Biological Vision and Applications
Module 05-01: Visual attention

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Attention

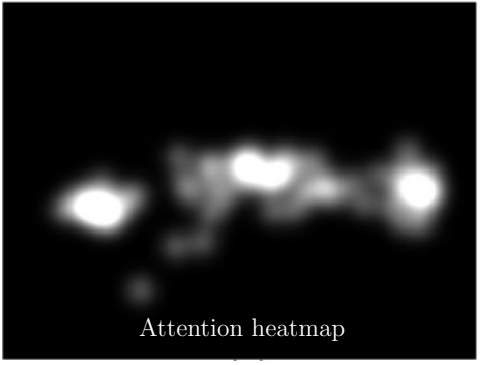
Coping up with huge data volume

- About 1 mn optic nerves come out of each eye
- Data rate is 10 Mbps, assuming
  - 1 bit of data for each nerve
  - Refresh rate: $\frac{1}{10}$th sec

What is the data rate of a video camera of modest resolution 1280×768 operating at 30fps?

Attention

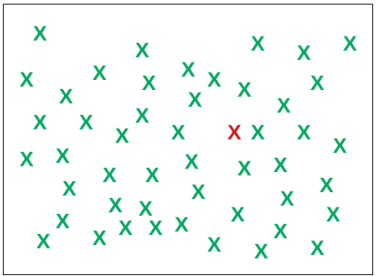
We see very little of a scene to understand it's content

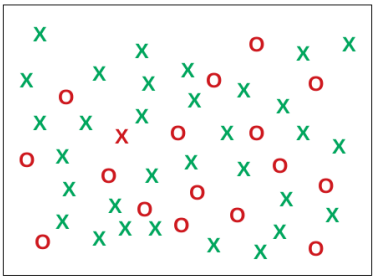


Attention leads to change blindness (Video illustration)

- Focus on the center of the disk and see other objects disappearing

Bottom-up and top-down attention





Bottom-up attention – stimulus driven (exogenous)

– spontaneous

Top-down attention – task driven (endogenous)

– knowledge-based

Bottom-up and top-down attention

More examples

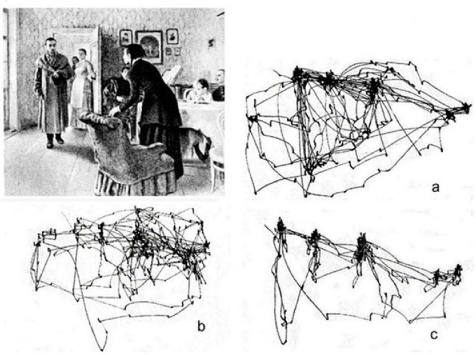
Bottom-up attention

Where is my cat ?

Top-down attention

Yarbus'es experiment

Eye movements depends on the task of the observer



- Attention is dynamic
  - Results in saccades and fixations
- Depends on task, such as
  - (a) Free examination
  - (b) Estimate the material circumstances of the family
  - (c) Give the ages of the people
  - ...

Yarbus experiments ... and more

Modeling attention

- Classical approaches
  - Image feature based
  - Surprise based
  - Object based
  - Context based
- Neural network based approaches
  - We reserve for the future
- Do bottom-up and top-down attention work together ?

Quiz

Quiz 05-01

End of Module 05-01