IT 351 Human Computer Interaction
Lab 3 – Fitts' Law & Hick's Law

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1. Fitts' Law

In 1954, psychologist Paul Fitts, examining the human motor system, showed that the time required to move to a target depends on the distance to it, yet relates inversely to its size. By his law, fast movements and small targets result in greater error rates, due to the speed-accuracy trade-off. Although multiple variants of Fitts' law exist, all encompass this idea.

MT = a + b log 2 (2A / W) where

W : Width of the target measured along the axis of motion

A : Distance from the starting point to the center of the target

Fitts' law is widely applied in user experience (UX) and user interface (UI) design. For example, this law influenced the convention of making interactive buttons large (especially on finger-operated mobile devices)—smaller buttons are more difficult (and time-consuming) to click. Likewise, the distance between a user's task/attention area and the task-related button should be kept as short as possible.

Screenshots

Screenshot of GUI

Response Time Using Mouse

Response Time vs Target Dist   Response Time vs Target Size
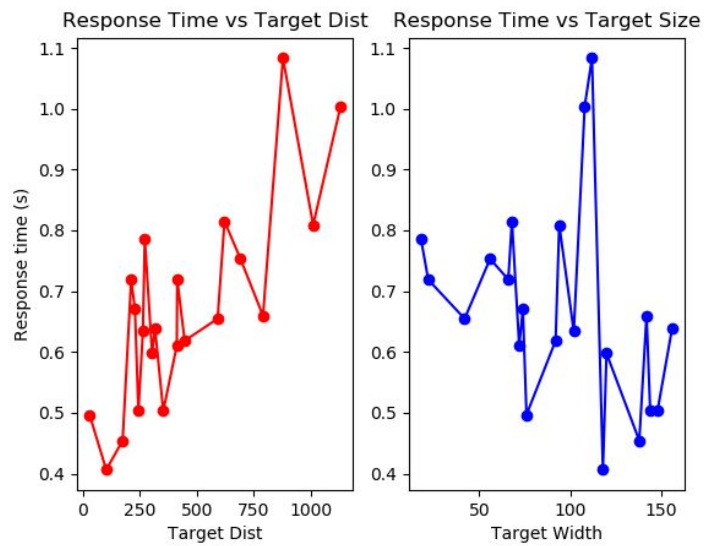
Distance	Diameter	Time
204.64	90.00	0.56
213.04	126.00	0.69
306.49	28.00	0.75
312.90	154.00	0.63
329.26	74.00	0.76
441.68	32.00	0.74
457.38	112.00	0.71
473.66	136.00	0.62
490.29	134.00	0.63
500.26	24.00	1.06
533.90	96.00	0.67
559.07	102.00	0.72
583.33	70.00	0.82
625.73	14.00	0.96
651.07	48.00	0.72
716.03	158.00	0.61
875.69	106.00	0.70
910.71	152.00	0.65
913.94	56.00	0.77
1,001.06	68.00	0.70
1,030.97	52.00	1.09

Response Time Using Touchpad

Response Time vs Target Dist   Response Time vs Target Size
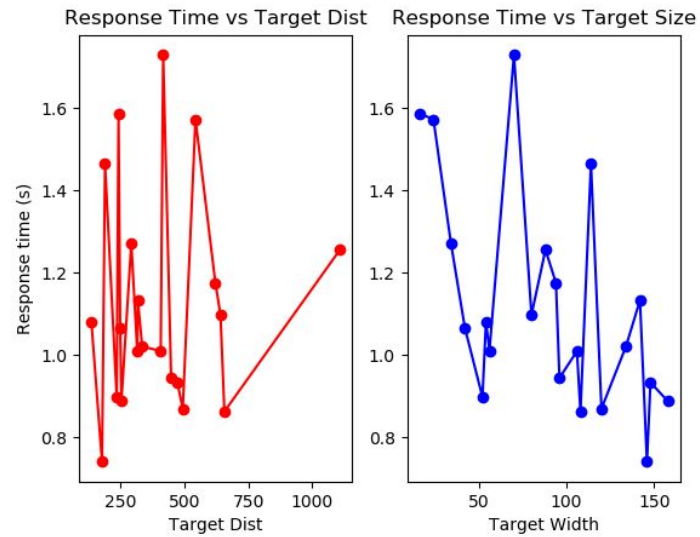
Distance	Diameter	Time
136.40	54.00	1.08
178.00	146.00	0.74
189.64	114.00	1.46
235.34	52.00	0.90
242.40	16.00	1.59
248.94	42.00	1.07
253.57	108.00	0.89
292.34	34.00	1.27
315.45	56.00	1.01
317.92	142.00	1.13
334.86	134.00	1.02
407.35	106.00	1.01
416.92	70.00	1.73
448.04	96.00	0.94
472.34	148.00	0.93
493.57	120.00	0.87
543.30	24.00	1.57
621.09	94.00	1.18
641.01	80.00	1.10
656.31	158.00	0.86
1,107.96	88.00	1.26

Analysis

Response time increases with increase in target distance and decrease in target diameter.
As observed from the graphs, we see that the response times are larger when using touchpad as compared to mouse.
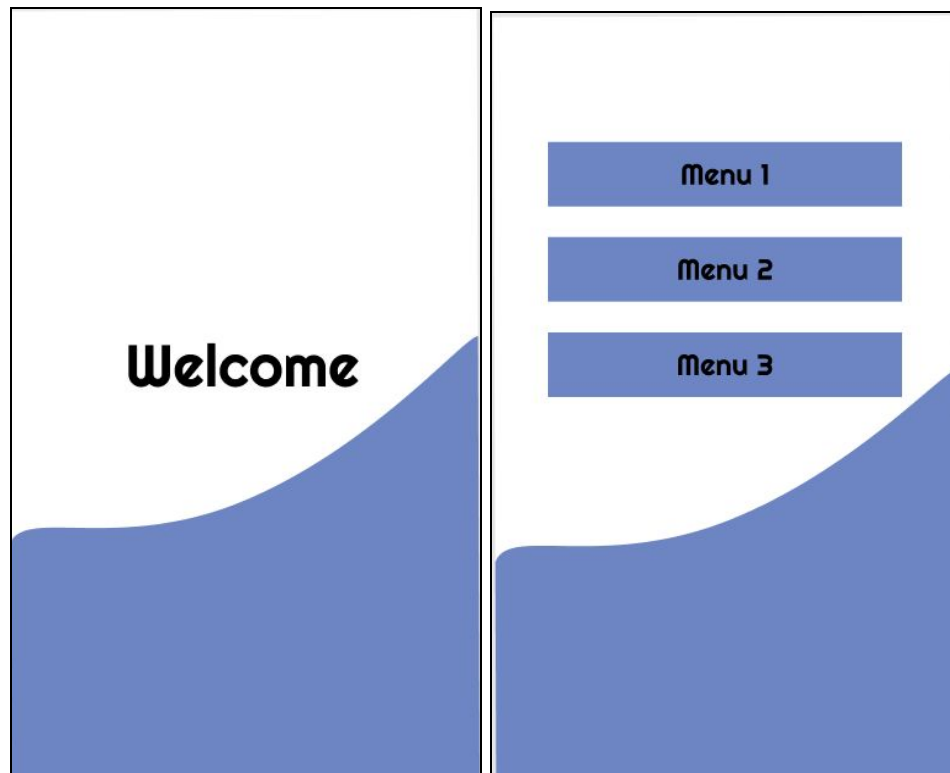Hence, Fitts' law is verified.

2. Hick Hyman's Law

Hick's Law is a simple idea that says that the more choices you present your users with, the longer it will take them to reach a decision. It examines the relationship between the number of stimuli present and an individual's reaction time to any given stimulus. As you would expect, the more stimuli to choose from, the longer it takes the user to make a decision on which one to interact with. Users bombarded with choices have to take time to interpret and decide, giving them work they don't want.

$RT = a + b \log_2(n)$ where
RT is the reaction time,
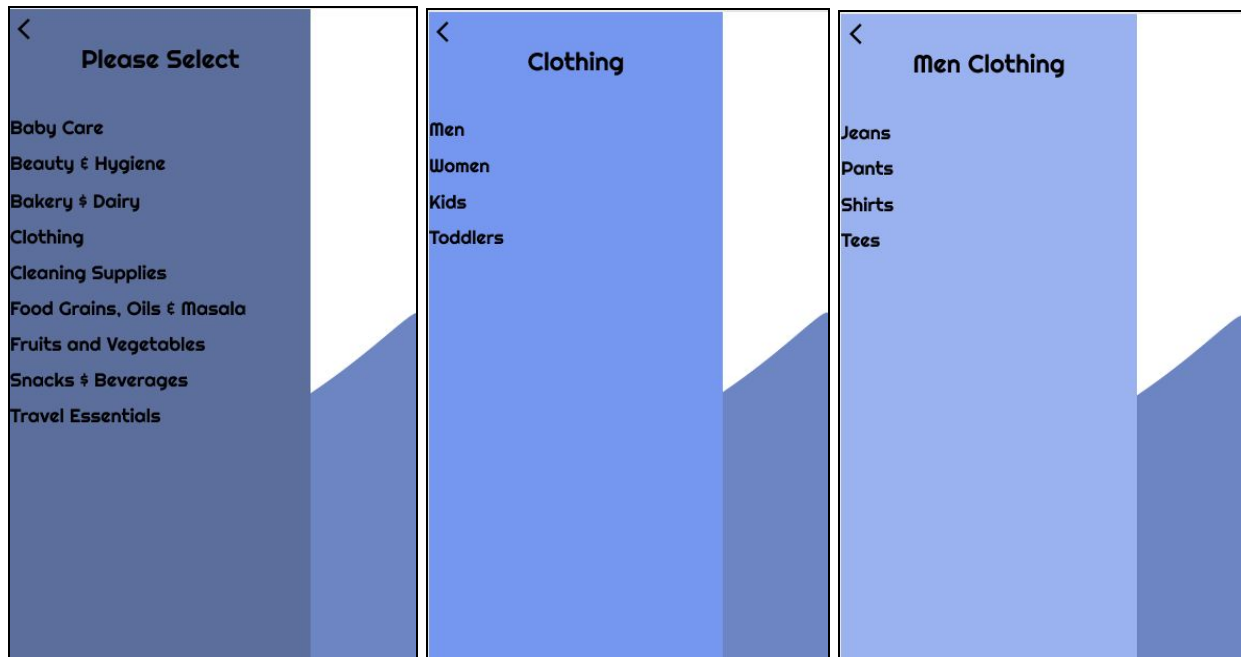n is the number of stimuli present

Screenshots

Home Screen

Please Select

Towels
Watches
Pants
Trowsers
Lipsticks
Flour
Potato
Flowers
Pulses
Chips
Baby bottle
Creame

Bad UI

Please Select

Food Items
Pulses   Chips
Fruits   Vegetables
Clothing
Pants   Shits
Leggins   Tops
Baby Care
Bottle   Diapers
Formula   Wipes
Cleaning
Broom   Mop
Mr. Muscle   Garbage Bag

Average UI

Please Select

Baby Care
Beauty & Hygiene
Bakery $ Dairy
Clothing
Cleaning Supplies
Food Grains, Oils & Masala
Fruits and Vegetables
Snacks & Beverages
Travel Essentials

Clothing

Men
Women
Kids
Toddlers

Men Clothing

Jeans
Pants
Shirts
Tees

Good UI

Analysis

Types of screens built and implemented:

Menu 1
In menu 1, we have all the choices listed. These are neither sorted alphabetically nor are categorized, thus the user will have to go through all the options to look for what they want to buy. This can be really frustrating and time consuming when there are a lot of options. Thus menu1 is a bad UI.

Menu 2
In menu 2, we have categorized all the options. So if the user knows what they want to buy, they can go to that category and select that option. This is better than menu 1 but all these options are still listed on the same page. Thus the user will have to scroll a lot to reach the destination. Thus this is an average UI.

Menu 3
Like in menu 2, here we have created categories and also have placed the other items in sub-menus. Thus we are simplifying things for the user and serving it in chunks. This is extremely good when the user knows what to buy, but when the user doesn't know what is needed, i.e. lack of prior knowledge, this menu could turn out to be a barricade. But for most cases, it is a good UI.

Menu Type	No. of choices	Measured Reaction Time (s)	Hick's Law Time (s)
Bad UI	12	5.4	5.2
Average UI	16 (in 4 categories)	4.1	4
Good UI	9	2.9	3.1

Hence, Hick's law is verified.

To make these designs work, we need to remember that:
- The user's time is precious
- A user is not obligated to stay on our site.

To enhance the user experience, we should consider the following:
- Categorizing Choice – Enabling users to find items from higher categories, as if they were looking under sections in a library.
- Obscuring Complexity – Breaking up long or complex processes into screens