Midterm

• 45 minutes + (10 min. break)
• 15 questions
  – 5 on users
  – 5 on design principles
  – 5 on solving usability needs
• 1 page hand-written cheat sheet
User

• Give an example why knowing users’ [characteristic] matter.

• User Characteristics
  – Age
  – Gender
  – Language
  – Cultural convention
  – Education
  – Physical limitations
  – Technical experiences
  – Motivation
  – Attitude
  – Usage pattern
Design

• State which usability attribute(s) and design principle(s) this interface is a good example for or in violation of.
Desktop metaphor (design principle), an example of good learnability (usability attribute).
Visibility of system status (design principle), an example of good satisfaction (usability attribute).
Violation of the principle of minimalist design, bad for efficiency and satisfaction.
Solving usability needs

• Suggest a solution to solve the following usability need.

• **User**: I need to see immediately which emails I have not read.
Initial Design Presentation

• 5 minutes
• No slides

• Problem statement
• User classes
• Persona
• Storyboard
Lecture 10: Memory

March 3
• Human memory
• Present
• Past
• Future
Human memory
Psych 100 stuff

• Sensory memory
• Short-term memory
• Long-term memory
Kinds of memory

- Different kinds of memory may be distinguished:
  - Declarative, knowledge of facts:
    - Episodic, what happened, where and when
    - Semantic, factual information, general knowledge independent of context
  - Procedural, how-to-do-it knowledge
    - Usually implicit, hard to put in words (hence ‘non-declarative’)

- Declarative knowledge:
  - described as semantic network
  - described as frames/scripts/schemas
Short-term memory (STM)

- Working memory
- Limited capacity: 7 plus minus 2
- Short-lived: 10 – 20 sec
  - Rehearsal prevents decay
  - Distraction erases short-term memory
STM Subsystems

- **Speech system**
  - whisper to ourselves to remember a given set of numbers.

- **Spatiovisual sketchpad**
  - remember scene or a schematic we have seen as a whole (nonverbal).

- **Central executive**
  - short-term controls and cognitive processing.
Long-term memory (LTM)

• Seemingly permanent and unlimited
• Access is harder and slower
Types of long-term memory

• Episodic memory
  – Events and experiences in serial form
  – What happened, when, and where

• Semantic memory
  – Structured record of facts, concepts and skills
  – Independent of context

• Procedural memory
  – How to knowledge
STM \rightarrow LTM

- Repetition
  - Immediate repetition does not help
  - Regular and conscious repetitions help

- Rehearsal
  - Internal
  - External

- Practice

- Use in context
Why we forgot?

• Decay
  – lack of use

• Interference
  – similar things get in the way
Age and memory

• Short-term memory capacity reduced 4% to 28% as people age
• Especially for visually acquired information
• STM to LTM is more difficult
• Reproduction of learned material without sufficient prior knowledge is increasingly challenging
Present
Needs

• Complete a task
• Stay focused
What do users need to keep in their working memory?

• Labels and parameters
• Current subgoal (current subtask)
• Current response
• Current state of the computer
Memory load

• On working memory
  – Sensory and Short-term Memory

• Intrinsic load
  – Imposed by the task
  – Central to what users try to do

• Extraneous load
  – Imposed by distractors (usually data)
  – Central to users’ concentration
Memory load

- Users perform tasks best when all required information fits in STM
  - accessing is fast
  - requires little work

- Memory failures
  - Overload
  - Lapses, major causes of errors (will talk about this later).
Example: asking someone for the direction to a restaurant

• Labels and parameters
  – Name of the restaurant

• Current subgoal
  – Asking for a direction

• Current response
  – Two blocks away

• Current state of the computer (person)
  – Talking
Example: asking someone for the direction to a restaurant

When working memory fails

- Labels and parameters
  - What is the restaurant I wanted to go?
- Current subgoal
  - What am I trying to ask?
- Current response
  - What did the person just say?
- Current state of the computer (person)
  - Cutting the person off
Example: data-entry task

- Labels and parameters
  - Employee’s social security number
- Current subgoal
  - Entering the SSN
- Current response
  - Please enter SSN
- Current state of the computer
  - Data entry mode
Example: data-entry task

When working memory *fails*

- Labels and parameters
  - What was the name I just read on the form?
- Current subgoal
  - What am I trying to do?
- Current response
  - What does the computer say?
- Current state of the computer
  - Am I in the viewing or editing mode?
How can we help users?

• Help users remember
  – By reducing memory load
  – Ultimate: no need to remember
  – Realistic: minimize the need to remember

• Help users stay concentrated
  – By reducing distractors
Help users remember: reducing memory load

1. Labels and parameters
2. Current subgoal
3. Current response
4. Current state of the computer
1. Labels and parameters

- What are today’s special items?
- What is the email address I wanted to type?
- What is the coupon code I needed to enter?
- How are these two products compared?
• Keep track of data for users
  – Clipboard
  – Shopping cart
  – Confirmation code embedded in links
• **Help users compare**
  – Make options visible
  – Reduce the number of options
  – Provide side-by-side comparison feature

<table>
<thead>
<tr>
<th></th>
<th>15” MacBook Pro</th>
<th>17” MacBook Pro</th>
<th>MacBook Air</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Processor</strong></td>
<td>2.33GHz, 250GB $1,699.00</td>
<td>2.8GHz, 500GB $2,499.00</td>
<td>1.8GHz, 120GB SATA $1,699.00</td>
</tr>
<tr>
<td><strong>Memory</strong></td>
<td>2.66GHz, 320GB $1,699.00</td>
<td>2.8GHz, 500GB $2,499.00</td>
<td>2.13GHz, 128GB SSD $1,799.00</td>
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<tr>
<td><strong>Hard Drive</strong></td>
<td>2.8GHz, 500GB $2,299.00</td>
<td></td>
<td></td>
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<tr>
<td><strong>Screen Size</strong></td>
<td>15.4-inch (viewable) LED-backlit glossy widescreen 1440 x 900 resolution</td>
<td>17-inch (viewable) high-resolution LED-backlit glossy widescreen 1920 x 1200 resolution</td>
<td>13.3-inch (viewable) LED-backlit glossy widescreen 1280 x 800 pixels</td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Option</strong></td>
<td>Antiglare</td>
<td>Antiglare</td>
<td>Antiglare</td>
</tr>
</tbody>
</table>
2. Current subgoal

- What am I trying to do now?
- What are the three or four things I need to do in sequence?
• Clear marking of each step
• Fast response time
  – So users don’t forget what they’re in the middle of doing while waiting
• Task-specific perspective
  – Debug perspective: I must be debugging
  – Edit perspective: I must be editing
3. Current responses

• What prompted me to do this?
• What did the computer just complain?
  – The disk is full.
  – The username does not exist.
• Keep computer’s response around long enough
• Repeat information in confirmations
4. Current states of computer
Help users focused: reducing distractors

• What was I doing just before I was interrupted?
• Too many popups?
• Why is MS office paper clip hated?

Sometimes I just popup for no particular reason, like now.
Alerts

• Can be relevant to the current task
  – security warning

• Can be irrelevant but important
  – You’ve got mail
• Design alerts and warning to be minimally disruptive so that users won’t forget what they are doing.
• Allow users to opt out
Dynamic updating environment

• E.g., Air traffic controller
• Reduce similarity interference
• Make information highly distinctive across items in the display
• Give users enough time to pay attention to an update
• Give users enough time to let a previous task item fade from memory
Needs

• Resume a partially finished task
• Reuse data
• Redo actions
• Review past events
Tasks

1. Lookup past activities
e.g., What did I do?
2. Lookup past contexts
e.g., Where did I go?
3. Lookup past data
e.g., Where is my stuff?
4. Inspect past activities
e.g., Have I done this before?
Recall vs Recognition

• Recognition is easier than recall

• Which is easier?
  – Short answers
  – Fill-in the blanks
  – Multiple choices
  – True or false
Recall then recognize

• Still need to recall where to look for items to recognize
• Easier than direct recall
• Support partial recall
  – E.g., part of the filename
• Support contextual recall
  – E.g., when the file created
1. Lookup past activities

- What did I do?
- How did I do that?
- What have I done?
- What other things I am working on?
What did I do?

```plaintext
k = 100;
who
k = 10;
dir
for n = 2
end
pwd
dir

%-- 10/30/06  1:31 PM --%
help profile
end
which collatz
collatzplot(3)
collatzplot(3)

ode45(@vdp1000,[0 3000],[2 0]);
```
What other things I’m also working on?

- Users multitask and need to look up a previous task in order to resume it.
2. Lookup past contexts

- Where did I visit?
Where did I visit?
3. Lookup past data

• Where is my stuff?
• Where is the document I worked on?
• What search terms did I use?
• What is my password?
Refinding

- Different from finding it for the first time
- Recall:
  - Where did I see that?
- Recognition:
  - Is this where I saw it?
- Context is very important.
- Users are certain the data is there.
Where is my stuff?

What do you want to search for?
- Pictures, music, or video
- Documents (word processing, spreadsheet, etc.)
- All files and folders
- Computers or people
- Information in Help and Support Center

You may also want to:
- Search the Internet
- Change preferences
- Turn off animated character

Claudia

Documents
Recent Items
Pictures
Music
Games
Computer

Network Connections
Command Prompt
Fax Console
Fax Cover Page Editor
Remote Desktop Connection
CompatWiz
Volume Control
Component Services
Computer Management
NetworkProjection

Control Panel
Set Program Access and Defaults
Connect to
Printers and Faxes

Start
Command Prompt

CO

Start
Where is the document I worked on?

• Temporal locality
What search terms did I use?
What is my password?

• Infrequently used passwords are easy to forget
  – Little rehearsal
  – Confused with other passwords

• Recognition-based memory scheme may raise security concern
  – E.g., Peeping eyes over the shoulder
What is my password?

• Secret question
What was my password?
4. Inspect past activities

• Did I read this article before?
• Did I read this email before?
• Did I save?

• Have I told this joke before?
Have I read this article before?

U.S.
- Buffalo featured in largest ice maze
- Silent film musician gasps at snow
- Before attack, a normal whale show
- US travel bill to charge tourists $10
- Defense: Garrido hears voices
- Police search for missing family
- Bronze 4 days after mom’s death

World
- Fireworks blast kills 19
- Barak: Iran not just threat to Israel
- More probe sought of Israel-Gaza war
- Court: Uribe can’t run again
- Clinton heading to Latin America
- Iraq reinstates Hussein officers
- 3 die in cruise ship accident

More
Have I read this mail before?

Which mail have I read?
Future
Needs

• Save in anticipation for future retrieval needs
• Remember to do something later.
• Remember NOT to do something bad.
• Users have to do themselves
  – Organize
  – Set reminders
  – Schedule automatic tasks

• Systems do for users
  – Forcing function
  – Predicative aiding
Organization

- Folders
- Bookmarks
- Favorites
- Tags

- The action of organizing can help memory.
Reminder

Windows Update

Restart your computer to finish installing important updates

Windows can’t update important files and services while the system is using them. Make sure to save your files before restarting.

Remind me in: 10 minutes

Restart now  Postpone
Forcing function

• Users are forced to do something before they can do the next thing.

• E.g., removing ATM card before getting cash
Predicative aiding

• Proactively anticipate users’ possible future tasks and remind the users

• Users can recognize which one they really want to do
  – Recognition vs. recall

• E.g., showing distance to the next exit
Activity: Memory