Modeling Color Difference for Visualization Design

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Are the colours the same or different?

Just noticeable differences (JNDs)

the point at which we can notice the difference 50% of the time

CIE L*a*b* colour space: perceptually equal steps

Visualizations are more complex

Assumptions
Simple World
Isolation
Geometric

Solution
crowdsource
don'
th

distractors

varied mark shape, size

Scatterplots

72 participants
factors:
- 6 diameters × 6 color differences × 3 color axes
each participant saw each diameter × color difference twice
Scatterplots

Bar charts

288 participants

- 6 thicknesses ×
- 8 lengths
- 6 color differences ×
- 3 color axes

Bar charts

72 participants

- 6 thicknesses ×
- 6 color differences ×
- 3 color axes

Line graphs

72 participants

- 6 thicknesses ×
- 6 color differences ×
- 3 color axes

ColorBrewer

- not robust to smaller mark sizes!

Applications

- only two marks were coloured - contrast differences absent
- marks tested at fixed distances and aligned

Limitations

- only two marks were coloured - contrast differences absent
- marks tested at fixed distances and aligned
  
  Author:

  - colour distance $\Delta E$ in CIEL*a*b* space is non-uniform to begin with
  - rather than overfit to CIEL*a*b*, start with a raw colour space
  - staircase method to sample more data around JND

Amon:

- colour distance $\Delta E$ in CIEL*a*b* space is non-uniform to begin with
- rather than overfit to CIEL*a*b*, start with a raw colour space
- staircase method to sample more data around JND

Thanks!

paper page: http://cmci.colorado.edu/visualab/VisColors/index.html