

EECS 3461: Assignment 3

Due: Thursday, November 6, 2014
(7 % of the final grade)

Motivation

This assignment will allow you to explore one of the fundamental empirical laws in HCI – the Fitts' Law.

Introduction

Fitts' law is a model for rapid aimed movements:

$$MT = a + b \cdot \log_2(A/W + 1)$$

where MT is movement time, A is the amplitude of the movement (i.e., the distance to the desired targets), and W is the width of a target. The log term is the Index of Difficulty (ID), which is commonly assigned a unit of bits:

$$MT = a + b \cdot ID$$

The coefficients a and b are determined empirically for a given device and interaction style (e.g., stylus on a tablet, finger on an interactive tabletop).

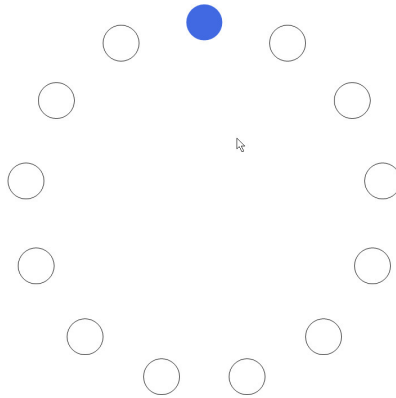
The interpretation of the equation is that movement tasks are more “difficult” when the targets are smaller or farther away. Fitts' law has been used to characterize the performance of pointing devices and is one of the components of the standard evaluation in accordance with ISO 9241-9. Indeed, if the movement time and determined ID are known, then the ratio gives the throughput of the input device in bits per second (bps).

Description

In this assignment you will have to do the following:

Step 1:

- Go to <http://depts.washington.edu/aimgroup/proj/fittsstudy/>
- Read (at least scan quickly) the papers in the List of Publications
- The software posted there implements a 2D pointing task commonly employed in Fitts' law studies, as described in ISO 9241-9 (see figure below). Use at least 11 targets in a circle (odd numbers are preferred, as they keep the distances consistent). The software logs multiple parameters – you should have anything needed to complete the next steps of the assignment.



Typical layout of an ISO 9241-9 testing application

Step 2:

Run your experiment with at least 5 people on at least two types of pointing devices (e.g., mouse, touchpad, touchscreen, stylus, Wii controller...) Try to keep the error rates consistent and low. 4 % miss rate is considered “normal”.

Step 3:

Analyze the results. Build the plots of MT vs. ID (plot the data points measured and fit lines to determine the a and b coefficients of the Fitts' Law; NOTE: you might not be able to use the graphs the program provides, as they plot the data of just one user/trial). Compute the throughputs for the devices used and plot them using bar charts (average the results over users with each device); if possible, display the standard deviations or standard errors for the data.

You don't have to (but you may) do the following:

- ANOVA analysis of the results (F -test; compute F and p numbers);

If you have any questions, don't hesitate to contact the instructor (andriyp@cse.yorku.ca).

Grading

The assignment is worth 7 % of the final grade. The points will be given as follows:

- 3 points: if the experiments were executed and the a , b coefficients, and the throughput were computed;
- 5 points: all of the results are collected and correctly plotted in the graphs;
- 7 points: if the paper is appropriately written and well formatted. Use the *HCI Archive Format* as a template (<http://chi2012.acm.org/cfp-formatting-instructions.shtml>). However, templates from other scientific conferences or journals are acceptable

Submission

Submit your report as a Word or PDF document electronically via via `submit` command (or equivalent) by the deadline, name it **Report.<extension>**.

Also submit all the logs created by the program, as well as any additional files (e.g., Excel documents) you used for analysis and creating graphs. Archive them (zip or 7z) and name the archive **data.<extension>**

Late penalty is 20 % per day. Submission 5 days or more after deadline will be given a mark of zero. Contact the instructor *in advance* if you cannot meet the deadline explaining your circumstances.

Academic Honesty

Direct collaboration (e.g., sharing results) is not allowed (plagiarism detection software may be employed). However, you're allowed to discuss the requirements, approaches you take, etc.

State any sources you use (online sources, books, etc.).