

# 11. Visual Variables

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# Introduction

- Our usual way of communicating is with words. Written words consist of single symbols (letters), gaining meaning when arranged in certain combinations.
- The question is: If there are basic visual symbols arranged in a particular way, can they be used to convey information in a similar manner?
- Jaques Bertin<sup>[3]</sup> described **marks** as these basic units and also developed a given number of methods through which these units can be modified, including position, size, shape, or color. Each of these variables can have certain **characteristics**.

# Visual variables - attributes



## Bertin's Original Visual Variables

<p><b>Position</b> changes in the x, y location</p>	
<p><b>Size</b> change in length, area or repetition</p>	
<p><b>Shape</b> infinite number of shapes</p>	
<p><b>Value</b> changes from light to dark</p>	
<p><b>Colour</b> changes in hue at a given value</p>	
<p><b>Orientation</b> changes in alignment</p>	
<p><b>Texture</b> variation in 'grain'</p>	

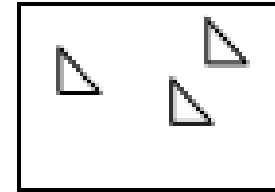
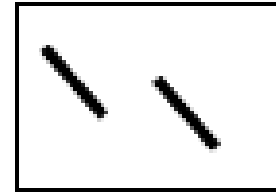
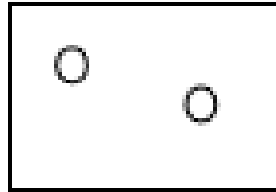
# Visual variables – characteristics



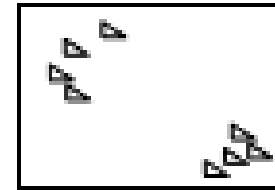
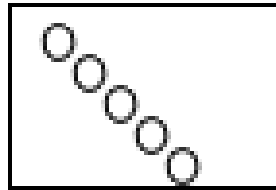
- **selective** is a change enough to allow us to select it from a group?
- **associative** is a change enough to allow us to perceive them as a group?
- **quantitative** is there a numerical reading obtainable from changes in this variable?
- **order** are changes in this variable perceived as ordered?
- **length** across how many changes in this variable are distinctions perceptible?

# Position

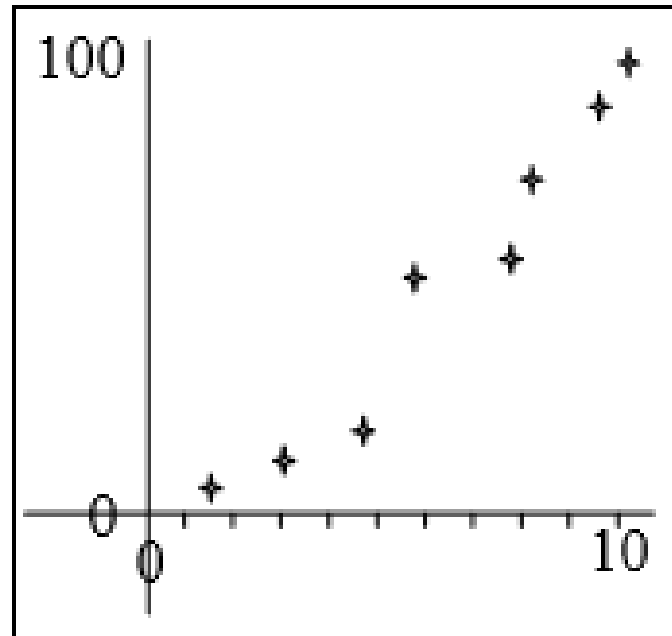
✓ selective



✓ associative



✓ quantitative

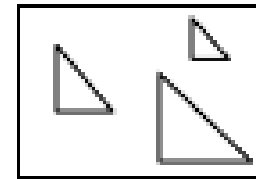
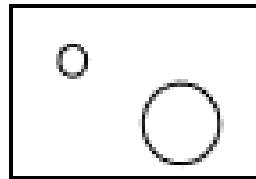


✓ order

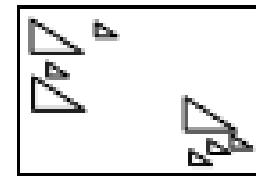
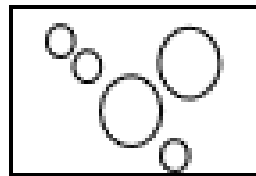
✓ length

# Size

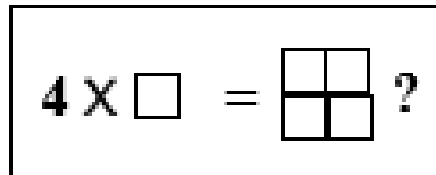
✓ selective



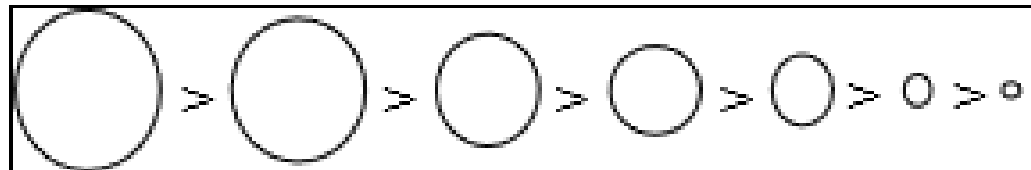
✓ associative



≲ quantitative



✓ order

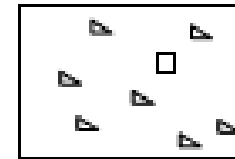
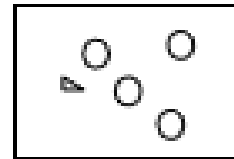


✓ length

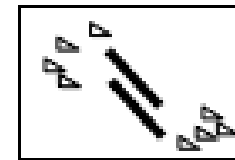
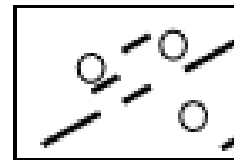
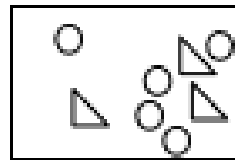
- theoretically infinite but practically limited
- association and selection ~ 5 and distinction ~ 20

# Shape

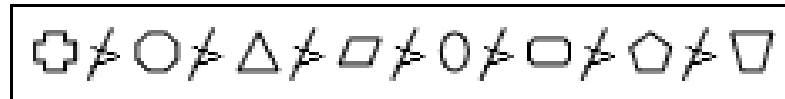
$\cong$  selective



$\cong$  associative

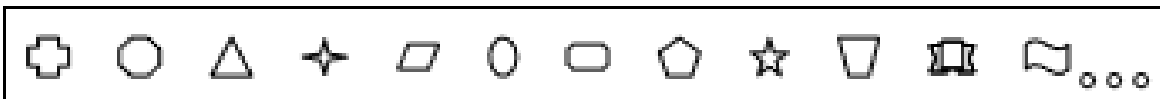


$\neq$  quantitative



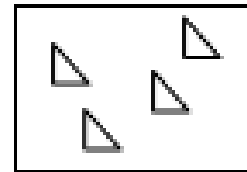
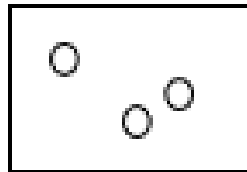
$\neq$  order

✓ length - infinite variation

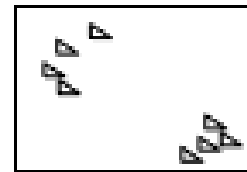
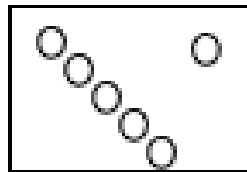


# Value

✓ selective

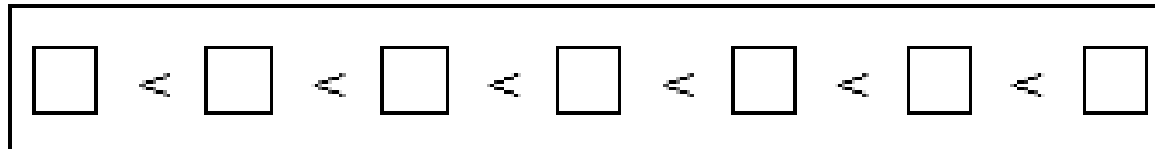


✓ associative



≠ quantitative

✓ order



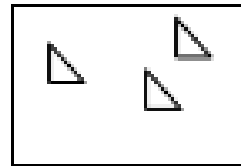
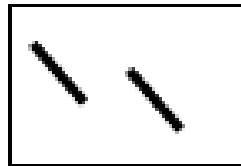
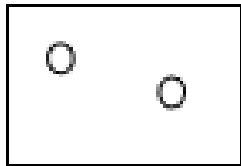
✓ length

- theoretically infinite but practically limited
- association and selection  $\sim < 7$  and distinction  $\sim 10$

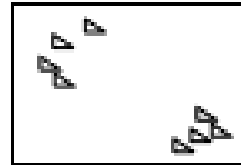
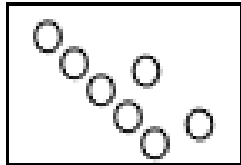


# Color

✓ selective



✓ associative



≠ quantitative

≠ order

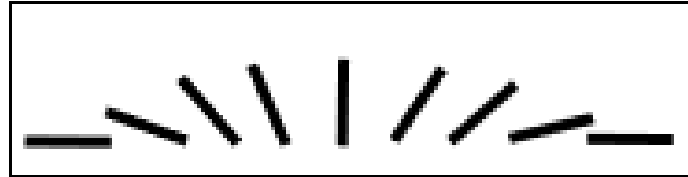


✓ length

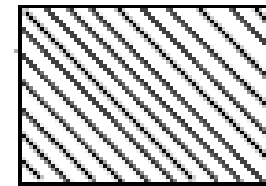
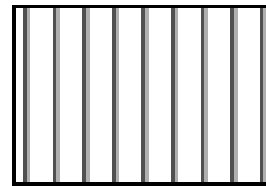
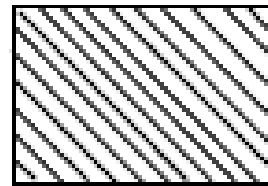
- theoretically infinite but practically limited
- association and selection  $\sim < 7$  and distinction  $\sim 20$

# Orientation

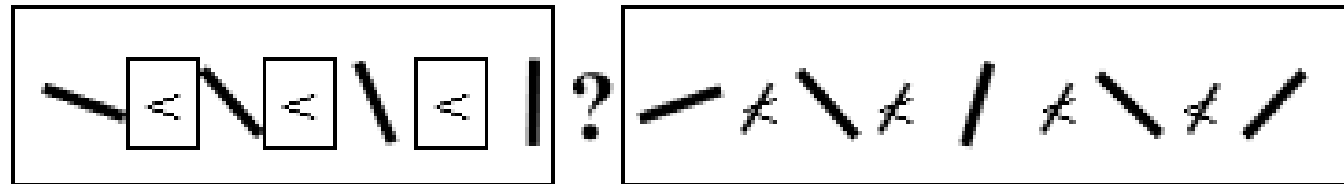
✓ selective



✓ associative



≠ quantitative



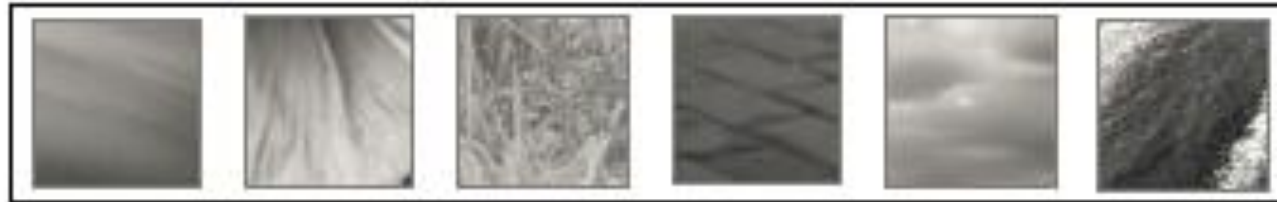
≠ order

✓ length

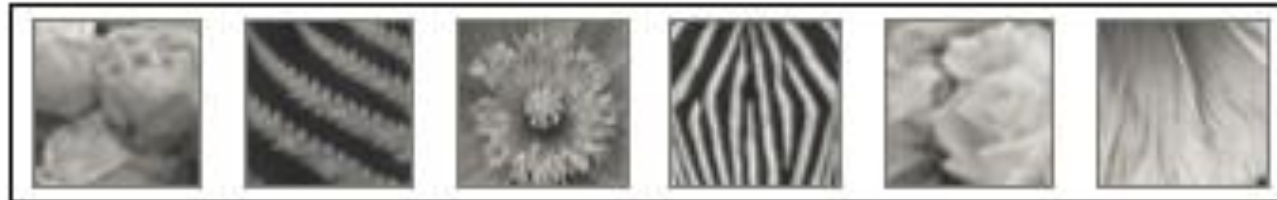
- ~5 in 2D; ? in 3D

# Texture

✓ selective



✓ associative



≠ quantitative

≠ order



✓ length

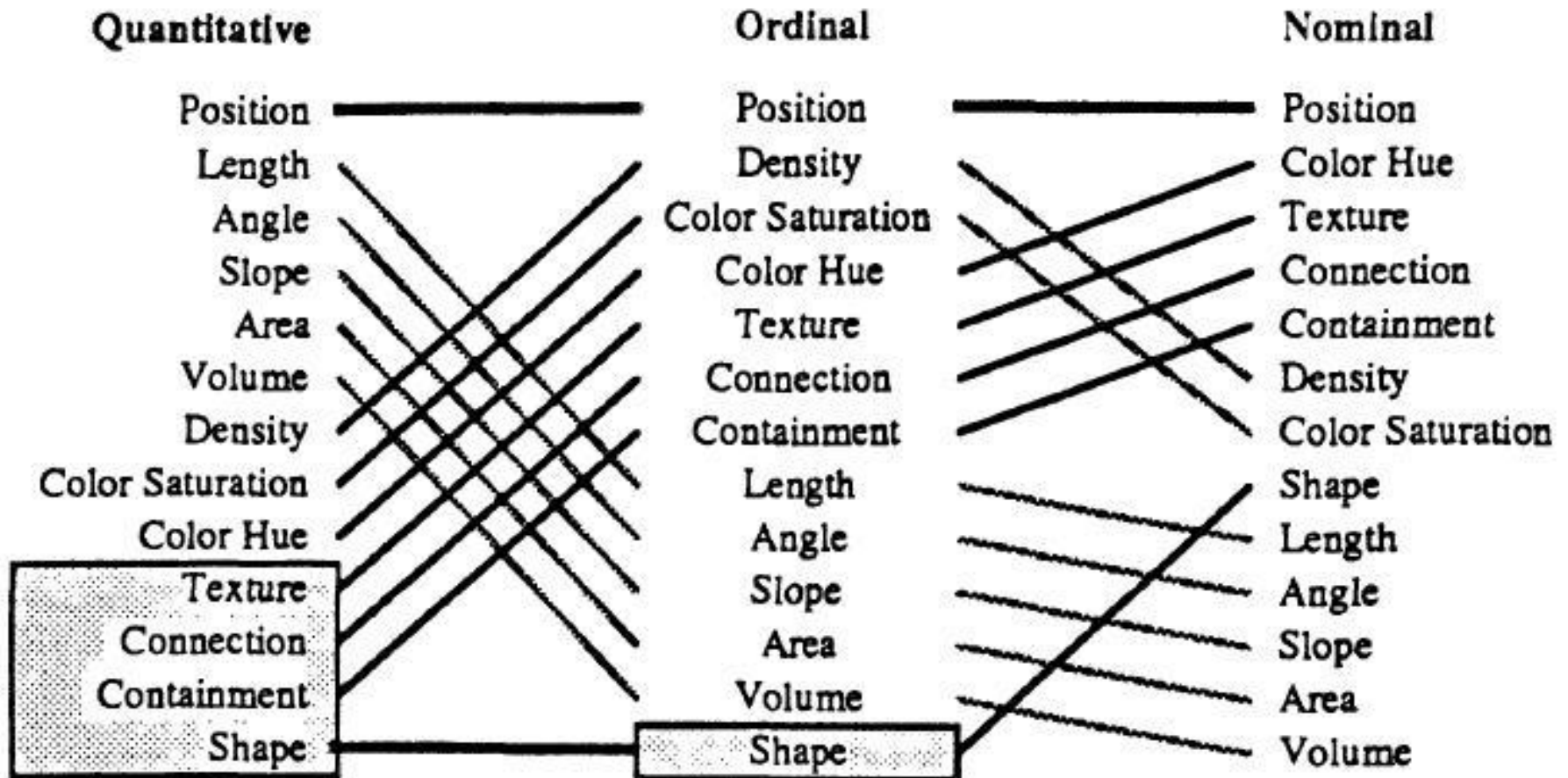
- theoretically infinite

# Conclusion



		Characteristics				
		<i>Selective</i>	<i>Associative</i>	<i>Quantitative</i>	<i>Order</i>	<i>Length</i>
Visual Variables	<i>Position</i>					Theoretically Infinite
	<i>Size</i>					Selection: ~5 Distinction: ~20
	<i>Shape</i>					Theoretically Infinite
	<i>Value</i>					Selection: <7 Distinction: ~10
	<i>Color</i>					Selection: <7 Distinction: ~10
	<i>Orientation</i>					Theoretically Infinite
	<i>Texture</i>					Theoretically Infinite

# Ranking of perceptual tasks





Thank You