Assignment 2 – Mensch-Maschine-Interaktion 2

Note: You can receive a maximum of 20 points for each exercise sheet. If you reached at least 15 points you get one bonus point. You can receive only 1 bonus point per sheet. Bonus points will be added to the points achieved in the final exam.

Tasks need to be performed individually. The consequence of plagiarism is the non-admission to the final exam. Your answers may be in English or German.

Exercise 1: Design Space (6 points)

Choose two interactive devices in your environment not yet presented in Card's design space and take a picture of them.

1) Describe your two input devices according to Card's design space (see related work below).
   a. Visually: draw the parametric space and place your device in it. (with composition!)
   b. Formally: as six-tuple (no need to formally describe the composition!)

Related work:
Stuart K. Card, Jock D. Mackinlay, and George G. Robertson. 1991. *A morphological analysis of the design space of input devices. ACM Trans. Inf. Syst.* 9, 2 (April 1991), 99-122.

Exercise 2: Implement and test the area cursor. (10 points)
Implement a Java Program (use Java 7), that opens a window and listens to cursor movements. Implement the following:

1) draw two circular targets (size=20px) inside your window. Their color is red and they turn green as soon as your cursor enters the target. Draw a small cross cursor at the position of your mouse cursor.

2) If you click the left mouse button of your mouse while the cursor is inside the target, a timer starts. As soons as you click inside the other target, the timer calculates the elapsed time between the two click events, prints them to the terminal, **and restarts the timer (which stops and restarts with the next click etc.)**.

3) Draw a circular „area" around your pointer cross (size=80px), that follows your mouse movements. As soon as the area intersects a target, the target turns green and mouse click events are delivered to the target starting a timer as in 2). Try your area cursor!

4) Draw 20 targets in a similar fashion to 1). They have the same size. Choose a random on-screen position with the condition that targets are not overlapping. Try your area cursor now. Describe in one sentence what problems can occur with an area cursor when having a large number of targets? Think about a solution to the identified problem and explain it in one paragraph. Implement the proposed solution **and submit it as a separate runnable program**.

Exercise 3: Movement Time Estimation (4 points)

You have two circular targets on your screen. Both are 99 pixels wide and 1150 pixels apart. Assume your input device is a mouse pointer and the CD-gain is one. Assume that a=230ms and b=166 ms/bit ([MacKenzie et al. 1991])

a) What movement time can we expect following Fitts' law?
b) Assume you have an area cursor with a diameter of 150px. What movement time can we expect now? tip: how imprecise can your movements be when using an area cursor?
   a. What is the distance in this case and why?
   b. What is the target size in this case and why?

Related work:
MacKenzie, I. S., Sellen, A., & Buxton, W. (1991). A comparison of input devices in elemental pointing and dragging tasks. *Proceedings of the CHI '91 Conference on Human Factors in Computing Systems* (pp. 161-166). New York: ACM.

Submission:
Create a folder called „assignment2" containing the following submission files:

1. Programming tasks: submit all java files, libraries etc., necessary to compile and run your program. **Submit exercise 2 1) to 4) as one program and the part with 'your solution' as another program.**
2. Writing tasks: submit either on physical paper or as .txt/.pdf file.
3. 'Taking pictures' tasks: submit .jpg files.

The submission date is november 13th 2pm in UniWorx.