channels
Visual encoding

• how to systematically analyze idiom structure?
Visual encoding

• how to systematically analyze idiom structure?
Visual encoding

• how to systematically analyze idiom structure?

• marks & channels
  – marks: represent items or links
  – channels: change appearance of marks based on attributes
Marks for items

• basic geometric elements

• 3D mark: volume, rarely used
Marks for links

- Containment
- Connection

vialab.science.uoit.ca/portfolio/bubblesets
Containment can be nested

[Untangling Euler Diagrams, Riche and Dwyer, 2010]
Channels

• control appearance of marks
  – proportional to or based on attributes

• many names
  – visual channels
  – visual variables
  – retinal channels
  – visual dimensions
  – ...

- Position
  - Horizontal
  - Vertical
  - Both

- Color

- Shape

- Tilt

- Size
  - Length
  - Area
  - Volume
Definitions: Marks and channels

• marks
  – geometric primitives

- Points
- Lines
- Areas
Definitions: Marks and channels

• marks
  – geometric primitives

• channels
  – control appearance of marks
Definitions: Marks and channels

• marks
  – geometric primitives

• channels
  – control appearance of marks

• channel properties differ
  • type & amount of information that can be conveyed to human perceptual system
Visual encoding

• analyze idiom structure as combination of marks and channels
Visual encoding

• analyze idiom structure as combination of marks and channels

1: vertical position

mark: line
Visual encoding

• analyze idiom structure as combination of marks and channels

1: vertical position
mark: line

2: vertical position
horizontal position
mark: point
Visual encoding

• analyze idiom structure as combination of marks and channels

1: vertical position
mark: line

2: vertical position
horizontal position
mark: point

3: vertical position
horizontal position
color hue
mark: point
Visual encoding

- analyze idiom structure as combination of marks and channels

1: vertical position
mark: line

2: vertical position
horizontal position
mark: point

3: vertical position
horizontal position
color hue
mark: point

4: vertical position
horizontal position
color hue
size (area)
mark: point
Redundant encoding

• multiple channels
  – sends stronger message
  – but uses up channels

Length, Position, and Luminance
Marks as constraints

- math view: geometric primitives have dimensions

Points (0D) → Lines (1D) → Interlocking Areas (2D)
Marks as constraints

• math view: geometric primitives have dimensions
  - Points: 0D
  - Lines: 1D
  - Interlocking Areas: 2D

• constraint view: mark type constrains what else can be encoded
  - points: 0 constraints on size, can encode more attributes w/ size & shape
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- **math view**: geometric primitives have dimensions
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    - Interlocking: size, shape, position

- **quick check**: can you size-code another attribute
  - or is size/shape in use?
Scope of analysis

• simplifying assumptions: one mark per item, single view

• later on
  – multiple views
  – multiple marks in a region (glyph)
  – some items not represented by marks (aggregation and filtering)
When to use which channel?

**expressiveness**
match channel type to data type

**effectiveness**
some channels are better than others
Channels: Rankings

Position on common scale
Position on unaligned scale
Length (1D size)
Tilt/angle
Area (2D size)
Depth (3D position)
Color luminance
Color saturation
Curvature
Volume (3D size)

Spatial region
Color hue
Motion
Shape
Channels: Rankings

**Magnitude Channels: Ordered Attributes**

- Position on common scale
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- Area (2D size)
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- Color luminance
- Color saturation
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- Volume (3D size)

**Identity Channels: Categorical Attributes**

- Spatial region
- Color hue
- Motion
- Shape

- **expressiveness**
  - match channel and data characteristics
Channels: Rankings

Magnitude Channels: Ordered Attributes

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Identity Channels: Categorical Attributes

- Spatial region
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- Motion
- Shape

Attribute Types

- Categorical
- Ordered
- Ordinal
- Quantitative

• expressiveness
  - match channel and data characteristics
  - magnitude for ordered
    - how much? which rank?
  - identity for categorical
    - what?
Channels: Rankings

**Magnitude Channels:** Ordered Attributes

- Position on common scale
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**Identity Channels:** Categorical Attributes

- Spatial region
- Color hue
- Motion
- Shape

- **expressiveness**
  - match channel and data characteristics
- **effectiveness**
  - channels differ in accuracy of perception
Channels: Rankings

Magnitude Channels: Ordered Attributes

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Identity Channels: Categorical Attributes

- Spatial region
- Color hue
- Motion
- Shape

• expressiveness
  - match channel and data characteristics

• effectiveness
  - channels differ in accuracy of perception
  - spatial position ranks high for both
Channel effectiveness

• accuracy: how precisely can we tell the difference between encoded items?
• discriminability: how many unique steps can we perceive?
• separability: is our ability to use this channel affected by another one?
• popout: can things jump out using this channel?
Accuracy: Fundamental theory

• length is accurate: linear

• others magnified or compressed
  – exponent characterizes

Steven’s Psychophysical Power Law: $S = I^N$

S = sensation

I = intensity
Accuracy: Vis experiments

Discriminability: How many usable steps?

- must be sufficient for number of attribute levels to show
  - linewidth: few bins
Separability vs. Integrality

Position
+ Hue (Color)

Size
+ Hue (Color)

Width
+ Height

Red
+ Green

Fully separable
2 groups each

Some interference
2 groups each

Some/significant interference
3 groups total: integral area

Major interference
4 groups total: integral hue
Popout

• find the red dot
  – how long does it take?
Popout

• find the red dot
  – how long does it take?
Popout

• find the red dot
  – how long does it take?
Popout

• find the red dot
  – how long does it take?
Popout

• find the red dot
  – how long does it take?
Popout

• find the red dot
  – how long does it take?
Popout

• find the red dot
  – how long does it take?
Popout

• find the red dot
  – how long does it take?
• parallel processing on many individual channels
  – speed independent of distractor count
  – speed depends on channel and amount of difference from distractors
• serial search for (almost all) combinations
  – speed depends on number of distractors
Popout

• many channels
  – tilt, size, shape, proximity, shadow direction, ...
• many channels
  – tilt, size, shape, proximity, shadow direction, ...

• but not all!
  – parallel line pairs do not pop out from tilted pairs
Factors affecting accuracy

- alignment
- distractors
- distance
- common scale
Relative vs. absolute judgements

• perceptual system mostly operates with relative judgements, not absolute
Relative vs. absolute judgements

- perceptual system mostly operates with relative judgements, not absolute
  - that's why accuracy increases with common frame/scale and alignment

Relative vs. absolute judgements

- perceptual system mostly operates with relative judgements, not absolute
  - that’s why accuracy increases with common frame/scale and alignment
  - Weber’s Law: ratio of increment to background is constant

length

position along unaligned common scale

position along aligned scale

Relative vs. absolute judgements

- perceptual system mostly operates with relative judgements, not absolute
  - that’s why accuracy increases with common frame/scale and alignment
  - Weber’s Law: ratio of increment to background is constant
    - filled rectangles differ in length by 1:9, difficult judgement
    - white rectangles differ in length by 1:2, easy judgement

A \hspace{1cm} B
\hspace{1cm} A \hspace{1cm} B
\hspace{1cm} A \hspace{1cm} B

length
position along unaligned common scale
position along aligned scale

Relative luminance judgements

- perception of luminance is contextual based on contrast with surroundings

http://persci.mit.edu/gallery/checkershadow
Relative luminance judgements

- perception of luminance is contextual based on contrast with surroundings

http://persci.mit.edu/gallery/checkershadow
Relative color judgements

• color constancy across broad range of illumination conditions

http://www.purveslab.net/seeforyourself/
Relative color judgements

- color constancy across broad range of illumination conditions

http://www.purveslab.net/seeforyourself/
Grouping

• containment
• connection

Marks as Links

Containment

Connection

• proximtity
  – same spatial region
• similarity
  – same values as other
  categorical channels

Identity Channels: Categorical Attributes

Spatial region

Color hue

Motion

Shape
Rules of Thumb
Rules of Thumb Summary

- No unjustified 3D
- No unjustified 2D
- Eyes beat memory
- Resolution over immersion
- Overview first, zoom and filter, details on demand
- Responsiveness is required
- Function first, form next
Unjustified 3D all too common, in the news and elsewhere

Depth vs power of the plane

- high-ranked spatial position channels: **planar** spatial position
  - not depth!

---

**Magnitude Channels:** Ordered Attributes

- Position on common scale
- Position on unaligned scale
- Length (1D size)
- Tilt/angle
- Area (2D size)
- Depth (3D position)

Steven’s Psychophysical Power Law: $S = I^N$

- Electric Shock (3.5)
- Saturation (1.7)
- Length (1)
- Area (0.7)
- Depth (0.67)
- Brightness (0.5)
No unjustified 3D: Danger of depth

• we don’t really live in 3D: we see in 2.05D
  – acquire more info on image plane quickly from eye movements
  – acquire more info for depth slower, from head/body motion

We can only see the outside shell of the world
Occlusion hides information

- occlusion
- interaction can resolve, but at cost of time and cognitive load

Perspective distortion loses information

• perspective distortion
  – interferes with all size channel encodings
  – power of the plane is lost!

[Visualizing the Results of Multimedia Web Search Engines. Mukherjea, Hirata, and Hara. InfoVis 96]
3D vs 2D bar charts

- 3D bars very difficult to justify!
  - perspective distortion
  - occlusion
- faceting into 2D almost always better choice

[http://perceptualedge.com/files/GraphDesignIQ.html]
Tilted text isn’t legible

- text legibility
  - far worse when tilted from image plane

- further reading


No unjustified 3D example: Time-series data

- extruded curves: detailed comparisons impossible

[Cluster and Calendar based Visualization of Time Series Data, van Wijk and van Selow, Proc. InfoVis 99.]
No unjustified 3D example: Transform for new data abstraction

- derived data: cluster hierarchy
- juxtapose multiple views: calendar, superimposed 2D curves

[Cluster and Calendar based Visualization of Time Series Data. van Wijk and van Selow, Proc. InfoVis 99.]
Justified 3D: shape perception

- benefits outweigh costs when task is shape perception for 3D spatial data
  - interactive navigation supports synthesis across many viewpoints

Justified 3D: Economic growth curve

• constrained navigation steps through carefully designed viewpoints

No unjustified 3D

- 3D legitimate for true 3D spatial data
- 3D needs very careful justification for abstract data
  - enthusiasm in 1990s, but now skepticism
  - be especially careful with 3D for point clouds or networks

No unjustified 2D

• consider whether network data requires 2D spatial layout
  – especially if reading text is central to task!
  – arranging as network means lower information density and harder label lookup compared to text lists

• benefits outweigh costs when topological structure/context important for task
  – be especially careful for search results, document collections, ontologies
Eyes beat memory

• principle: external cognition vs. internal memory
  – easy to compare by moving eyes between side-by-side views
  – harder to compare visible item to memory of what you saw

• implications for animation
  – great for choreographed storytelling
  – great for transitions between two states
  – poor for many states with changes everywhere
    • consider small multiples instead

literal    abstract
animation    small multiples
show time with time    show time with space
Eyes beat memory example: Cerebral

- small multiples: one graph instance per experimental condition
  - same spatial layout
  - color differently, by condition

Why not animation?

• disparate frames and regions: comparison difficult
  – vs contiguous frames
  – vs small region
  – vs coherent motion of group

• safe special case
  – animated transitions
Change blindness

- if attention is directed elsewhere, even drastic changes not noticeable
  - remember door experiment?
- change blindness demos
  - mask in between images
    - https://youtu.be/bh_9XFzbWV8
Resolution beats immersion

- immersion typically not helpful for abstract data
  - do not need sense of presence or stereoscopic 3D
  - desktop also better for workflow integration
- resolution much more important: pixels are the scarcest resource
- virtual reality for abstract data difficult to justify thus far
  - but stay tuned with second wave, AR (augmented reality) has more promise

Overview first, zoom and filter, details on demand

• influential mantra from Shneiderman


• overview = summary
  – microcosm of full vis design problem
Rule of thumb: **Responsiveness is required**

• **visual feedback: three rough categories**
  – **0.1 seconds: perceptual processing**
    • subsecond response for mouseover highlighting - ballistic motion
  – **1 second: immediate response**
    • fast response after mouseclick, button press - Fitts’ Law limits on motor control
  – **10 seconds: brief tasks**
    • bounded response after dialog box - mental model of heavyweight operation (file load)

• **scalability considerations**
  – highlight selection without complete redraw of view (graphics frontbuffer)
  – show hourglass for multi-second operations (check for cancel/undo)
  – show progress bar for long operations (process in background thread)
  – rendering speed when item count is large (guaranteed frame rate)
Function first, form next

• start with focus on functionality
  – possible to improve aesthetics later on, as refinement
  – if no expertise in-house, find good graphic designer to work with
  – aesthetics do matter: another level of function
    – visual hierarchy, alignment, flow
    – Gestalt principles in action
      – *(not covered in this class)*

• dangerous to start with aesthetics
  – usually impossible to add function retroactively
Form: Basic graphic design ideas

- **proximity**
  - do group related items together
  - avoid equal whitespace between unrelated

- **alignment**
  - do find/make strong line, stick to it
  - avoid automatic centering

- **repetition**
  - do unify by pushing existing consistencies

- **contrast**
  - if not identical, then very different
  - avoid not quite the same

- **buy now and read cover to cover - very practical, worth your time, fast read!**

Best practices: Labelling

• make visualizations as self-documenting as possible
  – meaningful & useful title, labels, legends
    • axes and panes/subwindows should have labels
      – and axes should have good mix/max boundary tick marks
    • everything that’s plotted should have a legend
      – and own header/labels if not redundant with main title
  • use reasonable numerical format
    – avoid scientific notation in most cases

[https://xkcd.com/833/]
Rules of Thumb Summary

• No unjustified 3D
  – Power of the plane
  – Disparity of depth
  – Occlusion hides information
  – Perspective distortion dangers
  – Tilted text isn’t legible

• No unjustified 2D

• Eyes beat memory

• Resolution over immersion

• Overview first, zoom and filter, details on demand

• Responsiveness is required

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Design Study Methodology
Design Study Methodology

Reflections from the Trenches and from the Stacks

http://www.cs.ubc.ca/labs/imager/tr/2012/dsm/

Design Study Methodology: Reflections from the Trenches and from the Stacks.
Methodology for problem-driven work

• definitions

• 9-stage framework

• 32 pitfalls & how to avoid them

• comparison to related methodologies
Lessons learned from the trenches: 21 between us
Design study methodology: definitions

### TASK CLARITY
- Crisp
- Fuzzy

### INFORMATION LOCATION
- Head
- Computer

#### DESIGN STUDY METHODOLOGY
- Suitable
- Not enough data
- Algorithm automation possible
9 stage framework

PRECONDITION
learn → winnow → cast → discover → design → implement → deploy → reflect → write

CORE

ANALYSIS
9-stage framework

- learn
- winnow
- cast

PRECONDITION

discover > design > implement > deploy

CORE

reflect > write

ANALYSIS
9-stage framework

discover
design
implement
deploy
9-stage framework

- guidelines: confirm, refine, reject, propose
9-stage framework
Design study methodology: 32 pitfalls

• and how to avoid them

<table>
<thead>
<tr>
<th>PF-1</th>
<th>premature advance: jumping forward over stages</th>
<th>general</th>
</tr>
</thead>
<tbody>
<tr>
<td>PF-2</td>
<td>premature start: insufficient knowledge of vis literature</td>
<td>learn</td>
</tr>
<tr>
<td>PF-3</td>
<td>premature commitment: collaboration with wrong people</td>
<td>winnow</td>
</tr>
<tr>
<td>PF-4</td>
<td>no real data available (yet)</td>
<td>winnow</td>
</tr>
<tr>
<td>PF-5</td>
<td>insufficient time available from potential collaborators</td>
<td>winnow</td>
</tr>
<tr>
<td>PF-6</td>
<td>no need for visualization: problem can be automated</td>
<td>winnow</td>
</tr>
<tr>
<td>PF-7</td>
<td>researcher expertise does not match domain problem</td>
<td>winnow</td>
</tr>
<tr>
<td>PF-8</td>
<td>no need for research: engineering vs. research project</td>
<td>winnow</td>
</tr>
<tr>
<td>PF-9</td>
<td>no need for change: existing tools are good enough</td>
<td>winnow</td>
</tr>
</tbody>
</table>
I’m a domain expert! Wanna collaborate?

Of course!!!
Have **data**?
Have **time**?
Have **need**?

Interesting **problem**?

...
Are you a user???

... or maybe a fellow tool builder?
Metaphor

Winnowing
Collaborator winnowing

initial conversation

(potential collaborators)
Collaborator winnowing

initial conversation

further meetings
Collaborator winnowing

initial conversation

further meetings

prototyping
Collaborator winnowing

- initial conversation
- further meetings
- prototyping
- full collaboration
Collaborator winnowing

Talk with many, stay with few!
EXAMPLE FROM THE TRENCHES

Premature Collaboration!

PowerSet Viewer
2 years / 4 researchers

WikeVis
0.5 years / 2 researchers
EXAMPLE FROM THE TRENCHES

Premature Collaboration!

PowerSet Viewer
2 years / 4 researchers

WikeVis
0.5 years / 2 researchers

- Fellow tool builders
- Data promised
## Design study methodology: 32 pitfalls

<table>
<thead>
<tr>
<th>PF-10</th>
<th>no real/important/recurring task</th>
<th>winnow</th>
</tr>
</thead>
<tbody>
<tr>
<td>PF-11</td>
<td>no rapport with collaborators</td>
<td>winnow</td>
</tr>
<tr>
<td>PF-12</td>
<td>not identifying front line analyst and gatekeeper before start</td>
<td>cast</td>
</tr>
<tr>
<td>PF-13</td>
<td>assuming every project will have the same role distribution</td>
<td>cast</td>
</tr>
<tr>
<td>PF-14</td>
<td>mistaking fellow tool builders for real end users</td>
<td>cast</td>
</tr>
<tr>
<td>PF-15</td>
<td>ignoring practices that currently work well</td>
<td>discover</td>
</tr>
<tr>
<td>PF-16</td>
<td>expecting <em>just talking</em> or <em>fly on wall</em> to work</td>
<td>discover</td>
</tr>
<tr>
<td>PF-17</td>
<td>experts focusing on visualization design vs. domain problem</td>
<td>discover</td>
</tr>
<tr>
<td>PF-18</td>
<td>learning their problems/language: too little / too much</td>
<td>discover</td>
</tr>
<tr>
<td>PF-19</td>
<td>abstraction: too little</td>
<td>design</td>
</tr>
<tr>
<td>PF-20</td>
<td>premature design commitment: consideration space too small</td>
<td>design</td>
</tr>
</tbody>
</table>
Of course they need the cool technique I built last year!
METAPHOR

Design Space

+ good
○ okay
- poor
METAPHOR
Design Space

your technique...

+ good
○ okay
- poor
METAPHOR
Design Space

know
Metaphor

Design Space

know

consider
Metaphor
Design Space

know
consider
propose
M**ETAPHOR**

**Design Space**

- know
- consider
- propose
- select
Think broad!
<table>
<thead>
<tr>
<th>PF-21</th>
<th>mistaking technique-driven for problem-driven work</th>
<th>design</th>
</tr>
</thead>
<tbody>
<tr>
<td>PF-22</td>
<td>nonrapid prototyping</td>
<td>implement</td>
</tr>
<tr>
<td>PF-23</td>
<td>usability: too little / too much</td>
<td>implement</td>
</tr>
<tr>
<td>PF-24</td>
<td>premature end: insufficient deploy time built into schedule</td>
<td>deploy</td>
</tr>
<tr>
<td>PF-25</td>
<td>usage study not case study: non-real task/data/user</td>
<td>deploy</td>
</tr>
<tr>
<td>PF-26</td>
<td><em>liking</em> necessary but not sufficient for validation</td>
<td>deploy</td>
</tr>
<tr>
<td>PF-27</td>
<td>failing to improve guidelines: confirm, refine, reject, propose</td>
<td>reflect</td>
</tr>
<tr>
<td>PF-28</td>
<td>insufficient writing time built into schedule</td>
<td>write</td>
</tr>
<tr>
<td>PF-29</td>
<td>no technique contribution $\neq$ good design study</td>
<td>write</td>
</tr>
<tr>
<td>PF-30</td>
<td>too much domain background in paper</td>
<td>write</td>
</tr>
<tr>
<td>PF-31</td>
<td>story told chronologically vs. focus on final results</td>
<td>write</td>
</tr>
<tr>
<td>PF-32</td>
<td>premature end: win race vs. practice music for debut</td>
<td>write</td>
</tr>
</tbody>
</table>
I can write a design study paper in a week!

“writing is research”

[Wolcott: Writing up qualitative research, 2009]
Metaphor

Horse Race vs. Music Debut

Must be first!

Am I ready?

technique-driven

problem-driven

http://www.alaineknipes.com/interests/violin_concert.jpg

EXAMPLE FROM THE TRENCHES
Don’t step on your own toes!

First design round published

Subsequent work not stand-alone paper

AutobahnVis 1.0
[Sedlmair et al., Smart Graphics, 2009]

AutobahnVis 2.0
[Sedlmair et al., Information Visualization 10(3), 2011]
Reflections from the stacks: Wholesale adoption inappropriate

• ethnography
  – rapid, goal-directed fieldwork

• grounded theory
  – not empty slate: vis background is key

• action research
  – aligned
  • intervention as goal
  • transferability not reproducibility
  • personal involvement is key

  – opposition
  • translation of participant concepts into visualization language
  • researcher lead not facilitate design
  • orthogonal to vis concerns: participants as writers, adversarial to status quo, postmodernity
Next week

• to read & discuss (async, before next class)
  – VAD book, Ch 7: Arrange Tables
  – paper: LineUp [technique]
  – paper: Revisiting Bertin Matrices [technique]

• sync class: project pitches!
  – 2 min each
  – if already have full or partial team, can combine your times together
  – up to you: prerecord video OR present live, need slides either way
    • due by 1pm (Wed Sep 29)
    – if prerecorded, videos and slides. if live: slides
    • video creation tips/resources https://www.cs.ubc.ca/~tmm/courses/547-21/video.html
  – near-realtime Q&A / discussion through dedicated Piazza thread
Plan for today

• 45 min: Marks & Channels
  – mini-lecture
  – examples & discussion
  – further Q&A

• 30 min: Rules of Thumb, Design Study Methodology
  – further Q&A

• 5 min: upcoming
  – next week: async reading, sync project pitches

• (break)

• 75 min small groups exercise: Decoding
  – 45 min: breakout groups
  – 30 min: reportbacks