Towards Visualization Literacy

Jean-Daniel Fekete, INRIA

with the help of:
Jeremy Boy
Luana Micallef
Pierre Dragicevic
Samuel Huron
Benjamin Bach
• 4 INRIA Researchers
• 5 Post-docs
• 6 PhD students
• Lots of cool stuff
Visualization for Experts or Not?

- We have now two lines of research
- Visualizations for expert users
- Visualizations for non-expert users
- Both lines are fruitful
- But is it the way to go?
PhD defense

Connections, Changes, and Cubes: Unfolding Dynamic Networks for Visual Exploration

Benjamin Bach

9 May 2014

Jury:
Chantal Reynaud
Jarke J. van Wijk
Tim Dwyer
Silvia Miksch
Guy Melançon

Advisors:
Jean-Daniel Fekete
Emmanuel Pietriga
Maray Friedrich and Eades, 2001

TempoVis Ahn et al, 2011
2.5D visualization  
Dwyer, 2004  
Visual Unrolling  
Brandes & Corman, 2003  
Gaertler & Wagner, 2005
Timelines

Dynamic Ego Networks 
Farrugia et al., 2011

Ego Network Representations

1.5D Visualization Shi et al., 2011

Parallel Edge Splatting Burch et al., 2011

Massive Parallel Sequence Views Willems et al., 2012

GraphDice Bezerianos et al., 2010

Temporal Aggregation

Reda et al., 2012

Collberg et al. 2003

Gestalt Lines Brandes & Nick, 2011
Unfolding Dynamic Networks
Central Model

Interactivity
Node-Link Diagrams

Matrix
Visual Patterns
Breakthrough in Social Network Visualization: Improving Matrices (2007-2010)

Several representations:

1. **Combined**
   - MatrixExplorer
     (Henry & Fekete InfoVis’06)

2. **Augmented**
   - MatLink
     (Henry & Fekete Interact’07, **Best Paper**)
   - GeneaQuilts
     (Bezerianos et al. InfoVis’10)

3. **Hybrid**
   - NodeTrix
     (Henry et al. InfoVis’07)
   - CoCoNutTrix
     (Isenberg et al. CG&A’09)

4. **Multiscale**
   - ZAME
     (Elmqvist et al. PacificVis’08)
Ceci n'est pas une visualisation 3D
Visualizing Dynamic Networks with Matrix Cubes

submitted to CHI2014
ALMA

Brain Signals
Brain Connectivity
Understanding Visualization
Seems So Easy

Here’s the beauty of charts. We all get it, right? [Jason Oberholtzer, Forbes, April 2012]

• Unfortunately, no!

• Why is it so easy for some and so hard for others?

• Several of our experiments failed because we thought: “We all get it, right?”
Turkers don't get it (sometimes)

• We performed experiments on the reading of simples charts:
  – bar-charts, pie-charts, line-charts

• On almost simple tasks:
  – Retrieve min/max, compare 2 values, estimate mean

• Most turkers failed (answered at random) for the complex tasks
Some Findings

• Visualization are easy to understand when they use “congruent” encodings or simple metaphors:
  – The words used in data space are the same as the words used in visual space
• For a bar-chart:
  – What is the biggest value?
  – What is the biggest bar?
• When visualizations are “non-congruent”, people “don't get it” and don't try hard spontaneously.
• Many effective visualizations are non-congruent:
  – Parallel coordinates, Scatterplots, Treemaps to some extent, adjacency matrices
Visualization Literacy

1. Definition

Visualization literacy is the ability to *confidently* use a given visualization to *translate* questions specified in the data domain into visual queries in the visual domain, as well as interpreting visual patterns in the visual domain as properties in the data domain.

- Abilities and competencies

2. Assessment

3. Education

- Can we teach “all” visual representations together instead of each one individually?
- We don't want popular visualizations to remain limited to simple charts, we need to move forward!
- Is Interaction Literacy part of it?
Suggested Interactivity Failure

• Visualizations are interactive
• How can we suggest this fact to novice users?
• We tried several methods
• None of the methods work!
Conclusion

• Exploring complex data is possible with novel visualizations
  – To make sense of datasets, check for quality, etc.
• It requires a bit of time to understand the visual mapping
  – About 10mn to 1h
• It also requires a bit of time to learn the interactions
• Visualization Literacy is necessary to realize how much you will gain from investing this time
IEEE VIS 2014 à Paris!

General Chair: Jean-Daniel Fekete, INRIA

Dates: Nov. 9-14 2014