Information Visualization

Reading Visualization Papers

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Animated Transitions









Animated Transitions









Composite Visualization Techniques



(a) Juxtaposed views.





(b) Integrated views.



(c) Superimposed views.











Integration



Autog. par Regnier, 8. Pas. Ste Marie St Gain à Paris

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[Napoleon's March to Moscow, C. J. Minard, 1869]





Brushing











Filtering using Widgets



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Dimensionality Reduction: PCA

Alcoholic drinks Beverages Carcase meat Cereals Cheese Confectionery Fats and oils Fish Fresh fruit Fresh potatoes Fresh Veg Other meat Other Veg Processed potatoes Processed Veg Soft drinks Sugars

England	N Ireland	Scotland	
375	135	458	
57	47	53	
245	267	242	
1472	1494	1462	
105	66	103	
54	41	62	
193	209	184	
147	93	122	
1102	674	957	
720	1033	566	
253	143	171	
685	586	750	
488	355	418	
198	187	220	
360	334	337	
1374	1506	1572	
156	139	147	

Wales

England

Scotland

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[Principle Component Analysis Explained, Explained Visually, V. Powell & L. Lehe, 2015]





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Aggregation: Histograms

- Very similar to bar charts

- Often shown without space between (continuity)
- Choice of number of bins
 - Important!
 - Viewers may infer different trends based on the layout







Focus+Context











Focus+Context











Visualization Research

- that improve the capabilities of users."
- in development of new tools."
- Evaluation Methods:
 - Quantitative and Qualitative
 - Validate hypotheses, refine theories.

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• General Goals: "New visual displays, control panels, features, and workflows

• Perceptual and Cognitive Theories: help accomplish goals, guide design, aid









Areas of Visualization Research

- Tools that make it easier to create visualizations
- New encodings
- Knowledge from controlled studies of visualization effectiveness
- Visualization-based communication
- Studies of visualization use in the world (Design Studies)
- Formal theories of visualization
- + Applications







New Encodings

- Determine what cannot currently be done
- Think about how new designs can show new, interesting patterns



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this nation will rise up and live out the true meaning of its creed: "We hold these truths to be self-evident,

-on the red hills of Georgia the sons of former slaves and the sons of former slave owners will be able to sit down together at

-even the state of Mississippi, a state sweltering with the heat of injustice, sweltering with the heat of oppression, will be transformed into

-down in Alabama, with its vicious racists, with its governor having his lips dripping with the words of interposition and nullification - one day.

every valley shall be exalted, and every hill and mountain shall be made low, the rough places will be made plain, and the

-my four little children will one day live in a nation where they will not be judged by the color of their skin but by the

down in Alabama, with its vicious racists, with its governor having his lips dripping with the words of interposition and nullification - one day.

every valley shall be exalted, and every hill and mountain shall be made low, the rough places will be made plain, and the

[[J. Hullman, 2018], Image: [Wattenberg & Viegas, 2007]



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Knowledge from studies of visualization effectiveness







What should Visualization Research be about?

- their prior experiences and perceptual and cognitive abilities to draw conclusions about phenomena in the real world" — J. Hullman
- Perception and cognition
- Not only that Vis A is better than Vis B, but why

• "[V] isualization is a method for contextualizing data, enabling people to apply











Visualization Research Boundaries?

- Interactive illustration
- Satellite imagery
- Sketching and analogical reasoning
- Understanding aesthetics independent of analytical utility
- Tables
- Uncertainty Vis: Worse than Nothing?







Topics for the Remainder of the Semester





Progress Reports

- Focus Area
- Problem Statement
- Ideas





Reading Visualization Papers





Reading Visualization Papers

- To understand an area, need to see what has already been done Sometimes requires reading tens if not hundreds of papers
- **Cannot** remember all of the details!
- "By 'read' we mean extracting the essential, most important information from a (previously) published scientific conference or journal paper." [R. S. Laramee, 2009]
- Goal: Read research papers for a literature review
 - Can be used to write a survey paper









Concept vs. Implementation

- Concept is the idea, more abstract
 - Example: Writing utensil
- - Example: Pencil
 - Many other examples: pen, marker
 - Many different implementations

• Implementation is the realization of a concept, a concept brought into reality











Important Pieces to Extract from a Vis Paper

- Concept: what is the main goal/idea?
- Implementation: how is this realized?
- Related Work: what previous work does this build on or relate to?
- Data Characteristics: what is the type of data (items & attributes)?
- Visualization Techniques: what classes of techniques are used?
- Application Domain: where can this research be applied?









