PERCEPTUAL VISUALIZATION

- Harness human visual system
- Layer data in “intelligent” ways
- Direct focus of attention
- Avoid perceptual blindness
- Build “optimal” visualizations semi-automatically

Painterly visualization of a slice through a simulated supernova collapse: pressure → luminance, velocity → hue, flow direction → orientation

Data courtesy Dr. Jon Blondin, Astrophysics, NCSU
PAINTERLY VISUALIZATION

Painterly visualization of a slice through a simulated supernova collapse:

*pressure* \(\rightarrow\) luminance, *velocity* \(\rightarrow\) hue, *flow direction* \(\rightarrow\) orientation

Data courtesy Dr. Jon Blondin, Astrophysics, NCSU

ENSEMBLE VISUALIZATION

Visualization of relativistic gold-on-gold collision:

- pressure $\rightarrow$ luminance,
- velocity $\rightarrow$ hue,
- flow direction $\rightarrow$ orientation

Data courtesy Dr. Steffen Bass, Nuclear Physics, Duke University
ELECTION VISUALIZATION

Visualization of voting patterns for President, U.S. Senate, U.S. House, and state Governor elections:
winning party $\rightarrow$ hue, winning percentage $\rightarrow$ saturation, incumbent loss $\rightarrow$ texture, electoral college votes $\rightarrow$ height

http://www.csc.ncsu.edu/faculty/healey/US_election
CHANGE BLINDNESS
CHANGE BLINDNESS
FIND FIVE DIFFERENCES
FIND FIVE DIFFERENCES

- beec's stripe colours reversed
- eyes tilted up
- extra leaf
- patch on knee
- extra flower
MOTIVATION

1. Visualizing short text snippets
   - Facebook wall posts, SMS text messages, tweets

2. Estimating and visualizing sentiment
   - Emotional scatterplot, topic clusters, overview+detail volume graph

3. Web-based visualization
   - Distribution to the general public

4. Twitter
   - Popular social network
   - Timely perspectives on world events
TAG CLOUD

Wordle tag cloud: term → text, term frequency → size

http://www.wordle.net
PHRASE NET

Phrase net: term frequency → size, links → neighbour relationship

http://www-958.ibm.com/software/analytics/manyeyes/
Interactive, topic-based visual text summarization and analysis.
**SENTIMENT**

- “An attitude, thought, or judgment prompted by feeling”
- **Natural language processing (NLP) approaches**
  - Subjectivity classification, machine learning, semantic orientation
- **Sentiment dictionaries**
  - Affective Norms for English Words (ANEW): valence, arousal, dominance
  - SentiStrength: 298 positive terms, 465 negative terms, support for social network text
  - SentiWordNet: Sentiment scores for WordNet synsets
Psychological models of emotion

- Russell’s emotional circumplex, with orthogonal valence and arousal axes

Emotional scatterplot

- 2D scatterplot with valence and arousal as horizontal and vertical axes
- Intermediate regions indicate emotions like upset, stressed, nervous, tense
EMOTIONAL SCATTERPLOT

Emotional scatterplot: valence → X-axis, arousal → Y-axis
TWEET GLYPHS

valence ⟷ hue
unpleasant → pleasant
sedate

arousal ⟷ luminance
low → high

response frequency confidence ⟷ size
low → high

standard deviation confidence ⟷ opacity
low → high
SYRIA + BOMB

Emotional scatterplot of tweets for keywords “Syria + bomb”

*valence* → hue, *arousal* → luminance, *response confidence* → size, *standard deviation confidence* → opacity
TWEET DETAILS

Emotional scatterplot of tweets for keywords “Syria + bomb”

valence → hue, arousal → luminance, response confidence → size, standard deviation confidence → opacity
TWEET DIALOGS

Emotional scatterplot of tweets for keywords “Syria + bomb”

valence $\rightarrow$ hue, arousal $\rightarrow$ luminance, response confidence $\rightarrow$ size, standard deviation confidence $\rightarrow$ opacity
TOPIC CLUSTERS

Emotional scatterplot of tweets for keywords “Syria + bomb”

valence → hue, arousal → luminance, response confidence → size, standard deviation confidence → opacity
LENS ZOOMING

Emotional scatterplot of tweets for keywords “Syria + bomb”

valence $\rightarrow$ hue, arousal $\rightarrow$ luminance, response confidence $\rightarrow$ size, standard deviation confidence $\rightarrow$ opacity
CONCLUSIONS

- Text sentiment is a promising way to summarize text collections
  - Emotional scatterplot, topic clusters, volume graph
- HTML5, CSS3, and JavaScript can support sophisticated 2D sentiment visualizations
  - Web visualizations offer effective dissemination to general public
- Ongoing collaborations
  - Presidential debates with WRAL
  - Wildfire community sentiment with School of Public Policy
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