

Quiz 2

This quiz is closed book, closed notes. You have 80 minutes to complete it.

Your name: _____

1. (6 points) Louis Reasoner is creating an interface that visualizes all the files on a filesystem. Using the theory of visual variables, discuss each of his design choices, and propose an alternative visual variable that might be better.

- (a) File age is represented by hue: the oldest files are yellow, medium-age files are blue, and the latest files are green.

Hue isn't a great choice here, because it's not perceptually ordered, but the data variable (age) is ordered. Hue also is a fairly short variable, with only 10 or so easily distinguishable levels, but age may be very long (spanning from minutes ago to years ago).

A better visual variable might be position (along a timeline, say).

- (b) File type is represented by a short extension, like .mp3 or .txt.

This uses shape as the visual variable. Shape is not selective, so the eye can't easily pick out all the .mp3 files from the visualization.

A better variable might be hue, which is selective, although short.

- (c) File size is represented by the font size of the filename and the size of the icon.

Size is also short, and it's disassociative – small files will make it harder to detect other visual variables, like the shape of the extension.

A better variable might be position (on a vertical scale, for example).

2. (3 points) Here are two interfaces for displaying information:

Interface A:

Title: HCI Bibliography : Human-Computer Interaction / User Interface ...

Summary: The HCI Bibliography (HCIBIB) is a free-access bibliography on Human-Computer Interaction, with over 20000 records in a searchable database. ... Learn about HCI. ...

Keywords: HCI

URL: www.hcibib.org/

Size: 14k

Interface B:

[HCI Bibliography : Human-Computer Interaction / User Interface ...](#)

The HCI Bibliography (HCIBIB) is a free-access bibliography on Human-Computer Interaction, with over 20000 records in a searchable database. ... Learn about HCI. ...

www.hcibib.org/ - 14k - [Cached](#) - [Similar pages](#)

Mentioning specific rules of simplicity and contrast, explain why interface B has a better graphic design than interface A.

B is simpler because each element does double-duty as both a label and a data value (e.g. www.hcibib.org/ instead of URL: www.hcibib.org/).

B has better contrast between elements because it uses redundant visual variables: e.g. the title is larger, underlined, and colored differently from the rest of the display.

3. (3 points) Which Gestalt rule of grouping is most relevant to white space, and why?

Proximity, because whitespace pushes elements farther apart or brings them closer together, changing the way we perceive how the elements are grouped.

4. (6 points) When Louis Reasoner writes papers, his section heading levels look like this:

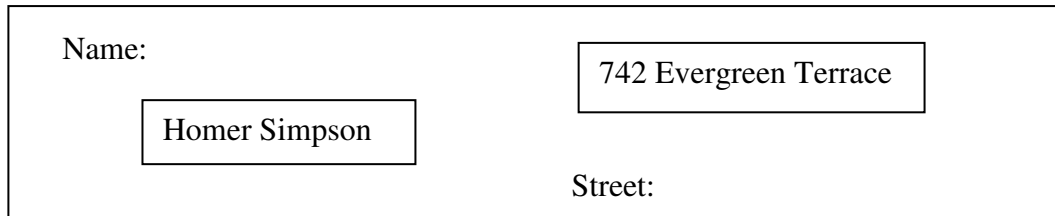
Title (12-point Arial)
 Chapter (12-point Comic Sans MS)
 Section (12-point Courier New)
 Subsection (12-point Times New Roman)

By appealing to graphic design principles, explain why this is a bad design. Give as many reasons as you can.

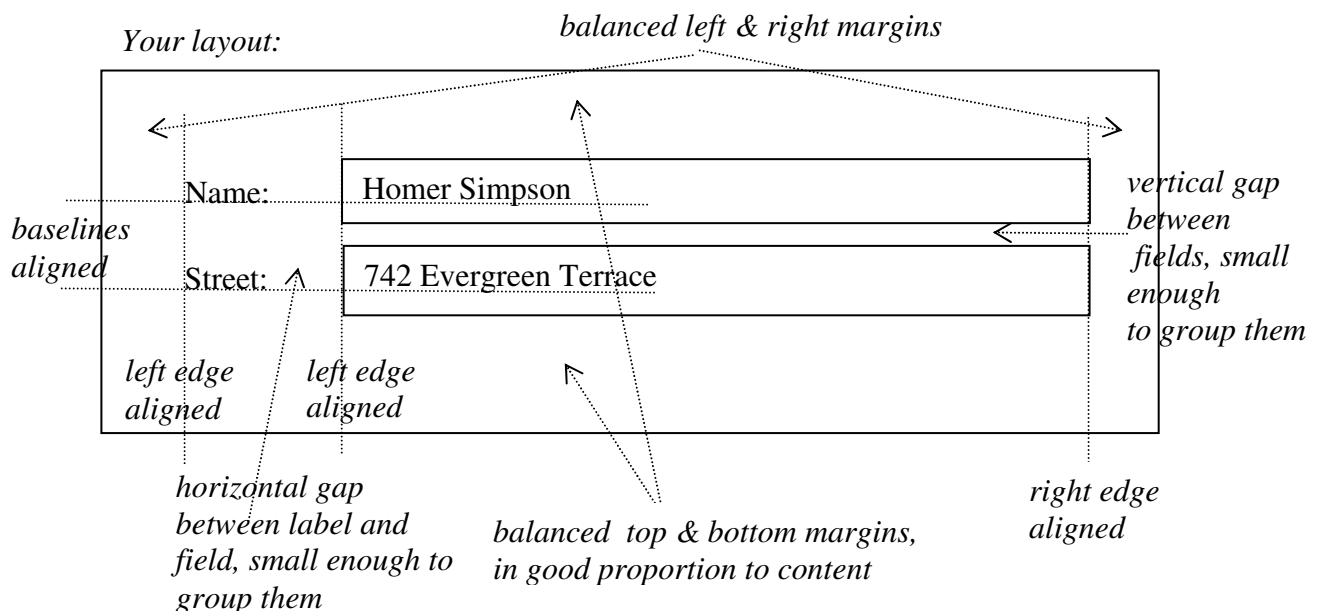
This design depends on differences in shape (font face) to distinguish the section heading levels. It's bad because (1) shape is unordered, but hierarchical ordering is essential to the nature of section headings; (2) only one visual variable is used, rather than sharpening contrast by using redundant variables; (3) shape is not selective, so it's much harder to scan through the paper looking at the headings for a single level (such as Chapter).

5. (6 points) A dialog box has four components (shown below in arbitrary locations). In the empty box below, draw a good layout of the four components, and label on your drawing the important alignment relationships and whitespace decisions.

The components:



Your layout:



- 6.

(6 points) Ben Bitdiddle's interface uses three colors (in addition to black and white): pure red (RGB=255,0,0), pure green (RGB=0,255,0), and pure blue (RGB=0,0,255). Give two reasons supporting his color design, and two reasons against it.

Pro: (1) the design uses only a small number of colors; (2) those colors use the full length of the hue and value visual variables, maximizing the contrast.

Con: (1) the colors are fully saturated, which tires the eye; (2) red and green can't be distinguished by red-green colorblind users.

7. (3 points) Explain how each of the three output models is handled by a typical GUI builder.

Components: a typical GUI builder has a palette of components that can be added to the UI.

Strokes: strokes must be encapsulated in a custom component in order to be added to the UI.

Pixels: images can be placed directly in the UI using an image or label component.

8. (4 points) Give one advantage and one disadvantage of using widgets to design a UI.

Advantages: (1) external consistency with other applications using the same toolkit; (2) reuse of code and user interface design.

Disadvantages: (1) widgets constrain the designers' thinking, overlooking potentially better designs that might need custom UI; (2) widgets can be misused, wedged into a purpose that they aren't suited for.

9. (6 points) In a Virtual Salad Bar program, the user can choose at most one salad dressing: Italian, Ranch, or French. Draw four different reasonable ways to design this interface using standard widgets, and discuss the tradeoffs between them.

3 radio buttons

3 toggle buttons

single-selection listbox with 3 choices

drop-down menu with 3 choices

Screen space: the drop-down menu saves screen real estate relative to listbox and radio buttons, or toggle buttons with text labels; toggle buttons with icon labels are use the least space.

Pointing efficiency: textual toggle buttons and listbox items have the biggest targets; radio buttons have big labels, but encourage aiming only for the little circle. Drop-down menu requires two pointing actions to change.

Scaling: listbox and drop-down scale better to many choices (with scrolling and jumping on keypress)

10. (6 points) Discuss the usability advantages and disadvantages of tab pane widgets.

Advantages: (1) familiar real-world metaphor; (2) fast navigation by a single pointing action; (3) the tab offers an affordance for operating on a pane (e.g. closing it).

Disadvantages: (1) doesn't scale beyond a single row of tabs, which limits the total number of tabs and the length of visible label on each tab; (2) can't see the contents of multiple tabs at once, so information may be unavailable for comparison or transfer

11. (3 points) Explain the similarities and differences between think-aloud and heuristic evaluation.

Similarities: both techniques expose the mental process of a person using an interface.

Differences: think-aloud is usually done by an actual user during user testing; heuristic evaluation is done by a usability expert, who may not be a target user. Think-aloud is verbalized out loud, while heuristic evaluation usually produces a written report (although sometimes a heuristic evaluator uses a think-aloud protocol to generate their comments, which are written down by an observer).

12. (6 points) For each of the following methods, list the dimensions of usability that it can evaluate:

- (a) formative evaluation

All: learnability and errors are most common, followed by efficiency, memorability, and subjective satisfaction.

- (b) heuristic evaluation

All but subjective satisfaction.

- (c) cognitive walkthrough

Primarily learnability and errors.

- (d) keystroke-level model

Efficiency only.

13. (8 points) Here is part of a Java program intended to animate a rectangle:

```
// instance variables
int x, y, w, h; // current position of rectangle
int newX, newY; // new position

// paint method
public void paint(Graphics g) {
    g.fillRect(x, y, w, h);
    if (newX != x || newY != y) {
        int oldX = x, oldY = y;
        for (int i = 1; i <= 100; ++i) {
            Thread.sleep(10); // sleep for 10 msec
            x = (int) (newX*(i/100.0) + oldX*(1 - i/100.0));
            y = (int) (newY*(i/100.0) + oldY*(1 - i/100.0));
            repaint();
        }
    }
}
```

Suppose the rectangle moves from (0,0) to (100,100) – i.e., (x,y) is currently (0,0), and (newX,newY) is set to (100,100). What will happen the next time paint() is called?

Check ALL that apply.

The for loop will take 1 second to run, blocking the event handling thread and preventing it from handling user input or repaint requests. So the repaint() calls in the loop won't do anything. As a result, the rectangle will stay where it is for 1 second, with the application unresponsive to user input, and then suddenly jump to the new location, and the app will become responsive again.

- the rectangle will leave a smear (an unerased trail) across the screen
- the rectangle will animate from (0,0) to (100,100), then stop moving
- the rectangle will animate from (0,0) to (100,100), jump back to (0,0), and then animate over the same path again
- the rectangle will immediately jump to (100,100)
- the rectangle will remain at (0,0) for 1 second, then jump to (100,100)
- the program will stop responding to user input for 1 second, then become responsive again
- the program will hang indefinitely, no longer responding to user input but not crashing either
- the program will crash with a stack overflow

14. (4 points) Explain when motion blur is needed for animation, and give two techniques for simulating it.

Motion blur is needed when an animated object moves very fast -- more than its own width between two frames of the animation. Without motion blur, this would leave empty space between the object's location in one frame and its location in the next frame -- hence appearing to teleport. Motion blur simulates how the retina would see such a fast-moving object in the real world, by filling the empty space with either (1) a smear of the object's dominant color, or (2) repeated overlapping drawings of the object.

15. (6 points) Ben Bitdiddle's interface has a rectangle that changes color, and he wants to animate the color change. Assuming the rectangle is changing from red (RGB=1,0,0) to blue (RGB=0,0,1), describe the visual appearance of each of the following animation paths.

- (a) A straight line through RGB space.

Red to dark purple to blue.

- (b) In the RGBA color space, first animate A to 0, then abruptly change R to 0 and B to 1, then animate A back to 1.

Red to transparent to blue.

- (c) In the HSV color space, first animate S to 0, then change H abruptly, then animate S back to 1.

Red to white to blue.

16. (8 points) Suppose a drawing surface is initially completely clear (RGBA=0,0,0,0), and then you fill it **twice** with 50% translucent white (RGBA=1,1,1,0.5) -- i.e., two separate compositing operations, each using 50% white as the source and the drawing surface as the destination. For each of the following compositing rules, what will be the resulting alpha value of the drawing surface?

(a) Source over destination

50% after one composite ($A_d = A_s + A_d(1-A_s) = 0.5 + 0$)

75% after the second composite ($A_d = 0.5 + 0.5(1-0.5)$)

(b) Destination over source

50% after one composite ($A_d = A_d + A_s(1-A_d) = 0 + 0.5$)

75% after the second composite ($A_d = 0.5 + 0.5(1-0.5)$)

(c) Source in destination

0% ($A_d = A_s A_d$)

(d) Destination in source

0% ($A_d = A_d A_s$)

17. (3 points) In the keystroke level model, which motor processing law governs the P operator, and which law governs the D operator?

P operator: Fitts's Law

D operator: steering law

18. (3 points) What kind of user behavior can a CPM-GOMS model represent that a keystroke level model cannot?

Parallel operation of the two hands, eyes, perception, and cognition.

19. (3 points) What particular incident spurred the creation of ethical guidelines for human-subjects research at federally-funded institutions in the United States? Answer in one sentence.

The critical incident was the public exposure of the US-government-funded Tuskegee Institute study that had been studying the progress of untreated syphilis among hundreds of rural Southern black men for 40 years, without telling them they had the disease, despite the existence of an effective treatment for syphilis, resulting in deaths and other health problems among the men, their wives, and their children.

20. (4 points) Describe two different kinds of reversibility in a user interface that do *not* involve the Undo command.

*Physical action reversibility, like dragging a scrollbar thumb.
Commands that reverse through other histories, like Back/Forward for web browsing.
Forward error recovery, like reversing a Boldface command by selecting the same text again and toggling Bold off.*

21. (3 points) Define *selective undo*.

Undoing an arbitrary action in the history, not just the last one.

END OF QUIZ