Assignment 3
Fitts's law

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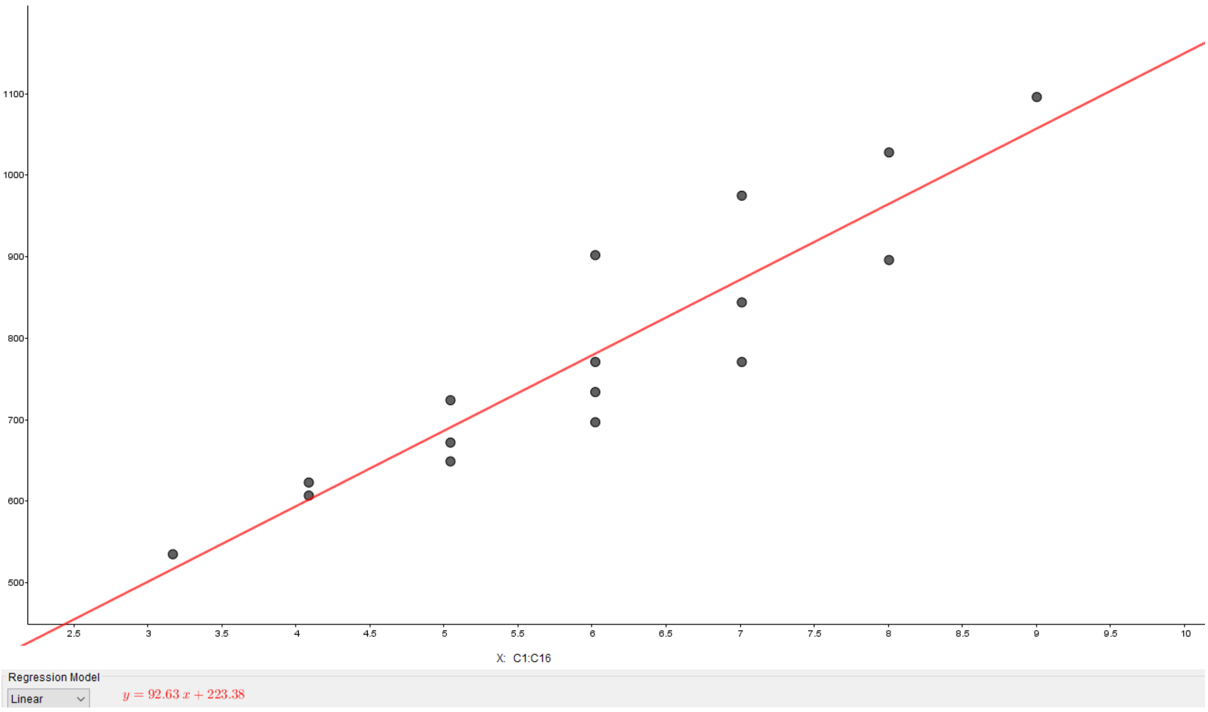
1) Determine input device-dependent constants

We see that Fitts's law

$$MT = a + b * ID$$

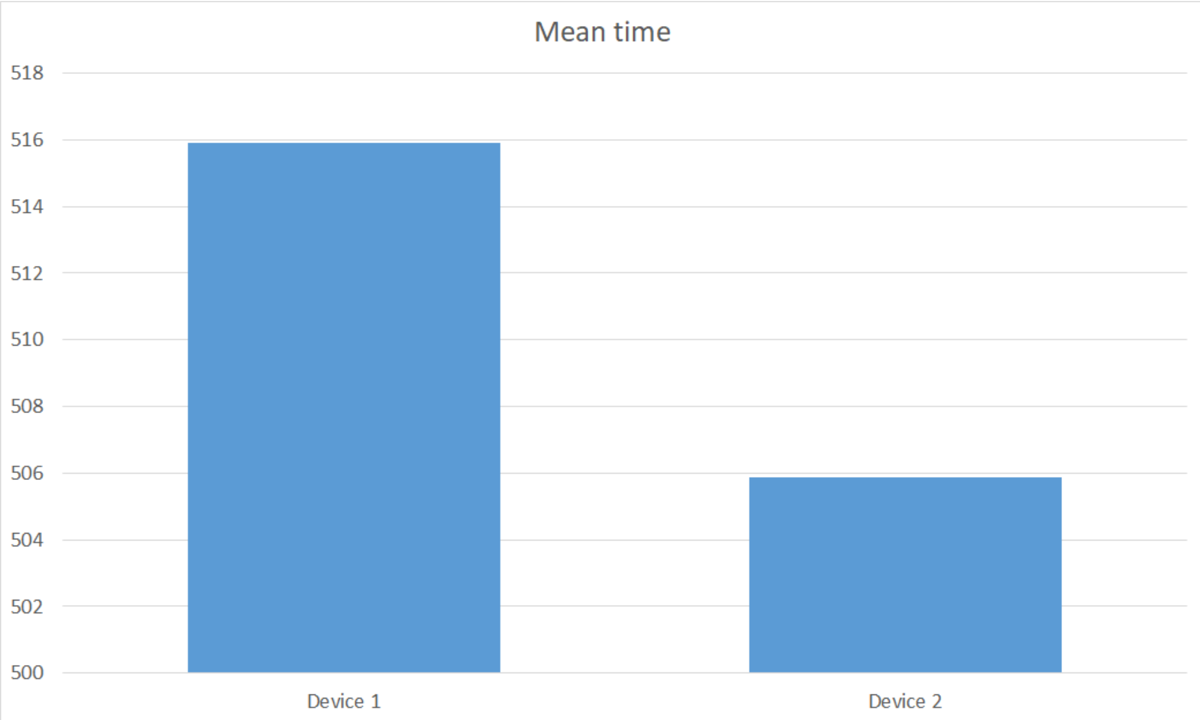
Is of the form $ax + b$ which is a linear function. We can plot MT with respect to ID and do a linear regression to get a and b. We get the following scatterplot and linear regression.



With $a = 223.38$ ms, $b = 92.63$ ms/bit

2) Compare performance with two different input devices

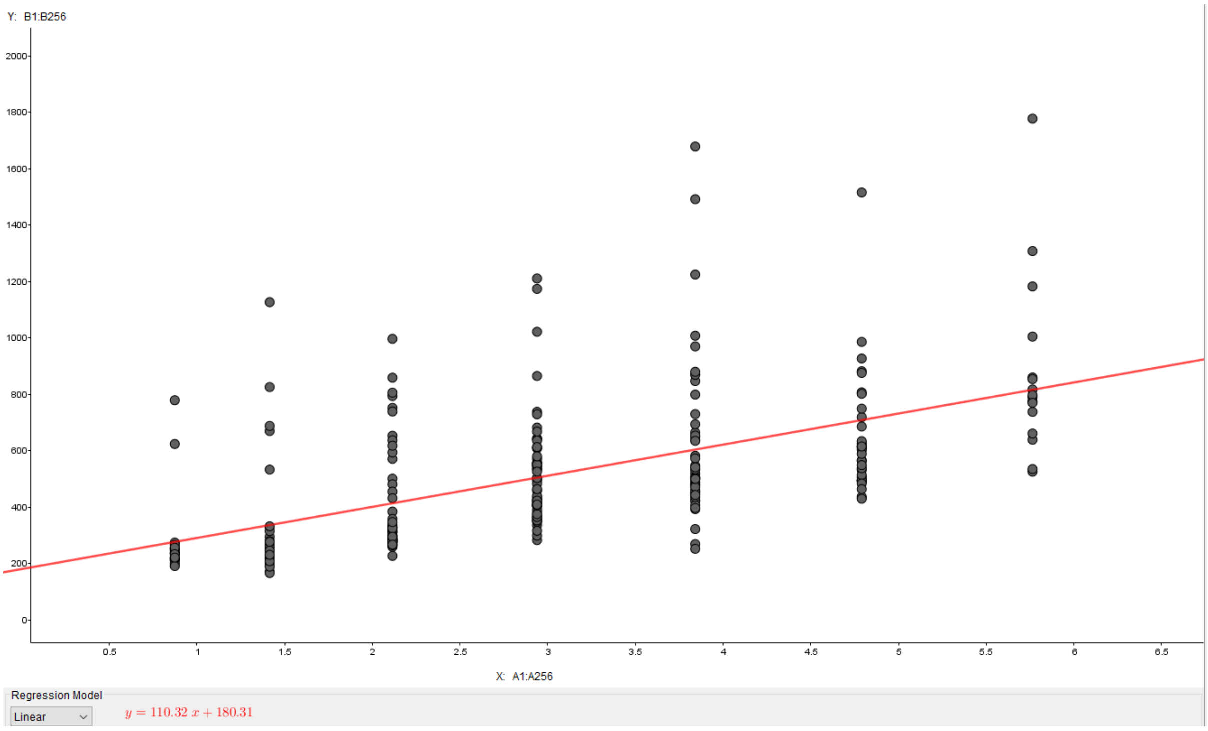
In this task, we let device 1 be a regular computer mouse and let device 2 be a tablet. A tablet is a pointing device, where you control the cursor with a pen whose absoluet position on the tablet maps to the absolute position of the cursor on the screen. We found the two mean times shown below



It generally seems like tablet is superior at longer distance. This could easily be a deviation due to low sample size, but there is also the fact that mouse uses relative movement as opposed to the tablet's absolute movement. This means that muscle memory is not as good for where exactly to put the mouse, as it can start in any position, and thus we rely more on visual feedback when using mouse in order to know where the cursor currently is and hence how much more we should move the mouse.

Another problem with using mouse is that the sensor is not perfect, so as we continue to move the mouse, it slowly drifts off in random directions. This is where we usually lift the mouse and move it back to a good starting position, but this entire problem does not exist with tablet since it is absolute position.

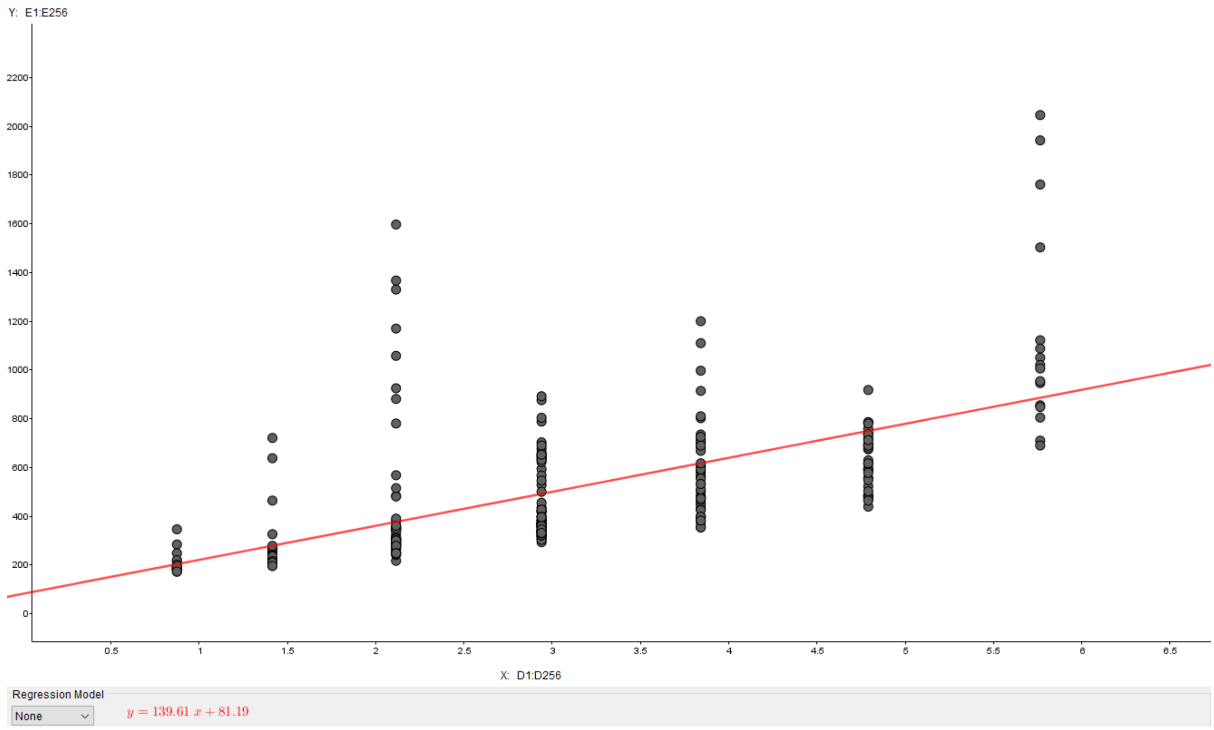
To find the throughput, i start off by finding b, i.e. the slope when we plot MT as a function of ID. The scatterplot and linear regression for the mouse is below



$$b = 110.32\,\frac{\text{ms}}{\text{bit}} \implies TP = \frac{1}{110.32}\,\frac{\text{bits}}{\text{ms}} \approx 0.009\,\frac{\text{bits}}{\text{ms}} = 9\,\frac{\text{bits}}{\text{second}}$$

We generally dont see a lot of points far below the regression line, however we do see a lot of points quite far above the regression line. This is probably from missing a couple of clicks, which immediately adds a bunch of time to the trial.

The scatterplot and linear regression for the tablet is below



$$b = 139.61 \frac{\text{ms}}{\text{bit}} \implies TP = \frac{1}{139.61} \frac{\text{bits}}{\text{ms}} \approx 0.007 \frac{\text{bits}}{\text{ms}} = 7 \frac{\text{bits}}{\text{second}}$$

It seems mouse has higher throughput than tablet. It does, however, seem to me that tablet is generally a tiny bit better time than mouse, but tablet has way higher deviations up to around 2200 ms as opposed to the mouse maxing out around 1800 ms. Since linear regression tries to minimise the the sum of the distances squared, these high deviations affect the regression line way more and we get a steeper graph for the tablet.

The reason we get higher deviations for tablet could be because it is harder to fix a mistake using an absolute input. This is because when we get close to a target, the only advantage we have thereafter is the feedback from watching where the cursor is relative to the target. With an absolute input device we do not use the feedback from watching the cursor much, so we typically ignore a big part of the advantage to already being close to the target.