NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA,

SURATHKAL.

DEPARTMENT: - INFORMATION TECHNOLOGY

IT351: - Human Computer Interaction

Assignment-1

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● Information About Fitts' Law :-

Fitts' law states that the amount of time required for a person to move a pointer (e.g., mouse cursor) to a target area is a function of the distance to the target divided by the size of the target. Thus, the longer the distance and the smaller the target's size, the longer it takes.

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.

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.

The law is applicable to rapid, pointing movements, not continuous motion (e.g., drawing). Such movements typically consist of one large motion component (ballistic movement) followed by fine adjustments to acquire (move over) the target. The law is particularly important in visual interface design or any interface involving pointing (by finger or mouse, etc.): we use it to assess the appropriate sizes of interactive elements according to the context of use and highlight potential design usability problems. By following Fitts' law, standard interface elements such as the right-click pop-up menu or short drop-down menus have had resounding success, minimising the user's travel distance with a mouse in selecting an option, reducing time and increasing productivity. Conversely, long drop-downs, title menus, etc., impede users' actions, raising movement-time demands.

Mathematically it can be written as :-

$MT = a + b \log_2 (2A / W)$

MT : Movement time (average) taken to complete the movement or point the target.

a : Start / Stop time of the device (y intercept)

b : Inherent speed of the device (slope of line)

W : Width of the target measured along the axis of motion, which corresponds to accuracy

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

The term $\log_2 (2A / W)$ is called the index of difficulty (ID). It describes the difficulty of the motor tasks. 1/b is also called the index of performance (IP) and measures the information capacity of the human motor system.

Thus $MT= a+b\ ID = a + ID / IP$.

- # Details About The Experiment Conducted:-

1. Create a user interface (ideally web-based) that displays an circle on the screen.

2. You must click on the circle immediately after it appears.

3. After you click the first circle, another circle will appear on the screen with a random size, colour, and position.

4. Immediately upon seeing this next circle, click on it as well.

5. Continue steps 3 and 4 indefinitely if circles continue to develop (about 30 circles).

6. Construct a table including information about your selection time, target circle distances, and circle dimensions (a,b,A,W,MT).

7. Plot a graph with diameter of target along x-axis and corresponding selection time on y-axis.

8. Perform the same experiment using a touchpad on a laptop instead of the mouse.Will use of touchpad on the laptop increase or decrease the target selection difficulty or the slope of the line? Compare your results and graphs.

- **ScreenShots :-**

/* home.html */

It includes a navigation bar which has two choices one is Home and another one is Simulation.When user clicks on home it will load the home.html page.Similarly when user clicks on Simulation it will load the Simulation.html page.

The initial page home.html includes information about the Fitts' law and how to perform the simulation.

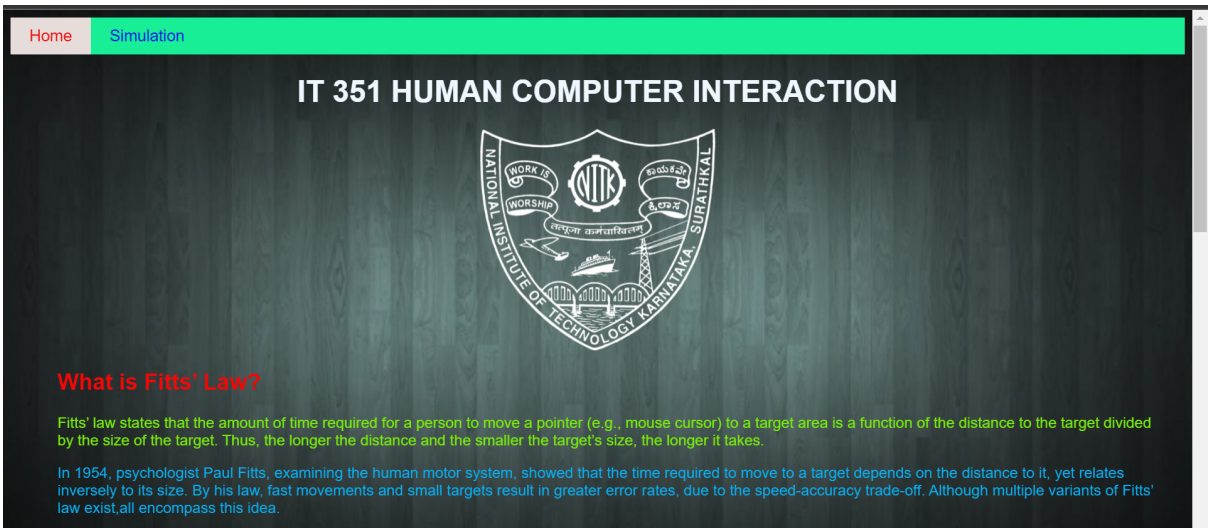

Fig.1 Home Page.

Fig.2 Home Page.

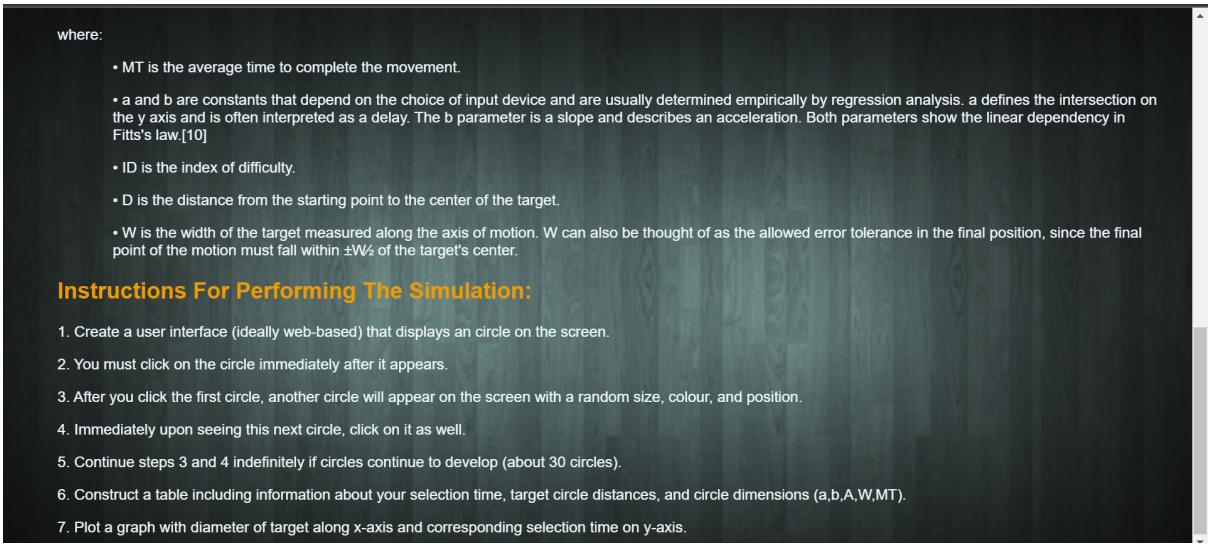

Fig.3 Home Page.

/* **simulation.html** */

This page has a 900 x 500 canvas with a circle of random diameter and random color.When a user clicks on the circle it will create another circle with random diameter and random color.After performing this about 30 times the graph will be generated with diameter of target along x-axis and corresponding selection time on y-axis. Similarly the table will be generated which includes information about selection time, target circle distances, and circle dimensions.

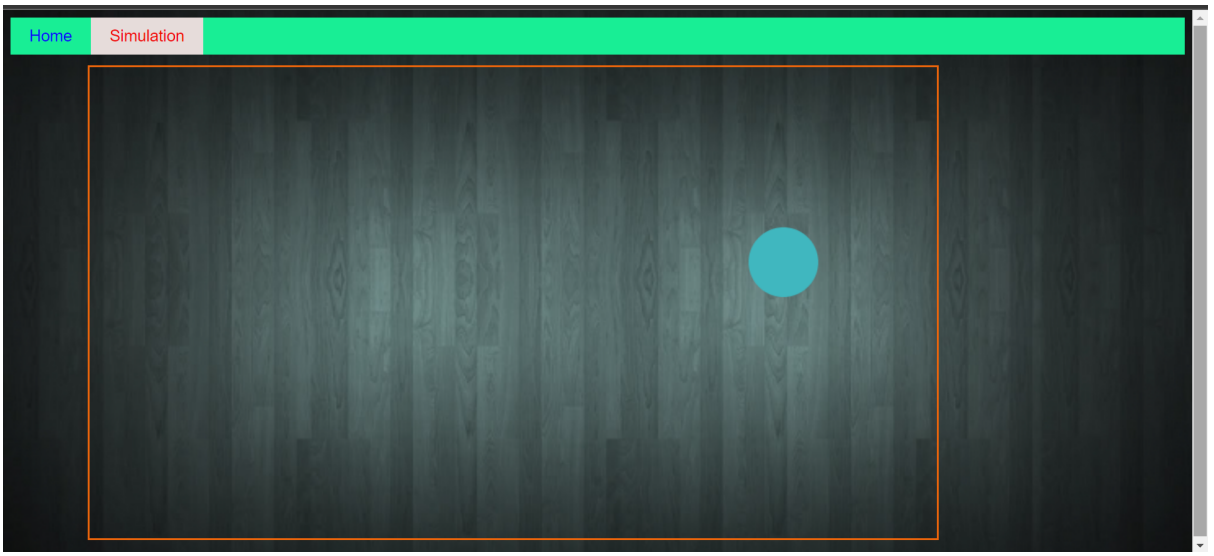

Fig.4 Simulation Page.

Using TouchPad :-

- Table

Sr. No.	Selection Time	Target Circle Distances	Circle Diameter
1	1.58	0	20
2	1.39	399	138
3	1.31	152	96
4	0.95	269	68
5	0.65	469	134
6	0.51	89	120
7	1.07	174	128
8	1.14	215	130
9	0.63	161	126
10	1.53	151	96
11	1.40	442	54
12	4.70	470	20
13	1.86	521	126
14	3.03	299	42
15	1.79	259	108
16	0.96	178	118
17	1.06	204	58
18	1.06	212	112
19	1.42	191	50
20	0.59	167	152
21	1.63	111	36
22	1.29	209	92
23	2.11	245	72
24	2.06	246	52
25	0.77	167	136
26	1.57	303	142
27	1.02	243	36
28	2.07	464	94
29	1.40	365	54
30	3.08	255	28

Fig.5 Touchpad Readings.

- Graph

Fig.6 Touchpad Readings Graph.

Using Mouse :-

- Table

Sr. No.	Selection Time	Target Circle Distances	Circle Diameter
1	4.78	0	74
2	2.92	766	122
3	2.41	82	24
4	0.65	121	102
5	1.87	483	126
6	1.63	284	70
7	0.89	95	102
8	1.89	193	68
9	0.44	37	64
10	1.08	75	22
11	0.95	389	126
12	0.80	103	86
13	1.47	310	152
14	0.74	206	154
15	0.60	394	136
16	1.67	217	118
17	2.36	531	40
18	1.44	277	148
19	1.61	194	112
20	0.60	164	128
21	0.67	486	148
22	0.64	111	126
23	1.34	251	130
24	1.52	298	118
25	0.82	114	152
26	0.96	233	110
27	2.55	369	82
28	1.87	344	58
29	1.98	258	94
30	1.57	318	28

Fig.7 Mouse Readings.

- Graph

Fig.8 Mouse Readings Graph.

- **Novelty :-**

1. I created a home page which includes the navigation bar.
2. Home page includes information about the fitts' law and instructions for performing the simulation.
3. Simulation part has a sound effect i.e when a user clicks on the circle he/she can hear the sound.So that blind people can also perform this simulation.
4. At the end the bell sound will come; it means that 30 iterations have been completed (you are done with the simulation).

- # Conclusion :-

By seeing the above values in the table for touchpad and mouse,we can come to a conclusion that when the user uses a mouse it's taking more time to select an object compared to touchpad.Use of touchpad on the laptop decreases the target selection difficulty.

The above table and graph show a direct inverse relationship between circle diameter and circle selection time, i.e., when circles are tiny, the time required to click on them is longer than when circles are large. Fitts' Law is well explained by this inverse relationship.

We have observed the effect of target distance and target size on the GUI target selection time.