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IST 526

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Final Project Report

Report

Hypothesis: Participants would take less time to solve counting and estimation problems using shapes than tooltip.

Experiment Design: The idea is to count the targets in the least amount of time.

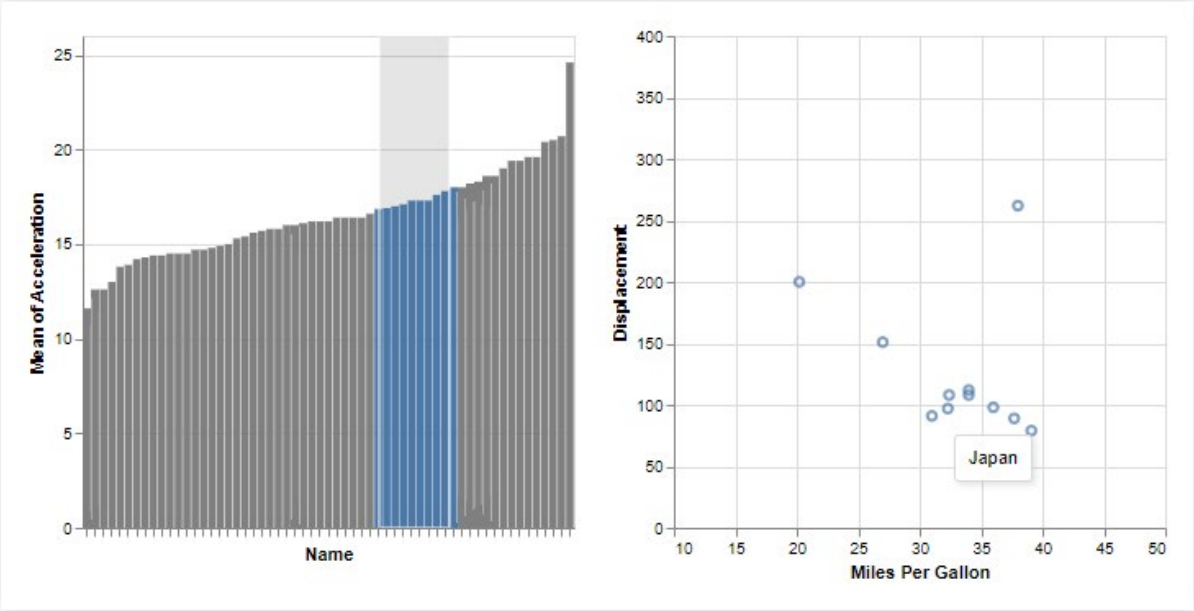
- Descriptions of conditions, tasks, and trial: There are 2 conditions for this experiment. In both conditions, an overview + detail graph is given to an observer. Observers are asked to count 10 cars that are made in USA with acceleration greater than 15 and 10 cars that are manufactured in Japan with acceleration greater than 15, as quickly as possible.

  In condition 1, car manufactures in different countries have different shapes and have no tooltip. One graph is a bar graph of average mean acceleration of car in sorted order. The other graph is a scatter plot of mileage vs horsepower. In the scatter plot each car has a unique shape based on the country it is manufactured in.

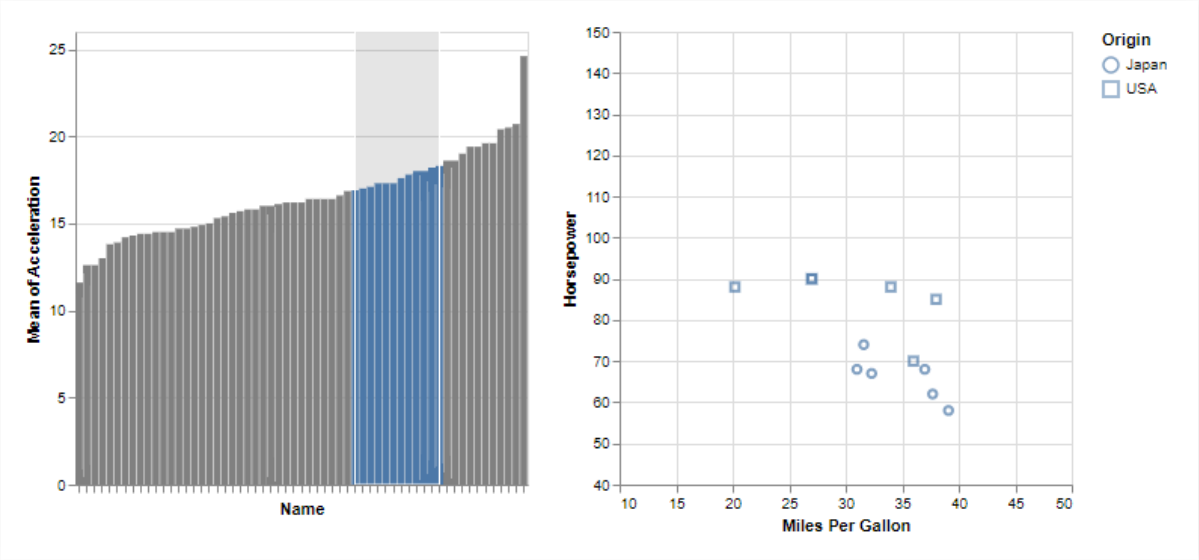
  In condition 2, all the cars are marked as points but has a tooltip which represents countries. Here one graph is a bar graph average mean acceleration of car in sorted order. The other graph is a scatter plot of mileage vs displacement. In the scatter plot each car has same shape but has a tooltip showing the country it is manufactured in. Participants needs to hover over the cars using the mouse, to see the countries.

  Each participant is given tasks and conditions in counterbalanced ways and are asked to complete the task (counting cars) in shortest amount of time. Task completion time was measured using a stopwatch on iPhone. Timer starts as soon as they see the graph and ends when they can complete the task (finding/counting 10 cars, with certain conditions). Only task completion time was noted, along with NASA TLX and SUS score for each condition. All the condition/ tasks' combinations were performed only 1 time.

- **Condition 1:**



- **Condition 2:**



Data Analysis: To prove the hypothesis, we need NASA TLX score, SUS score and task completion time. NASA TLX and SUS score will help in determine the difficulty participants

faced in completing the task, in other words qualitative analysis and task completion time will help us prove our hypothesis, using quantative analysis.

Result

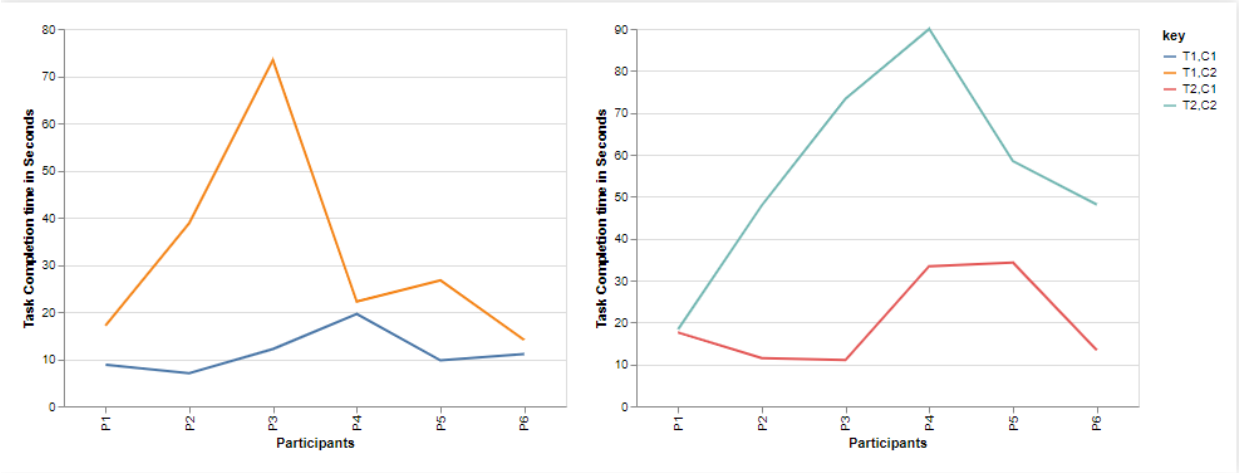


Fig1: Line Graph of task completion time in seconds for each participant.

Quantitative Analysis:

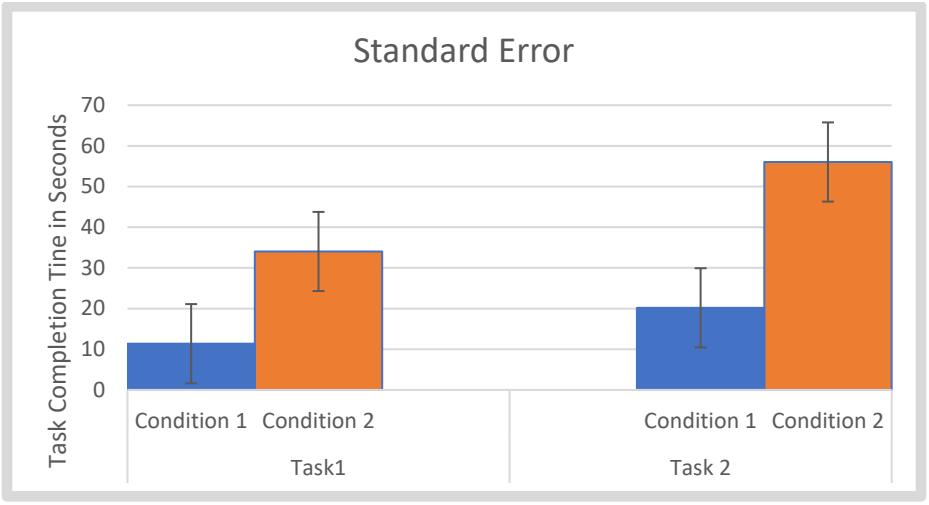


Fig2. Task Completion time with standard error for 2 task and 2 condtions, to perform each task.

The standard error shows that for both tasks, condition 1 took less time than condition 2.

The mean task completion time for condition 1(use shapes for counting) is 15.78s (SD= 8.73). This was 64% less time than time the mean completion time for condition 2 (use tooltip for counting) of 44.04s (SD=24.42) . The difference is statistically significant (t(12)= 3.77, p<.05).

From quanative analysis we can say that shapes are better at counting than tooltips.

	Task1, Condition 1	Task1, Condition 2
Mean	11.37	32.04
SD	4.38	22.02
Paired t-test T(6)	-2.2664	
Paired t-test p-value	0.07276	
Df	5	
Mean Difference	-20.665	

	Task 2, Condition 1	Task 2, Condition 2
Mean	10.84	56.04
SD	10.84	24.5
Paired t-test T(6)	-3.92	
p-value	0.011	
Df	10	
Mean Difference	-35.83	

Qualitative Analysis

	Condition 1	Condition 2
Average SUS score	84.1	49.58
Average NASA TLX score	18.83	52.8

The quantative analysis shows that participants found shapes as a better tool than tooltip for counting and estimation.

Source Code: https://github.com/lpp5139/HCI-report

Conclusion:

In the study, we found evidence that shapes are better than tooltip for counting and estimation problem. As can be seen from the results, SUS score for condition 1, i.e using shapes is greater than condition 2. Also based NASA TLX score, condition 2 requires more effort than condition 1. For both the tasks p value is close to the benchmark, stating that they are different from each other. Time completion for condition 2 is more than condition 1 for both tasks. All this proves that our hypothesis is correct.