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1. (5 points each) Define the following terms

a) Fitts’ Law
   Time to move the hand depends only on the relative precision required

b) Memory chunking
   Data stored in short-term memory can hold varying amounts of information depending on how it is represented and organized. Chunking refers to the technique of grouping common patterns.

c) Rods
   primarily for night vision & perceiving movement
   sensitive to broad spectrum of light
   can not discriminate between colors
   sense intensity or shades of gray (luminance)

d) Cones
   used to sense color (chrominance)

e) Common responsiveness bloopers
   Windowed OS in which the pointer on the screen doesn’t keep up with the user’s movement.
   Word processors and text editors that can’t keep up with the users’ keystrokes, etc.
   On-screen buttons that don’t acknowledge mouse clicks.
   Menus that lag

f) Pizza
   Yummy!

g) Sans serif font
   Fonts without the 'feet'

h) WYSIWYG
   What You See Is What You Get

i) UI widget
   User interface abstraction for input/output.

j) Task analysis
   Asking questions to learn as much as possible about how intended users do tasks to be supported by a user interface being designed
2. (10 points) During the interactive prototype presentations, what did the ParseView team do to embed a Java Swing application directly into their PowerPoint presentation (i.e., what techniques or software plug-ins did they use)?

They used successive image screen shots overlapping within the PowerPoint slide to simulate interaction with a running application.

3. (20 Points) Answer the following questions about color.

a) What is the additive model of color? Where does it occur?

- Light adds to create different colors
- All RGB gives white, no RGB gives black
- Typical in monitors and projectors

b) What is the subtractive model of color? Where does it occur?

- Light absorbed by material on surface so it removes primaries to create color
- All RGB gives black and no RGB gives white
- Typical in printing – inks on different surfaces absorb different light/color wave lengths

c) Describe two examples where color can impact the design of a user interface.

Example 1:
Avoid use of Red/Green to differentiate meaning as color blind users will not see a difference.

Example 2:
Avoid pure blue for texts, lines and small shapes as people have less ability to detect/see the objects or text.
4. (20 points) Answer the following questions about the model human processor.

a) Draw a diagram of the model human processor.

![Diagram of the model human processor]

b) Explain the difference between long- and short-term memory

- **Working memory (short term)**
  - Small capacity (7 ± 2 “chunks”)
  - 6174591765 vs. (617) 459-1765
  - DECIBM G/MC vs. DEC IBM GMC
  - Rapid access (~ 70ms) & decay (~200 ms)
  - pass to LTM after a few seconds

- **Long-term memory**
  - Episodic & semantic
  - Huge (if not “unlimited”)
  - Slow access time (~100 ms) w/ little decay
c) Give one example of how this understanding of memory impacts user interface design?

An interface should not expect a user to remember many details from one screen to be re-entered on another screen.

5. (20 points) Consider interface evaluation and testing.

   a) List four distinct methods discussed in lecture to evaluate a user interface.

      Any four of the following:
      Free market
      Panel of experts
      Feature comparison
      Usability study
      Human factors experiment

   b) Explain the difference between evaluation and testing of a user interface.

      Evaluation tests how well an interface solves a problem - compare an
      interface to another interface or to a currently manual process.

      Interface testing checks whether the behavior of an interface is
      correct - does it do what the requirements/design says it should do or
      does it behave the same way on different platforms?

   c) What is the fundamental rule for deciding whether to do a controlled experiment?

      Is the cost of doing the experiment greater than the cost of doing the wrong thing? In other words, if you make the wrong design decision, will the cost be higher than the cost of doing the experiment that presumably will give the correct answer.
6. (15 points) List three variations of a web page hidden link blooper:

   a) Images that aren’t clearly links

   b) Inconsistent link colors

   c) Click this! Burying links in text.

7. (15 points) Human behavior has lead to three “time constant” goals that computer systems must meet in order to be perceived as responsive. Given the time constant, describe the human perception limit.

   d) 0.1 second
      Perception of successive events
      Perception of causation
      Perception fusion, of smooth animation

   e) 1 second
      Turn-taking in conversation
      Minimum response-time for unexpected events

   f) 10 seconds
      Unbroken concentration on a task
      Unit task: completing one ‘unit’ task in a larger task

8. (30 points) Answer the following questions about the model-view-controller (MVC) paradigm for a GUI application architecture.

   a) Draw a diagram showing the software and hardware elements of an MVC architecture.

   b) Briefly describe the function of the model, view, and controller.
• **Model** – the application data structures  
• **View** – code to produce output displays  
• **Controller** – code to handle input events

c) What advantages does the MVC architecture have over other GUI application architectures?

- Separation eases maintenance  
- Easy to add item to model  
- Easy to add a new view

d) Why do some observers argue that the paradigm should be model-view/controller” rather than model-view-controller?

- View & controller are tightly intertwined  
- Lots of communication between the two  
- Almost always occur in pairs  
- Each view typically has its own controller  
- In practice, controllers are never re-used  
- Many toolkits combine into one class

9. (10 points) Describe two “presenting information poorly” bloopers.

- Overwhelming users with decisions and detail  
- Easily missed information  
- Unexpected rearrangement of display  
- Instructions that go away too soon
10. (20 points) Answer the following questions about event-driven programming.

a) Describe event-driven programming

Program is organized into segments that are called in response to events input to the program from user actions.

b) Why do GUI interface programs use event-driven programming?

The user of an interface does actions in a random order depending on his or her use of the application. Hence, the program must be organized so that it can accept any one of several actions at any time.

c) What problems might occur if an event handler executes for too long?

User might get frustrated and start generating more input events trying to get the program to respond. In essence, the program will be unresponsive.

d) Can you think of a circumstance where you might want an event handler to execute for a long time?

The user action requests a long computation such as “compile this system” or “print the 10 thousandth digit in pi.” In these circumstances the interface should change the mouse cursor to signify that the program is computing.