COSC 341

HUMAN COMPUTER INTERACTION

Fitts Law Selection

University of British Columbia

Group Member's

Karanpreet Kaur #76838655

Dasampreet Kaur #75180752

Mandeep Singh #72040231

Introduction

This report details a Fitts' Law study comparing the performance differences between using a Mouse and a Touchpad for target selection tasks.

Objective

The objective of this test is to analyze the difference in performance between using a Mouse and a Touchpad for selecting targets, and to visualize the data using a Fitts' Law graph (Time vs. Fitts ID).

Procedure

Task Details

- A Fitts' Law study was conducted using a 2D target selection task.
- Participants were required to select 9 targets arranged in a circular pattern.
- The study included 3 different distance conditions and 3 different target size conditions, resulting in 9 combinations.
- Each participant performed the task using both a Mouse and a Touchpad.

How was it done?

- Target Selection: Users select 9 targets in a circular arrangement. The initial target is red, and the remaining targets are white. System turns the next circle to be selected, to red. This continues until the last selection is same as initial then goes to next scene. Repeats Again!
- Target Size Conditions: Three target sizes (0.5cm, 1.25cm, 2cm) were used.
- Distance Conditions: Three distances (3cm, 6cm,10cm) were used.
- Data Logging: For each selection, the following data were logged:
    - Technique (Mouse and Touchpad)
    - Distance (distance between consecutively selected circles)
    - Width (diameter of circle itself)
    - Time to select the target.
    - Correctness of the selection (0 to correct and 1 for wrong selection)

Data was collected from three participants, each performing the task under all 9 combinations of conditions using both the Mouse and the Touchpad, resulting in a total of around 162 data points per participant.

Computations and Analysis

The final data is logged in excel sheets for each participant under both (mouse and Touchpad) conditions. Then for all unique (9) combinations of width and distance, mean calculated for all three participants. Further, Calculated Index of Difficulty (ID) values using formula (1), were entered into a spreadsheet.

$$\text{Fitts ID} = \log_2(D/W + 1) \quad \ldots. (1)$$

Separate columns were used for Mouse and Touchpad data. The data for the Mouse was selected and inserted as a scatter plot. The same process was repeated to add the Touchpad data to the same scatter plot. A linear trendline was added to the Mouse data points to show the overall trend. A separate linear trendline was added to the Touchpad data points for comparison. Plot can be seen below-

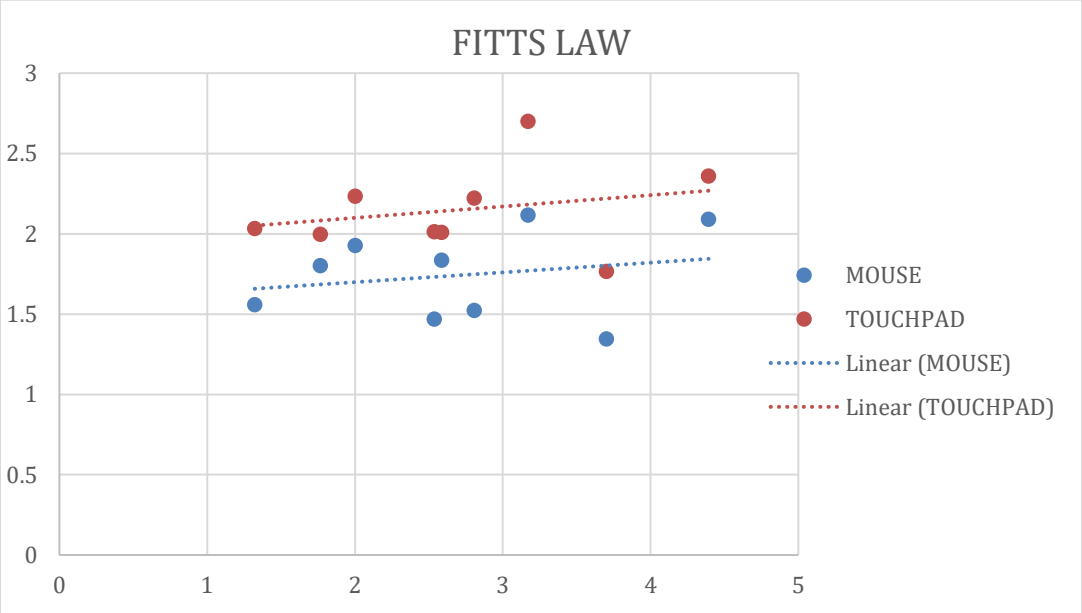

Diagram 1: Time vs. Fitts ID

Representation in graph

- Blue Dots: Represent the data points for the Mouse.
- Orange Dots: Represent the data points for the Touchpad.
- Dotted Blue Line: Shows the trendline for the Mouse data.
- Dotted Orange Line: Shows the trendline for the Touchpad data.

End Note, The Fitts' Law graph (Time vs. Fitts ID) was plotted to visualize the relationship between the movement time and the index of difficulty for each technique.

Observations

The analysis reveals significant performance differences between the Mouse and the Touchpad. The scatter plot indicates that the Mouse consistently achieves lower completion times across various Index of Difficulty (ID) levels. The trendline for the Mouse is gentler, reflecting more consistent performance. In contrast, the Touchpad shows higher completion times, with a steeper trendline that suggests a more rapid increase in task completion time as difficulty rises. These results imply that the Mouse is generally more efficient for target selection tasks, likely due to its precision and ease of use compared to the Touchpad.

Conclusion

The study successfully demonstrated the application of Fitts' Law in evaluating the performance of different input devices for target selection tasks. The Mouse generally showed better performance in terms of efficiency compared to the Touchpad.

References

- Source code is available at https://github.com/mandeep3535/Assignment-2
- Excel files at https://github.com/mandeep3535/Assignment-2/tree/main/Excel%20Files
- Video Available at https://youtu.be/dvNUuz00jCw