



Human-Computer Interaction IS4300

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Midterm

I. Concepts & Definitions (20%)

- 1. What is usability?
- 2. Why is the classic waterfall development methodology inappropriate for HCI?
- 3. What is one UI design technique that minimizes user memory load? How does it do this?

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Midterm

4. Usability problems. For each of the following write which usability problem from Table 1 best describes the problem.

- **4a.** ____ A user just selected “File.../Save” from their application’s menu, but has no idea whether anything was actually saved or not.
- **4b.** ____ A user is trying to open a file in an interface, but has no idea what to click on.
- **4c.** ____ A user clicks the little ‘x’ on the upper right corner of their new Windows-based joke-of-the-day application but, instead of closing the application (as the user expects), it displays another joke.


3



- **4d.** ____ A user clicks on one of the arrows in the UI panel shown but nothing happens (the user is supposed to drag the arrow in the indicated direction to scroll the display).




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5a. Indicate which of the following orderings is correct for the 7 steps of Norman's interaction model (O1-O6): _____

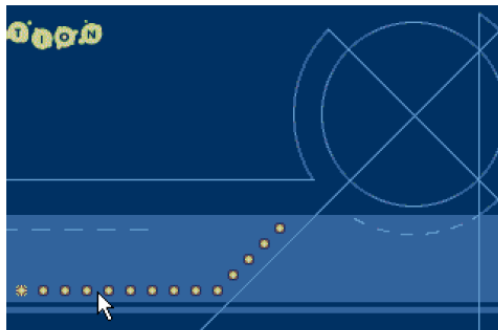
	<u>Orderings (pick one):</u>
1. formulate intention	O1. 1 2 3 4 5 6 7
2. interpret system state	O2. 6 1 4 7 3 5 2
3. evaluate system state with respect to goal	O3. 4 7 5 2 3 6 1
	O4. 6 1 4 7 5 2 3
4. specify actions at interface	O5. 1 6 5 4 7 2 3
5. perceive system state	O6. 7 3 2 1 6 4 5
6. establish the goal	
7. execute action	



- **5b.** ____ Which step above concerns the "gulf of execution"?
- **5c.** ____ What kind of usability problem (Table 1) does the "gulf of execution" impact?
- **5d.** ____ Which step above concerns the "gulf of evaluation"?
- **5e.** ____ What kind of usability problem (Table 1) does the "gulf of evaluation" impact?

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6. Below is an attempt at a novel mechanism for website navigation. On the homepage is a series of dots (7 pixels in diameter). As you hover the mouse over each dot, a description of the hyperlinked page appears in the circle to right. You click on the dot to navigate. Critique the UI using categories from Table 1.



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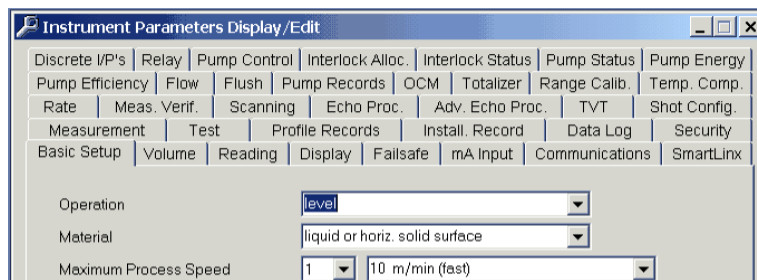
II. UI Critique, continued

7. Below is an interface to let users create SQL (database query) commands using a GUI. When you click on one of the check boxes at the top it inserts the appropriate command phrase into the SQL command string at the bottom, then immediately unchecks the checkbox. Critique the UI using categories from Table 1.

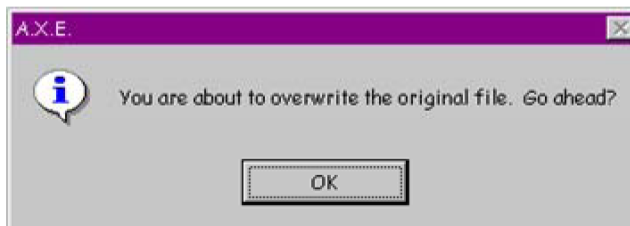
8

8. For each of the following, list the single most significant usability problem in Table 1 that applies:

8a. _____



8b. _____



8c. _____





■ III. User & Task Analysis (5%)

- 9. You are to design a new interactive grocery store kiosk to dispense gumballs, to replace the racks of mechanical gumball machines found at the front of most stores.
- 9a. Who are the primary stakeholders?
- 9b. Who are the secondary stakeholders?
- 9.c Who are the tertiary stakeholders?
- 9d. Who are the facilitating stakeholders?

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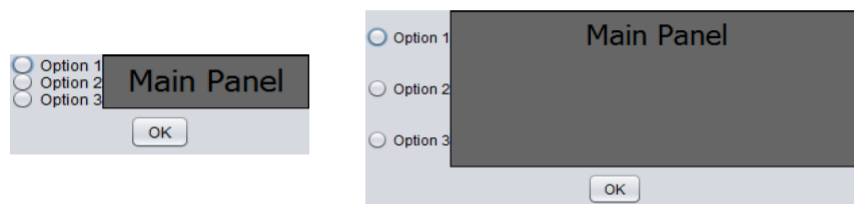
IV. Ethics of Human Subjects Research (5%)

- 10. You want to evaluate a new brain implant to connect users to their smart phones.
- 10a. You select a study population of prisoners in Oklahoma to do your testing. Which ethical principle does this violate?
 - Autonomy Beneficence Justice
- 10b. Study subjects are identified by the warden, who tells them they have to participate or lose their leisure privileges. Which ethical principle does this violate?
 - Autonomy Beneficence Justice
- 10c. Study subjects are told they will be the envy of their cellmates with their new iPhones, but are not told of any risks associated with the procedure. Which ethical principle does this violate?
 - Autonomy Beneficence Justice

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V. Java Swing (5%)

11. Show a panel hierarchy, and associated layout managers, required to produce the layout shown below (same window at two different sizes).



Example hierarchy:

```

Outer Frame (Flow layout)
  Main Panel (Flow layout)
    Option Panel (Border layout)
      Option 1 Radio Button (North)
      Option 2 Radio Button (Center)
      Option 3 Radio Button (South)
    Button Panel (Grid layout, 1 row, 1 column)
      OK Button
  
```

VI. Data Analysis (10%).

12. What are the types of the following measures (Table 3)?

- 12a. ___ Latte size (small/medium/large)
- 12b. ___ Servings of fruit per day someone eats
- 12c. ___ Score on a 5 item, 7-point Likert scale
- 12d. ___ Whether someone smokes or not (yes/no)
- 12e. ___ Time to complete a standardized task

13. Below is an excerpt from a study questionnaire. For each numbered question, indicate (via checks on the following page) the descriptive statistics you would use. Assume interval and ratio measures are approximately normal unless noted

Sample Questionnaire

Please take a moment and answer a few questions about yourself:

Q1. Age: _____ Q2. Sex: M, F, Other _____ Q3. Weight: _____

Q4. Ethnic Background (check one):

American Indian or Alaskan Native	_____
Asian or Pacific Islander	_____
Black, Not of Hispanic Origin	_____
White, Not of Hispanic Origin	_____
Hispanic	_____

Q5. How satisfied are you with the new Monkey Torture game?


not at all • • • • • • • very satisfied

Q6. How long did you play the game for (in minutes) _____

VII. Usability Testing (40%)

Short answers (10%).


- 14. How do you determine how many test users you need for a comparison evaluation study in which you will be proving which of two interfaces is better, based on quantitative usability metrics?
- 15. How do you determine how many test users you need for a formative think-aloud evaluation of an early software prototype?



- 16. Your customer says she wants you to design an information kiosk for an airport terminal, and that it should be “as easy to use as possible”. Specify a usability metric (Table 2) that can be used to evaluate your end product. Describe how you would evaluate the metric.

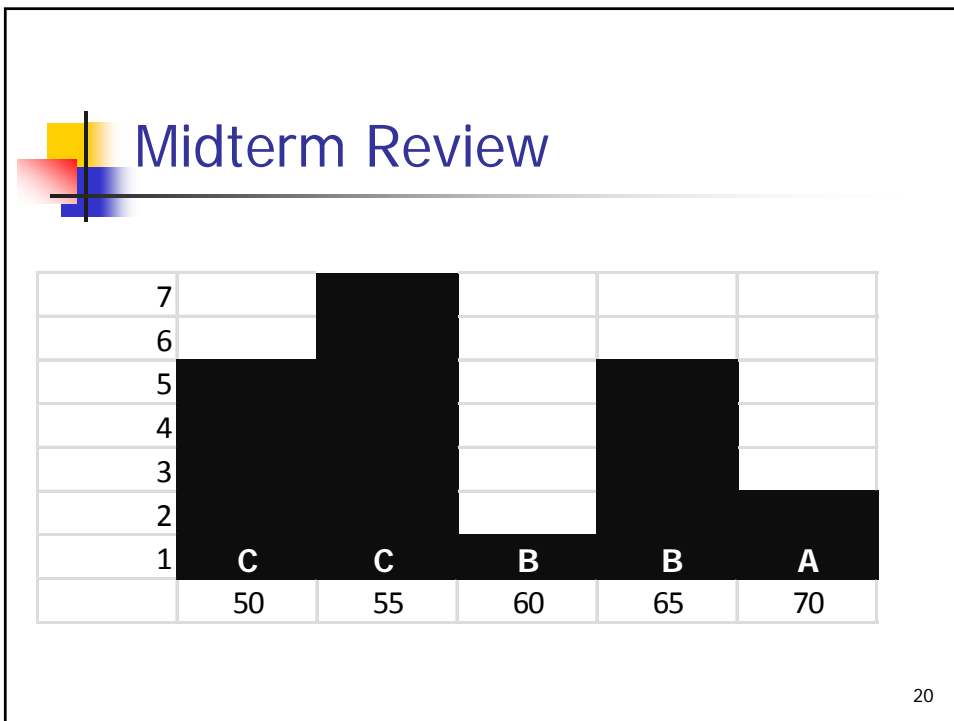
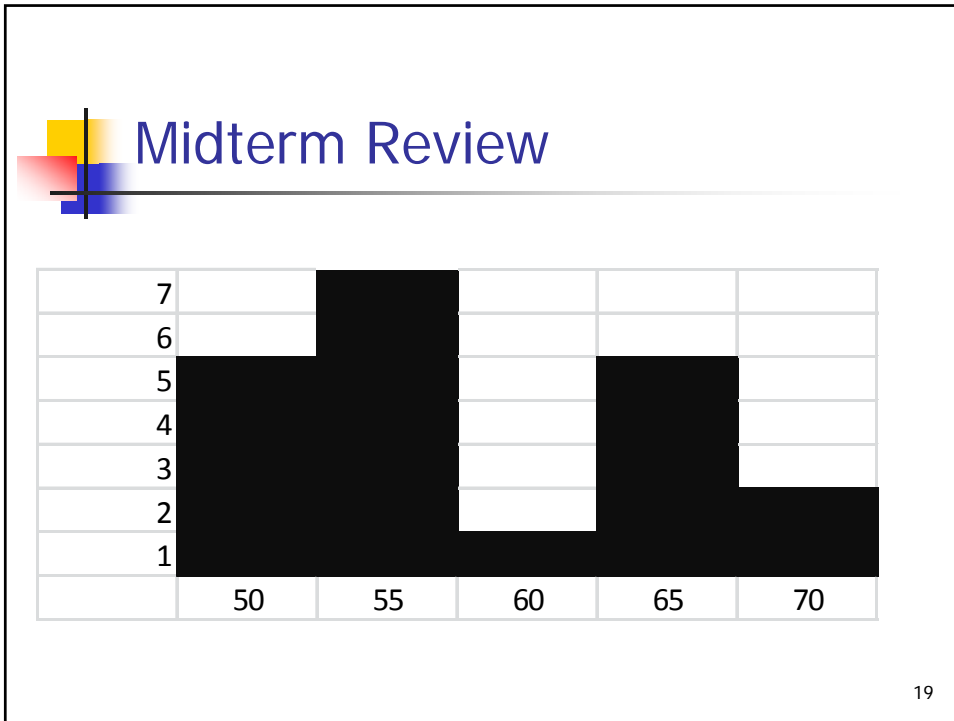
17


Usability Test Plan (30%)



- 17. The MBTA hires you to conduct formative usability testing for a new web page they are developing that lets riders report overly-polite people to the Transit Police (part of the “see something, say something” program). The interface lets you upload a digital photo and description of the offending kind act, and specify the station and time the event occurred at.
- **17a. Post-Task Evaluation** (15%) After test users have tried the interface, the customer would like them to be interviewed about their experience (using a semi-structured interview) and administered a quantitative satisfaction measure (“Gotta have some numbers for the boss!”). Write the questionnaire and interview guide (protocol) so that a member of the Transit Police could conduct the evaluation without any training.
- **17b. Write the test plan** (15%)


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Midterm

- 20% Concepts
- 15% UI Critique
- 5% User & Task Analysis
- 5% Java Swing (focus on layout managers)
- 5% Ethics of Human Subjects Research
- 40% Usability testing
 - Choosing an appropriate evaluation method
 - Writing a study protocol
 - Writing an analysis plan
- 10% Data analysis



Heuristic Evaluation

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Heuristic Evaluation

- There are many “checklists” available
- ➔ ■ Nielsen’s 10 design heuristics
- Tognazzi’s First Principles of Interaction Design
- Gerhardt-Powals’ cognitive engineering principles
- etc



1. Visibility of System Status / aka Feedback

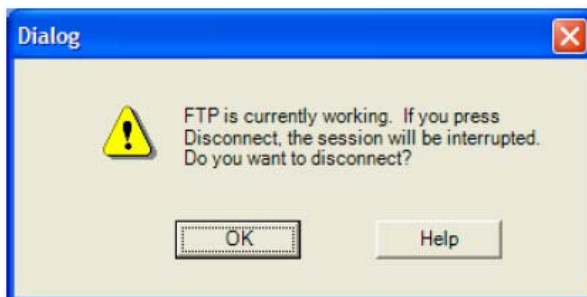
- Keep user informed of system state
 - Cursor change
 - Selection highlight
 - Status bar
- Response time
 - < 0.1 s: seems instantaneous
 - 0.1-1 s: user notices, but no feedback needed
 - 1-10 s: display busy cursor or other feedback
 - > 10 s: display progress bar

2. Match system / real world aka Speak the User's Language

- Use common words, not techie jargon
 - But use domain-specific terms where appropriate
- Don't put limits on user defined names
- Allow aliases/synonyms in command languages
- Metaphors are useful but may mislead

3. User control & freedom aka Clearly Marked Exits

- Provide undo
- Long operations should be cancelable
- All dialogs should have a cancel button





Nielsen's Heuristics

4. Consistency

- Principle of Least Surprise
 - Similar things should look and act similar
 - Different things should look different
- Other properties
 - Size, location, color, wording, ordering, ...
- Command/argument order
 - Prefix vs. postfix
- Follow platform standards
- Kinds of Consistency
 - Internal
 - External
 - Metaphorical



Nielsen's Heuristics

5. Prevent Errors

- Selection is less error-prone than typing
- Disable illegal commands
- Description Error
 - different things/commands should look and act different
- Mode Error
 - Eliminate modes
 - Visibility of mode
 - Spring-loaded or temporary modes



6. Recognition rather than recall aka Minimize User Memory Load

- Use menus, not command languages
- Use combo boxes, not textboxes
- Use generic commands where possible (Open, Save, Copy Paste)
- All needed information should be visible



7. Flexibility & efficiency aka Shortcuts

- Provide easily-learned shortcuts for frequent operations
 - Keyboard accelerators
 - Command abbreviations
 - Styles
 - Bookmarks
 - History

8. Aesthetic & minimalist design aka Simple and Natural Dialogue

- “Less is More” / KISS
 - Omit extraneous info, graphics, features



9. Help users recognize, diagnose & recover from errors

- Be precise; restate user's input
 - Not “Cannot open file”, but “Cannot open file named paper.doc”
- Give constructive help
 - why error occurred and how to fix it
- Be polite and non-blaming
 - Not “fatal error”, not “illegal”
- Hide technical details (stack trace) until requested



10. Help and Documentation

- Model
 1. Searching
 2. Understanding
 3. Applying
- Important features
 - Index
 - Overview map
 - Help visible while user is applying
 - Describe confirmatory feedback



Heuristic Evaluation the process

- “Expert” evaluators independently inspect an interface, using a list of heuristics
- Identify problems, and rate severity as
 - Cosmetic; Minor; Major; Catastrophic
- Problems are aggregated, sorted by severity
- Provides a “to do” list for modifying the design

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Cognitive walk-through

- A more methodical approach to heuristic evaluation
 1. Define a task (as end goal, not how-to)
 2. For each step (UI action)
 - Is the next action obvious?
 - Is the effect of the action taken obvious?



Nielsen & Molich, 1990



Four ways to evaluate a UI

- Formally
- Automatically
- Empirically
- Heuristically

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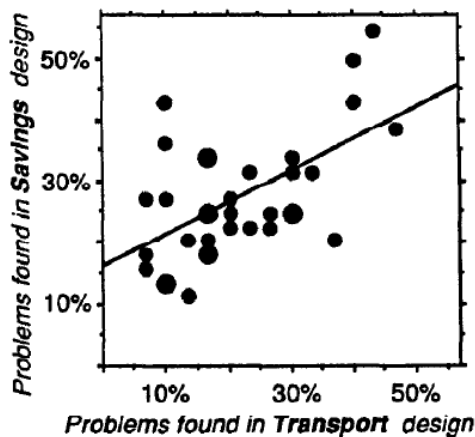


Identification of problems by individual (naïve) testers

<i>Experiment (short name)</i>	<i>No. Evalu- ators</i>	<i>Total Known Usability Problems</i>	<i>Average Problems Found</i>
Teledata	37	52	51%
Mantel	77	30	38%
Savings	34	48	26%
Transport	34	34	20%

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Testers have different performance on different UIs

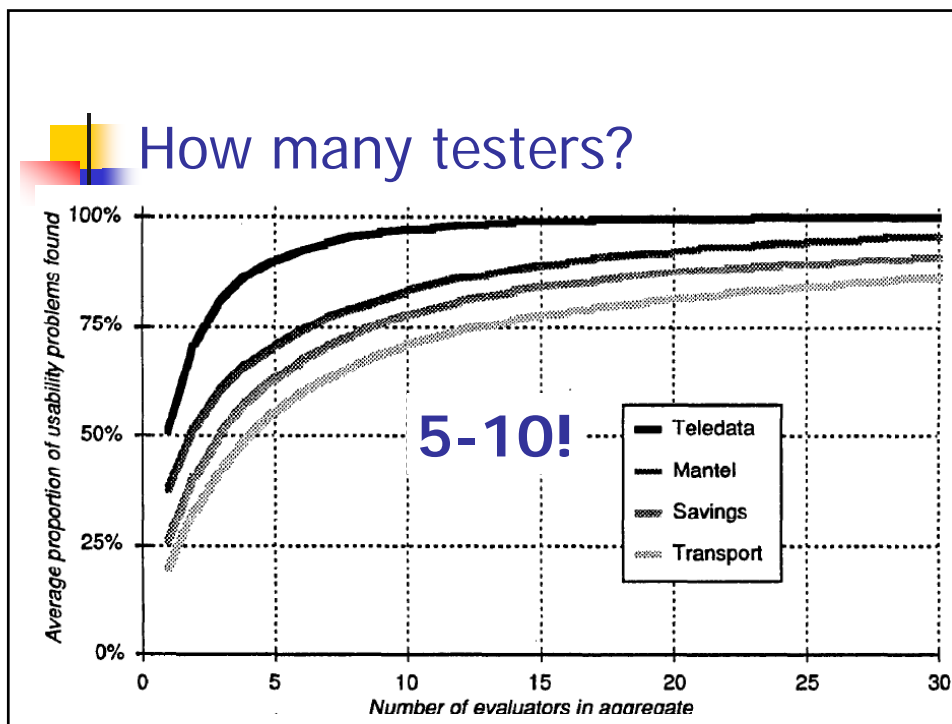


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Bottom Line


- Heuristic evaluation by a single tester is not very reliable.
 - Heuristic evaluation is hard.
 - Different testers see different things.
 - The same tester focuses on different things in different UIs.
- But, few false positives
- => Aggregate problems across testers!

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Advantages of Heuristic Evaluation


- Inexpensive.
- Intuitive & easy to motivate people to do it.
- Does not require advance planning.
- Can be used early in the development process.



Heuristic Evaluation for Games

Pinelle, Wong, Stach
CHI 2008

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Intro

- Game Usability
 - Degree to which a player is able to learn, control, and understand a game.
- Games are different than other UIs
 - User errors are expected in games
 - "Standard tasks" may not make sense
 - Different concerns (e.g., camera angles)
- Playtesting
 - Requires playable prototype

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Derivation of Heuristics

- Analyzed 108 game reviews on GameSpot
 - Focused on 18 reviews for 6 genres
 - excluded bugs
 - NOT focusing on playability
 - NOT focusing on multi-player

- Resulted in 12 problem categories
- Cast into 10 usability heuristics


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Using Heuristics to Evaluate the Playability of Games

Desurvire, Caplan, Toth
CHI 2004

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Focus - Playability

- Game play
 - Problems & challenges a user must face to win a game
- Game story
 - Plot and character development
- Game mechanics
 - Programming that provides the structure by which units interact with the environment
- Game usability
 - Interface

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Game Play Heuristics

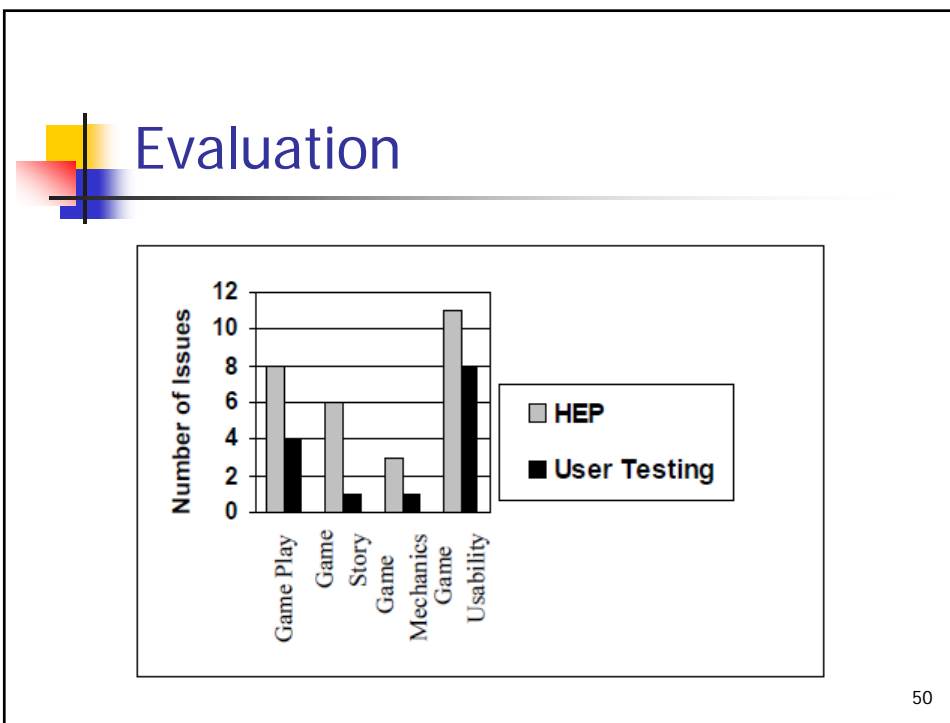
1	Player's fatigue is minimized by varying activities and pacing during game play.
2	Provide consistency between the game elements and the overarching setting and story to suspend disbelief.
3	Provide clear goals, present overriding goal early as well as short-term goals throughout play.
4	There is an interesting and absorbing tutorial that mimics game play.
5	The game is enjoyable to replay.
6	Game play should be balanced with multiple ways to win.
7	Player is taught skills early that you expect the players to use later, or right before the new skill is needed.
8	Players discover the story as part of game play.
9	Even if the game cannot be modeless, it should be perceived as modeless.
10	The game is fun for the Player first, the designer second and the computer third. That is, if the non-expert player's experience isn't put first, excellent game mechanics and graphics programming triumphs are meaningless.
11	Player should not experience being penalized repetitively for the same failure.
12	Player's should perceive a sense of control and impact onto the game world. The game world reacts to the player and remembers their passage through it. Changes the player makes in the game world are persistent and noticeable if they back-track to where they've been before.
13	The first player action is painfully obvious and should result in immediate positive feedback.
14	The game should give rewards that immerse the player more deeply in the game by increasing their capabilities (power-up), and expanding their ability to customize.
15	Pace the game to apply pressure but not frustrate the player. Vary the difficulty level so that the player has greater challenge as they develop mastery. Easy to learn, hard to master.
16	Challenges are positive game experiences, rather than a negative experience (results in their wanting to play more, rather than quitting).

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Game Story Heuristics

1	Player understands the story line as a single consistent vision.
2	Player is interested in the story line. The story experience relates to their real life and grabs their interest.
3	The Player spends time thinking about possible story outcomes.
4	The Player feels as though the world is going on whether their character is there or not.
5	The Player has a sense of control over their character and is able to use tactics and strategies.
6	Player experiences fairness of outcomes.
7	The game transports the player into a level of personal involvement emotionally (e.g., scare, threat, thrill, reward, punishment) and viscerally (e.g., sounds of environment).
8	Player is interested in the characters because (1) they are like me; (2) they are interesting to me, (3) the characters develop as action occurs.

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Exercise

- “Heuristic evaluation of Games”
- Critique a game using heuristics from Pinelle et al.
- Use Nielsen’s severity ratings
- Teams of 2-3
- Pick a random web or phone-based game
 - E.g., <http://www.kongregate.com>



17 – Heuristic Evaluation

- In this individual assignment, you will do heuristic evaluation on two computer prototypes developed by your classmates.
- The two interfaces you will be evaluating will be assigned in class. For each, go to the project team’s webpage and review the **I6** report for each project, which will give you instructions for running the prototype and background information about the project. This is not an anonymous evaluation, so feel free to contact a project group directly if you need more information than you were given.
- **As soon as you receive your prototype assignments, try to download and run both prototypes.** You don’t have to do your heuristic evaluation right away, but poke around a bit and make sure the prototypes appear to work. We need to get logistical problems out of the way as early as possible, since everybody else is going to be working on heuristic evaluations too.

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17 – Heuristic Evaluation

- Follow the heuristic evaluation procedure to evaluate both interfaces carefully. Make a numbered list of usability problems and successes you find. For each problem or positive comment, you should:
 - describe the problem or positive feature
 - identify the relevant usability heuristics (from Nielsen's Ten Usability Heuristics, or any other guidelines we've discussed in class)
 - estimate its severity (for problems, use cosmetic, minor, major, or catastrophic; for positive comments, just say good)
- You aren't required to recommend solutions for the problems, but any ideas you have would no doubt be appreciated.
- Be thorough. **You should have at least 20 useful comments** (positive or negative) about each interface that you evaluate. Write your reports in a readable style. The usability of your report to its recipients will matter in your grade. In particular, don't bury the problems you found in reams of free-flowing prose. Where possible, include screenshots to illustrate the problems you found. In general, make your report easy to read and understand.


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17 – Heuristic Evaluation

- **What to Post**
 - You should post two reports, one for each interface you evaluated, on separate web pages.
 - Email the relevant URL to the appropriate team members.


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17 Assignments (Team #s)

Bucci, Dana V.	1,2
Cardinal, Stephen J.	3,4
Doyle, Benjamin	5,6
Gamonal Capdevila, Eduard	1,2
Geshev, Kiril	3,5
Grover, Daniel	6,1
May, Michael S.	4,3
Mayerchak, Dylan R.	2,5
Meenagh, John P.	6,1
Millman, Jonathan	2,3
Najjar, Maroun	4,6
Nakamura, Marika	5,2
Nashi, Joni	3,4
Ozkaynak, Deniz S.	1,6
Scorza, Leigh A.	2,3
Skouras, Andrea L.	4,5
Smith, Nathaniel K.	1,2
Tebaldi, Matthew T.	6,3
Vieira, Benjamin	4,5
Williams, Ryan C.	6,2

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Heuristic Evaluation & Prototype Revision

- You can continue implementing the “back end” of your system, but should not make any major changes to the UI.
- After you receive the heuristic evaluations you should assign each of these problems a severity rating (cosmetic, minor, major, catastrophic), and brainstorm possible solutions for it. Modify your system to correct as many of the problems found as possible (in priority order), documenting how you do this.
- **What to Post**
 - A link to your updated prototype and a report describing how you responded to the heuristic evaluations.

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To Do

- I7 – Heuristic Evaluation (1 week)
- T7 – Prototype Revision (1.5 weeks)

- Read Stone ch 28-29