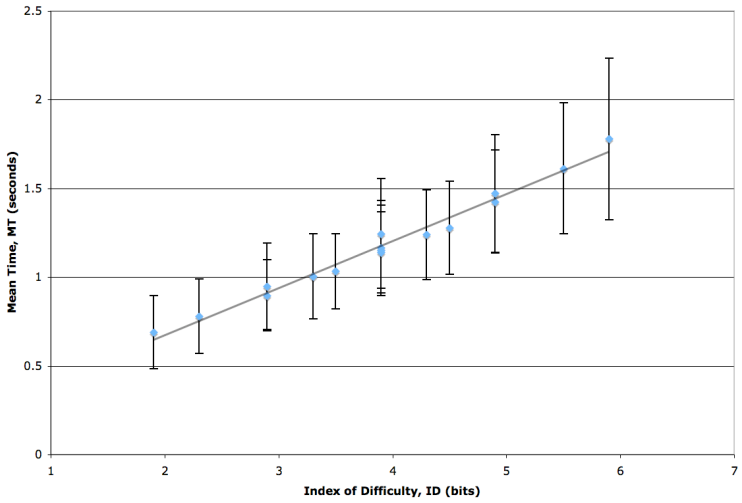
Fitts' Law lab April 2008

The goal of this lab is to analyze data from a standard Fitts' law experiment with three different hand controllers. Approximately 9 subjects were used for each. This document describes how you convert the raw data into Fitts' law plots that you can use to quantify the human performance with each hand controller and how the three controllers compared. Would suggest using Matlab to read in files and process the data, but other methods are also possible (Perl scripts etc). The command 'csvread' might come in handy.

1. Calculate index of difficulty (ID) for each trial type (feel free to use either Fitts' original or more modern representations), from distances and tolerances given in excel sheet provided.

2. For each subject result file:
    a. Extract successful trials (1 in 'Successful' column), should be 48 total.
    b. Extract results from trials that were not used for training ('Training' column not used here, simply use the last 36 successful trials).
    c. Calculate mean time (MT) and standard deviation for each trial type (4 types total).

3. For each hand controller:
    a. Calculate mean time and standard deviation for each trial type across subjects used.
    b. Plot mean times against index of difficulty (one for each trial type, 4 total). Show standard deviation on plot. An example with 16 trial types is shown below:



c. Make a linear fit to the points and obtain the slope and intercept, which describes the Fitts' law performance of that hand controller.
d. Find the square of the correlation coefficient for the linear fit.
e. Find the index of performance (IP) for the hand controller.

4. Show the three linear fits together on one plot so you can compare hand controllers. What is the 'best' input device? Does it depend on the index of difficulty (ID) of the task?

5. What is the benefit of using Fitts' law as a basis for performance when comparing input devices? (Hint: Imagine instead comparing devices on a specific task, like say measuring time taken to draw a large circle on the screen. Could you predict the time taken to draw a smaller circle? Could you predict which input device would be the 'best' for drawing a small circle?)

6. Analyze the number of unsuccessful trials per subject (errors). What was the average error % across subjects for the non-training trials? How many subjects had less than 5% errors? How did the average error % compare for the 12 training trials and the 12 following trials?

7. Extra credit:
    a. Investigate the position vs time trajectories produced (trajectory files are described in excel sheet provided). Are they similar for the same trial type for each subject? What about across subjects?
    b. Convert position vs time to velocity vs time. Does the velocity plots produce a consistent shape? Is there noise? What could the cause of the noise be?