

IT351 HUMAN COMPUTER INTERACTION

Assignment – 1: Fitts's Law

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Introduction:

Fitts's Law is a model of speed-accuracy trade-offs used in human computer interaction and ergonomics. It predicts time required to acquire a target on screen as a function of the distance to the target and the size of the target. Fitts's law is used to model the act of pointing, either by physically touching an object with a hand, finger or virtually or by pointing to an object on a computer monitor using a pointing device.

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.

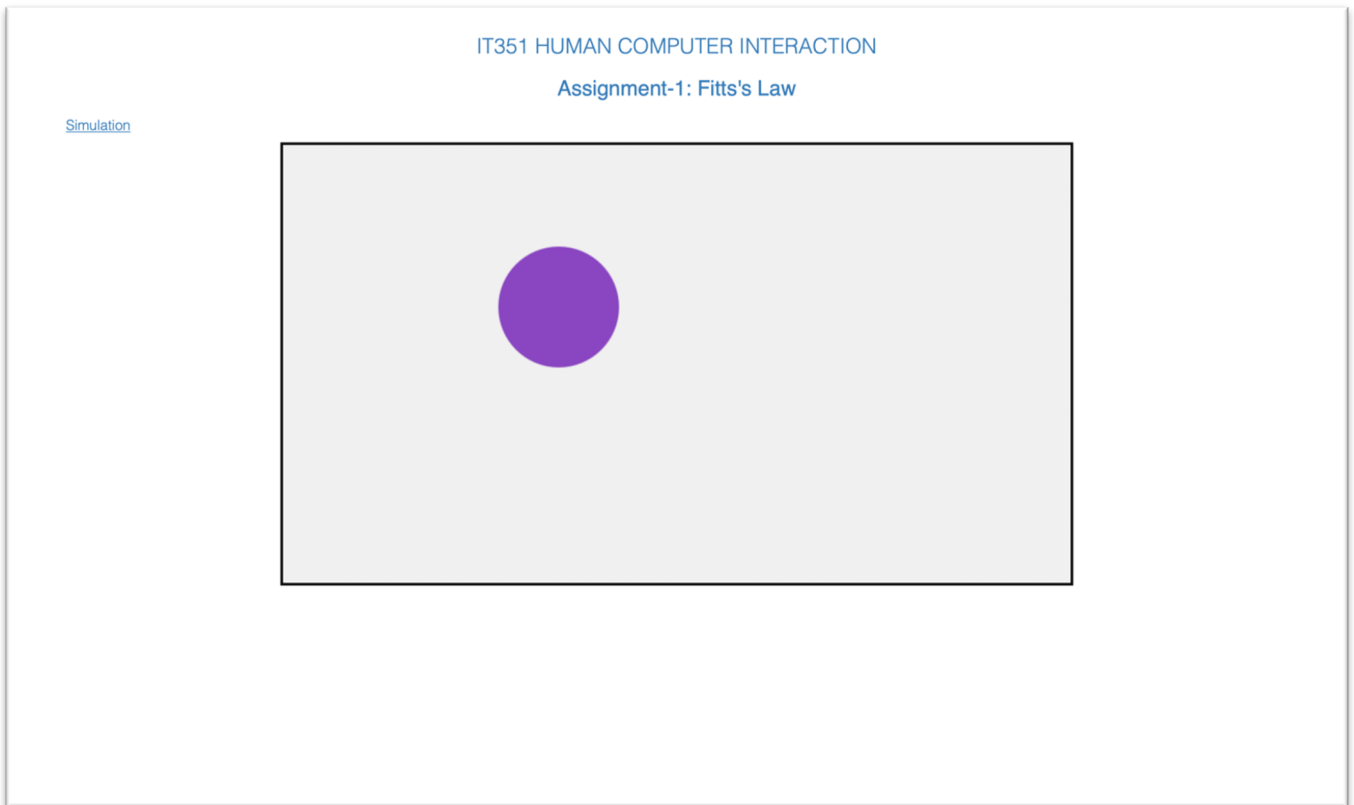
Thus,

$$MT = a + b ID = a + ID / IP$$

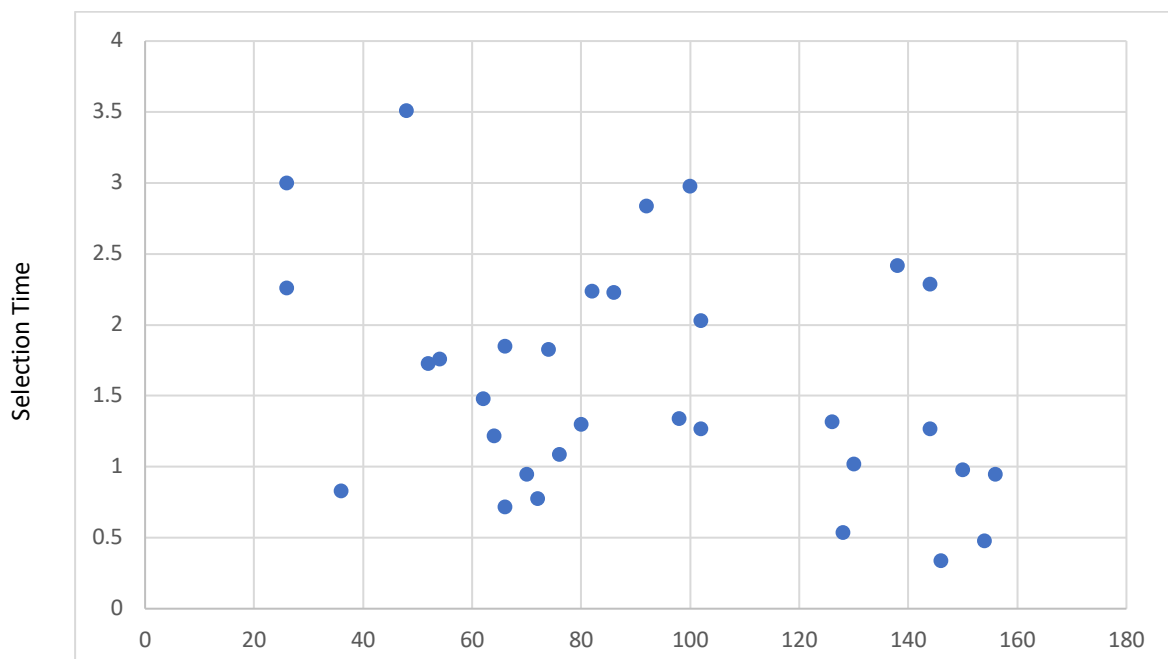
Method:

1. A web-based interface is designed.
2. The user has to click on the circles and the response time of the user will be recorded and analysed accordingly.
3. The user has to click on the circles and the time period between the subsequent clicks is recorded.
4. After the counter has reached to above 30, the user is provided with graphical analysis based on results.
5. Finally, user will see a table having data of selection time, target distances to circle and circle dimensions.
6. Table include information about selection time, target circle distances, and circle dimensions.
7. Graph with diameter of target along x-axis and corresponding selection time on y-axis.

Screenshots of the Web page:



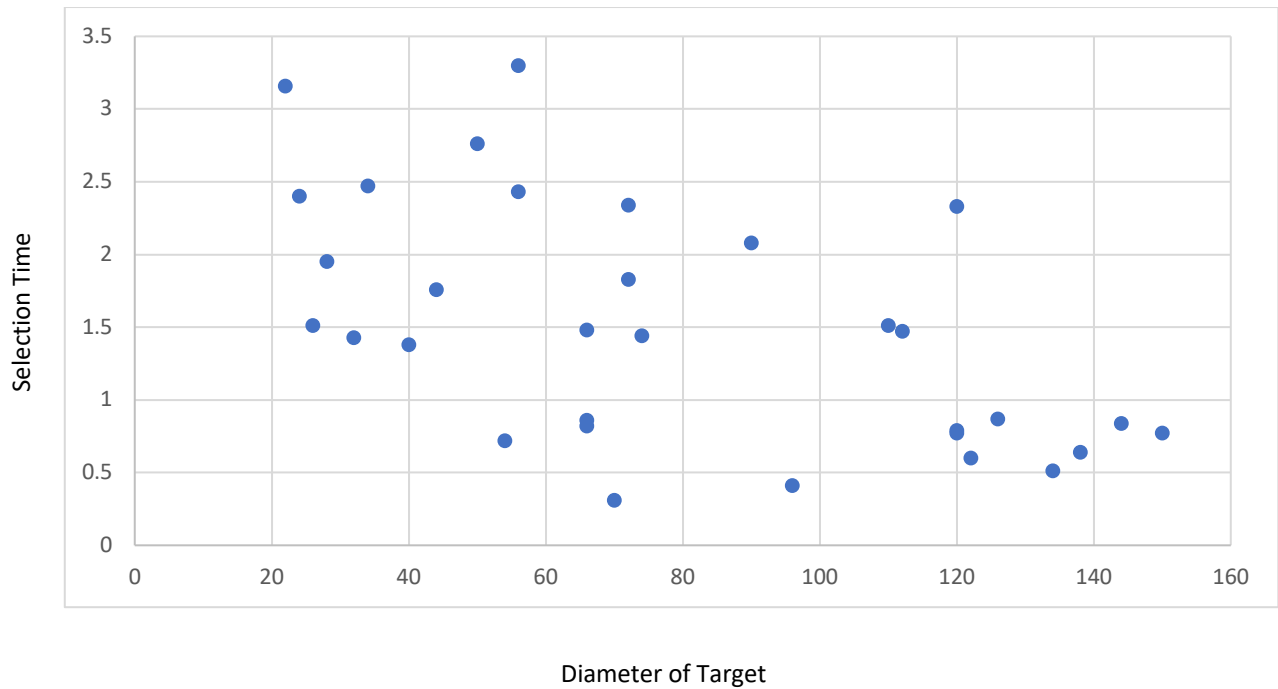
i) touchpad



Diameter of Target

Distances	Diameters	Selection Time
0	138	2.42
365	98	1.34
146	66	1.85
355	36	0.83
587	92	2.84
565	100	2.98
69	146	0.34
286	126	1.32
146	52	1.73
214	156	0.95
173	74	1.83
360	76	1.09
515	70	0.95
122	128	0.54
102	62	1.48
513	144	1.27
448	82	2.24
226	102	2.03
248	130	1.02
456	26	2.26
196	54	1.76
143	154	0.48
297	86	2.23
539	144	2.29
114	66	0.72
471	64	1.22
121	102	1.27
474	80	1.3
429	72	0.78
202	26	3
554	48	3.51
161	150	0.98

ii) Mouse



Distances	Diameters	Selection Time
0	24	2.4
518	74	1.44
254	34	2.47
299	72	1.83
187	66	0.86
300	26	1.51
55	32	1.43
374	56	2.43
59	96	0.41
124	28	1.95
220	40	1.38
226	110	1.51
257	120	0.77
358	120	0.79
13	66	0.82
622	120	2.33
220	72	2.34
152	144	0.84
366	66	1.48
143	122	0.6
53	70	0.31
182	126	0.87
261	90	2.08
270	112	1.47
176	138	0.64
377	50	2.76
447	56	3.3
132	44	1.76
237	22	3.16
85	134	0.51
62	54	0.72
28	150	0.77

Results of the Experiment:

The Graph depicting the Diameter of Target v/s Selection Time was plotted and the obtained graph show the inverse relationship between the diameter of the target and the selection time.

The results found that mouse interaction performed better than touch interaction as it has more control than the touch pad.

We can infer from the graph that the diameter of target varies inversely with the selection time.

Conclusions:

We can conclude that the Fitts's Law and Hick's law are pivotal in designing an efficient, and appealing User Interface. To ensure fast movement time and response times of users using the website, it should be ensured that the Index of Difficulty is kept minimum by ensuring proper distance and size of buttons. Also the Degree of Choice should be maintained by reducing the variety of buttons present. With the homogeneity of buttons, the time taken is less.