EECS 4441 / EECS 5351

Human-Computer Interaction
Summer 2025

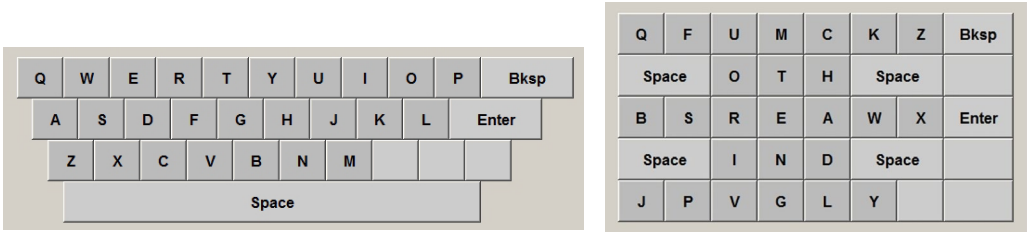
--- Assignment ---

--- Due May 21st ---

This assignment is a mini research project. It is also a precursor to the course project. You have the requisite skills to do the assignment *now*! So, don't delay. Get the assignment done as soon as possible.

A research project in human-computer interaction (and other fields) involves *investigators* and *participants*. The investigators are the researchers – the people doing the research. The participants are the humans (aka "users") the investigators observe. Participants interact with a user interface while their performance is observed and measured. The participants' thoughts and opinions are solicited afterward. For the assignment, you are both the investigator and the participant.

The assignment involves testing and comparing two soft keyboard layouts for text entry. The layouts are Qwerty (left) and Opti (right):



The Qwerty layout is well known. The Opti layout attempts to minimize finger or stylus movement for a soft keyboard layout. To learn more about the motivation and design for the Opti keyboard, open Google Scholar and search on "Opti soft keyboard."

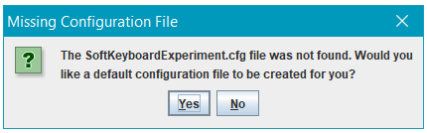
Part 1

Download and Launch the SoftKeyboardExperiment Software

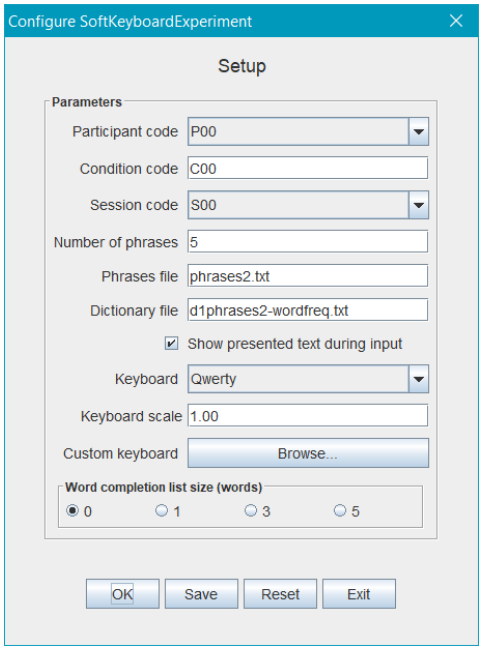
For the first part of this assignment, visit Professor MacKenzie's web site for experiment software (click here). The site includes a variety of HCI experimental apps for Windows and Android platforms. In the Windows section, click on SoftKeyboardExperiment. Download the JAR file (`SoftKeyboardExperiment.jar`) and place it in a directory on your computer. The JAR file is an executable Java archive file. It contains the entire application.

The JAR file will execute on any computer with the Java runtime environment (JRE) installed. If you've ever run a Java app on your computer, the JRE is already installed. If you need to install the JRE, you can download it free from Oracle (click here). If you need help installing the JRE on your computer, please contact the course TA.

On your computer, navigate to the directory containing `SoftKeyboadExperiment.jar` and launch the app (e.g., by double-clicking the icon). The first time the app launches, a popup will appear noting that the configuration file is missing:

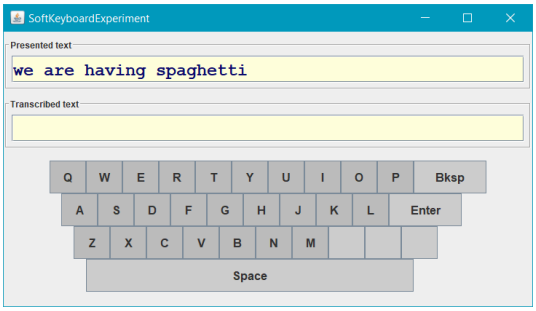


Click "Yes" to create the configuration file. This will also extract a dozen or so other files needed by the app. When this is complete, the app launches and presents a Setup dialog:

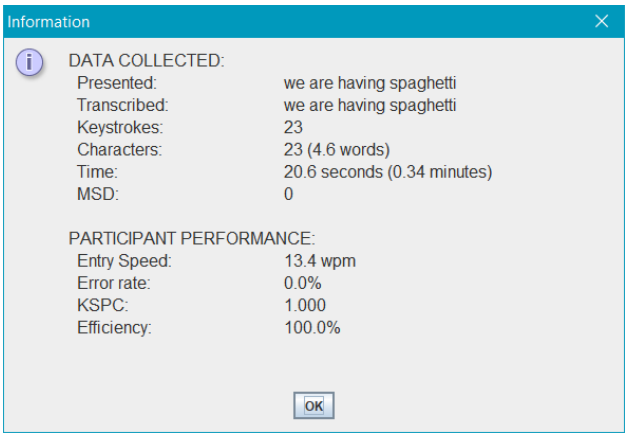


For the moment, **do not change any of the settings in the Setup dialog**.

Click "OK" to begin an experiment block of trials with the default settings. For now, the trials are just practice. A Qwerty soft keyboard appears along with a randomly-selected phrase of text for you to enter. An example is shown below:



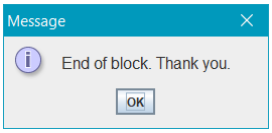
Enter the phrase of text by clicking the corresponding letter keys in the Qwerty layout. Proceed quickly and accurately, at a steady yet comfortable pace. No need to rush. Don't forget to click "Space" between words. Click "Enter" at the end of the phrase. A popup result dialog appears. An example is shown below:



Click "OK" and another phrase appears. Repeat.

Timing begins when you click the first letter key in a phrase. Timing ends when you click Enter at the end of the phrase. Proceed without stopping while entering a phrase. Rest as you wish between phrases.

After five phrases are entered (that's the default number in the Setup dialog), you are done:



This is a block of testing. Two text files of performance data are created on your computer in the same directory as the app. An example listing follows:

These "summary data" (sd) files were created and saved during your interaction with the app. Have a look in these files. The "sd1" file contains summary data on a per-keystroke basis. The "sd2" file contains summary data on a per-phrase basis. For most analyses, only the sd2 files are needed.

Tip: Opening an sd2 file in a text editor is a bit unsightly since the data are full precision comma-delimited. Try opening the file in Excel as a comma-delimited text file. The data will appear nicely aligned in columns.

A full description of the contents of the data files and the SoftKeyboardExperiment software is contained in the app's API which you can access on the experiment software website.

Mini Experiment Explanation

For the mini experiment, you will do two blocks of trials with five phrases of input in each block. This will take 15-20 minutes. You will enter five phrases of text with one layout, then five phrases with the other layout. When done, you will upload the two corresponding sd2 files to eClass.

Instead of random phrases, you will enter the same phrase repeatedly. For this mini experiment, we'll use the well-known quick-brown-fox phrase:

```
the quick brown fox jumps over the lazy dog
```

This phrase is useful since it contains all 26 letters of the English alphabet. The phrase is contained in a file called `quickbrownfox.txt` which was extracted from the JAR file when the app first launched.

As noted above, the keyboard layouts we're interested in are Qwerty and Opti. The order of testing is extremely important. Ideally, we want half of you to do Qwerty first, then Opti, with the other half doing Opti first, then Qwerty. The reason for this will be explained in classroom lectures. To achieve this (more or less), here's what we'll do. Please read this carefully – it's important.

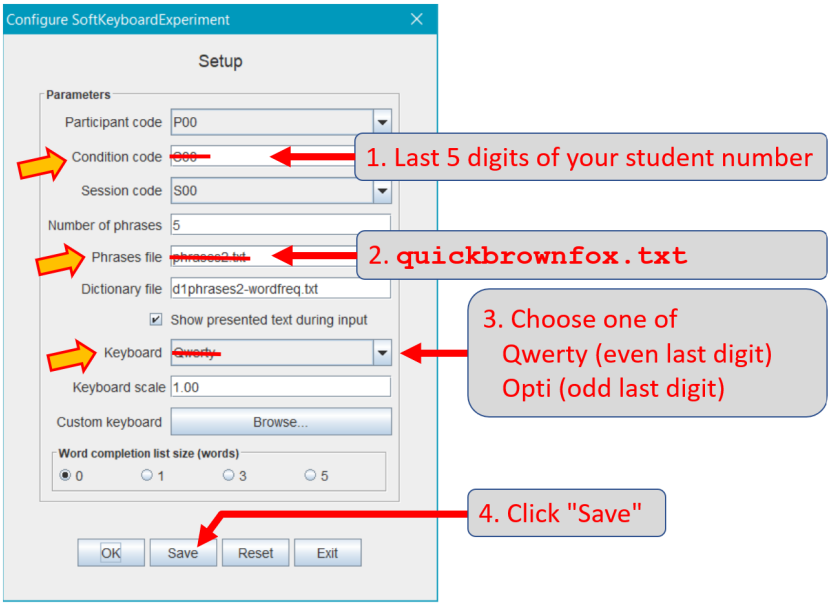
> If your York student number ends in an even digit (2, 4, 6, 8, 0), do Qwerty first, then Opti.
>
> If your York student number ends in an odd digit (1, 3, 5, 7, 9), do Opti first, then Qwerty.

Configuring the Setup Dialog

OK, ready to go? First off, launch SoftKeyboardExperiment and change three – and only three – values in the Setup dialog:

- Condition code → enter the last five digits of your York student number
- Phrases file → change to `quickbrownfox.txt`
- Keyboard → select either Qwerty or Opti, as instructed above

Then, click "Save" to save the changes. The figure below illustrates what you need to do:



OK, that's about it. When you're ready to do the actual experiment trials, proceed by clicking "OK." Enter the quick-brown-fox phrase five times on the first keyboard.

When you're done, launch the app again, change to the second keyboard layout via the Setup dialog and click “Save.” When you are ready to enter the phrase five more times with the second layout, click “OK.”

When you've done the two blocks of experiment trials – five phrases for each keyboard layout – upload the two corresponding sd2 files to eClass. This completes Part 1 of the assignment. After uploading the required files on eClass (see below), proceed to Part 2.

What to submit for Part 1 of the Assignment

Upload two (2) files to the Assignment section of the course eClass:

`SoftKeyboardExperiment-P00-99999-QWERTY-Scale_1.00-S00-B01.sd2`

`SoftKeyboardExperiment-P00-99999-OPTI-Scale_1.00-S00-B01.sd2`

These are the sd2 data files created when you did the mini experiment. Where you see `99999` above, the last five digits of your student number should appear.

Part 2

Spreadsheet

For Part 2 of the assignment, download the spreadsheet file provided under Assignment on eClass. Change the name of the file to `Assignment_Part2_99999.xlsx`, where `99999` is replaced with the last five digits of your student number. Modify the spreadsheet as described below and as explained in the notes in the spreadsheet.

As you modify the spreadsheet, do not insert or delete any rows or columns. Just enter data or formulas in the indicated cells.

Preferably, use Microsoft Excel to modify the spreadsheet. If you do not have access to Excel, use LibreOffice, which is a free and open-source office suite from The Document Project. LibreOffice supports Excel files through import and export filters. Click here to visit the LibreOffice download site.

The spreadsheet contains two worksheets.

The first worksheet contains questionnaire responses. Replace the "xxx" values in the grey cells with the requested data. Consult the Notes for further information on what to enter and the required format.

The second worksheet contains a table of the performance results from the mini-experiment. Replace the "xxx" values in the grey cells with values from the sd2 files under the column labeled "Speed_(wpm)". That's the text entry speed in words per minute for the phrases entered. For other "xxx" values, insert Excel formulas to compute the required values from the data in the grey cells.

In the second worksheet, create a bar chart and a line chart illustrating the results. These charts are typical of the charts found in published HCI papers. See the example charts provided in the URL links. Create your charts to mimic the organization and style in the example charts. If you're not sure how to add error bars to an Excel chart, try typing "add error bars to Excel chart" in the search field of your browser.

When you are satisfied with the charts, use a screen grabber or some other tool to create a copy of each in a `.png` file.

Further discussion on what to do for Part 2 will be provided during classroom lectures.

What to Submit for Part 2 of the Assignment

Upload three (3) files to the Assignment section of eClass:

- `Assignment_Part2_99999.xlsx`
- `BarChart_99999.png`
- `LineChart_99999.png`

Where you see `99999` above, the last five digits of your student number should appear.

*** end ***