Estratégias de Visualização e Interação
Representações Visuais

.inf
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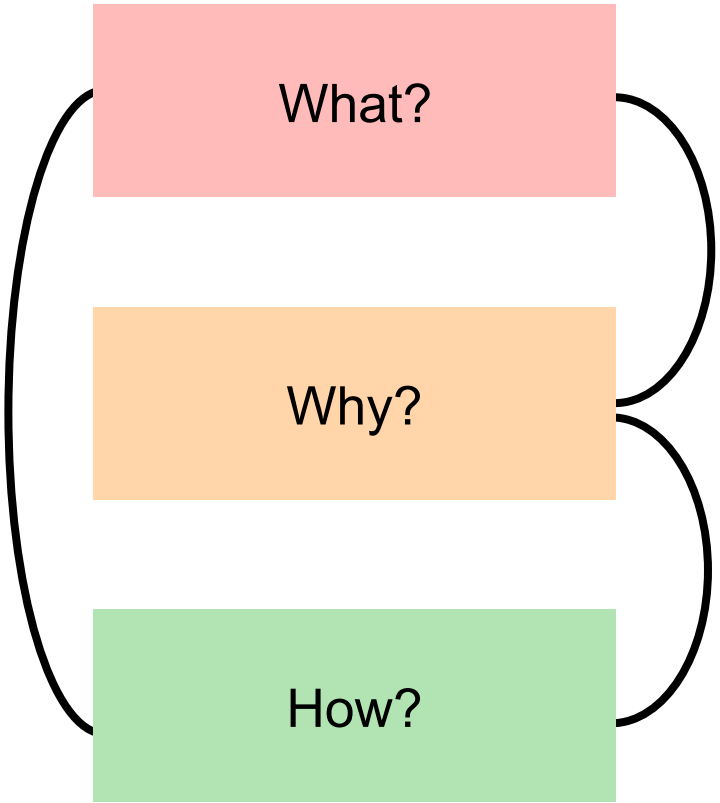
Abordagem “what-why-how”



- Abordagem para analisar técnicas de acordo com as 3 questões
- What
  - Que dados os usuários vêem
- Why
  - Quais as intenções dos usuários em usar uma técnica de vis
- **How**
  - **Quais são as codificações visuais e as técnicas de interação (*idiomas*)**

Munzner, Tamara *Visualization Analysis and Design*. Boca Raton, FL:Taylor & Francis, 2014

How?

Encode

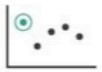
- **Arrange**
  - Express
  - Separate
  - Order
  - Align
  - Use

- **Map**
  from categorical and ordered attributes
  - Color
    - *Hue*
    - *Saturation*
    - *Luminance*
  - Size, Angle, Curvature, ...
  - Shape
  - Motion
    Direction, Rate, Frequency, ...

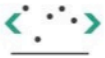
Manipulate

- **Change**

- **Select**

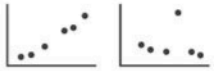


- **Navigate**

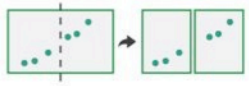


Facet

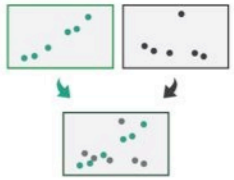
- **Juxtapose**



- **Partition**



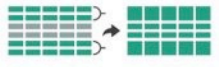
- **Superimpose**



Reduce

- **Filter**

- **Aggregate**



- **Embed**

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Mapemento/ codificação visual

(Munzner, 2014)

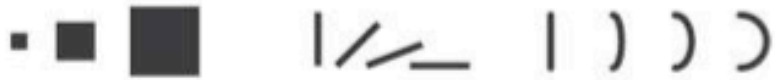
Map
from categorical and ordered attributes

→ Color

→ *Hue* → *Saturation* → *Luminance*



→ Size, Angle, Curvature, ...

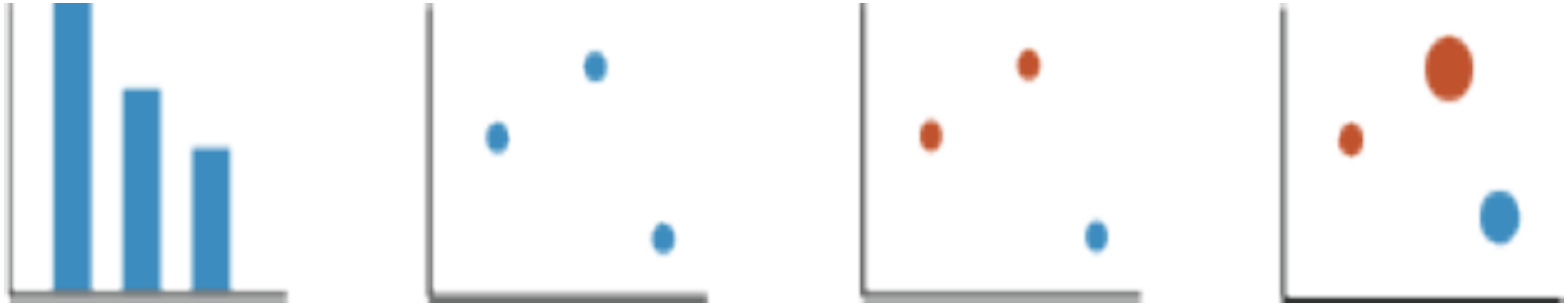


→ Shape

→ Motion
Direction, Rate, Frequency, ...

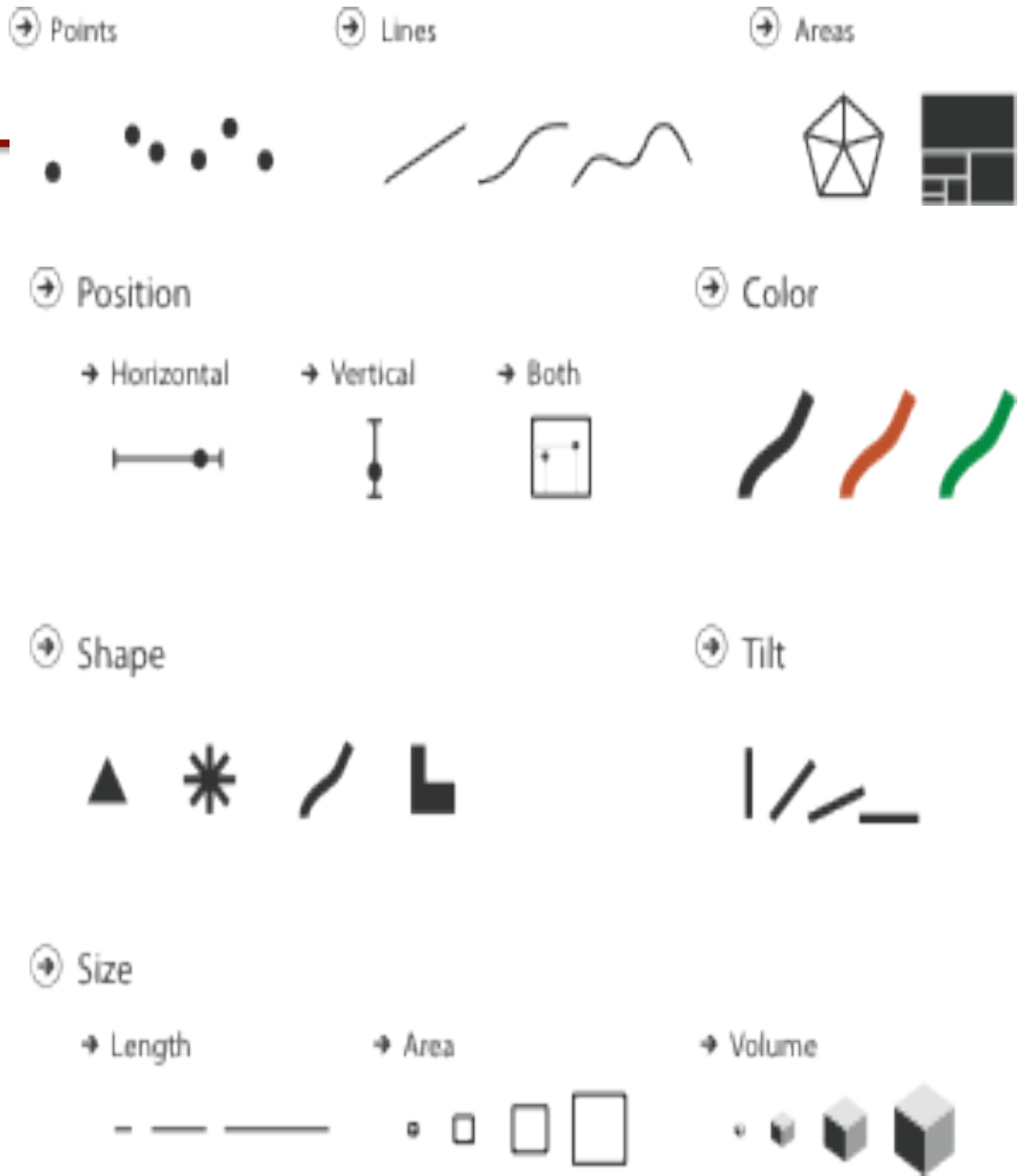
Codificação visual

- Estrutura da representação e marcas utilizadas



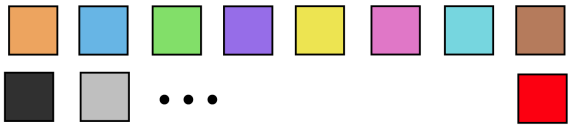
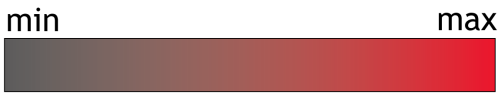
Marca and canais

- Marcas
  - Primitivas geométricas
- Canais
  - Atributos visuais
  - Controlam a aparência das marcas
- Características
  - **Pontos (0D)** representam posição
  - Podem variar cor e forma
  - **Linhas (1D)** representam posição e comprimento
  - **Áreas (2D)** só podem ser representadas por áreas marcadas



Mapeamento/codificação visual

canais

property	marks	ordinal/nominal mapping	quantitative mapping
shape	glyph		
size	rectangle, circle, glyph, text		
orientation	rectangle, line, text		
color	rectangle, circle, line, glyph, y-bar, x-bar, text, gantt bar		

Codificação visual

- Combinação de marcas e canais

1:
vertical position

mark: line

2:
vertical position
horizontal position

mark: point

3:
vertical position
horizontal position
color hue

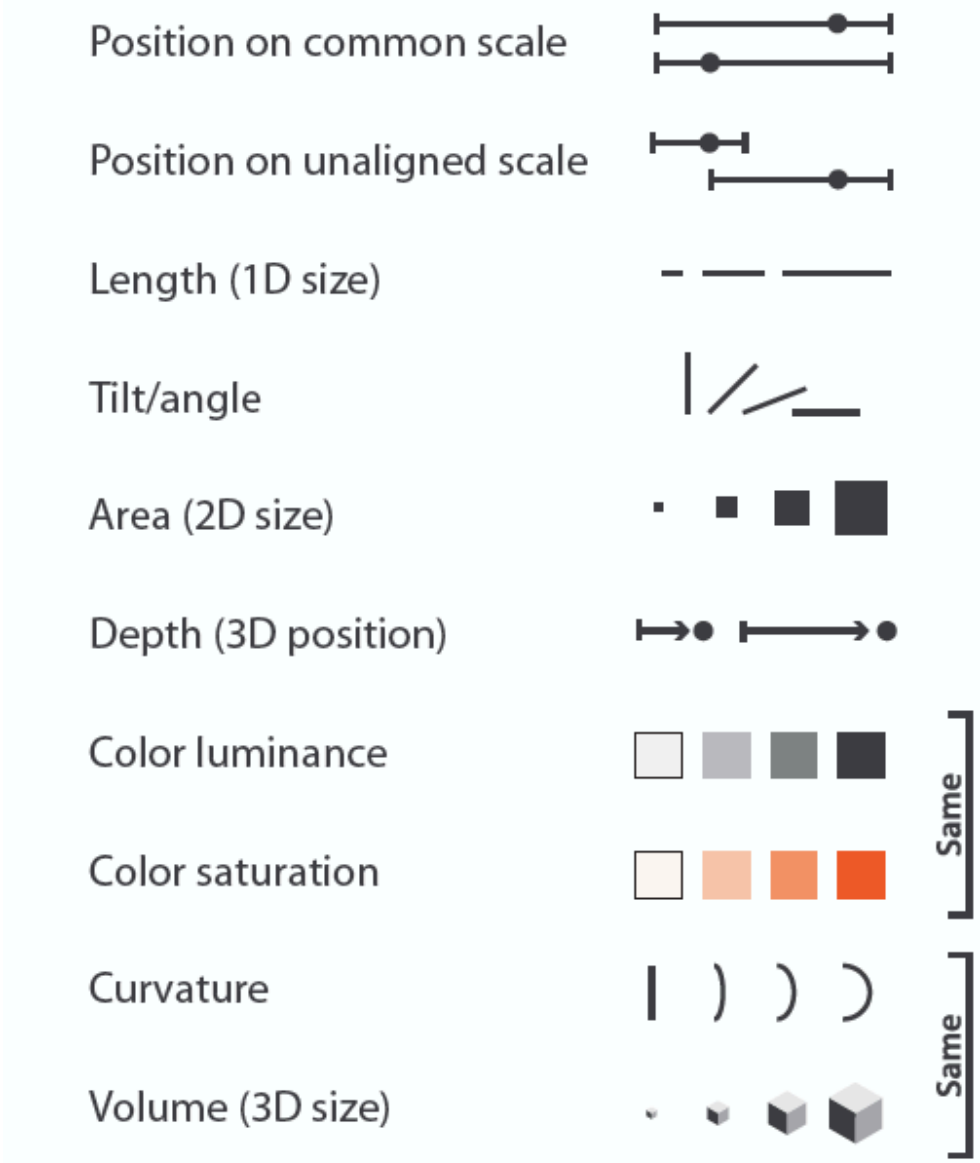
mark: point

4:
vertical position
horizontal position
color hue
size (area)

mark: point

Canais: tipos e efetividade

Magnitude: atributos ordenados

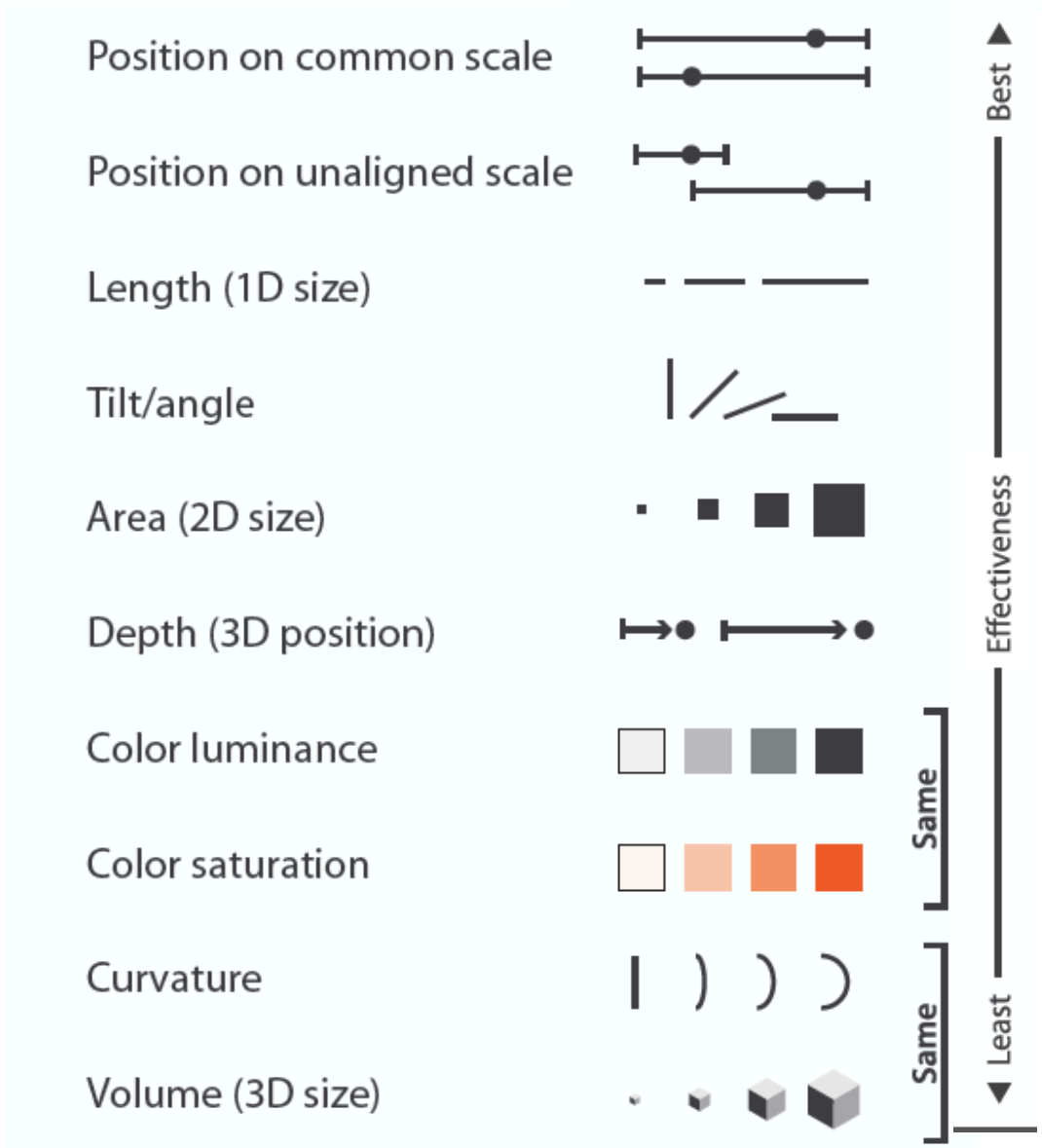


Identificação: atributos categóricos

Princípio da Expressividade: "casar" características dos dados com canais

Canais: tipos e efetividade

Magnitude: atributos ordenados

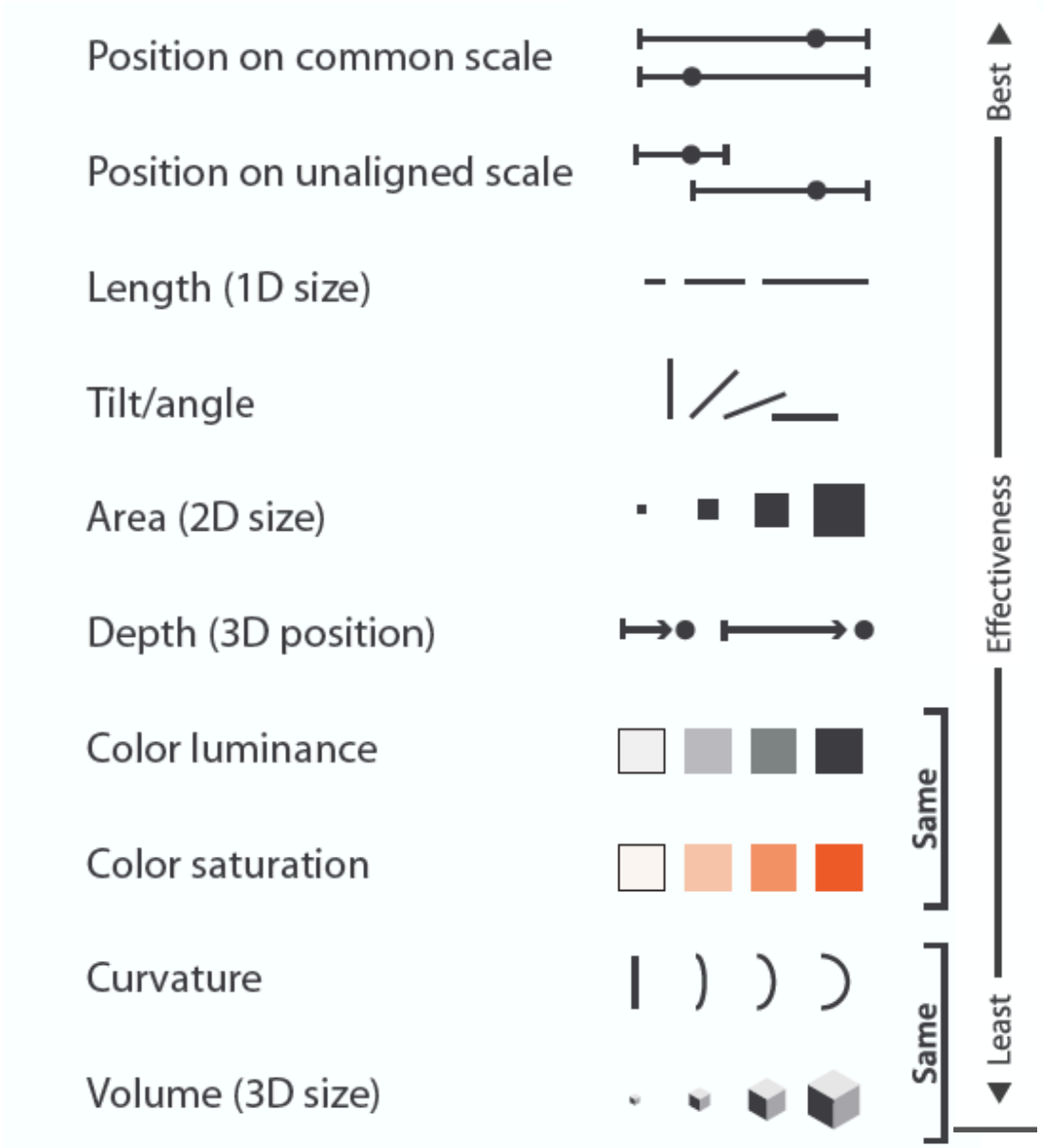


Identificação: atributos categóricos

Princípio da Efetividade: utilizar os canais melhores ranqueados em termos de percepção

Canais: tipos e efetividade

Magnitude: atributos ordenados



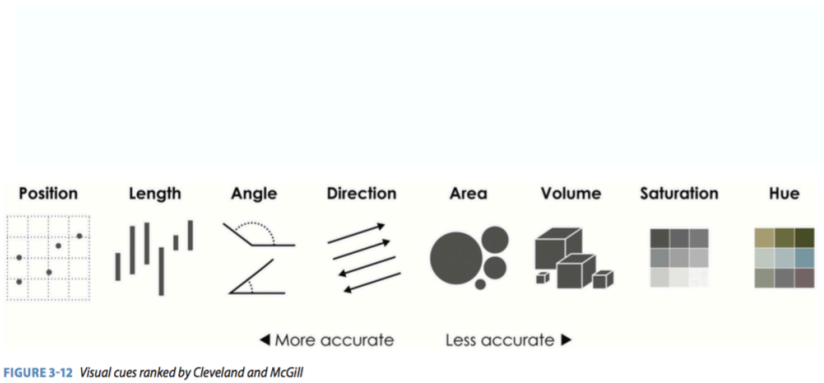
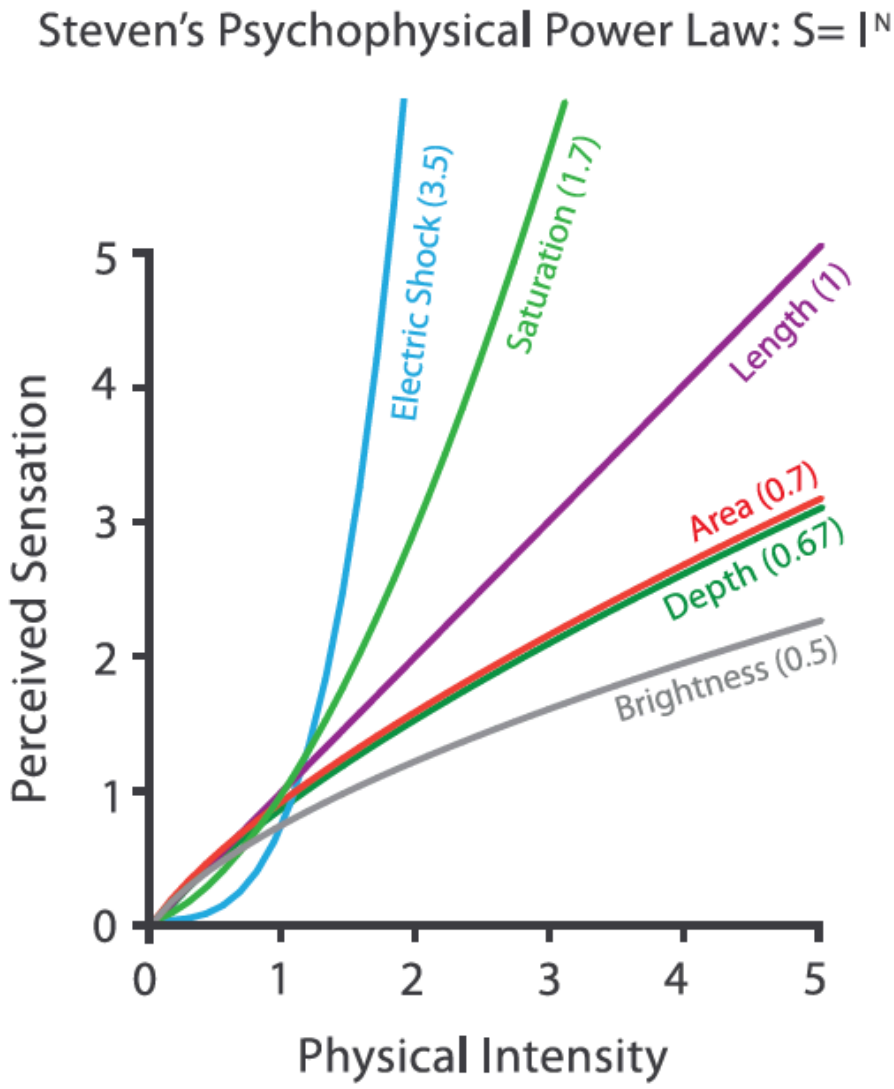


FIGURE 3-12 *Visual cues ranked by Cleveland and McGill*

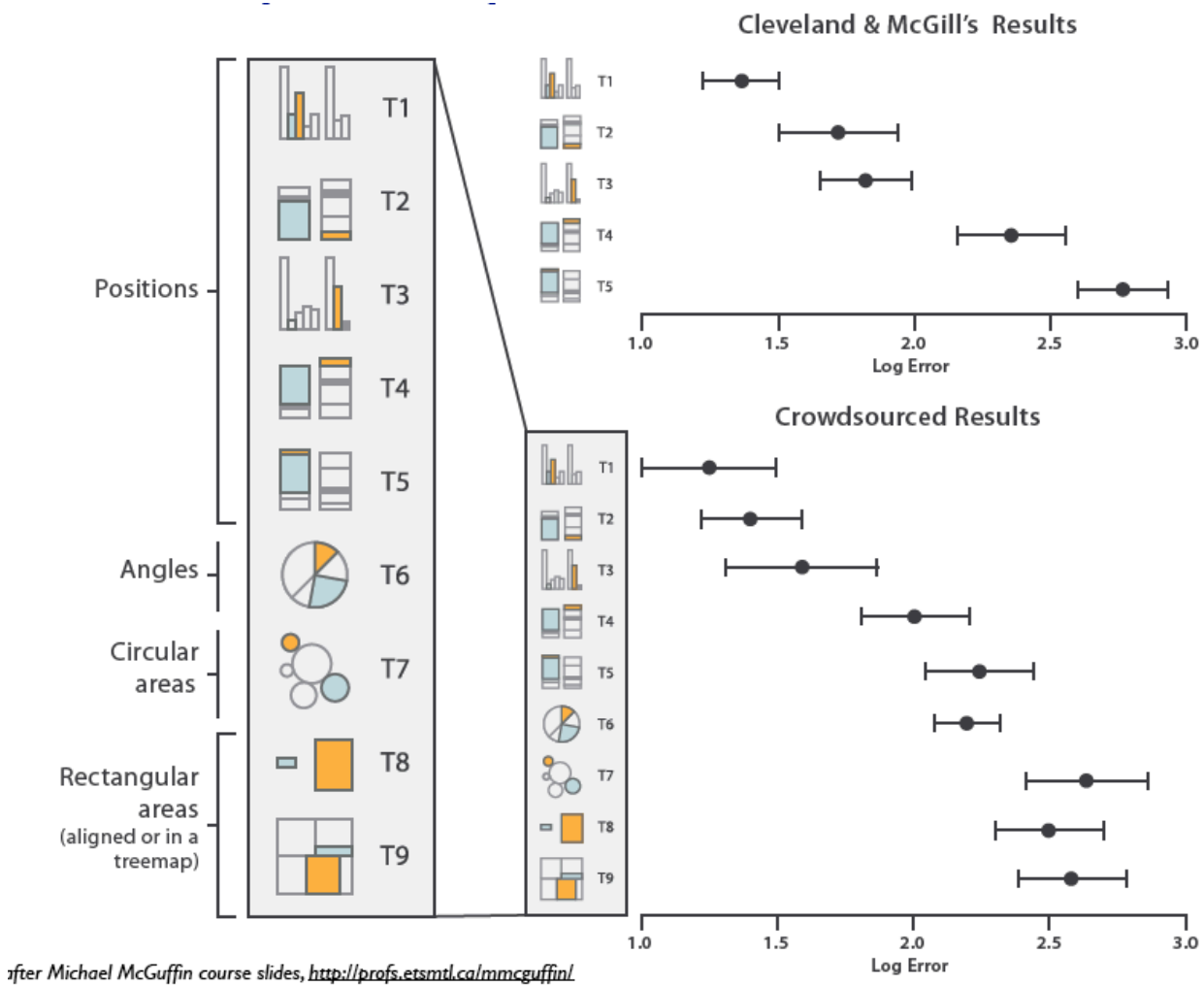
Expressividade e efetividade

- Mapear “corretamente” dados e canais/marcas
- Utilizar os canais mais altos no ranking de efetividade
- Rankings são baseados em
  - Precisão
  - Discriminação
  - Separabilidade
  - “Popout” (percepção em pré-atenção)

Precisão: Teoria fundamental



Precisão: Vis experiments

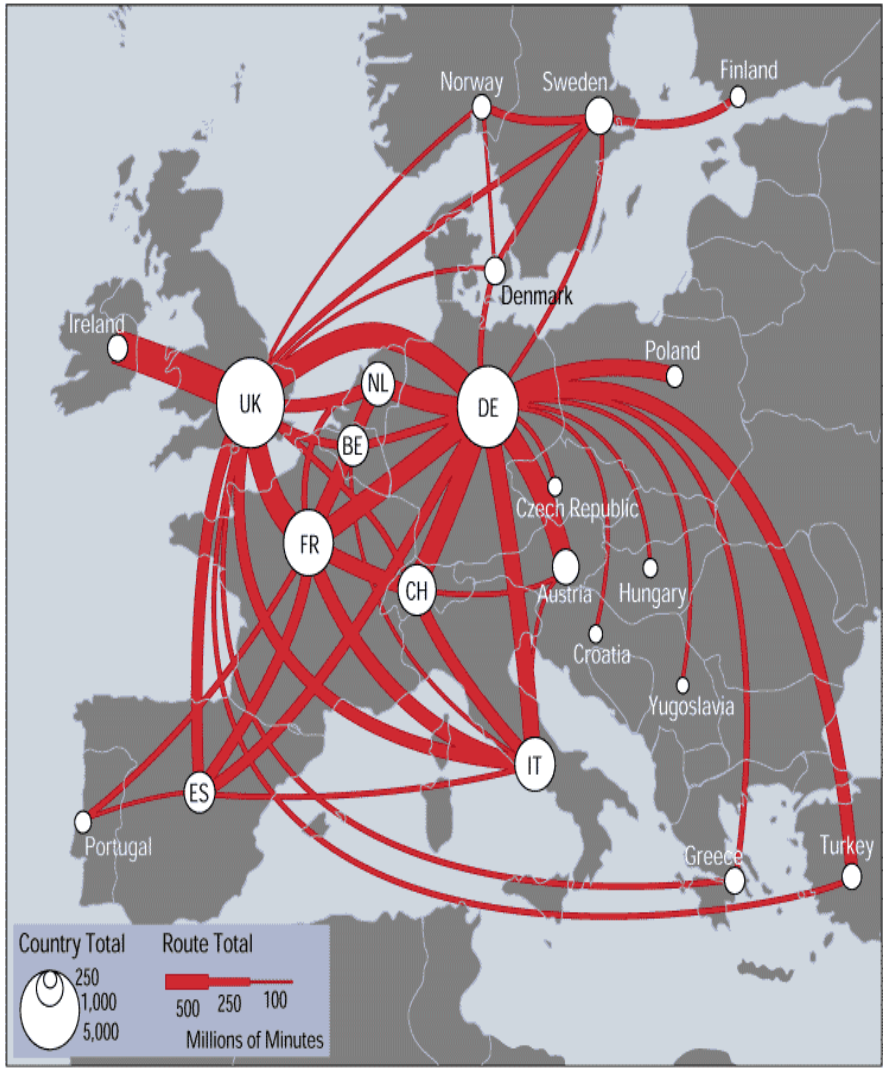


after Michael McGuffin course slides, http://profs.etsmtl.ca/mmcguffin/

[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.]

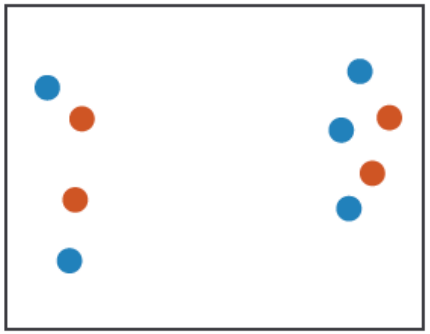
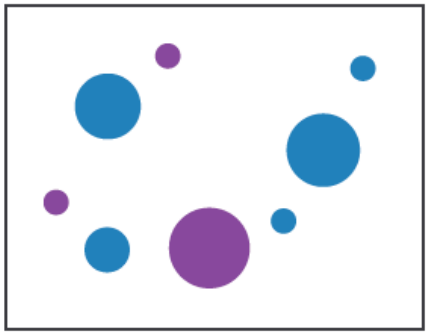
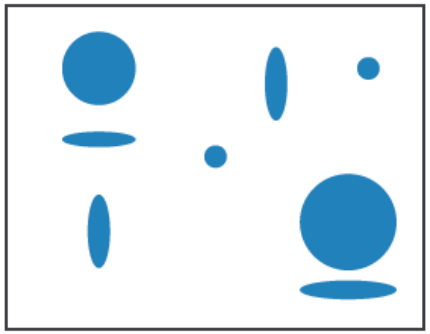
Discriminação

- Espessura de linhas: quantas conseguimos discriminar?



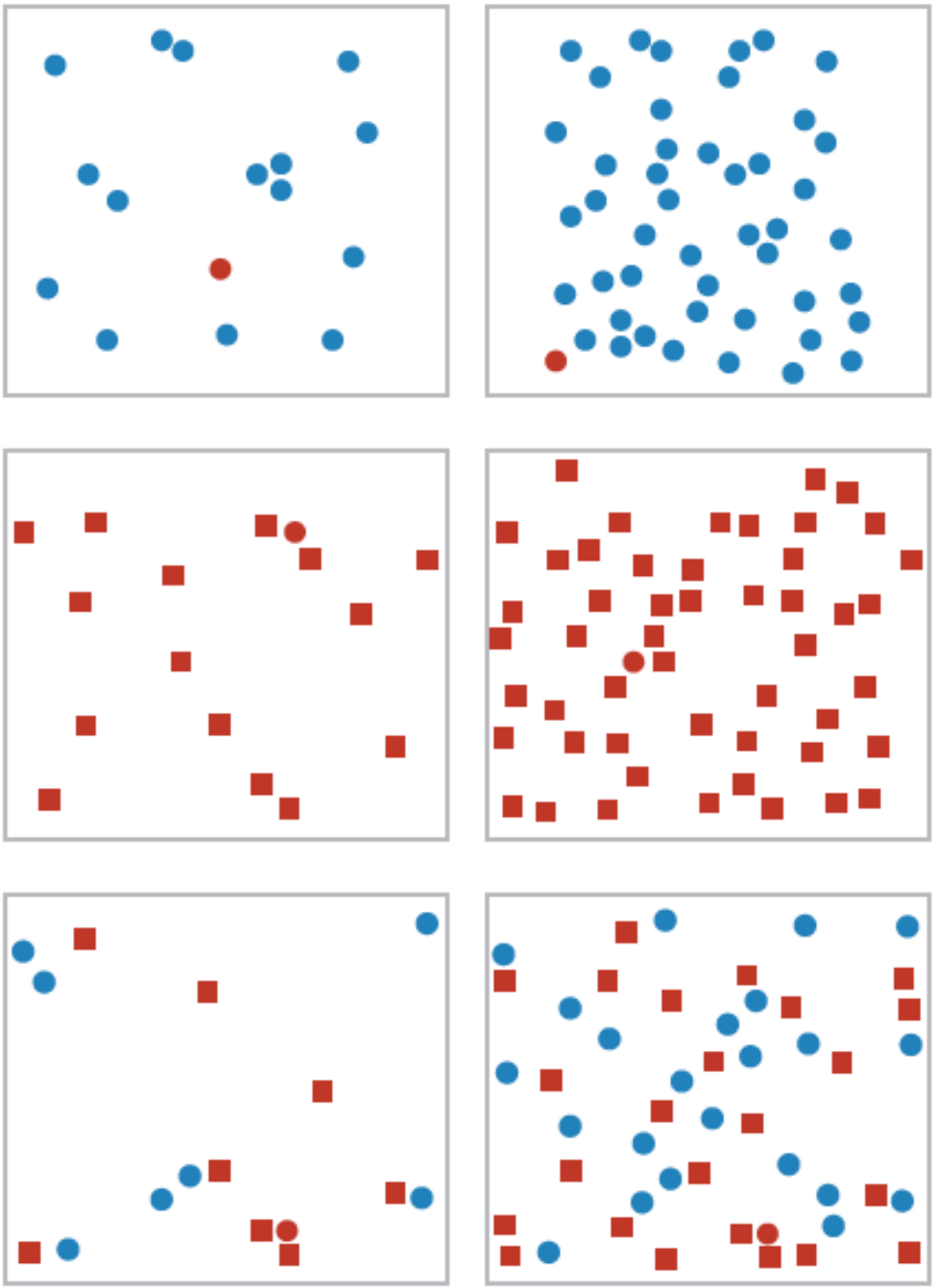
[mappa.mundi.net/maps/maps 014/telegeography.html]

Separabilidade (vs agrupamento)

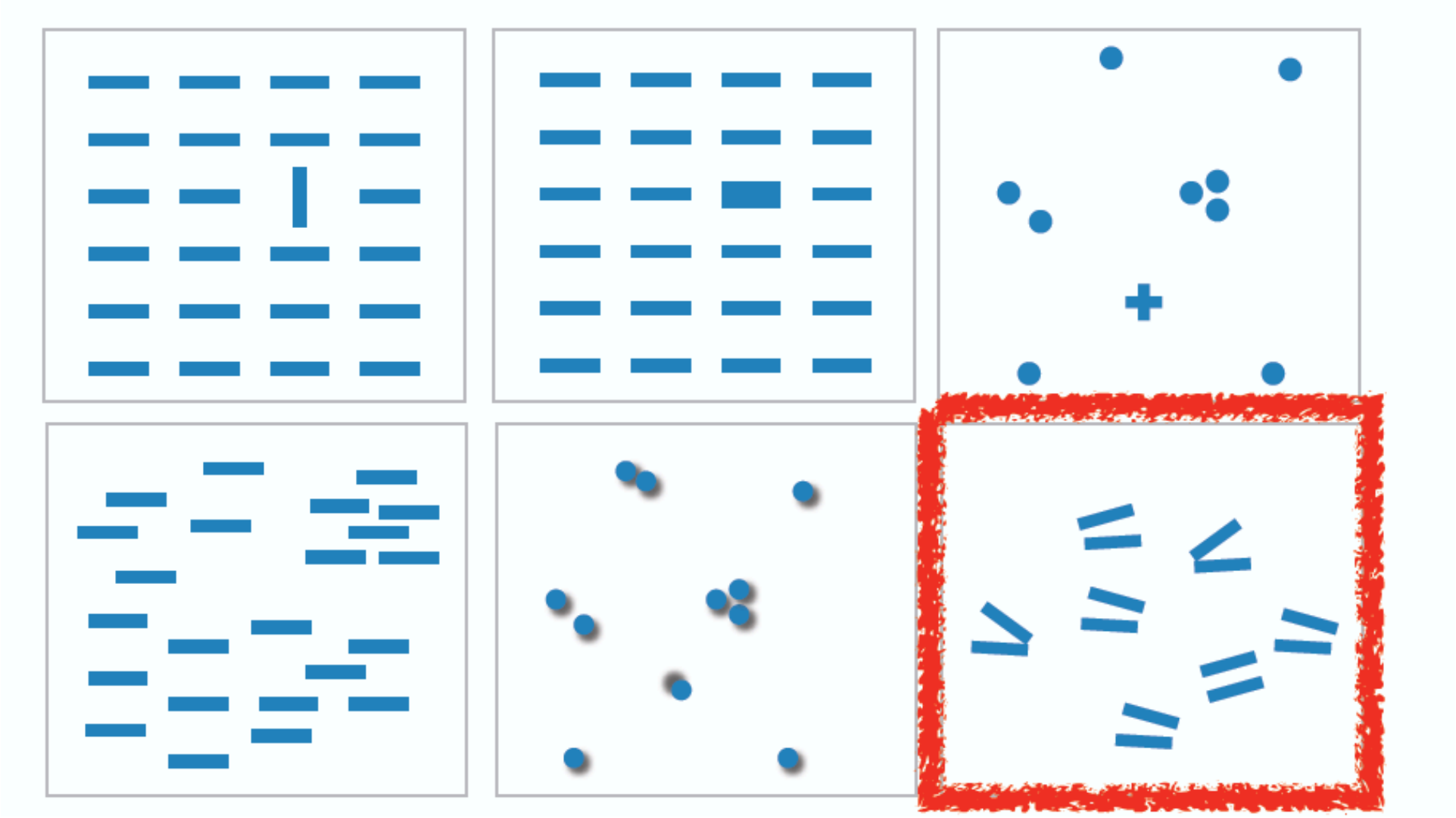
Position + Hue (Color)	Size + Hue (Color)	Width + Height	Red + Green
			
Fully separable	Some interference	Some/significant interference	Major interference
2 groups each	2 groups each	3 groups total: integral area	4 groups total: integral hue

Popout

- Cor é percebida em pré-atenção
- Forma é percebida em pré-atenção
- Diferentes canais são processados em paralelo
  - Velocidade depende do canal em do número de distratores



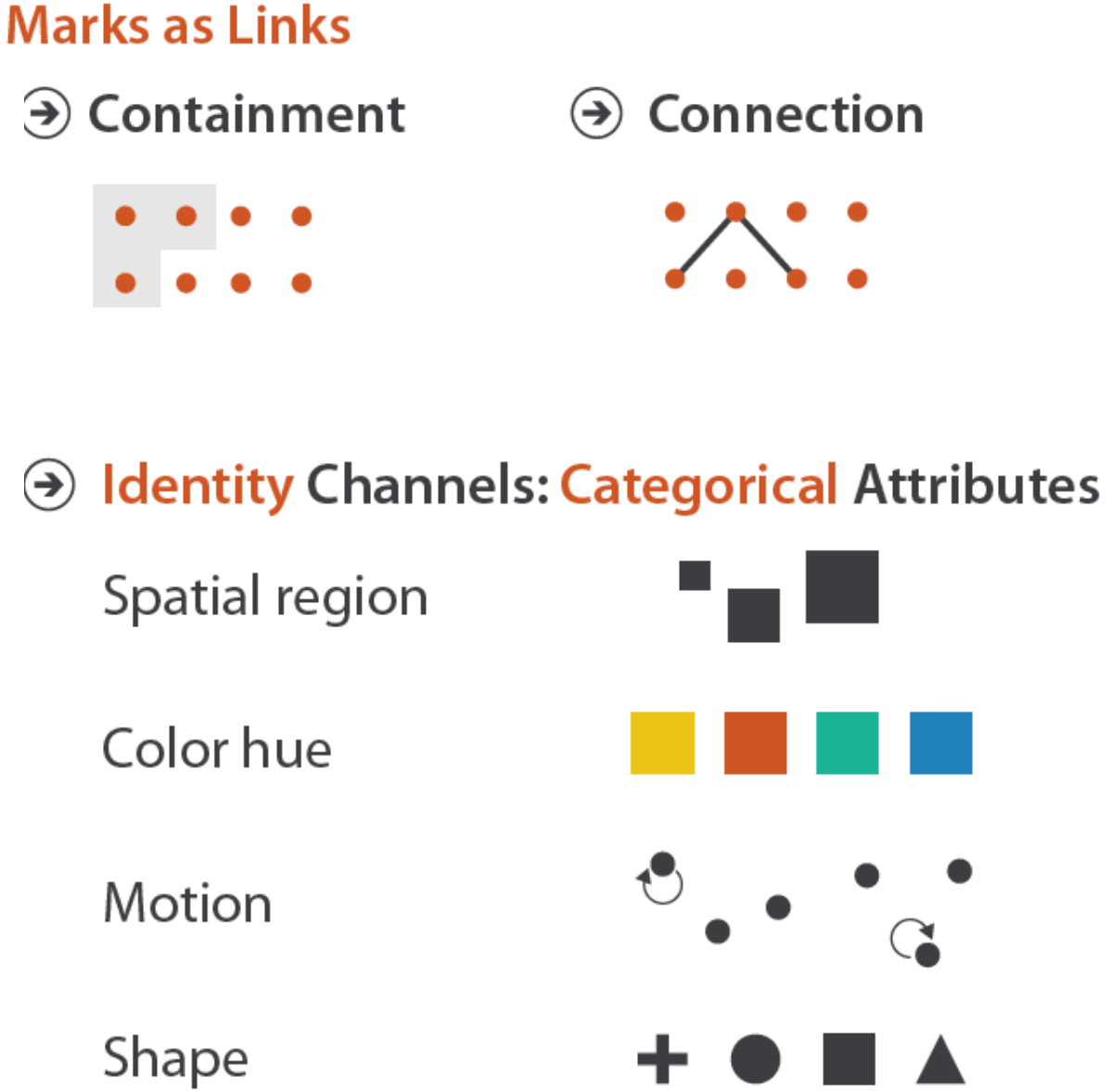
Popout



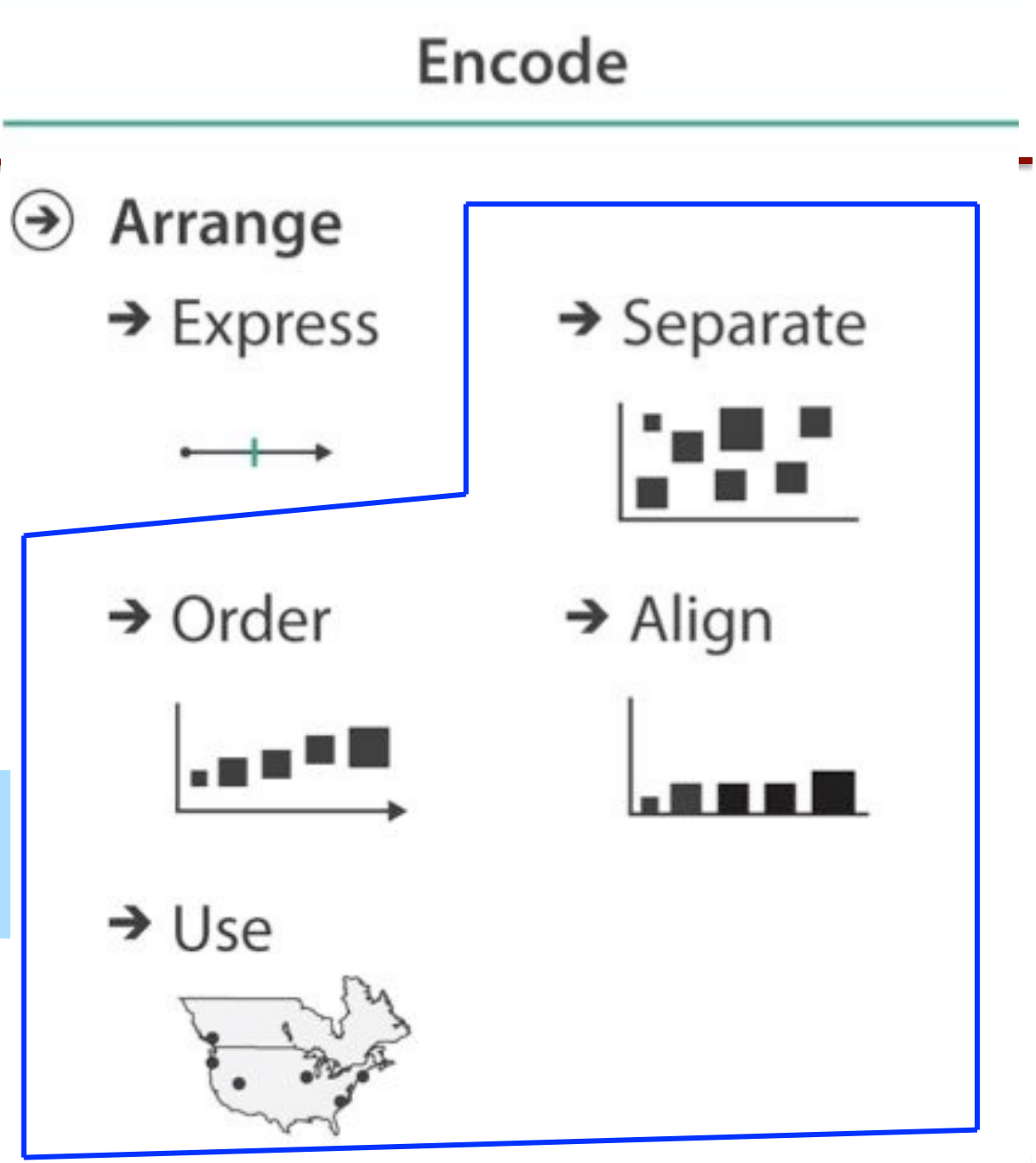
Agrupamento

- Explícito com marcas de ligação ou conjunto

- Implícito
  - Proximidade
  - Similaridade



Mapeamento/ codificação visual



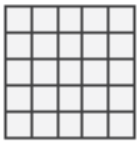
Abordagens usadas no contexto de diferentes técnicas de visualização

Mapeamento/codificação visual

- Align

- *1 Key*
  List

- *2 Keys*
  Matrix



- *3 Keys*
  Volume

- *Many Keys*
  Recursive Subdivision

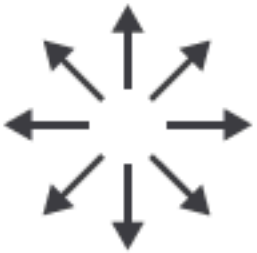
Mapeamento: uso do espaço

Axis Orientation

- Rectilinear

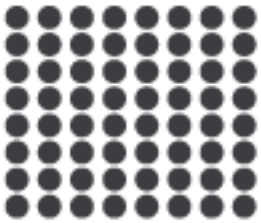
- Parallel

- Radial



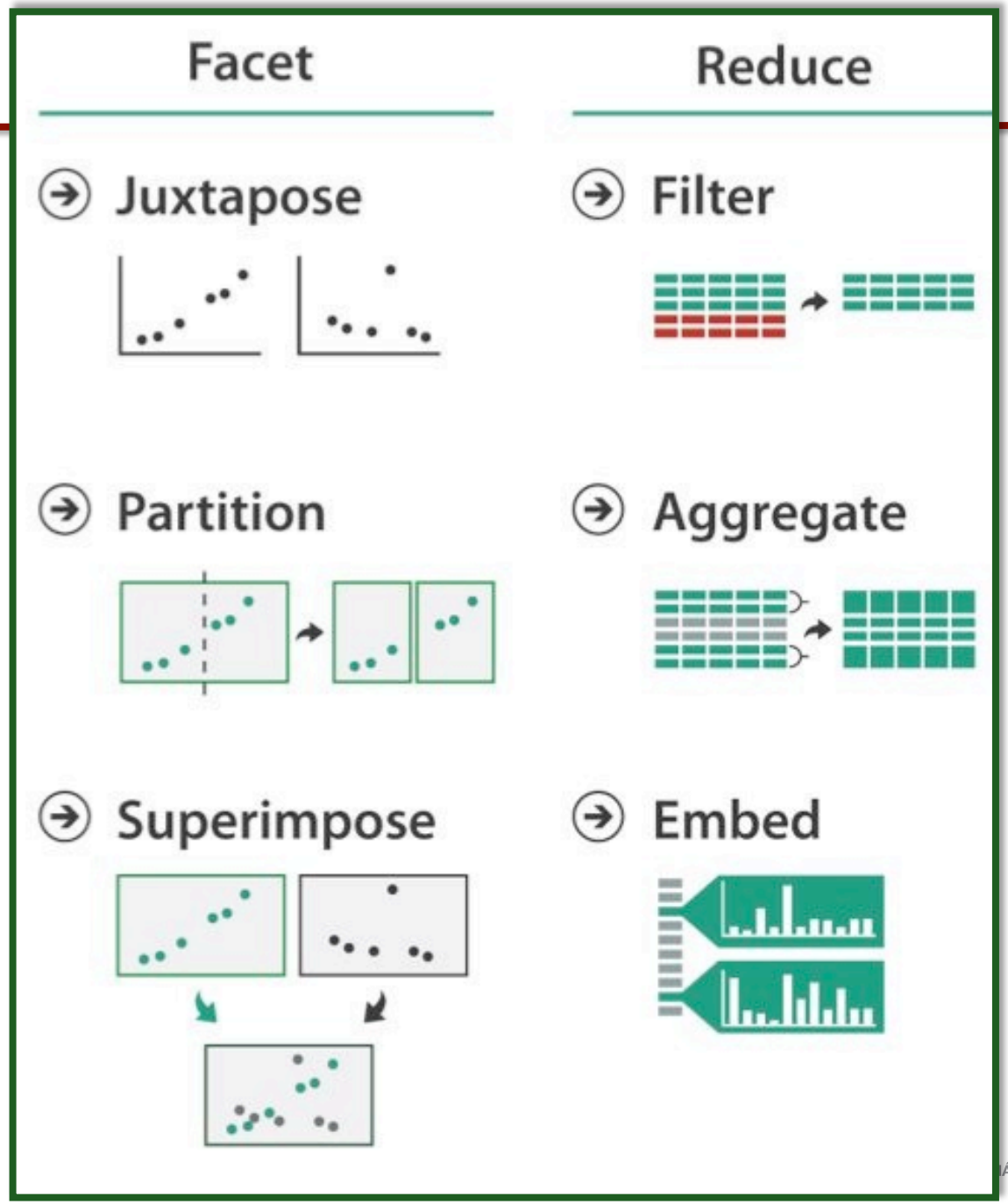
Layout Density

- Dense



- Space-Filling

Mapeamento/ codificação visual



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