Ch 5: Marks and Channels

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http://www.cs.ubc.ca/~tmm/courses/547-17

News

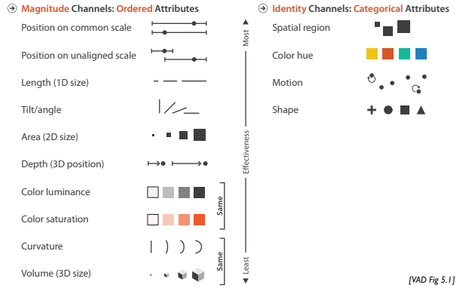
- comments marks out for 3/Tasks and 4/Validation,
  - lect 2 avg 86, min 73, max 94
  - lect 3 avg 85, min 78, max 98
  - lect 4 avg 88, min 84, max 100

Now

- first, work in small groups
  - exercise: decoding marks and channels
  - 45 min, +/- 15 min
    - status checkins at 30 min, 45 min, (60 min)
- then readings discussion

VAD Ch 5: Marks and Channels

Channels: Expressiveness Types and Effectiveness Ranks



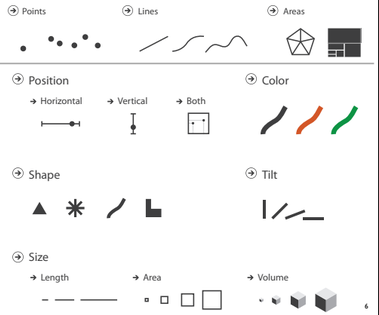
[VAD Fig 5.1]

Encoding visually

- analyze idiom structure

Definitions: Marks and channels

- marks
  - geometric primitives
- channels
  - control appearance of marks

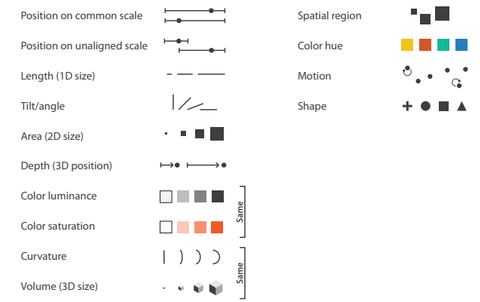


Encoding visually with marks and channels

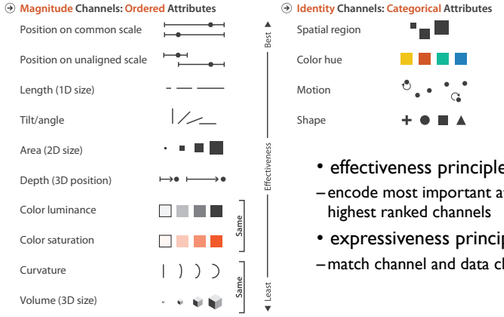
- analyze idiom structure
  - as combination of marks and channels

1:	2:	3:	4:
vertical position	vertical position horizontal position	vertical position horizontal position color hue	vertical position horizontal position color hue size (area)
mark: line	mark: point	mark: point	mark: point

Channels



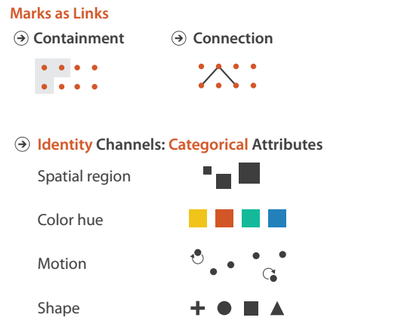
Channels: Rankings



- effectiveness principle
  - encode most important attributes with highest ranked channels
- expressiveness principle
  - match channel and data characteristics

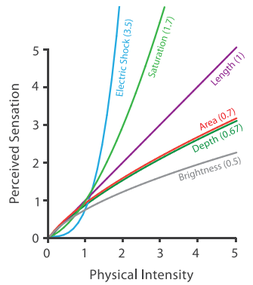
Grouping

- containment
- connection
- proximity
  - same spatial region
- similarity
  - same values as other categorical channels

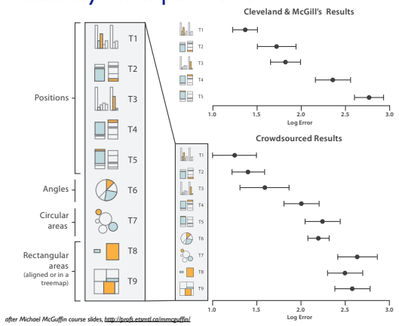


Accuracy: Fundamental Theory

Steven's Psychophysical Power Law: $S = I^N$



Accuracy: Vis experiments

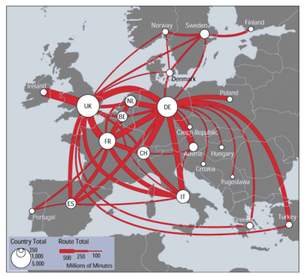


after Michael McGuffin course slides, http://profs.etsmtl.ca/mmcguffin/

[Crowdsourcing Graphical Perception: Using Mechanical Turk to Assess Visualization Design. Heer and Bostock. Proc ACM Conf. Human Factors in Computing Systems (CHI) 2010, p. 203–212.]

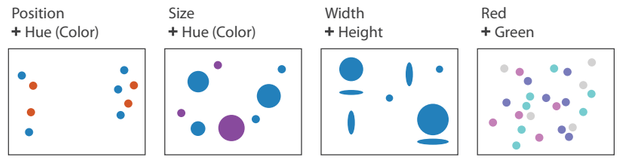
Discriminability: How many usable steps?

- must be sufficient for number of attribute levels to show
  - linewidth: few bins



[mappa.mundi.net/maps/maps 014/telegeography.html]

Separability vs. Integrality



Fully separable	Some interference	Some/significant interference	Major interference
2 groups each	2 groups each	3 groups total: integral area	4 groups total: integral hue

Further reading: Articles

- Perception in Vision web page with demos, Christopher Healey. (see also Attention and Visual Memory in Visualization and Computer Graphics, Christopher G. Healey and James T. Enns, IEEE TVCG 18(7):1170-1188 2012.)
- Crowdsourcing Graphical Perception: Using Mechanical Turk to Assess Visualization Design. Jeffrey Heer and Michael Bostock. Proc. CHI 2010
- Graphical Perception: Theory, Experimentation and the Application to the Development of Graphical Models. William S. Cleveland, Robert McGill, J. Am. Stat. Assoc. 79:387, pp. 531-554, 1984.
- A Model for Studying Display Methods of Statistical Graphics (with Discussion). William S. Cleveland. Journal of Computational and Statistical Graphics 2(4):323-364 1993.
- Automating the Design of Graphical Presentations of Relational Information. Jock Mackinlay. ACM Transaction on Graphics, vol. 5, no. 2, April 1986, pp. 110-141.
- Taxonomy-Based Glyph Design---With a Case Study on Visualizing Workflows of Biological Experiments. Eamonn Maguire, Philippe Rocca-Serra, Susanna-Assunta Sansone, Jim Davies, and Min Chen. IEEE TVCG (Proc. InfoVis 12) 18(12):2603-2612 2012.
- Glyph-Based Visualization: Foundations, Design Guidelines, Techniques and Applications. Rita Borgo, Johannes Kehrer, David H.S. Chung, Eamonn Maguire, Robert S. Laramee, Helwig Hauser, Matthew Ward, and Min Chen. Eurographics State of the Art Reports (STAR):39-63 2013.
- On the Theory of Scales of Measurement. S. S. Stevens. Science 103(2684):677-680, 1946.
- Feature Analysis in Early Vision: Evidence from Search Asymmetries. Treisman and Gormican. Psychological Review 95(1): 15-48, 1988.

Further reading: Books

- Visualization Analysis and Design. Munzner. CRC Press, 2014.
  - *Chap 5: Marks and Channels*
- Visual Thinking for Design. Ware. **Morgan Kaufmann, 2008.**
- Information Visualization: Perception for Design, 3rd edition. Ware. Morgan Kaufmann /Academic Press, 2013.
- How Maps Work: Representation, Visualization, and Design. Alan M. MacEachren. Guilford Press, 1995.
- The Grammar of Graphics, Leland Wilkinson, Springer-Verlag 1999.
- Semiology of Graphics, Jacques Bertin, Gauthier-Villars 1967, EHESS 1998.
- Psychophysics: Introduction to its Perceptual, Neural, and Social Prospects. Stevens. Wiley, 1975.

Next Time

- to read
  - VAD Ch. 6: Rules of Thumb
  - paper: Artery Viz (type: design study / evaluation)

- reminder: office hrs after class today