

Interaction Technology and Techniques

Assignment 2: Experiments, Logging

Summer semester 2016

Submission due: Monday, 2. May 2016, 23:55

Hand in in groups of max. two.

Your first task is to read and summarize a paper on experimental design in HCI. Your second task is to build the basis of a tool for conducting and logging experiments. Using this tool you have to plan and conduct a user study and document the results in CSV files. Feel free to analyze the results you obtained. However, we will also do this together in the next session.

2.1: Whys and Hows of Experiments in HCI

Read Kasper Hornbæk's paper "Some Whys and Hows of Experiments in HCI"¹ and answer the following questions in a plain-text file (no more than 5000 characters):

- What does Hornbæk say about the relationship between self-reported and objectively measured task performance?
- Describe advantages and limitations of research hypotheses.
- Is it acceptable to conduct user studies with media informatics students as participants instead of a broad sample of potential users? What are advantages and limitations? Name one topic for a user study where it would be problematic to have only media informatics students as participants. Name one counter-example.

Points

- **1** Good answer for the first question.
- **1** Good answer for the second question.
- **2** Good answer for the third question.

2.2: Plan an Experiment

Plan a single study for measuring the reaction time of users for different tasks. Compare the influence of the following two factors on the speed with which users are able to press keys on a keyboard.

- **amount of mental processing required:** participants are either subjected to a pre-attentive binary choice or an attentive binary choice. The participant is pseudo-randomly presented one of two similar stimuli that require either pre-attentive processing (e.g., red/blue squares, one or two squares, letter 'X' or letter 'O') or attentive processing (e.g., even and odd numbers, German and English words). They should press one of two keys (e.g., 'v' or 'b' - they should be close together) depending on which of the two stimuli is presented on the screen.
- **distraction:** participants are either distracted by something (noise, music, background image, movement in the visual periphery) or not. Choose a suitable distraction.

¹<http://www.kasperhornbaek.dk/papers/SomeWhysAndHows.pdf>

Your study should use a within-subjects multi-factorial design with at least 10 repetitions per condition. Try to minimize confounding and random variables, such as learning effects, fatigue, participants' cognitive properties.

Document your study's goal, hypotheses, setup, participant selection, etc. Also document your independent, dependent, and controlled variables. Document values for controlled variables, e.g. keyboard type.

Hand in the following file:

reaction_time_experiment_design.pdf: a report (2 pages max.) that contains the following sections:

- *Introduction* which explains the goal of the experiment,
- *Experimental setup* which documents the factors and variables, and
- *Participants* which describes the participants of the experiment and explains why you chose them.

You may use any formatting. Properly reference all sources.

Points

- **2** Experiment design contains all information mentioned above.
- **2** Correct and comprehensive description of all variables.
- **1** Proper formatting and language in the document.

2.3: Implement the Experiment

Expand `space_counter.py` so that it displays the necessary information on screen and records all relevant information to a log file. The application should read the experimental setup from a file given as the only parameter on the command line. The file should contain a test description in the following format:

```
PARTICIPANT: 1  
REPETITIONS: 10  
TIME_BETWEEN_SIGNALS_MS: 1000
```

For every trial, the following information should be logged to a CSV file:

- participant ID
- shown stimulus (concrete word/color/number/etc.),
- mental complexity (pre-attentive vs. attentive) of stimulus
- distraction (yes/no)
- pressed key
- whether the correct key was pressed
- reaction time
- timestamp
- all other information you deem important

Trials should be randomized or counterbalanced.

Helpful tips for logging of experiment data will be given in the course session on 26.4.2016

Hand in the following file:

reaction_time_test.py: a Python script that implements the above requirements and can be used to conduct the aforementioned test.

Points

- **2** The python script has been submitted, is not empty, and does not print out error messages.
- **2** The script correctly reads the test description and shows the required signals.
- **2** The script correctly logs all information to a CSV file.
- **1** The script is well-structured and follows the Python style guide (PEP 8)

2.4: Conduct the Experiment

Find four participants (which may also include you) to conduct the experiment. One member of the group conducts the experiment and instructs the participants what they need to do. (Please do a test run beforehand to catch any technical problems.) Log the results of all four participants.

Hand in the following files:

reaction_time_results.csv: a CSV file containing concatenated log files of all participants.

reaction_time_report.pdf: a short report documenting any interesting events during the experiment and all limitations of your experiment that you found when conducting it (e.g., you forgot to explain to all participants what they had to do).

Points

- **1** All four log files have been submitted.
- **1** The report has been submitted.
- **2** The report is overall plausible and well-written.

Submission

Submit via GRIPS until the deadline

All files should use UTF-8 encoding and Unix line breaks. Python files should use spaces instead of tabs.

Have Fun!