High-level perception

- Change blindness
- Theories of object recognition
- Viewer-centered theories
- Object-centered theories

The rich visual world

- We appear to see a lot when we look around
- There is a problem
  - Our eyes are constantly in motion
    - Saccadic eye movements
    - These movements are jumps
  - How do we match up the image from successive fixations?
- The answer to this question depends on how much information is left from the last fixation

Change Blindness

- Rensink, O'Regan & Clark (1997)
- Design of study
  - Picture for 240ms
  - Gray screen for 80ms
  - Changed picture for 240ms
  - Gray screen for 80ms
  - People press a button when they notice the change
- Much of what is perceived is transient
  - Eases problem of integrating across saccades.
- Information in focus of attention remains

Object Recognition

- Vision helps us to identify objects
- Identification is important
  - Helps us to know what things are for
- May occur at many levels
  - Is that a car?
  - Is that my car?
- Two aspects of recognition
  - Object recognition
  - Face recognition

Object recognition theories

- Distinguished by representation theories
  - Feature theories
  - Structural theories
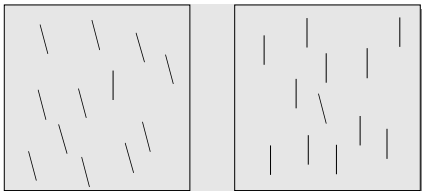 - Template/Alignment theories

Feature theories

- Visual objects are broken down into features
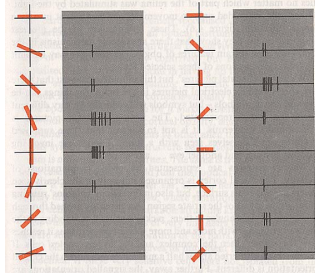 - Features are basic components

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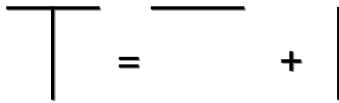
Behavior and Features

- Evidence for features from visual search
  - Deviations from regular features "pop out"
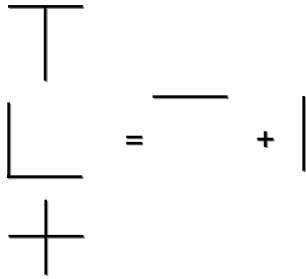 - Treisman & Gormican (1988)

Features and the Brain

- Evidence for feature detectors in the brain
  - Bug detectors in the frog
    - Lettvin, Maturana, McCulloch, & Pitts (1959)
  - Line detectors
    - Hubel + Wiesel

Structural theories

- Featural theories are incomplete
  - How are the features related to each other?
- Structural theories
  - Relations among components are also important.

Natural parts of objects

- Presumably these are components of object structure
  - Reed; Palmer

Recognition-by-components

- Representations of objects made from basic components
  – Called *geons*
- Different items are generated by combining geons using spatial relations

Templates and alignment

- Not all objects have obvious parts

Templates

- Represent the object using simple elements
  – Pixels perhaps
- Compare it to images in memory
- Transform one image to get the best overlap with another
- Identify object based on the best matching image in memory.

Object vs. viewer centered

- Object centered
  - Description of object is independent of where the viewer is located
  - Structural descriptions are object centered
    - Locations of parts are specified relative to each other
- Viewer centered
  - Representation changes with position of viewer
  - Template theories are viewer centered
    - Template depends on where the viewer is located.

Face recognition

- Face recognition seems to be viewer centered

Inversion effects

- Faces are harder to recognize when inverted
- Like the Beetle, faces do not have good parts.

Summary

- Object recognition is concerned with how people use visual information to recognize an object.
- Feature theories
  - Some biological basis
- Structural theories
  - Accounts for how people keep track of relations among parts.
- Template/alignment theories
  - Good for cases where objects do not have good parts.