Human-Computer Interaction Group

Leibniz Universität Hannover

# Mobile Interaction
# Summer 2024

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# Assignment 6

All exercises that are not explicitly declared as group tasks must be done individually and handed in individually. Identical submissions are treated as plagiarism. Plagiarism may lead to loss of exam bonus points.

You can submit the solution to this task in English or German until Wednesday, May 15, at 23:59 via https://assignments.hci.uni-hannover.de. Create a pdf file that contains the text and images of your solution, name it "Assignment-06-<Firstname>-<Lastname>.pdf", and save it together with the exported project (Android Studio: File → Export → Export to Zip File) in a single zip file. Your submission must consist of a single zip file containing all necessary files. The name of the .zip file, as well as the names of the contained files, **must not contain any umlauts**. Therefore, please resolve umlauts in file names.

**Android Phones:** Please let us know if you need an Android phone for the assignments. We can lend a limited number of simple Android phones for the duration of the semester. These must only be used for the assignments.

## Exercise 1: Comparison of Off-Screen Visualizations (24 points)

In this exercise we experimentally compare the accuracy of *Halo* and *Wedge*. The aim is to clarify which visualization enables a more precise localization of off-screen objects and how well the visualizations work depending on the visible width of the halo or wedge. Use the Web page template available on Stud.IP (MI-assignment-06-OffscreenJavaScript.zip) for this experiment. The template uses JavaScript. So, if necessary, activate JavaScript in your browser. In one variant, the Halo or Wedge should protrude 20 pixels into the display, in the other variant 40 pixels. The experiment should be carried out as a within-subject design, i.e., each participant should execute all variants.

a) What are the independent variables (factors, experimental conditions) in this experiment and what values (levels) can they take? **(3 points)**

b) What is the dependent variable (the measured value)? **(1 points)**

c) In the within-subjects design, attention must be paid to the arrangement of the variants (counter-balancing, ordering of the conditions). Why? **(2 points)**

d) Execute the experiment with **three** participants. Explain the order in which you ask the participants to perform the different conditions. The browser window should be maximized first. The participants should click as quickly and precisely as possible on the imagined midpoints of the objects outside the mobile device screen. Please tell your

participants that the empty space around the device is clickable! Halo or Wedge indicate where the objects are located. The position of the objects is 50, 100, or 200 pixels from the edge of the display. This must not be communicated to the participants! 50 clicks are recorded for each variant.

At the end of the experiment, the result appears on the web page. The appearing table shows the raw data. You do **not** have to be **present in person** during the trials – you could also have the results **emailed** by the participants. (Select all text on the result page, paste into a response email.) The generated raw results pages are part of the submission. **(8 points)**

e) Insert the collected results by cutting-and-pasting them into a **spreadsheet** of your choice. Collect and view the data of the three participants together (use one column as the participant ID). Determine the mean and median of measured accuracy (distances in pixels) for the four variants (halo-20, halo-40, wedge-20, wedge-40) and for each object distance (50, 100, or 200 pixels). To do this, create a bar chart that shows all four variants. The object distance should be displayed on the x-axis and the mean of the measured accuracy on the y-axis. **Ask the participants** which technique they preferred and report their statements. Label the chart (axes, legend for lines). **(7 points)**

f) Compare the results of the variants. Try to answer the question which off-screen visualization technique enables more precise localization and whether the width of the visible area has an influence on the result. Discuss your results. **(3 points)**


**Figure 1:** Halo, which protrudes 20 pixels into the display and Wedge, which protrudes 40 pixels.

## Exercise 2: Touch Screen Interactions (10 points)

a) The lecture presented "Shift" and "Escape" as interaction techniques to improve target selection. Which of the two techniques do you find suitable for real-world use? Why?

Can you point out similar techniques that are actually applied in commercial mobile user interfaces? **(2 points)**

b) Design a "bezel input" interface for mobile phones and tablets for text annotations in PDF files. Have a look for "bezel input" in the lecture slides: A gesture starts at the border of the device and crosses a narrow button into the touch screen. The possible text annotations should be: yellow background highlighting, green background highlighting, red wiggly line underlining, and clearing the highlighting for a piece of text. Describe your design (textually or with a sketch) and describe how to do annotations with it. **(4 points)**

c) Explain why the "two-state model for touch input" is inadequate for back-of-device input. **(2 points)**

d) Explain the tradeoff regarding target sizes of tappable targets on touch screens. **(2 points)**