Visual Clutter

Feature Congestion Model

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Feature Congestion model

- Rosenholtz et al.
  - SIGCHI 2005

- CHI perspective
What is “clutter”?
Is clutter subjective?
Is clutter subjective?
Is clutter subjective?
Clutter and scale
Clutter and scale
Clutter and task

Definition in terms of task performance
Clutter and task

Sense of clutter even without task
Clutter and expertise
Clutter: quantifiable?

- Traditionally: set-size
- Number of objects may be ill-defined
Ways to measure clutter

- Number of visible objects
- Number of vertices
- Number of elements on webpage
- Density of graphics tokens
- Number of vectors needed to draw
- Length of program
- Amount of ink per unit area
- Number of bullet points
Not just about quantity
Not just about quantity
Not just about quantity
Not just about quantity
Feature Congestion

• Textual definition
  – “Clutter is the state in which excess items, or their representation or organization, lead to a degeneration of performance at some task”

• Operational definition
  – The more cluttered a scene, the more difficult to add a new item that would draw attention
Feature Congestion

Putting note on desk
Feature Congestion

\[ \Delta = \sqrt{(T - \mu_D)' \Sigma_D^{-1} (T - \mu_D)} \]

Saliency

Iso-salient contours
Feature Congestion

(a)  (b)  (c)

(d)  (e)
Process

1) Features (color, contrast, orientation)
2) Finding (co)variances
3) Combine across scales
   - Take maximum
4) Combine across features
   - Divide by range
   - Average across features
5) Average across map
DEMO
Precipitation Forecast

Rainfall: 0.1" 0.5" 1" 2" 3-6" 6-12" 12"+

Snowfall: 0.1" 0.5" 1" 2" 3-6" 6-12" 12"+

THROUGH MID-AM SAT

Map ranking

- 25 maps at various scales
- 20 users, not told definition of clutter
- Kendall’s coefficient of concordance, $W$
  - 0 to 1 (most agreement)
- $W = 0.72$ ($p < 0.001$)
- Average Spearman correlation = 0.70
Map ranking - Results

Spearman corr (model and avg subj) = 0.83 (p < 0.001)
Visual search

- 16 colored maps
- Find the grayscale Gabor, if present
  - 6 general locations
Visual search - Results

$r = 0.73$ (present), $r = 0.75$ (absent), $p < 0.001$
Other results
Discussion

Information theory interpretation?
Clutter vs. Complexity
Clutter and Scene Understanding

What’s useful and what’s not?
Sources

• http://presentationzen.blogs.com/
• http://www.ipodobserver.com/story/25957
• http://www.davidpogue.com/
http://www.youtube.com/watch?v=EUXnJraKM3k