Today's Agenda

- Review for Exam 1

Exam 1

Questions in Exam 1 including

- True/false
- Single-choice
- Short answer
- Case study

Graduate students will have a different exam.

Make sure you use the correct version

Review for Exam 1

What is HCI?

- **HCI** "concerned with the design, evaluation, and implementation of **interactive computing systems for human use".**"

What is Interaction Design?

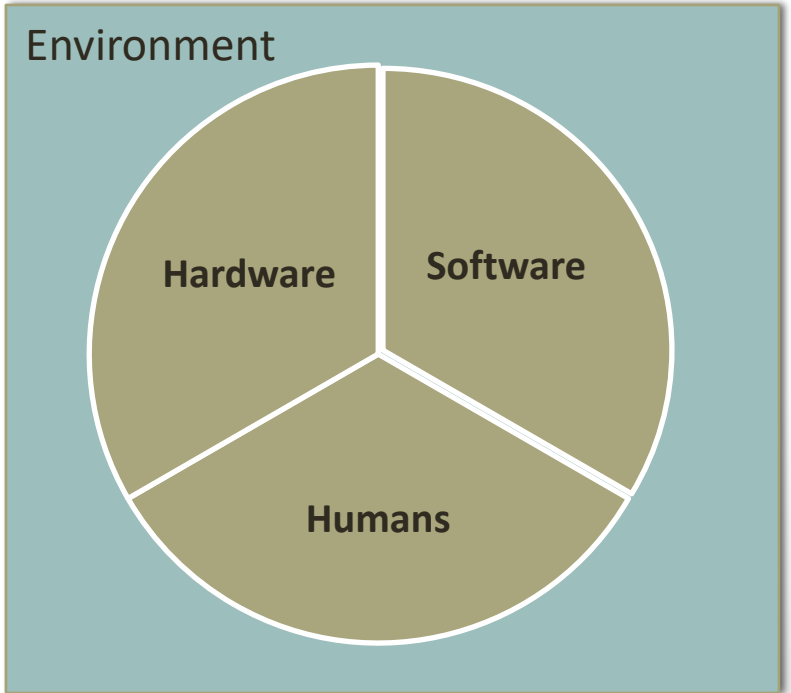
- **Interaction Design** focuses on designing **interactive products** to support the way **people communicate and interact** in their everyday and working lives

Which one is a broader concept?

HCI: Approach to Understanding A System

- A system is a collection of entities that interact to accomplish a goal/task which could not be obtained independently
- System optimization should include all elements:
  - Hardware
  - Software

  } Technology variables
  - Humans → person variables
  - Environment → environment variables



Goals of HCI – Usability Goals

Usability refers to ensuring that interactive products are:

1. Easy to use (effectiveness)
2. Efficient to use (efficiency)
3. Safe to use (safety)
4. Having good utility (utility)
5. Easy to learn (learnability)
6. Easy to remember how to use (memorability)

Fundamental to the quality of UX

Goals of HCI – UX Goals (Table 1.1 ID)

UX goals cover a range of emotions and felt experience

- Desirable aspects
  - Satisfying, enjoyable, exciting,
  - Helpful, engaging, …
- Undesirable aspects
  - Boring, frustrating, unpleasant, …

Most of them are subjective

Fundamental Beliefs

- Things are built to serve people
- Individual differences exist
- For whom do you design?
- Can’t accommodate everyone
- Design influences behavior and well being
- Empirical data will provide the answers

What HCI is Not

- Not just applying checklists and guidelines
- Not using oneself as the model for designing things
- Not just common sense

Interactive Design Process

Four basic activities:

- Establish requirements
- Design alternatives
- Make prototype
- Evaluate

The design process is executed iteratively

Six Design Principles (ID Ch. 1)

1. Visibility – Can I see it?
2. Feedback – What is it doing now?
3. Affordance – How do I use it?
4. Mapping – What is the relationship between things?
5. Constraint – Why can't I do that?
6. Consistency – I think I have seen this before?

Human Abilities – Auditory System

Sound - A wave of pressure created when an object vibrates

Physical	Perceptual
amplitude	→ loudness
frequency	→ pitch
waveform complexity	→ timbre
physical location	→ apparent location

Auditory alarms - Designing good alarms

1. Not above danger level for hearing (85-90 dB)
2. Not startle (rise time)
3. Not disrupt understanding of other signals
4. Should be informative (E.g., earcons, voice/speech)

Enhancing Auditory Performance

Designer must consider:

- Ambient noise (environment analysis)
- Frequency (pitch) of sound

} Masking

- Intensity (loudness) of the sound
- Duration of the sound

<u>Depends on the user, the task, the environment</u>

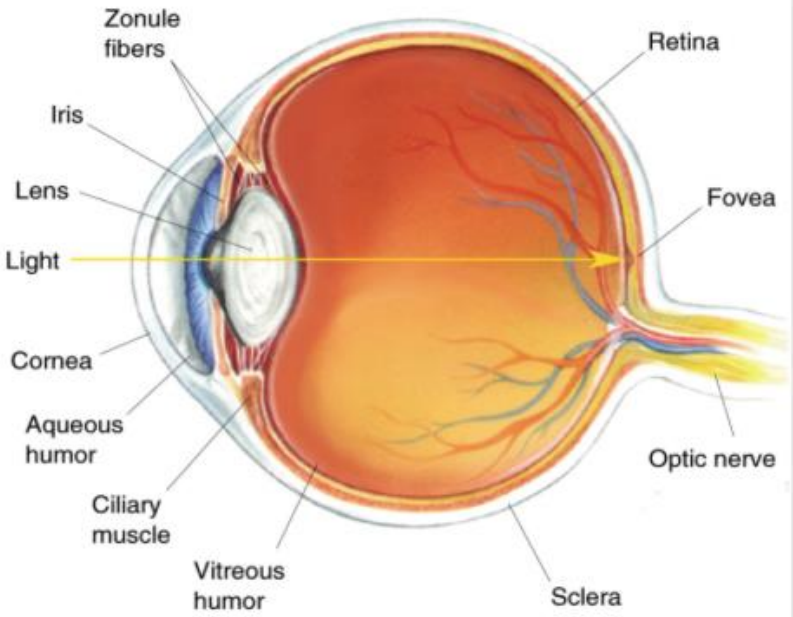
Human Abilities - Vision

Photoreceptors:

- 6.5 M Cones (color vision)
  - Mostly at Fovea
  - Fewer blue cones at Fovea, mostly red/green
- 100 M Rods (night vision)
  - Spread throughout retina

Brightness adaptation

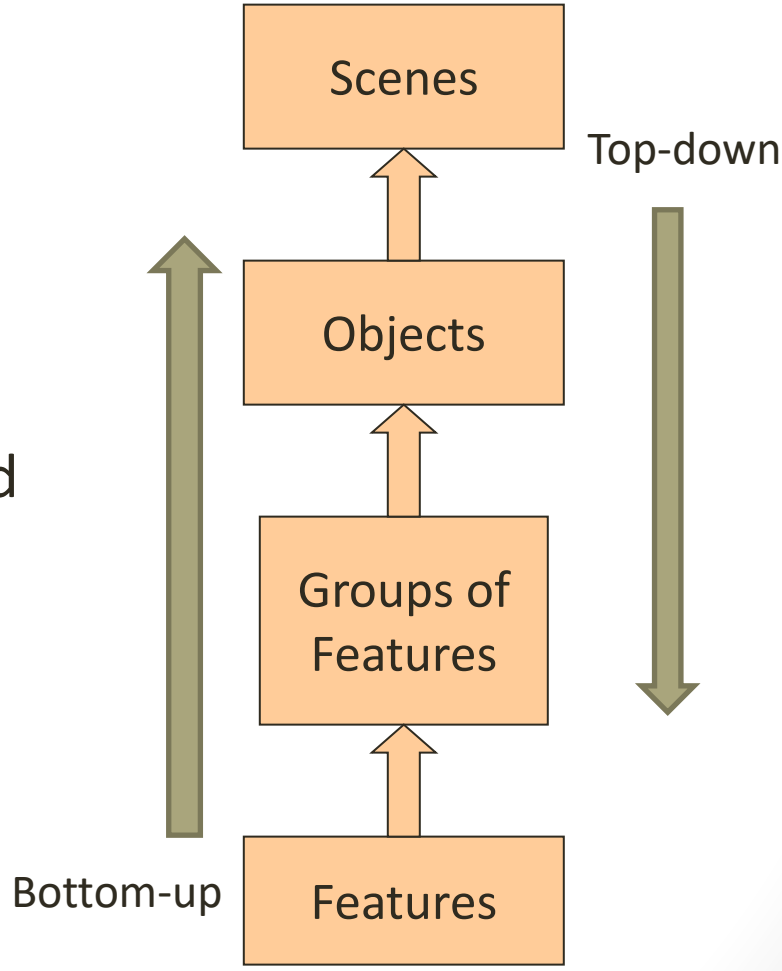
Brightness discrimination



Object Perception

How do we perceive separate features, objects, scenes, etc. in the environment?

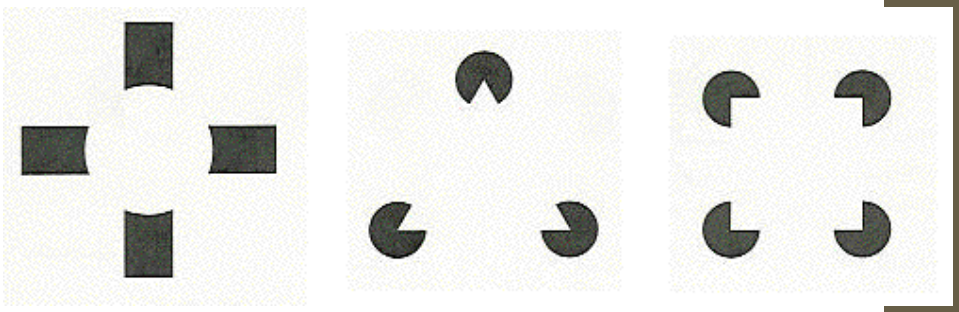
- "Bottom up processing"
  - Data-driven
  - Sensation reaches brain, and then brain makes sense of it
- "Top down processing"
  - Cognitive functions inform our sensation
  - E.g., walking to refrigerator in middle of night



Illusory Contours

Perception of an edge where no edge is explicitly present in the stimulus.

- The perception of the edge is due to the relations among the features.
- Clearly there is more to object perception than just the stimulus features alone.



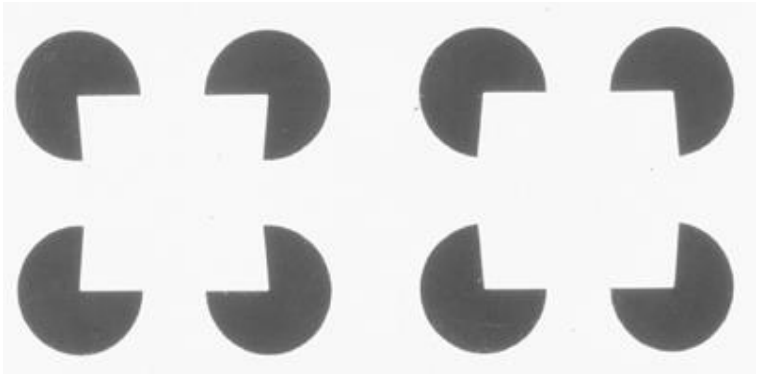


Figure & Ground Perception

When looking at a visual scene, we tend to see coherent shapes (figures) that are in front of a background area (ground).

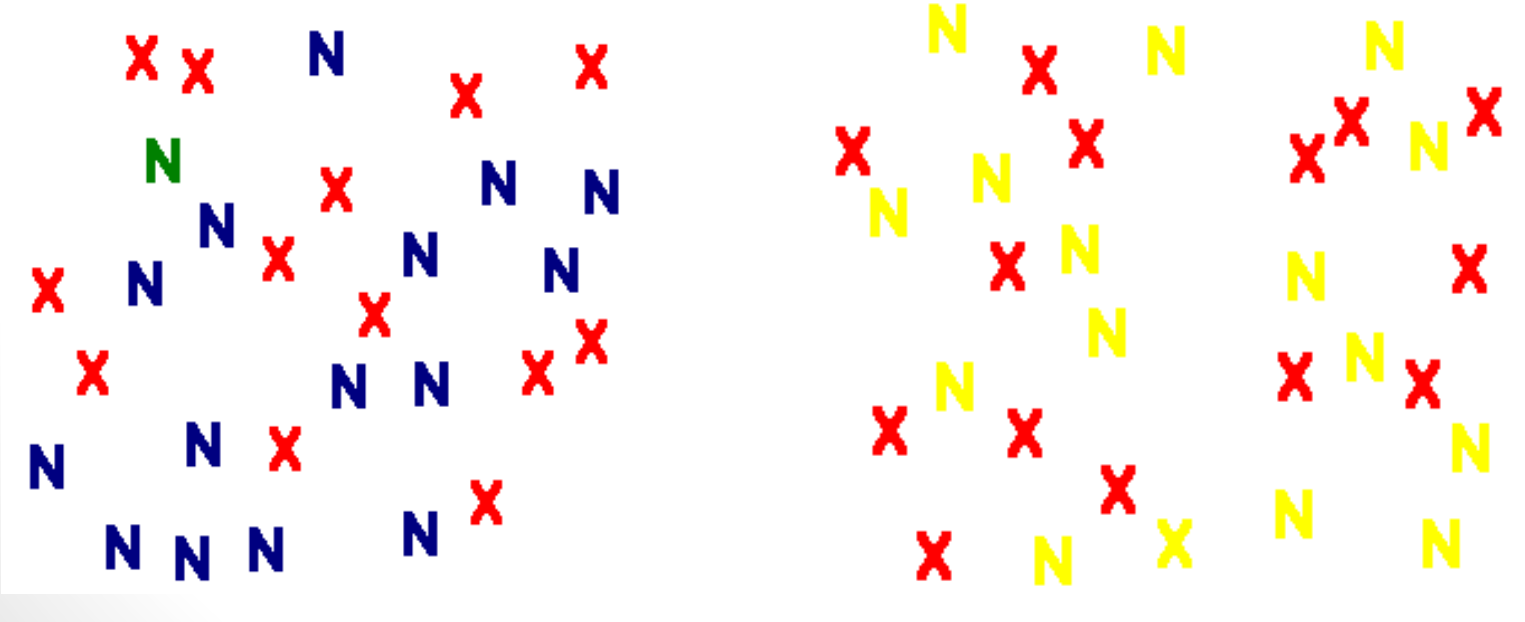
- The figure will be perceived as separate from its ground.

Factors that Affect Figure-Ground Perception

1. Size of Features
   - The element with the smaller area will tend to be perceived as the figure.
2. Symmetry
   - Symmetric areas tend to be perceived as the figure.
3. Vertical & Horizontal Layouts
   - Elements oriented in the vertical or horizontal direction are more likely to be perceived as the figure than elements in a diagonal orientation.
4. Meaningfulness
   - Meaningful areas are more likely to be perceived as the figure.

Visual Search

- Search time = $\frac{N \times I}{2}$
  - N = number of items
  - I = how much time you spend on each item
- Parallel vs. serial search



Some Visual Guidelines

1. Large font is good, so is contrast
2. Don’t use too many graphics
   - distracting and bad for screen readers
3. Something is important?
   - make it “pop” (bottom up processing) to reduce visual search
4. Simple text – easier to read and understand
5. “Color match” when you can (consistency)

Some Visual Guidelines

6. Never blur pictures
   - bad for low vision
7. Blue is hard to read
   - less blue cones in fovea
8. Group similar items
9. Use logical visual order – helps with read flow
10. Think about foreground and ground

Cognition

Norman's two general modes: (ID 3.2)

- Experiential cognition
  - effortless
  - Perceive, act, and react
  - Requires a certain level of expertise and engagement
  - E.g., driving, reading, conversation
- Reflective cognition and slow thinking
  - Mental effort
  - Involving attention, judgement, decision making
  - New ideas and creativity, e.g., designing, learning, and writing a paper/book

Human Information Processing - Attention

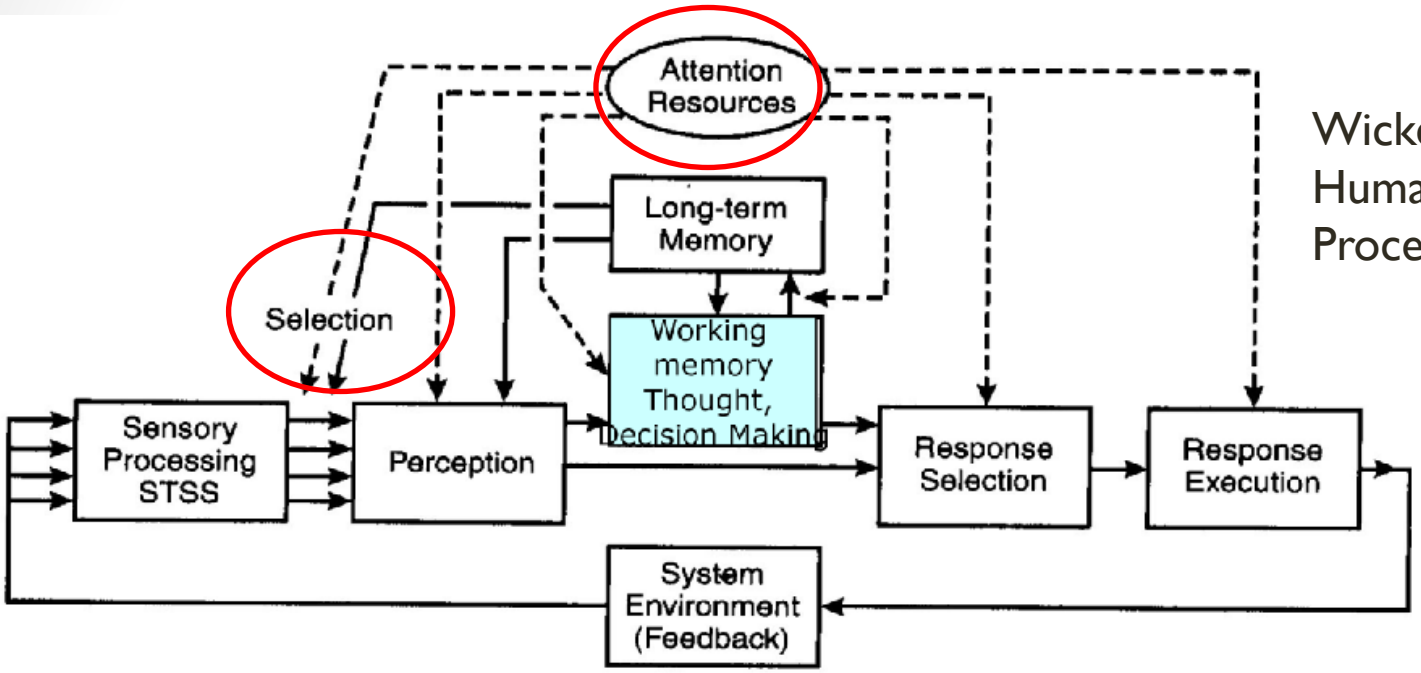


Figure 1.3 A model of human information processing stages.

Wickens Model of Human Information Processing

- Mental effort
- Selecting sensory channels for further processing

Selective Attention

Driven by four factors:

1. Salience
   - Bottom-up
2. Expectancy
   - Top-down
3. Value
4. Effort

Does NOT guarantee perception

Design Guidelines - Attention

- Make information salient
- Use techniques like animation, color, underline, ordering, sequencing, and spacing of items to achieve attention
- Avoid cluttering the interface with too much information
- Search engines and forms should use simple and clean interfaces

Human Information Processing - Memory

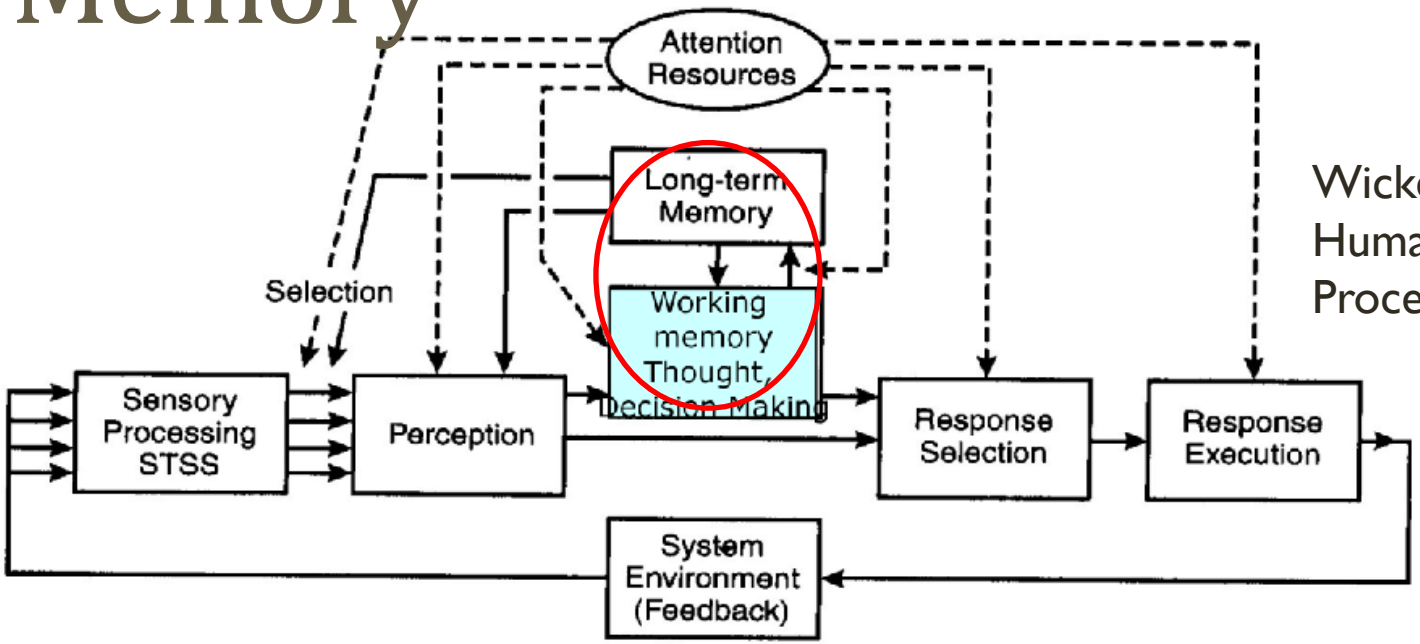


Figure 1.3 A model of human information processing stages.

Wickens Model of Human Information Processing

Working Memory (WM)

- "Think about" or manipulate information
- Temporary storage

Long-term Memory (LTM)

Working Memory Limitations

Limited capacity: 7±2 items, 15-20seconds

Chunking is based on

- Familiarity with links between items
- Past experience (LTM)
- Advantageous because
  - Increases the amount of information stored in WM
  - Aids retention by making use of LTM associations
  - Easier to rehearse (and transfer to LTM)

Social Security #
123 45 678

FBICIAUSA
vs.
FBI CIA USA

Confusability & Similarity

- Similarity between items in WM increase confusability
- Decay and time more disruptive for similar material

WM: Design Guidelines

1. Minimize working memory load (avoid the user having to remember)
2. Provide placeholders for sequential tasks (what steps have been completed? e.g., automated check out)
3. Exploit chunking (meaningful sequences – e.g., 1-800-438-4357 ; 1-800-GET-HELP)
4. Avoid “0”s (regal member number: 000000100290978)
5. Consider WM limits in instructions (Before doing X and Y, do A) (Do A. Then do X and Y)

Human Information Processing – Decision Making

Influenced by:

- WM
- LTM
- Sensation & perception
- Attention

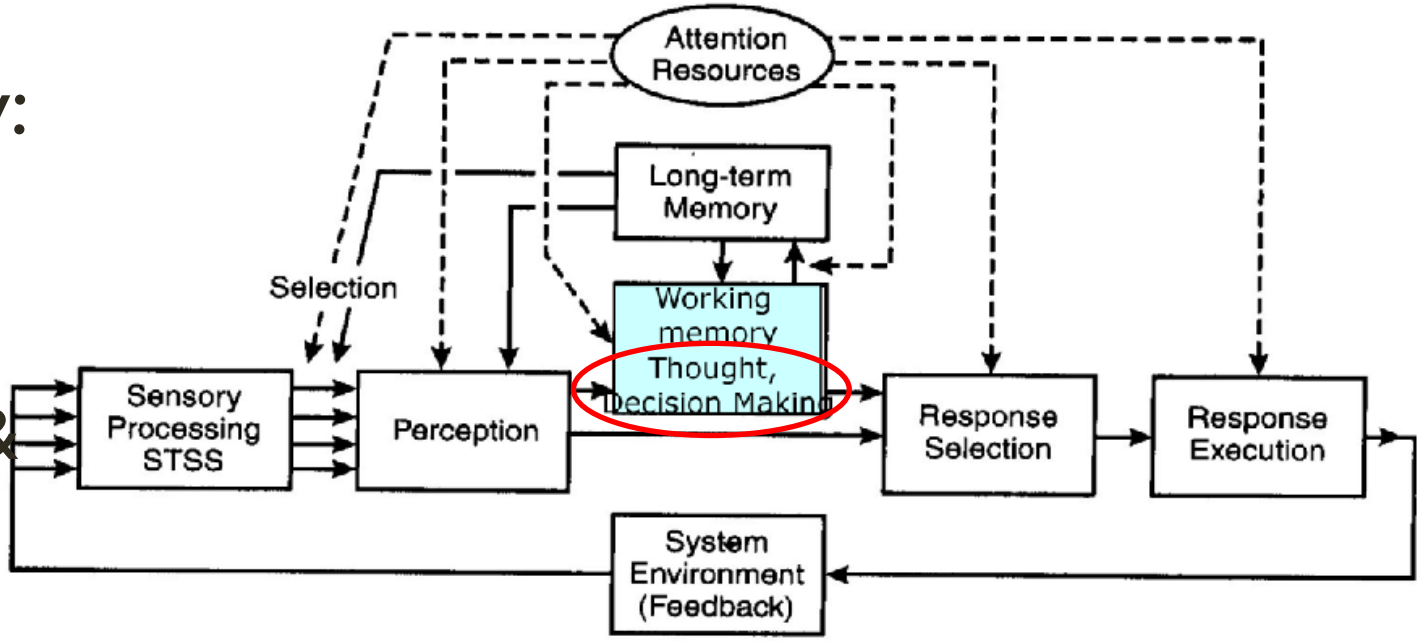


Figure 1.3 A model of human information processing stages.

Wickens Model of Human Information Processing

Decision Making

What is a decision making task?

- A choice between alternatives
  - Example: Course A or Course B?
- Some information available about the choices
  - Example: Course A: MWF, Course B: TTH
- Time frame longer than a second
  - Decision making vs choice-reaction
  - Example: Drop day is in October
- Uncertainty & risks
  - Example: what type of exams are involved in A

Decision Making

- Three processes or steps
  - Cues go into working memory
  - Using cues, we generate hypotheses
  - Based on cues and hypotheses, we plan and act
- Normative decision models
  - How people ideally *should* make decisions
  - Mathematical assessments of probability
- Issues pertaining to decision making
  - Cognitive fixation
    - Stay fixated on particular hypothesis (chosen for testing)
    - Stay fixated on particular solution even when not working
  - Confirmation bias
    - Seek cues that confirm; avoid those that disconfirm
    - Interpret ambiguous evidence as supportive

Improving Decision Making

- ***Redesign the task***
  - Provide information – not data
- ***Proceduralization (Training)***
  - Practice normative decision making skills as much as possible
- ***Automation (Decision support system)***
  - Computers can present many sources of data in aggregated format
  - Decision making can be informed by more sources of information
  - Computer aids can offload working memory load by displaying different hypotheses that fit data
  - Computers can also display all recommended actions based on data
- ***Give feedback (results of decision) as soon as possible: clear and diagnostic***

Prototyping Dimensions

1. Representation

- How is the design depicted or represented
- Textual description or visuals and diagrams

2. Scope

- Just the interface or including computational components

3. Executability

- Can the prototype be run?

4. Maturation

- What are the stages of the product as it comes along

More terminology

- Low-fidelity prototype
  - Paper-based sketches without user interactions
    - Focus on functionality
    - Less focus on aesthetics
  - Early visualization of design alternatives
  - Quick to create and easy to change
- High-fidelity prototype
  - Computer-based with user interactions
  - Close to true representation
  - More effective to collect performance data

Ethical Guidelines for HCI Researchers

All researchers must:

1. Obtain informed consent from participants
2. Minimize any discomfort and risk to participant
3. Ensure participants will not suffer any long-term negative consequences
4. Treat any information from participant as confidential
5. Debrief the participant afterward

– The Role of the IRB

Good luck on your exam!