

Course: **Human-Computer Interaction**
Topic: **Statistical data analysis in HCI research**
Resource: **Mock-up cases (descriptions)**

CASE 01

The experiment investigates the potential effects of placing a menu component within the user interface of a specially developed web application. Specifically, four menu design options are examined: drop-down menu at the top, pop-up menu at the bottom, docked menu on the left, and docked menu on the right.

45 participants accessed the test application and worked with specially prepared tasks in all four versions of the menu in the previously defined order. The total time taken to complete a task cycle with each individual menu was measured. These time values for each individual participant are available in an Excel file.

Perform a statistical analysis of the available data and draw appropriate conclusions.

CASE 02

The experiment investigates the potential effects of placing a menu component within the user interface of a specially developed web application. Specifically, four menu design options are examined: drop-down menu at the top, pop-up menu at the bottom, docked menu on the left, and docked menu on the right.

30 participants accessed the test application and completed specially prepared tasks in all four versions of the menu in the previously defined order. After completing all tasks, participants had to rate their satisfaction with each menu design. A specially developed questionnaire with a minimum total score of 0 (worst score) and a maximum total score of 15 (best score) was used to assess the level of satisfaction. The values of all scores for each individual participant are available in an Excel file.

Perform a statistical analysis of the available data and draw appropriate conclusions.

CASE 03

The experiment investigates the effectiveness of task performance within a specially developed mobile application. The mobile application can be executed on two different observed devices (smartphone and tablet), and interaction can take place in two different ways (finger and stylus).

The controlled experiment included 20 participants who had to perform a specially designed task of longer duration on each device and using both interaction modalities. The order of the experimental conditions was counterbalanced accordingly. The values of task execution time for each participant are available in an Excel file.

Perform a statistical analysis of the available data and draw appropriate conclusions.

CASE 04

The experiment investigates the efficiency of text entry based on the WPM metric using a specially developed virtual keyboard for mobile devices. The special feature of this keyboard is that it does not have a standard QWERTY layout, but is based on two alternatives: the user can use an alphabetical order of the keys or a specific order determined as part of predictive modeling using a genetic algorithm.

In the controlled experiment, 30 participants took part in the typing tasks in both versions of the keyboard (with alphabetical and specific layout) and in three different ways: one-handed typing with the thumb, typing with two thumbs, and typing in cradle mode (while one hand holds the device, the index finger of the other hand is used for typing). The order of the test conditions was properly counterbalanced. Each user entered 30 different phrases for each test condition so that the average performance for each condition could be determined. The mean values of the WPM metric for each participant are available in an Excel file.

Perform a statistical analysis of the available data and draw appropriate conclusions.

CASE 05

The aim of the experiment was to investigate whether working in the developed web application is faster and more pleasant when it is used in a desktop browser (on a PC) or in a mobile browser (on a smartphone).

40 participants took part in the controlled experiment. During the test, they had to complete a cycle of 10 tasks within the said web application using both a desktop browser and a browser on a smartphone. The mean value of the execution of all 10 tasks in the cycle was used as a quantitative efficiency indicator. At the end of the test, the participants completed a simple questionnaire in which they gave their subjective assessment of the level of satisfaction when working with the web application (1 - lowest level of satisfaction, 11 - highest level of satisfaction). The mean values of the task execution time and the results of the questionnaire are available in an Excel file.

Carry out a statistical analysis of the available data and draw appropriate conclusions.

CASE 06

The aim of the experiment was to compare the usability of three different designs for a specific mobile application. The names of these designs are "Light theme", "Dark theme" and "Joy theme". It was decided that usability should not be examined on the basis of individual usability attributes, but on the basis of a standardized SUS (System Usability Score) questionnaire.

30 participants responded to the call for experimental testing and tested all three different designs in a predetermined order by going through the corresponding checklist of representative tasks. After testing each design, the participants had to complete the SUS questionnaire. The SUS questionnaire is based on 10 questions in a Likert scale format, and a final metric ranging from 0 to 100 is formed based on the answers.

A higher score indicates a higher level of usability. The SUS score values for each mobile app design, as rated by individual users, are available in an Excel file.

Perform a statistical analysis of the available data and draw appropriate conclusions.

CASE 07

The aim of the experiment was to compare the workload caused by two different interaction modalities in a virtual reality (VR) system. In the first modality, interactive elements in a VR application are accessed via a hand controller, while in the second modality, a virtual beam projected according to the position of the headset is used for this purpose.

Twenty users participated in the experiment, performing the given task set with both modalities (with corresponding counterbalancing in determining the order). After performing representative tasks with the given modalities, participants completed the standardized NASA TLX questionnaire (the so-called "raw" version), in which they directly compared five selected TLX factors on semantic differential scales with 21 levels. The TLX factor scores for each modality tested, according to each user's rating, are available in an Excel file.

Perform a statistical analysis of the available data and draw appropriate conclusions.

CASE 08

The experiment examines the effect of the pointing device on the time of the trajectory tracing task. A test application was developed in which path tracking can be performed with the finger, the mouse, the stylus and the joystick.

Thirty participants took part in the experiment and completed a cycle of 10 unit tasks of varying complexity with each pointing device. The order of the devices in the test procedure was counterbalanced according to the principle of the 4x4 Latin square. The mean time of task execution in the cycle was used as a measure of efficiency. These mean values of task execution time for each individual participant are available in an Excel file.

It is necessary to perform a statistical analysis of the available data and draw appropriate conclusions in two different contexts:

- (1) Considering all pointing devices as separate interaction modalities;
 - (2) Averaging the values for direct manipulation (finger, stylus) and indirect manipulation (mouse, joystick) and comparing the efficiency only in relation to these two aspects.
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CASE 09

The experiment examines the potential effects of the pointing device when performing trajectory tracing tasks. A test application was developed in which trajectory tracing can be performed with the finger, mouse, stylus and joystick.

Twenty participants took part in the experiment and completed a cycle of 10 unit tasks of varying complexity with each pointing device. The order of the devices in the test procedure was counterbalanced according to the principle of the 4x4 Latin square. After completing all tasks with all devices, participants had to rate their perceived interaction workload in relation to each individual pointing device. A specially developed questionnaire with a minimum total score of 1 (best score, lowest workload) and a maximum total score of 15 (worst score, highest workload) was used for the evaluation. The values of all scores for each individual participant are available in an Excel file.

It is necessary to perform a statistical analysis of the available data and draw appropriate conclusions in two different contexts:

- (1) Considering all pointing devices as separate interaction modalities;
 - (2) Averaging the questionnaire values for direct manipulation (finger, stylus) and indirect manipulation (mouse, joystick) and comparing the interaction workload only in relation to these two aspects.
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