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CS 522

HW#3

Due: November 21, 2017

**Part B: Fitts’s Law Replication**

For this assignment, you will be replicating Fitts’s law experiment for aimed movement in graphical user interfaces (GUI). You will need to build the experimental apparatus before collecting and analyzing data. Developing an application for this experiment is **required**. You are NOT allowed to use a third-party app for collecting data in this assignment.

1. **Describe Fitts’s Law (Fitts’s 1954).**

Paul Fitts’s, in 1954, established Fitts’s Law in a paper that basically models a type of human movement, specifically a model for pointing to objects. It basically is a model that predicts the amount of time it will take a subject to point to a specified target. “This scientific law predicts that the time required to rapidly move to a target area is a function of the ratio between the distance to the target and the width of the target,” (Wikipedia, <https://en.wikipedia.org/wiki/Fitts%27s_law>). \*\* According to Wikipedia, the following are the parts of Paul Fitts’s model formulation for human movement for pointing.

**Index of difficulty:**

where ***ID*** is the index of difficulty, ***D*** is the distance of the pointer’s current position to the target, and ***W*** is the width of the target.

**Index of performance:**

where ***IP*** is the index of performance, ***ID*** is the index of difficult as shown above, and ***MT*** is the movement time it takes the user to point to the target. Most importantly, is the movement time model shown below:

**Movement time:**

where ***MT*** is the average movement time, ***ID*** is the index of difficulty, ***b*** and ***a*** are the slope and intercept parameters respectively which are obtained using linear regression.

Based on Fitts’s Law, an important deduction is that as a target’s width increases and as the distance between serial targets decreases, the index of difficulty and movement time both decrease.

\* I don’t typically use Wikipedia as a formal source of information because it’s not a formal document, but it was the best formulated out of the first five documents I went through.

1. **Conduct and report a Fitts’s law experiment for aimed movement.**

**Developing the experimental apparatus (app):**

* 1. Your input modality could be mouse, trackpad, or touchscreen. Choose ONE of them.
  2. You will be designing a 2D pointing task to test Fitts’s law. Use the ISO 9241-9:2000 standard for designing your experimental tasks (multi-directional tapping task; e.g., Figure 2, <http://www.yorku.ca/mack/ijhcs2004.html>)
  3. Have 2 different target sizes and 3 different distances.
  4. You may use any programming language to design the experiment and collect data.
  5. Use the Shannon formulation of Fitts’s law.

**Data collection:**

* 1. After developing the apparatus, collect data by once using it yourself and once by a peer (2 users; no need to have more users).

**Data analysis:**

* 1. Find the regression coefficients after fitting your movement time data (HINT: use R, MATLAB, or Python).
  2. Plot movement time over Index of Difficulty.
  3. Plot throughput over Index of Difficulty.

**Deliverable:**

1. The application source code (preferably a link to a Bitbucket or GitHub repo)
2. Data dump
3. A brief report describing the experimental method and analysis of the data collected (maximum 3 pages + figures)

An example of the Fitts’s law experiment and visualization: <http://simonwallner.at/ext/fitts/>. This is an example implementation (All aspects of this implementation may not be correct. This is provided as an example.). Do NOT use this app to collect data as part of this assignment. You MUST develop your own application to collect data.