

# Modeling Color Difference for Visualization Design

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Are the colours the **same** or **different**?



1

2

3



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5

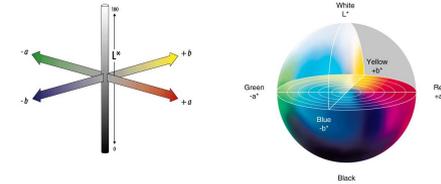
6

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**Just noticeable differences (JNDs)**

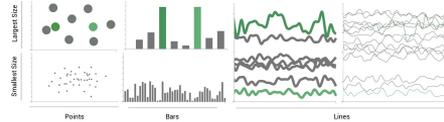
the point at which we can notice the difference 50% of the time

**CIE L\*A\*B\* colour space: perceptually equal steps**



8

**Visualizations** are more complex



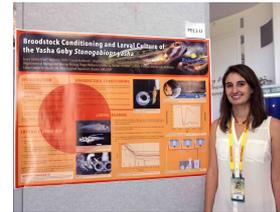
goal: build qualitative understanding of color perception in visualization

**Assumptions**

- Simple World
- Isolation
- Geometric

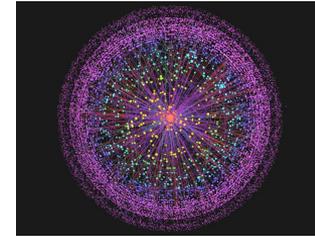
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9

10

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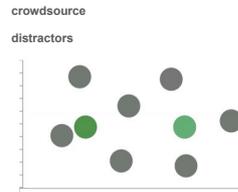
**Solution**

- Simple World
- crowdsource
- Isolation
- Geometric



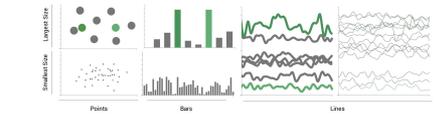
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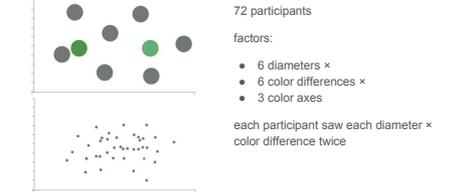


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**Scatterplots**



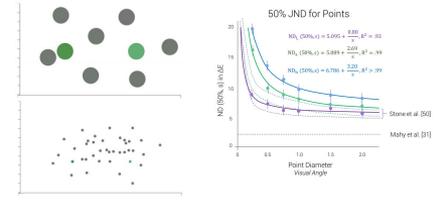
12

13

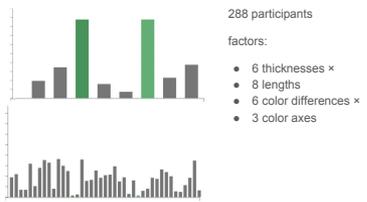
14

15

### Scatterplots

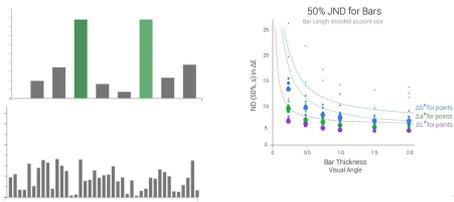


### Bar charts

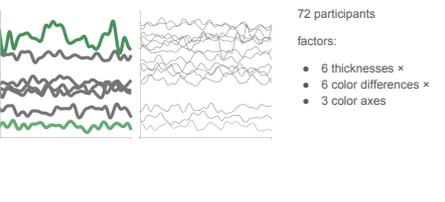


- 288 participants
- factors:
- 6 thicknesses x
  - 8 lengths
  - 6 color differences x
  - 3 color axes

### Bar charts

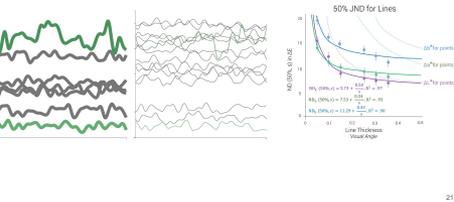


### Line graphs

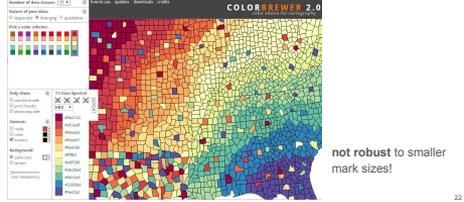


- 72 participants
- factors:
- 6 thicknesses x
  - 6 color differences x
  - 3 color axes

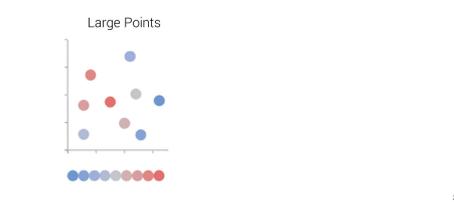
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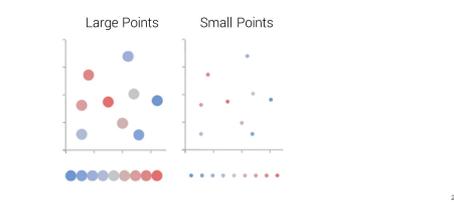
### ColorBrewer



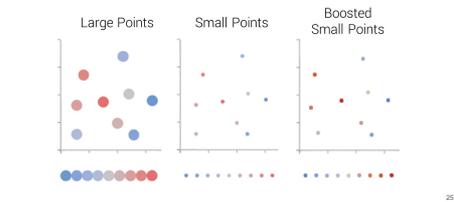
### Applications



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### Limitations

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

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- Author:
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  - marks tested at fixed distances and aligned
- 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>