Human Abilities 2

How do people think?

Universal Design
Agenda

- Revisit Brainstorming
- Memory
- Cognitive Processes
  - Implications
- Universal Design
- Recap
- Homework and Project
Brainstorming

When is it useful?

- **P1**
  - Trying to think of potential user groups
  - Interesting areas that haven’t been explored

- **P2**
  - Prototyping
  - Possible solutions
  - Chance to explore through Participatory Design
Overview

I. Senses
   A. Vision
   B. Hearing
   C. Touch
   D. Smell?

II. Information processing
    A. Perceptual
    B. Cognitive
       1. Memory
          a. Short term
          b. Medium term
          c. Long term
       2. Processes
          a. Selective attention
          b. Learning
          c. Problem solving
          d. Language
    C. Motor system

III. Motor system

IV. Motivations

V. Social Attachments

TODAY
II. Information Processing

- Three major systems of human information processing:
  - Perceptual (read-scan) -- memory
  - Cognitive (think)
  - Motor system (respond)
Sensation + Perception Process

Source: Goldstein’s *Sensation and Perception* book
Memory

Four “types”

- **Perceptual “buffers”** (e.g., chess)
- **Short-term memory**
  Conscious thought, calculations
- **Intermediate**
  Storing intermediate results, future plans
- **Long-term**
  Permanent, remember everything ever happened to us
Perceptual Store

- Visual and auditory impressions
  - visuospatial sketchpad, phonological loop
- Very brief, but veridical representation of what was perceived
  - Details decay quickly (~.5 sec)
  - Rehearsal prevents decay
  - Another task prevents rehearsal
Short-term memory

- Use “chunks”: 4-5 units (not 7 ± 2 !)
- Display format should match memory subsystem used to perform task
- New info can interfere with old info
Chunking Examples

- CBNCBASBC? ASANSICIBFASN?
- CBSABC CNBC? NSA FBICIANASA?
  - CBS ABC NBC
  - NSA FBI CIA NASA

- Phone numbers
  - Wrong way to do it
Design Implications?

- Minimize pipeline between info presentation and taking action
- Larger intervals for complex info

- What about universal design?
Long-term Memory

- Seemingly permanent & unlimited
  - Access is harder, slower (Activity helps)

- Episodic memory
  - Events & experiences in serial form
    - Helps us recall what occurred

- Semantic memory
  - Structured record of facts, concepts & skills
    - One theory says it’s like a network
    - Another uses frames & scripts
Memory Characteristics

- Things move from STM to LTM by rehearsal & practice and by use in context.

  - Unclear if we ever really forget something.
  - Lack of use.
  - We “forget” things due to decay and interference.
  - Similar gets in way of old.

Exercises
Model-Human Processor

Three parts:
1. Perceptual systems
2. Motor systems
3. Cognitive systems

Card, Moran, and Newell (1981)
Recognition vs. Recall

- Which is easier?
  - Acronym lists from earlier?
  - What color is this text?
- Design implications?
Cognitive Processing

- Cognitive models
  - Plenty of them
  - How well do they work?

- Four main processes of cognitive system:
  - Selective Attention
  - Learning
  - Problem Solving
  - Language
Selective Attention

- We can focus on one particular thing
  - Cocktail party chit-chat

- Salient visual/auditory cues facilitate this
  - Examples?
    - Boldface, blinking and beeping

- Visual or Auditory Streams form after a few seconds
1. Bottom-up
   - Gestalt

2. Top-down
   - Search task
Gestalts

- Figure/Ground
- Common Fate
- Closure
- Proximity
- Similarity
Implications for design?
Easier to Identify?

Top-down versus Bottom-up
Learning

- Procedural Learning
  - How to do something

- Declarative Learning
  - Facts about something

- Involves
  - Memorization
  - Understanding concepts & rules
  - Acquiring motor skills
  - Automatization
Learning

- Facilitated
  - By analogy
  - By structure & organization
  - If presented in incremental units
  - Repetition

- Use user’s previous knowledge in interface
Where should you put a menu?

http://www.hollistercreative.com/dont-put-your-websites-main-navigation-on-the-bottom/
Observations

- Users focus on getting job done, not learning to effectively use system

- Users apply analogy even when it doesn’t apply
  (Beware the unintended metaphor)
Problem Solving

- Storage in LTM, then application of knowledge
- Reasoning
  - Deductive - If A, then B
  - Inductive - Generalizing from previous cases to learn about new ones
  - Abductive - Reasoning from a fact back to the action or state that caused it
Observations

- People are more heuristic than algorithmic
  - They try a few quick shots rather than plan
    - Resources simply not available
- People often choose suboptimal strategies for low priority problems
- People learn better strategies with practice
BUT!

- People get FED UP
  - Abandoning online shopping carts

*Average Online Shopping Cart Abandonment Rate (Global)*

Source: Various

From Baymard Institute
Implications

- Allow flexible shortcuts
  - Forcing plans will bore user

- Have active rather than passive help
  - Recognize waste

- And?
Language

- Rule-based
  - How do you make plurals?
- Productive
  - We make up sentences
- Key-word and positional
  - Patterns

- Should systems have natural language interfaces?
Issues with this?

- Accents?
- Dealing with rules from other languages
  - Compounded words
  - Parsing speech/word placement in the sentence
People

**Good**
- Infinite capacity LTM
- LTM duration & complexity
- High-learning capability
- Powerful attention mechanism
- Powerful pattern recognition

**Bad**
- Limited capacity STM
- Limited duration STM
- Unreliable access to LTM
- Error-prone processing
- Slow processing

*Computer is opposite! Allow one who does it best to do it! (Function allocation)*
Computer Capabilities

- Important for HCI too
  - Participate in informed brainstorming
  - Need to be able to call “B.S.” to programmers

- Intentional omission (time & scope)
  - (Take more CS courses 😊)
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V. Social Attachments
IV. Motivations

- Various and hierarchical motivations
  - e.g. Maslow’s Hierarchy of Human Needs
  - Consider all levels in your design
V. Social Attachments

- Consider how humans form part of a group, society, club, culture, team, clique, family, peer group
- How does technology fit into the culture or social fabric?
- Understand the implications of this for design
  - Gold iPhone?
  - Dressing up Roombas? Cute Roboraptors!
  - Movie viewing at home vs. on a plane?
  - Need to remain connected at all times?
  - Changes to manners/etiquette... etc.
Activity (Revisit)

- Designing an app to order pizza
  - BUT! Universal design
  - What if your user group is older adults?

- Possible design considerations?
  - Font (size, type)
  - Button size (placement)
Recap

➢ Know your user!

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Design Implications?!
Assignments

- **Homework 1**
  - Due September 15

- **P1**
  - Questions?
  - Panels
    - Scheduled 2\textsuperscript{nd} Week of P1
  - IRB
    - When to start?
    - Problems?