CS 4065/6065 Assignment 1: Investigating the Human Factors of Reaction Time

Date due: January 26, 2021 @ 11:00pm

Overview

In this assignment, you will explore the human factors of reaction time as it relates to choice. You will build a system to gather data, you will carry out a basic analysis, and you will draw conclusions about what factors affect the speed of reacting to a stimulus.

You will be graded on your working experimental system and report that are to be handed in through D2L.

This assignment is to be done by both **CS4065 and 6065 students and completed in groups of two**. However, CS4065 students should only work with other CS4065 students and CS6065 Students should only work with other CS6065 students.

You must find a partner and submit both partner names to this form by **Jan. 18 (only one submission per group):**
https://forms.office.com/Pages/ResponsePage.aspx?id=0m5OJJoz80e5XORTUcGYt5Cv_Yazi1ZOk3ethx-h5lhUNEJaOENRUzg0QjdHU1ZTWU5ENUpSMEhPMC4u

You will also participate in the experiments of other groups, **between Jan. 21st and 25th**. You will be assigned other groups to work with as participants, and it will be your job to make sure that you coordinate with the other groups to complete the assignment.

Requirements

Technology

You will use Processing for this assignment to build this assignment (https://processing.org).

Part 1. The system

Build a system that allows you to gather data about people's reaction time. The system should present a window (or full screen display) to the user. The system will record data about the time and errors (trying to click on a button but missing the button).

Specific requirements:

- When started, the system should ask for a user number (this will be attached to all trial records). Note: if you are using Processing you are able to use Java Swing GUI components; e.g., JDialog (see: https://forum.processing.org/two/discussion/4764/how-to-make-a-popup-window).

- The system should then present the testing system, the system will consist of 3, 5 or 9 buttons. One button is in the center and says "start". The other buttons will be placed equal distance from the "start" button.

- When the start button is clicked, one of the other (2, 4 or 8) buttons randomly lights up and stays lit up until the user clicks on it. The user's goal is to click the lit-up button as quickly as possible.

- Each time the user clicks the "start" button and one of the other buttons (called "target" buttons), it is considered a trial (i.e., a trial is one time that are person needs to react, you will collect data for every trials).

- For each trial, the system records the time taken from the click of the "start" button to the click of the target illuminated button. The system will also collect the number of error clicks before a successful click on the target (i.e., how many times they misclicked for the current trial attempt).

- The target buttons and are located an equal distance from the "start" button.

- Only one target button is illuminated at a time; once it is clicked it is no longer illuminated.

- The system should play a sound upon a successful click of the target button to provide feedback.

- After twenty targets, one *block* of trials is complete. The system does not present a new target, but rather shows the "click to continue" sign. This allows the user to rest before continuing.

- When the user clicks the "continue" button, the system continues to the next block of twenty trials, as described above.

- Your system will present three different blocks. Each block increases the number of target buttons.
    1. Block 1: 2 target buttons
    2. Block 2: 4 target buttons
    3. Block 3: 8 target buttons

- The system should record and write out the following data in tab-delimited format, with each individual target button click (i.e., trial on a separate line):

user# block# trial# elapsedTime numberOferrors

 (note that 'elapsedTime' is the time in milliseconds between the target being lit up and a successful click on the lit-up target)

(note that 'numberOfErrors' is the number of times the user clicked during this trial without hitting the lit-up target)

(note that 'trial#" increments within each block; the final trial should be block 3, trial 20)

- You should log data to the console window and the data can be copied and pasted by participants into a message to you in Teams.
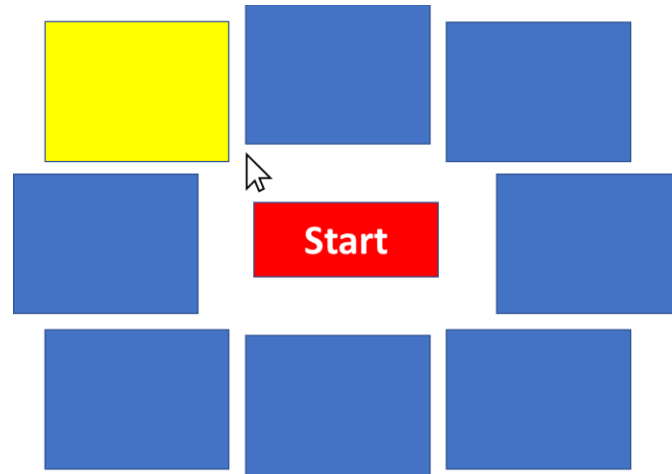
Figure 1. An example of the system after clicking start and one button is highlighted in block 3 (8 targets). Note that this was mocked up in PowerPoint.

Part 2. The investigation

Use your system to gather data from six people who are not in your group. You will be assigned other groups to work with as participants and who will run your experimental program. You must coordinate with these other groups as described above (in the Overview between the dates provided). It is suggested that you contact the other groups as early as possible to schedule times to exchange programs and data. In addition, please treat one another with respect, rests can be taken between blocks, and remember to thank one another. Please notify the instructor as early as possible if you are having trouble contacting or coordinating with other group members.

You will need to provide the other groups with your program and have them paste the data they produce into a message. You will then copy and paste the data they collect into a spreadsheet like Excel and complete the steps described below.

Using a spreadsheet program (e.g., Excel), do the following steps:
- Create a scatterplot for each block (i.e., one plot for each of 2, 4, and 8 targets) with chart with reaction time on the y-axis and trial number on the x-axis.
- Create a scatterplot for each block (i.e., one plot for each of 2, 4, and 8 targets) with chart with number of errors on the y-axis and trial number on the x-axis.
- Calculate the average completion time and number of errors per trial, for each of

the 3 blocks.

- Create a bar chart with completion time on the y-axis and number of targets on the x-axis category (i.e., one bar for each of the three target blocks).
- Create a bar chart with errors on the y-axis and number of targets on the x-axis category (i.e., one bar for each of the three target blocks).

Part 3. The report

Write a 3-4 page report with the following sections (see formatting instructions below).

Format of the report:

- A title and name of the report authors should be included at the top of the report.
- 1-inch margins, single spaced text
- All paragraph text in 12-point Times Roman
- Headings in 12-point bold Arial or Helvetica

1. Introduction (1/2 page max)

- State what you set out to investigate
- State why it might be important to study reaction time and how it might inform the design of a user interface based on your knowledge of typical user interfaces (i.e., how would understanding more about reaction time inform the design of user interfaces? What type of user interfaces would this information be important for?)

2. Methods (1/2 page max, plus figures)

- Summarize the system you built, and the steps you took to gather and analyze your data
- Include a screenshot or two from your system to show how it works

3. Results (3/4 page max, plus charts)

- Display and describe your charts in your report
- Report on the what you found out – using your data, answer the question "what factor(s) (if any) affect reaction time?"
- Report on the what you found out – using your data, answer the question "what factor(s) (if any) affect the number of errors?"
- Identify and state the factors that you have discovered that affect reaction time and errors, and indicate what effect they have

4. Reflection on Results (1/2 page max)

- Reflect on the results that you found. What do you think about your results? Do they make sense? Can you provide some reasoning for why you found these results (do some careful thinking about this and try to describe why you think you found these results)?
- You can optionally do some research for this step, but it is not expected (e.g., search online databases or Wikipedia) for an answer, or ask someone who might know.

5. Implications for Design of Interfaces and Future Work (1/2 page max)

- Based on what you found, do you think that your results could be used in any user interface? How could it be used or what types of situations could it be used in?
- How confident are you in the results you found? Is there anything else that could be done to improve your results (it's OK if you think that something else could be done to improve your experiment or system)?
- Is there any information that is missing from your experiment that you think could provide further useful details for interface design? What other experiments might you do, if so?

What to hand in

- A zipped project archive with your system, including all instructions on how to run the system (if they are needed)
- A PDF version of your report
- An excel file containing all of your data and analysis

Hand in your work to D2L using the links below. Only one submission per group is need, just make sure both group members names are in the report.

CS 4065: Submit here:
https://lms.unb.ca/d2l/le/content/175233/viewContent/1944646/View?ou=175233

CS 6065 Submit here:
https://lms.unb.ca/d2l/le/content/175267/viewContent/1944643/View?ou=175267

Evaluation

Marks will be given for producing a system that meets the requirements above, for collecting the data required for the investigation, for carrying out a thoughtful analysis of the data with coherent charts to demonstrate your findings, and for writing a clear, thorough, and insightful report on your investigation. Additionally, your group will be penalized if you were not willing and helpful participants in the other group projects.