User Capabilities and Limitations

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CS 4570 Human-Computer Interfaces

Lecture Overview
Human Capabilities and Limitations

- Human diversity and its impact
  - In this section, we will discuss human diversity in the context of HCI.
- Human Information Processing
  - We will discuss models of cognitive psychology and their importance in HCI design.

Human Diversity

- In psychology much of this material is covered under the heading, “Individual Differences”.
- We are interested in the ramifications of this diversity not its source.
- How are people different?

Emotional reaction circumstances

- Take the survey found at tba
- Print the results and bring them to class Friday.
- We will compile class results Friday.

Emotional reaction circumstances

- Extraversion vs. Introversion
- Intuition vs. Sensation
- Think vs. Feeling
- Judging vs. Perceiving
### Physical differences
- height
- weight
- strength
- dexterity
- hearing
- visual acuity
- color perception
- gender

### Cognitive abilities
- intelligence
- problem solving
- attention
- perception
- reasoning

### Education
- Language
  - Which language?
  - Reading level
- mathematics
- topic specific differences (library searches, etc.)

### Culture
- idioms
- manners
- habits
- “scripts”

### Computing experience
- General
- Specific
  - novice
  - knowledgeable beginner
  - knowledgeable intermittent user
  - expert

### Motivation & Goals (1)
- Extrinsic motivations
  - pay
  - benefits
  - working conditions
  - “Lead to dissatisfaction if used to motivate; will not lead to greater effort.”
Motivation & Goals (2)

- Intrinsic motivations
  - individual challenge
  - task meaningful
  - task significance
  - fantasy
  - curiosity
  - autonomy, freedom, control
  - personal relevance
  - personal cost
  - personal benefit
  - resistance to change

Motivation & Goals (3)

- Interpersonal
  - cooperation
  - competition
  - recognition

Human Information Processing

- In the first section of this class, we discussed what makes people different.
- In the second section, we will discuss similarities in fundamental human information processing.
- Disclaimer: Take great care here—don’t take implications too far. These are just “models.” We know far less about the human brain than anyone cares to admit.

Characteristics of Memory Components

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Sensory Registers</th>
<th>Working Memory</th>
<th>Long-term Memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cause of Forgetting</td>
<td>primarily decay, but also interference</td>
<td>primarily interference, but also decay</td>
<td>retrieval failures</td>
</tr>
<tr>
<td>Kind of Representation</td>
<td>closely tied to form of external stimulus</td>
<td>flexible, probably including verbal, visual, and semantic</td>
<td>semantic, verbal, and visual</td>
</tr>
</tbody>
</table>

Representation of Information in LTM

- semantic
  - networks
  - hierarchical
  - ISA, HAS, etc.
- episodic
  - role of context
  - verbal, visual cues
Norman’s Knowledge in the Head & Knowledge in the World
- Knowledge in the Head
  - Memory for arbitrary things
  - Memory for meaningful relationships
  - Memory through explanation
- Knowledge in the World
  - Reminding
  - Natural mappings

Control Processes of Memory
- rehearsal
- problem solving
- searching

Problem Solving
- bottom-up
- top-down
- means-ends analysis
- functional fixedity