Assignment 4
Mini HCI Research Experiment

Group member list due June 12, 2015, 6:00 AM   **Group of 6–7**
Part 1: Research questions latest on June 18, 2015, 6:00 AM
Part 2: Experiment protocol latest on June 25, 2015, 6:00 AM
Part 4: Pilot study latest appointment July 3, 2015, 14:00 PM
Presentation July 9, 2015 in the lab
Report due July 16, 2015 6:00 AM

Description

So far in the class, you have learned to read, understand, and evaluate research articles. In this assignment, you will conduct a small experiment to investigate a research question that you will come up with in the domain of <u>text entry on small screen-based devices</u> (e.g., smart watches). (You will simulate the small touch screen using your own smart phones.) You will design your experiment, conduct a small-scale user study, and analyze the data from the user study. Finally, you will give a presentation of your results and write up a short research report.

In this assignment, we will focus on how experimental research methods that you have learned are applied. For your user study, you will design and configure a simple software to provide randomization of the condition exposure and data logging. The main challenge is this research area is the small input screen for both input and feedback. You can investigate different keyboard layouts, input gestures, letters search algorithm, feedback techniques, etc. You may use additional input devices such as Leap Motion sensor[*] and built-in inertial sensors[†]. You need to allocate time to work on implementing the software for such studies.

You should divide responsibility among team members. For example, form two subgroups that are responsible for implementation and user study to work in parallel.

Task

First, gather your group and fill in this Google Doc (https://goo.gl/R8ltNl) with the names for your team members. Then, perform the task in each part below. Some of the parts can be done in parallel. The submission dates for part 1, 2, and 4 are the upper bound recommendation. You may submit earlier for an earlier feedback and have more time for the later parts.

Part 1: Research question generation: You are to propose three experimental research questions that you want to investigate. (Your question does not need to be original or novel.) Nur will choose one of the proposed research questions and help you refine it for the study. (Turnaround time: 1–2 days)

Appendix 1 provides some pointers for papers that you can skim for inspiration. These papers suggest possible independent variables and dependent variables that you may use in your study.

Appendix 3 provide some examples of research questions. You are however, encouraged to come up with some research questions by yourself before reading this section.

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[*] The Leap Motion hardware be released by Nur upon request. You should get familiarize with Leap Motion API beforehand.

[†] Consult with Nur on other devices.

❏ Submit a text file listing three research questions that you want to investigate

Part 2: Experiment protocol and consent form: After the research question has been approved, create an experiment protocol (as you did in Assignment 2, but this time you must include Data Analysis section as well). You must include at least three citations in the Context section of your protocol.

You also need to provide a signed consent for the users who will participate in your study. Use the provided template (Appendix 2) to create the consent form.

Your experimental protocol will be reviewed by two peer groups (to be assigned after all groups have their research question approved) and by Nur (Turnaround time: 3–4 days).

❏ Share a copy of a Google Doc containing your experiment protocol and the consent form (give a "can comment" permission).
❏ Peer group: provide feedback to the experiment protocol (Turnaround time: 3–4 days)

Part 3: Implementation: You may work on the implementation as soon as the research question is approved. You may need to make adjustments according to the changes and feedback to the user study protocol. Note that you need to explicitly add these functionalities on top of your implementation:

- *Ordering and configuration of the condition that the users will be exposed.*
- *Data logging:* Make sure that your log provide adequate information you need in order to measure the dependent variables you planned. I recommend you log both raw (e.g., finger position on screen or in 3D) and summarized data (e.g., task completion time) to maximize recoverability of the results without requiring participants to redo the experiment.

Part 4: Pilot study: Once you have the implementation, experiment protocol, and the consent form ready, test the entire procedure of your experiment with one or two of your group members. Then, schedule your pilot study with Nur and one person from each of your peer group. We will observe and comment on your experiment on the following points:

- How you prepare the setup before the study
- How you conduct the study
- How were and what are the data logged both in the software and manually

❏ Test run your study with your team members

❏ Make an appointment with Nur and one person from each of your peer group to observe your pilot study

❏ At least 24 hours before the pilot study, send Nur and the peer observers the experimental protocol (PDF, by email).

Part 5: User study: After the pilot study, you will conduct the user study with at least five participants. You may recruit classmates from other groups or external people, depending on your research question.

- Don't forget to collect demographic information, e.g., age, gender, etc.
- Organize the data you collected into folder and create a README file.
- Separate the data from the identifiable information of your participants. E.g., refer to participants in the data by anonymous ID.

Part 6: Data analysis: You will analyze your data as planned in the experimental protocol. For the purpose of this class, you may use solely the central tendency (mean or median) and spread (95% confident interval or interquatile range) for the analysis. Null-hypothesis significant tests (e..g, ANOVA or *t*-tests) are optional.

• Keep track of your data analysis as you will have to submit the analysis details

Part 7: Presentation and write up: Here, you will prepare a 10-minute presentation and write a report for your project (2–3 pages). The presentation must provide an overview of the research questions, the procedure, and the main results. As for the report, use the HCI Archive Format Latex or Microsoft Word template (http://chi2014.acm.org/authors/format) and structure your paper similar to the conference papers:

• *Introduction:* describe the context that you are investigating and motivate the readers of the importance of your research questions

• *Related work:* review previous research that are relevant to your research question to highlight the gap of the knowledge.

• *User study:* Briefly describe procedure, participants, and results from your user study

• *Discussion:* Discuss the implications of your results and connect back to the research question and the context

You may add more sections as appropriate.

❏ Prepare the presentation for your project

❏ Submit a PDF file for the final report

❏ Submit a PDF file for the final version of the experiment protocol and the consent form

❏ Submit the anonymized raw data

❏ Submit the analysis file (e.g., Excel spreadsheet, JMP data files)

Submission
Submit each part above by email to hamdan@cs.rwth-aachen.de with the subject "A04 Group XX".

Appendix 1: *Papers related to small device input*

These papers provide diverse perspective to graphical input experiments and interaction designs. An easy way to grasp the overview of the papers are to check "Source Material" section in the ACM digital library for the video figure provided by the authors.

Use these sources to find: interesting independent variables, important dependent variables, valid tasks, and variations of experimental design and procedures.

Leiva, Luis A., et al. "Text Entry on Tiny QWERTY Soft Keyboards."*Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*. ACM, 2015.

Hong, Jonggi, et al. "SplitBoard: A Simple Split Soft Keyboard for Wristwatch-sized Touch Screens." *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*. ACM, 2015.

Markussen, Anders, Mikkel Rønne Jakobsen, and Kasper Hornbæk. "Vulture: a mid-air word-gesture keyboard." *Proceedings of the 32nd annual ACM conference on Human factors in computing systems*. ACM, 2014.

Oney, Stephen, et al. "ZoomBoard: a diminutive qwerty soft keyboard using iterative zooming for ultra-small devices." *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. ACM, 2013.

Chen, Xiang'Anthony, Tovi Grossman, and George Fitzmaurice. "Swipeboard: A text entry technique for ultra-small interfaces that supports novice to expert transitions." *Proceedings of the 27th annual ACM symposium on User interface software and technology*. ACM, 2014.

Partridge, Kurt, et al. "TiltType: accelerometer-supported text entry for very small devices." *Proceedings of the 15th annual ACM symposium on User interface software and technology*. ACM, 2002.

Appendix 2 is available on https://goo.gl/9hAR4f

Appendix 3: Example of research questions

These are some examples of research questions in text entry on small devices. You are encouraged to come up with your own research questions rather than using one of these. However, should some of the questions below be compelling to you, you may use some of them.

• How do different keyboard layouts influence speed (WMP) and error rate of touch input?

• How does the size of the keys in a soft keyboard influence speed and error rate of touch input?

• How does audio feedback influence speed and error rate of input?

• How do different fingers on the hand performs in a typing task?

• How does the performance differ between touch input vs. gesture input?