Investigating Potential Pointing Laws for Targets on Touch Screen

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BACKGROUND

Fitts law, first developed in 1954 by Paul Morris Fitts Jr., is a model which predicts the amount of time it takes to move to a target area in regards to distance and width. It pertains primarily to a stylus or pointer, before touch screen devices were invented. An extension to Fitts' Law is the FFitts' law, standing for "Finger Fitts". It introduces dual-distribution to model the accuracy of finger touches. However, FFitts' law doesn't look into small target sizes thoroughly and its hypothesis is based on a 1D target. We would like to propose a model that could model both 1D and 2D targets along with small target consideration.

OBJECTIVE

To create a model that better represents the difficulty of target selections, especially when target sizes are small, and to investigate how well our candidate model performs in various tasks.

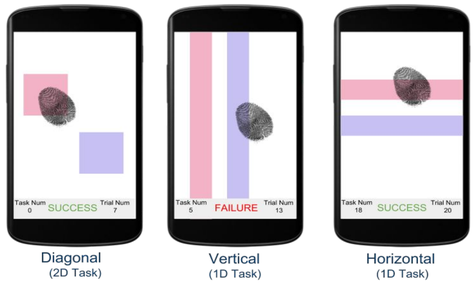
METHOD

Unlike Fitt's Law and FFitts Law[2], the candidate model takes both width and height into account, which frees the model from being constrained by only one aspect (width or height only) of the target.

$$T = a + b\log_2\left(\sqrt{\left(\frac{A}{\sqrt{W^2 - 2\pi e\sigma_{aW}^2}}\right)^2 + \eta\left(\frac{A}{\sqrt{H^2 - 2\pi e\sigma_{aH}^2}}\right)^2} + 1\right)$$

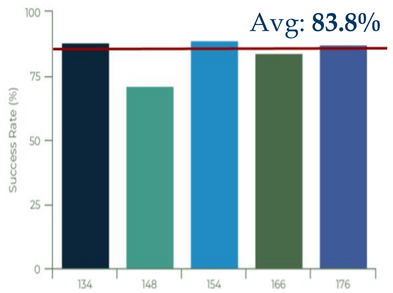
DATA COLLECTION

We asked 5 subjects, whose ages range from 16 to 28, to practice tasks on 3 different blocks (vertical and horizontal bars, rectangles). Each task asks the subject to complete a successful touch down event on the red shaded shape.

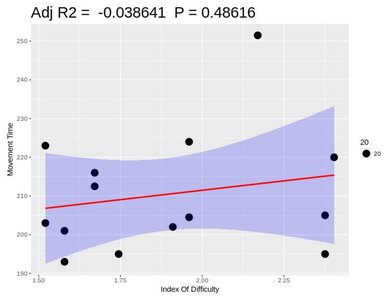


RESULTS

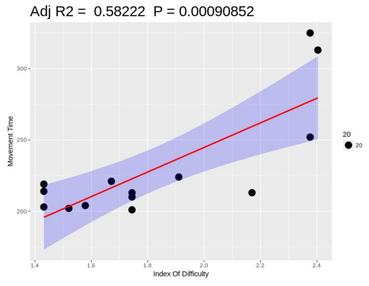
Linear Regression was used to graph line of best fit in order to accurately represent all data points.



Success rate of 5 subjects was calculated and compared with others based on time taken to complete task. The results show that the subjects have close to the average success rate.



Horizontal Bar



Vertical Bar

Models in horizontal bar and vertical bar are both highly correlated within the middle band of the index of difficulty. The reasons why small and large index of difficulties have less correlation are worth investigating.

REFERENCES

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DISCUSSION

DATA OBSERVATIONS

It is assumed that human behaviors often vary from expected results, which is why outliers are present in the data set.

RESULT OBSERVATIONS

Larger width and height values of targets allow for greater flexibility, decreasing the ID value.

POTENTIAL ISSUES

Small target sizes can cause the denominator of the formula to be negative or display a negative time value. Building up an empirical or general approach can assist in finding the lower bound of the denominator.

FUTURE WORK

- Further advance application to include crosshairs to increase precision
- Include other age groups during experimentation to compare results on basis of age
- Analyze the result of 2D targets

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