Biological Vision and Applications
Module 04-01: Feature Integration Theory

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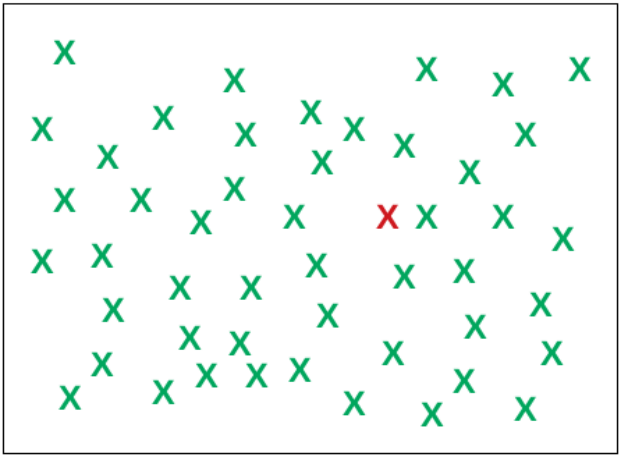
Experiment in visual Search

- We shall show you two slides with one figure each
- There is exactly one red X in each of the figures, besides other characters
- You will have to find the red X in the figures

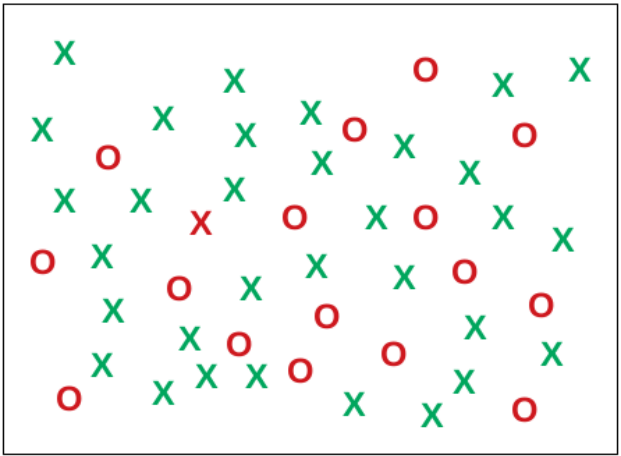
Experiment in visual Search

Find the red X in the figure



Experiment in visual Search

Find the red X in the figure

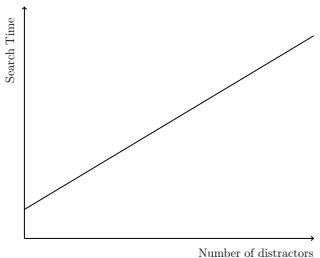


Observations

When the target is distinguished by a single feature (color), search is almost instantaneous

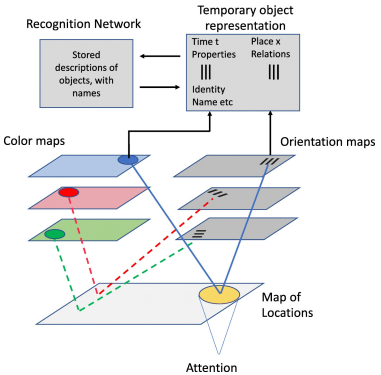
When the target is distinguished by more than one features (color and shape), search takes longer

- It increases linearly with the number of distractors



Triesman's Feature Integration Theory (1980)

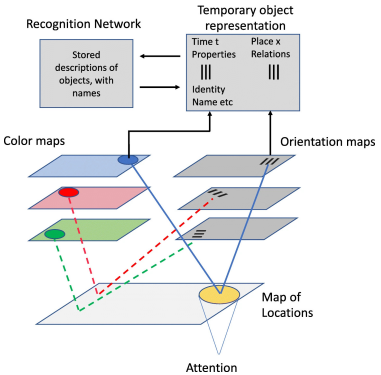
A very simple but elegant theory



- Perceptual process is hierarchical
- **Stage I.** Pre-attentive (early) vision
  - Visual scene encoded on feature dimensions
    - "Automatic"
    - Without any cognitive effort
    - In parallel
  - The locations of objects are mapped
    - "Where" and not "what"

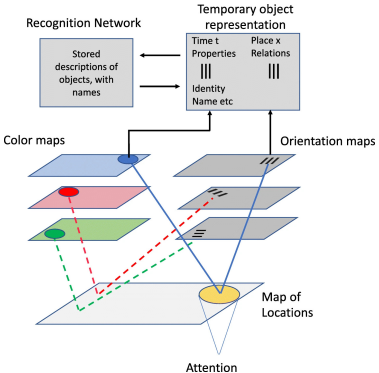
Triesman's Feature Integration Theory (1980)

contd.



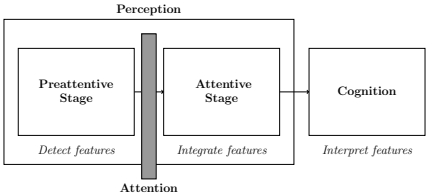
- **Stage II.** Attentive (late) vision
  - Attention "glues" the features together
    - Required for localization
  - Such integrated entities came to be called "visual objects"
    - Conjunction of properties
    - Limited capacity
    - Features within same attentional focus can be encoded as belonging to the same object

Cognitive process follow perception



- Visual objects compared with descriptions of real objects
  - Objects are detected and localized
- A “scene” is a spatial organization (interaction) of objects
- Events are temporal sequence of scenes (objects and interactions)
  - Within finite temporal bounds (episode)

Vision pipeline



- Are the stages strictly sequential and independent of each other ?
  - Total processing time should be the sum of the individual stages
- Later experiments prove otherwise
  - Relationships between perception, attention and cognition are more complex

Quiz

No quiz for module 04-01

We shall conduct an experiment instead

End of Module 04-01