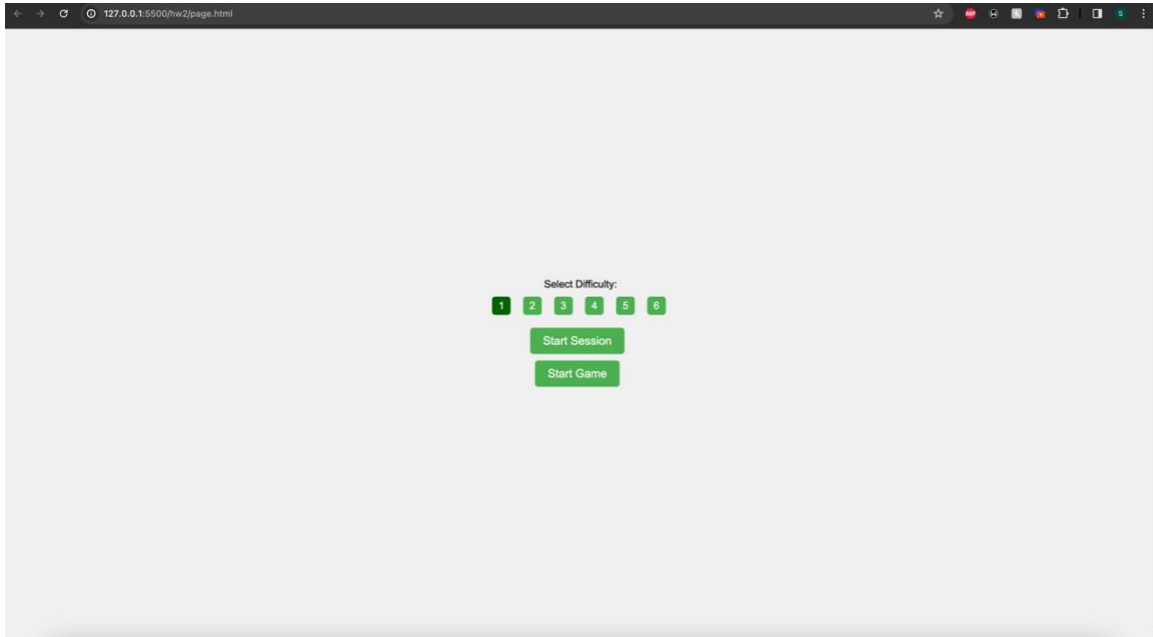# CS 5063 Homework 2
Sinaro LY

Interface design

The game has been implemented as a webpage using HTML/CSS and Javascript. The source code is available in this GitHub repository: https://github.com/L-Sinaro/hci-hw/tree/main/hw2

The start-up screen looks like that:

The user can choose to select specifically one difficulty and click on 'Start Game' to play a specific difficulty level or click on 'Start Session' which will go through all the difficulties. At the end of each trial, there is a completion screen with the average time for that trial. After the last trial, the page will display the average time over all the difficulties.

The difficulty has different combinations:

Difficulty Level	Distance between squares (in px)	Square Width (in px)
1	200	130
2	400	130
3	400	110
4	600	110
5	600	90
6	800	90

Some images of the game are available here:
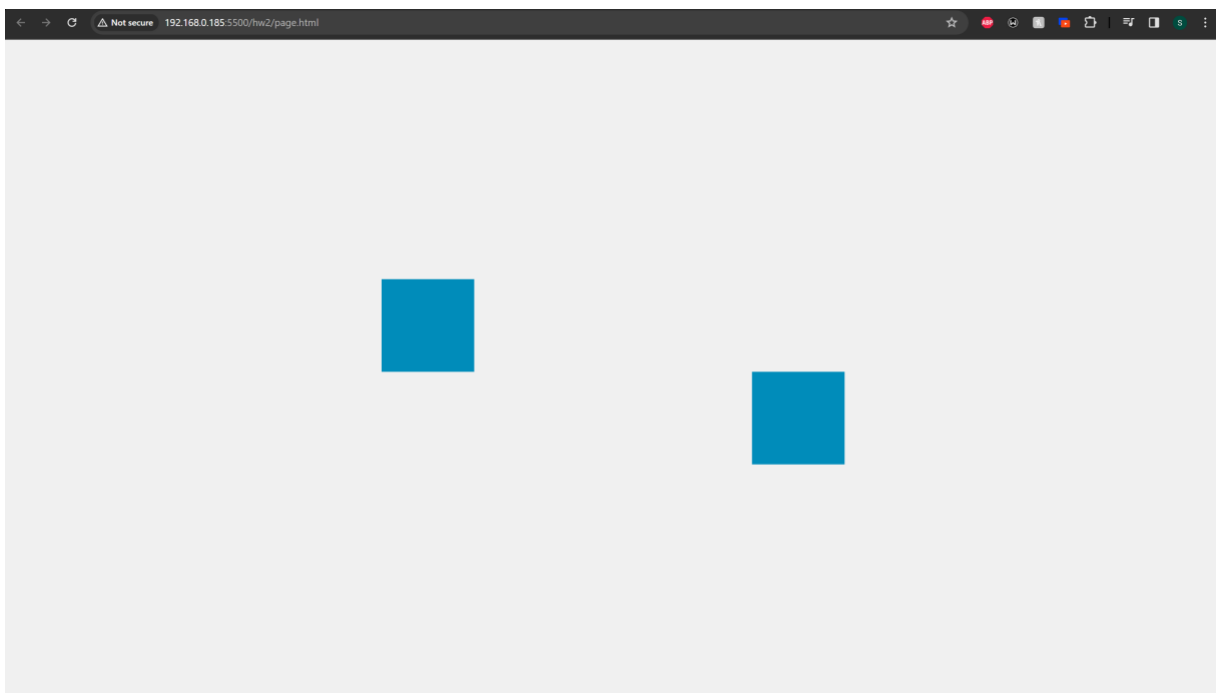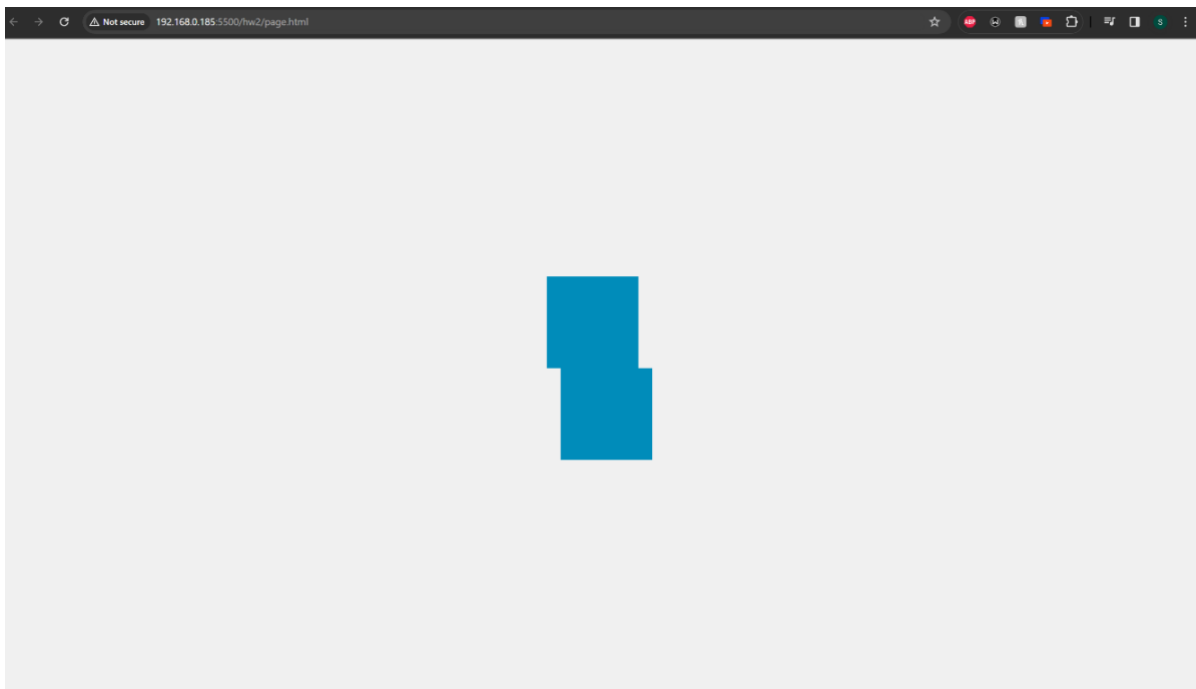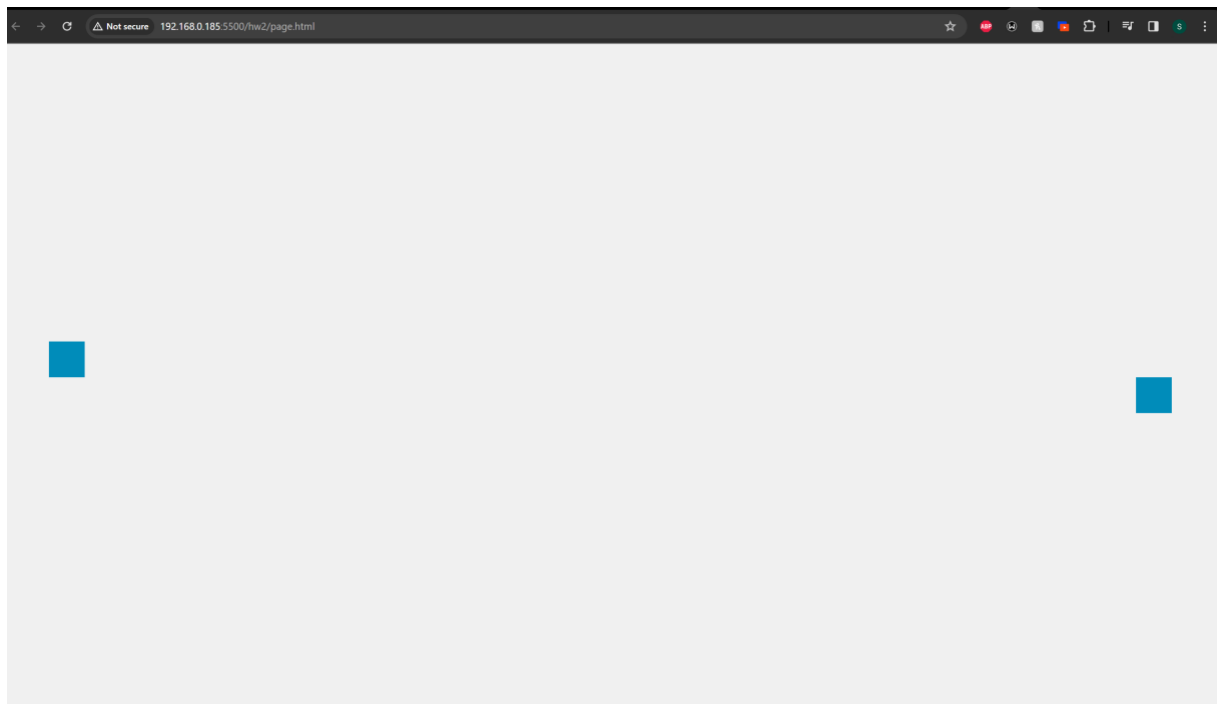
The end after a trial is presented like this:

Average time per pair of clicks: 298.90 ms
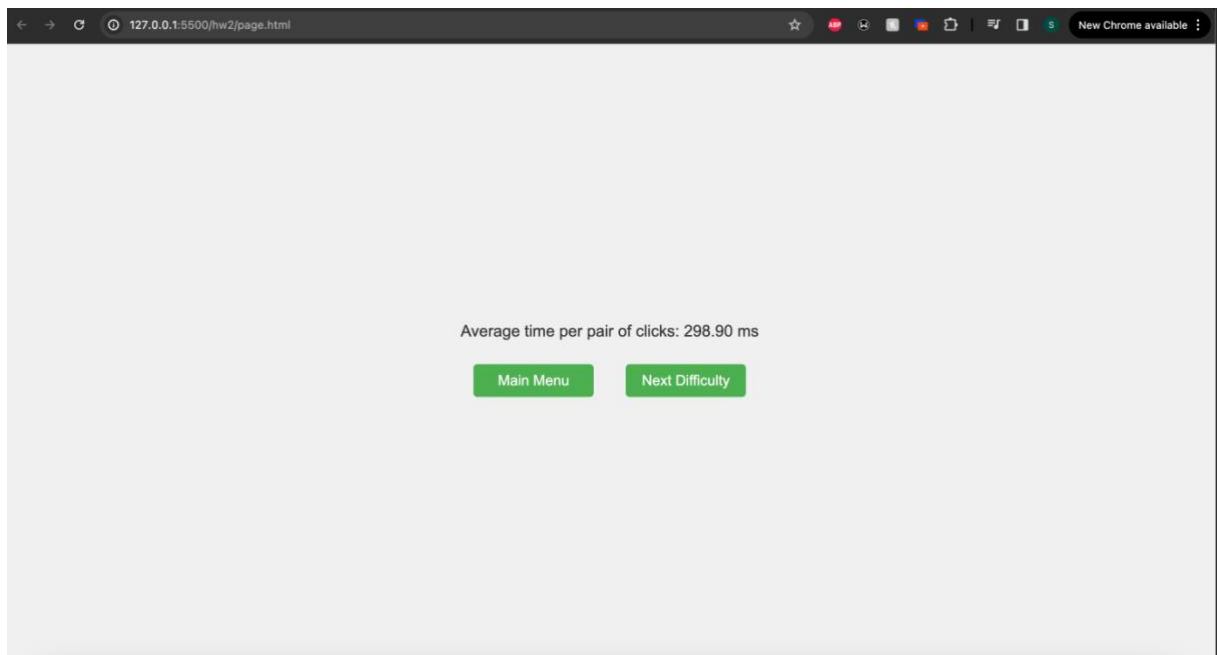
The user can see their average time for this trial and can choose to go back to the main menu or go to the next difficulty.

Average time per pair of clicks: 842.60 ms Overall average time: 624.47 ms
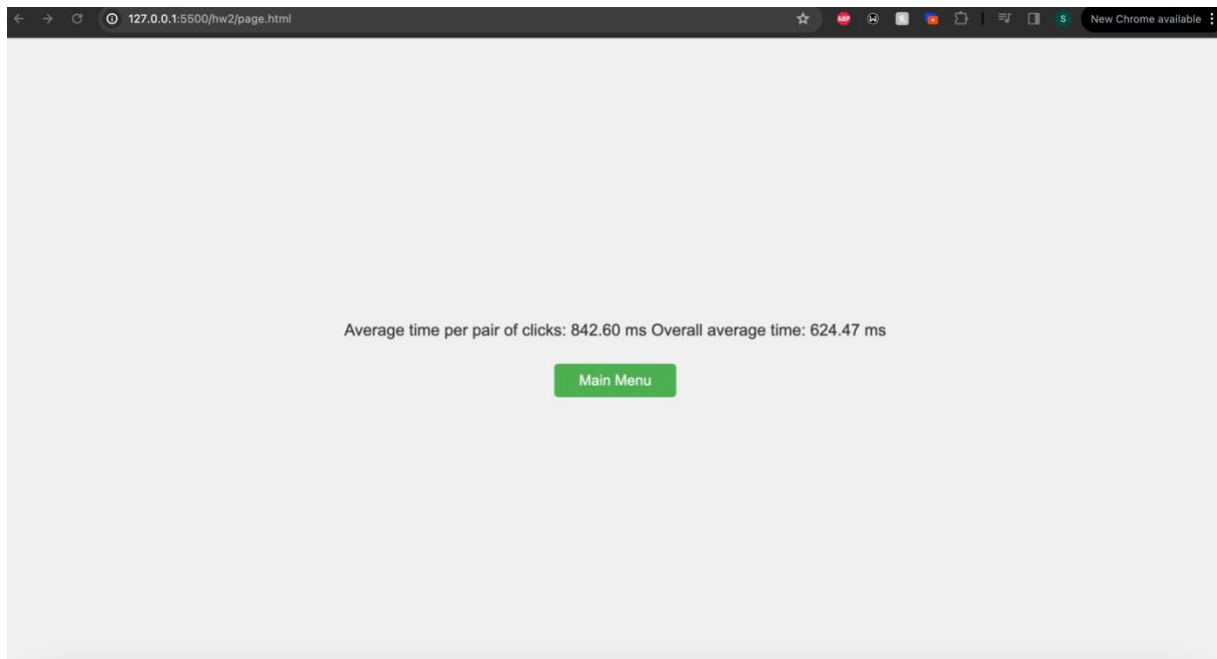
Main Menu

At the end of the session, after going through all difficulties, the user is presented with the average time for the last trial and the average time across all trials during the session. The user can then go back to the main menu to restart quickly.

Protocol description

The experiment is done on a laptop with a 15inch screen with an external mouse by my project teammate Jacob, a regular student without any health issue.

Hypothesis

For this protocol, the Fitt's law formula will be used:

$$T = a + b * log_2(\frac{D}{W} + 1)$$

For this setup, we will suppose that a = 100ms and b = 150ms:

Difficulty Level	Distance between squares (in px)	Square Width (in px)	Predicted time (ms)
1	200	130	301.1426469
2	400	130	352.5831293
3	400	110	366.5443727
4	600	110	402.4664159
5	600	90	421.1516453
6	800	90	448.7868743

Variables

The independent variables are:

- D the distance to the Target: How far the user must move the pointer to reach the target. It's an independent variable because the experimenter can change it to see how it affects the time it takes to reach the target.
- W the target width: The size of the target that the user needs to hit. It also is an independent variable because the experimenter can change it to see how it affects the time it takes to reach the target.

The dependent variable is:

- T the time to Complete the Movement: The time it takes for a user to move from a point to another with a curser in this case. This is dependent on the values of the independent variables introduced previously.

Experimental results

After those 150 trials, the average over each difficulty has been processed and the result is:

Difficulty Level	Predicted time(ms)	Measured Time(ms)
1	301.1426469	302.9
2	352.5831293	475.4
3	366.5443727	508.9
4	402.4664159	636.5
5	421.1516453	816.4
6	448.7868743	852.6
Average	382.1125141	598.7833333

The measured average is way higher than the predicted one.

Discrepancies between predicted and measured times

At the beginning, when the difficulty is low, Fitt's Law seems to be accurate. However, after increasing the difficulty, the measured time starts to be higher and higher than the predicted time using Fitt's Law. Looking at the predicted average and the measured average time, the discrepancy is significant. It can be explained by multiple factors:

- a and b values have not been chosen correctly for Fitt's Law. Maybe other values would have been better to get results closer to the measured time.
- The users who tested the program can also be a decisive factor as they can have different affinities with a computer, be more a less fast, more a less used to using a computer.
- If the task requires a high degree of accuracy (in this case the targets get smaller and smaller), users might prioritize precision over speed, leading to longer completion times than Fitts' Law predictions.