Assignment 3
Movement Time / Fitts' Law

Timur Bas, 201906748

01/10/2020

Task 1

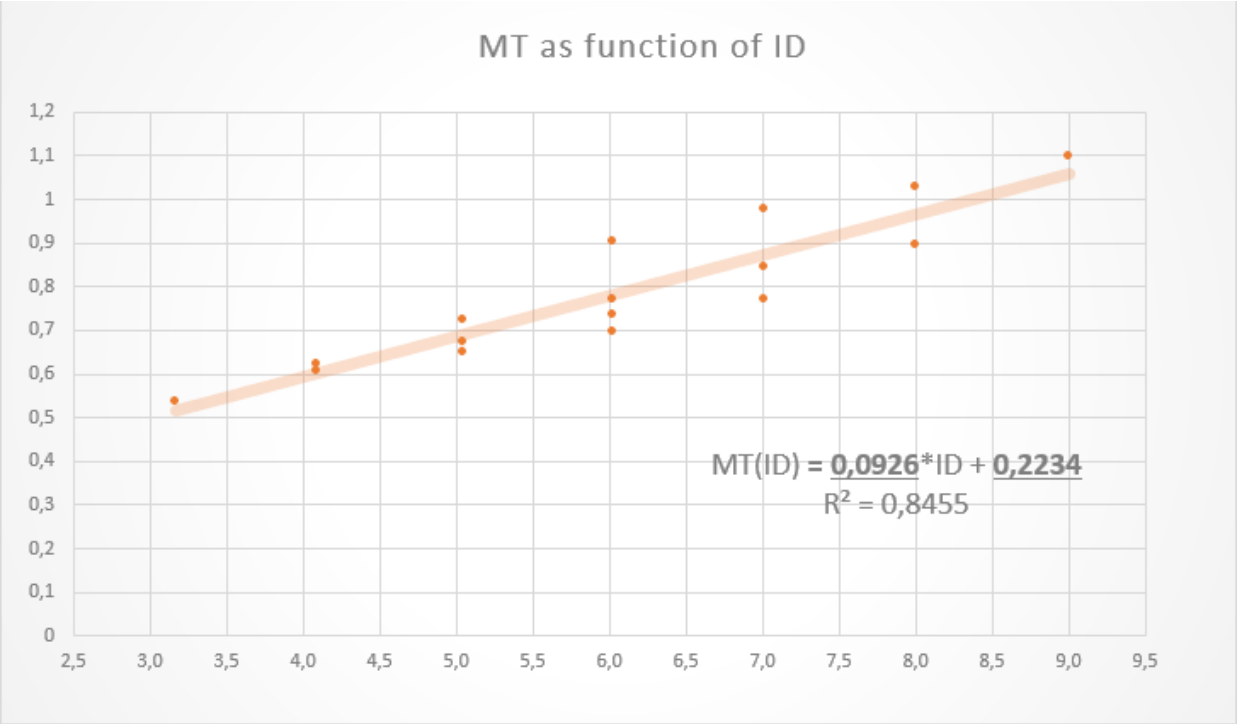
In order to find out what the a and b coefficients are, we first need to calculate the ID for each pair of distance and width. The formula is given as

$$ID = log_2\left(\frac{D}{W} + 1\right)$$

then our IDs are

ID
6.022
7.011
8.006
9.003
5.044
6.022
7.011
8.006
4.087
5.044
6.022
7.011
3.170
4.087
5.044
6.022

and we plot the MT as function of the IDs



and as we can see the linear fit provides the two constants

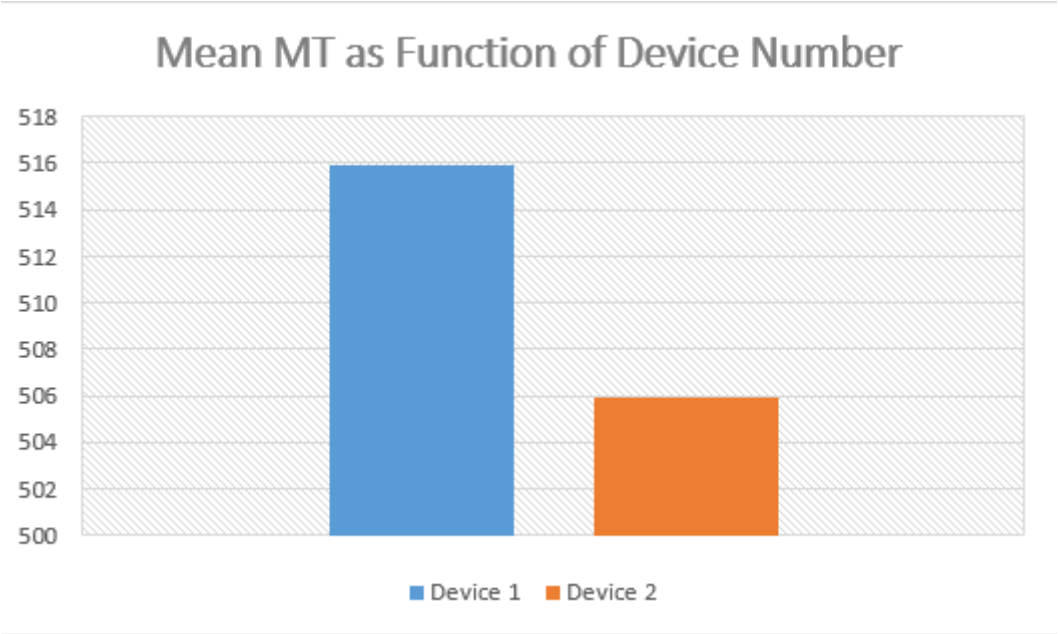
$$\mathbf{a} = \mathbf{0.2234}\text{s} = \mathbf{223.4}\text{ms}$$
$$\mathbf{b} = \mathbf{0.0926}\frac{\mathbf{s}}{\mathbf{bit}} = \mathbf{92.6}\frac{\mathbf{ms}}{\mathbf{bit}}$$

and the linear equation

$$MT(ID) = 0.2234s + 0.0926\frac{s}{bit} \cdot ID\ bit$$

Task 2

First off we bar plot the mean MT as the function of device number



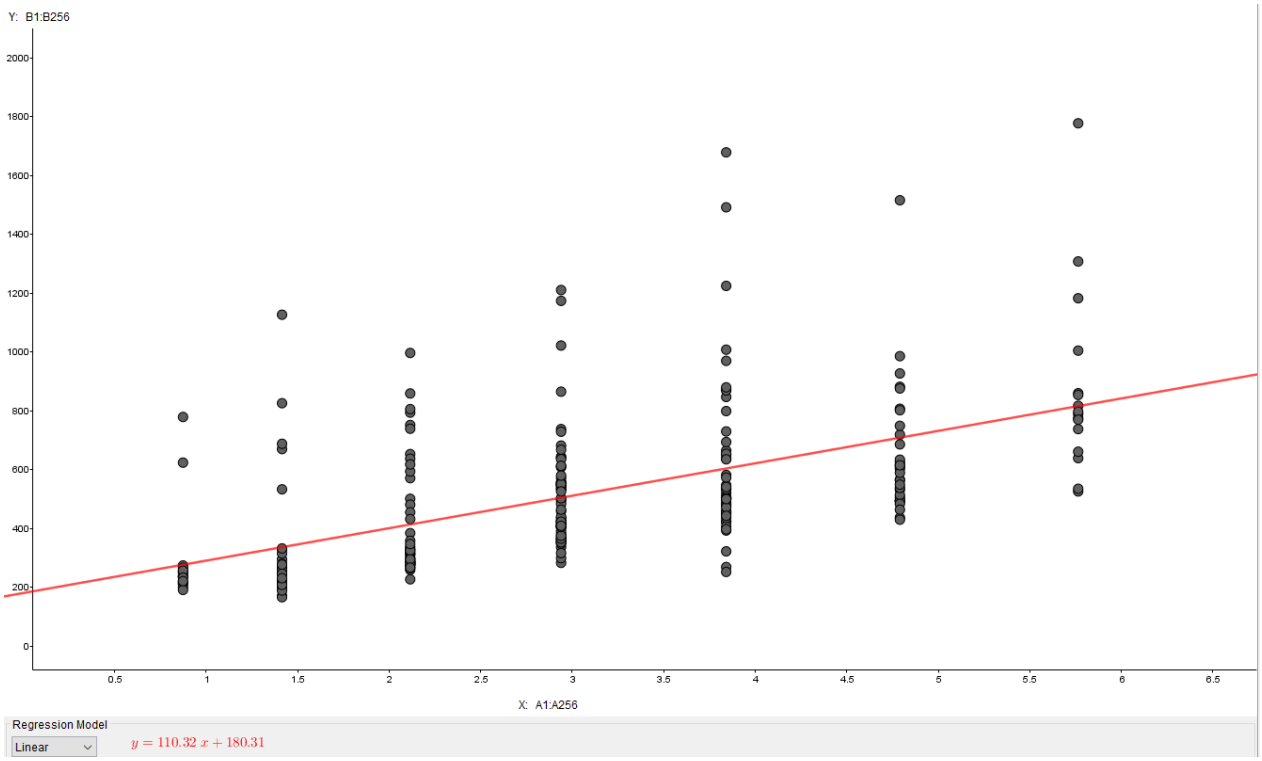
where device 1 is a mouse and device 2 is a tablet.

As we see from the barplot the tablet has a slightly lower mean than the mouse. One reason to why that might be is because we do not have enough samples. Another reason could be that the tablet's area is absolute e.g. if the tablet's area is the whole tablet area then the center is always the middle of the screen. This means an experienced tablet user (with good muscle memory) will have an easier time to drag the cursor to the rectangles whereas the mouse is relative and relies on visual feedback at all times. Therefore, the mouse does not inherit the same property as the tablet and thus harder. Another interesting fact is that in the game *osu*[1] almost all high-tier players are using tablets[2] because it becomes more easily to hit the circles in contrast to regular mice.

Now in order to calculate the throughputs let TP_1 and TP_2 be the throughputs respectively for device 1 and device 2. Generally, we scatter plot MT as function of ID and find the coefficient b and calculate the reciprocal value of b which is equal to the throughput for the given device.

Mouse:

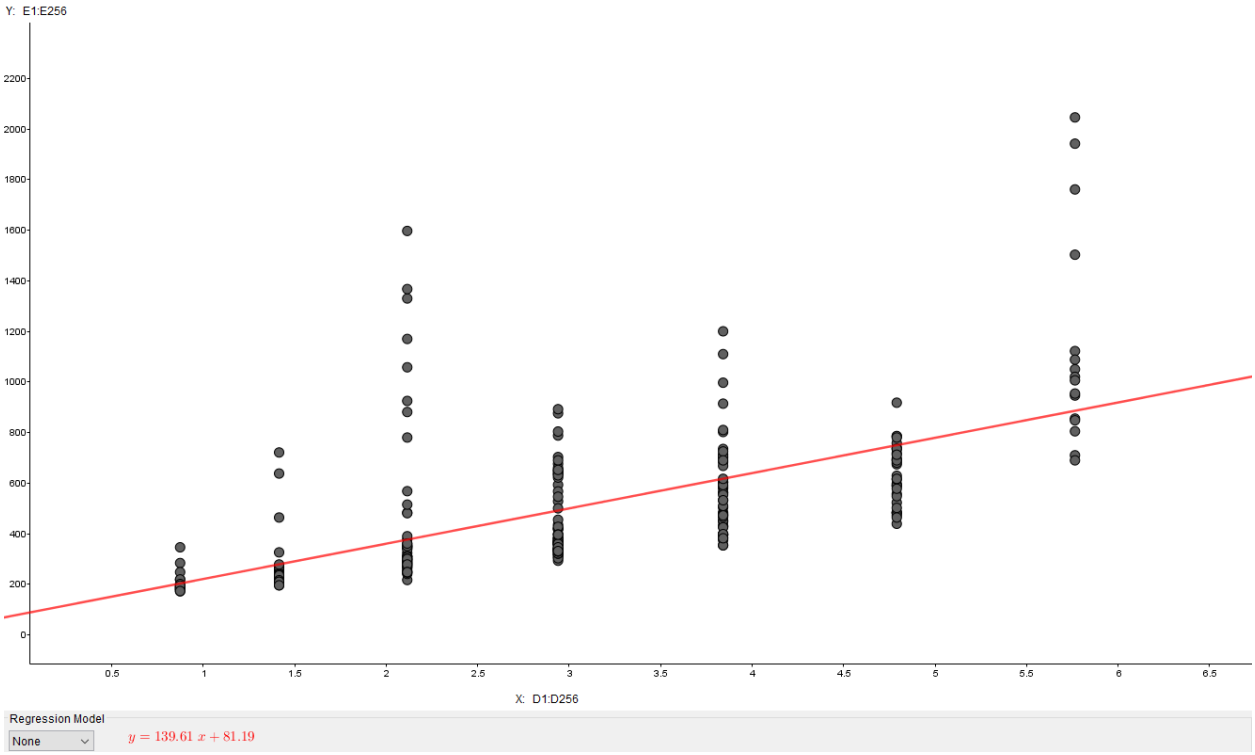
[1]The game can be found here
[2]Just a well-known fact (part of the community for 6 years)



$$b = 110.32\frac{ms}{bit} \Leftrightarrow b = 0.110\frac{s}{bit}$$

$$TP_1 = \frac{1}{b} = 9.1\frac{bit}{s}$$

Tablet:



$$b = 139.61\frac{ms}{bit} \Leftrightarrow b = 0.139\frac{s}{bit}$$

$$TP_2 = \frac{1}{b} = 7.2\frac{bit}{s}$$

We see that $TP_1 > TP_2$ which means that we get more information per bit with the mouse than the tablet. If we consider the graph for the tablet we see that deviations are up to 2200 ms whereas the mouse has deviation up to 1800 ms. This is because it is more difficult to adjust errors with tablet. The explanation is, when we get close to a target, the only advantage we have, is the feedback from watching where the cursor is relative to the target. With tablets we do not use the feedback from watching the cursor, but instead think in terms where to position the pen on the tablet's area.