Psychology 260
Lecture 2-4: Scene Perception

Readings: (none)

Basic idea: Use the world as part of visual processing

1. Subjective Experience

Proposal: We need attention to consciously experience the world.

But: We can’t attend to much (3-4 items)
→ Observers have coherent representation of only a few objects at any moment (= objects that are attended)

Problem: If we only attend to a few objects at a time, we only have a partial representation
• how can we overcome the limits of this partial representation?
• why do we feel we see all events at once?

Possibility: We build up a detailed internal description

- high-precision (and colour) measurements only in c. ±2 degrees from fovea
- move this around – sequence of eye fixations
- assemble each fixation in a visual buffer

However: change-blindness results suggest that not much is accumulated…

2. Virtual Representation

Proposal: Although objects may be present simultaneously, they do not need to be represented simultaneously. All that is needed is that the properties of the objects can be accessed when requested.

In a similar way to web surfing, can always obtain information from the world
→ use the world itself as an external memory (e.g., Stroud, 1955; Brooks, 1991)

For vision: To build a coherent representation of an object, focus eyes and attention on appropriate location whenever that object is needed
• this representation “dissolves” once it is no longer needed
• only a few objects need to be represented at any one time
Note: In this proposal, the world is used as an *external memory*

- don’t need to store all details in an internal memory (i.e., in the brain); just need to be able to retrieve them when they are needed

3. Triadic Architecture
- How might a virtual architecture be implemented?
  - Proposal: A “just-in-time” system with three interacting parts:

  1. **Preattentive system** - computes proto-objects rapidly and in parallel. These do not require attention. Are volatile (see Coherence Theory).

  2. **Attentional system** – creates coherent representations of objects. Limited in capacity (3-4 items max)

  3. **Nonattentional guidance system** – determines scene gist (meaning) and layout rapidly (c. 150 ms) and without attention. Result is used to guide attentional system to create a coherent representation of the right object at the right time.

  **Note:** What is seen can differ for different observers (depending on where they attend)
4. Natural-Born Cyborgs

- possibility: humans operate largely via such mechanisms
  - e.g. don't keep much memory - use world as "external memory"
    - file systems, writing
  - also, use computers as "external processors"
    - calculators, expert systems
  - when interacting with machines, cognition is **distributed** over the user and their environment
- processing in the agent can take advantage of its environment to do some of the work
  - agent and environment are partners
- in a sense, we are “natural-born cyborgs” (Clark, 2003)
  - use “cognitive scaffolding” in our lives:
    - e.g.: language externalizes thought; extends ability to think
    - e.g.: sketching externalizes design; extends ability to work with space
    - e.g: watches have been incorporated transparently into our body image
      - also true of cars, skis, etc

- humans not very intelligent without their artifacts?
  - high-powered cognition because of environment (culture)?
  - if so, may be unable to understand cognition without understanding culture (no "pure" cognition?)

**Extending Human Cognition**

- e.g. information visualization - “**using vision to think**”
  - use external environment to facilitate thinking
  - a variety of types of data can be represented this way
- human + computer system can be more intelligent than either of its components

Two points to consider:

1. **No individual is an entirely isolated cognitive system**
   - processes depend on environment (and on neighbours, society…)
   - conscious thought may be only part of a bigger process

2. **The key to the cognitive amplification of an individual may be the design of an appropriate (smart) environment to interact with**
   - may be able to go far beyond current abilities?
REAL-WORLD SEGMENT: Presentation II - Elevator pitches

1. Format your *graphics* correctly
   - Keep to a uniform colour scheme
   - Use colours distinguishable by colour-blind people
   - Keep static
   - *Suggestion: Use a dark background*

2. Format your *fonts* correctly
   - Keep to a uniform font scheme
   - Font ≥ 20 point
   - Don’t use large mismatches in font size
   - *Suggestion: avoid serif fonts*
     - consider common sans serif fonts — e.g., Ariel, Geneva, Helvetica
     - leave serif fonts for written material (like this)

3. Format your *points* correctly
   - Build each main point, one at a time
   - Maximum four points (cf. rule of 3)
     - five maybe, but *only in an emergency*
     - *each point has ≤ 3 lines*
   - Maximum two levels of structure in a point
   - Align all points

4. Use images on occasion
   - Useful for illustrating a point
   - Should be accompanied by text
   - Location: anywhere it works

5. Order your points so as to tell a story (cf. writing):
   
   0. Title
      - Title
      - Name, course, date, etc.
   
   1. The Situation (the problem)
      - Current controversy; what is unknown, etc
      - Why this is an important issue
   
   2. The Solution
      - How you solved the problem
   
   3. Discussion
      - Connections to other problems / areas
   
   4. Summary
      - Recap problem, solution, and why it’s important