CS 4470 — UI Software   **November 3rd 2000**

Midterm Exam #2

1. (*15 points*) When we talk about the output side of a toolkit, we break the process into two separate phases, "geometry management" and "redraw". What is the difference between these two phases, and why are they normally separated?

2. (*15 points*) You have been hired by Microsoft to design "Windows for Wearable Computing". The hardware you will use includes a head-worn display with a high resolution (2048x1024) that gives the user the impression that the Windows desktop is surrounding them (180 degrees horizontal by 90 degrees vertical). Your input device is a gyroscopic sphere that you can turn in any direction, and outputs how far it has been turned in the horizontal (X) and vertical (Y) directions. The sphere would have a strap so it could hang from a persons belt, and have some buttons on it. This device needs to be used to control the Windows mouse. Should this basic input device be used to create an absolute or relative locator, or be used in some other configuration? Justify your answer based on the mechanics of the device and the context in which it will be used.

3. (*15 points*) You are designing a new kind of scrollbar. The original scrollbar (shown at the left) has a slider and an arrow button at each end of the bar to move the scroll bar by a small amount. You want to modify the scrollbar to have two arrows at each end. Two similar designs are shown below, one which uses arrows that are the same size as the original and one that uses arrows that are half as the size (in one direction, either horizontal or vertical).
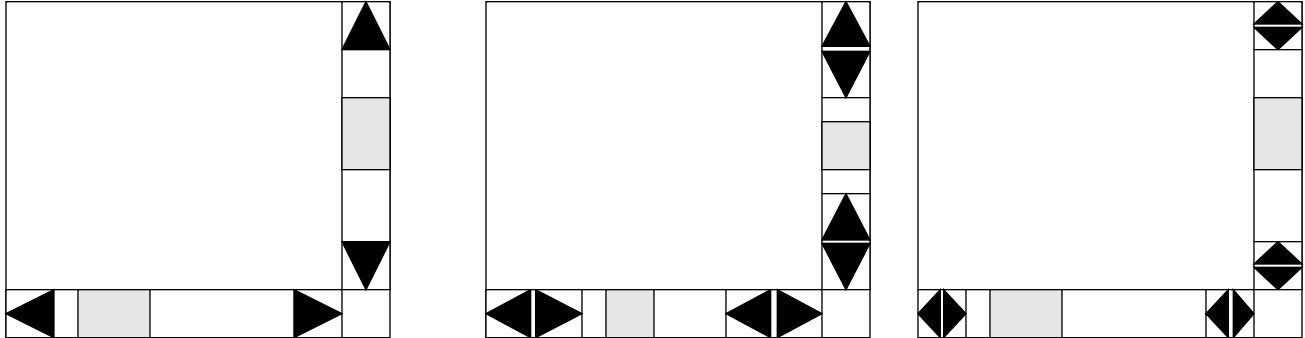
What are the advantages and disadvantages of all three designs?

4. (*15 points*) You are building a Paint program, and want to ensure that when you drag regions around the screen (while copying them, for example) the interactive response of the program does not become too slow. How would you use the approach suggested by the "Pacers: Time-Elastic Objects" paper to ensure that the drag happens smoothly?

5. (*25 points*) Constraints.

a) What is the different between one-way and multi-way constraints?

b) State one advantage and one disadvantage of each.

c) Which is more commonly used in user-interface toolkits? Why?

d) In the DeltaBlue system, a multi-way constraint system is reduced to a one-way constraint system so a fast one-way constraint solving algorithm can be used to solve it. In a situation where we have a constraint such as "A = f(B, C)", (such as one point being a function of two other points), DeltaBlue can be used to allow the user to manipulate any of the 3 points, and have the others change accordingly. Explain this apparent contradiction.

6. (*15 points*) Many forms of input (such as speech, gesture or handwriting) are error prone and potentially ambiguous. Currently, most approaches to handling this ambiguity are incorporated into applications. How can the common toolkit event architecture be extended to deal with the input ambiguity that arises when using these forms of input?