Fitt's Law

2.

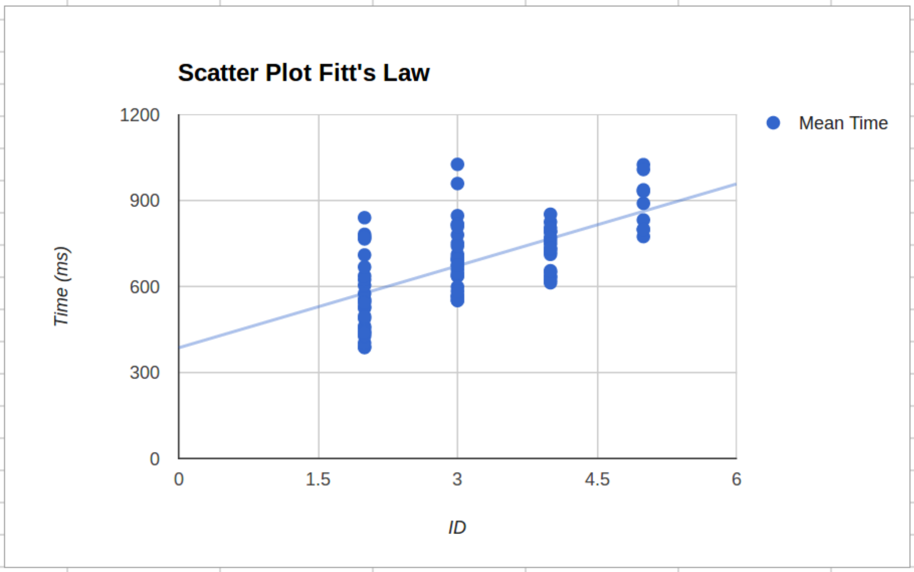

Figure 1: Fitt's Plot

This is a scatter plot of ID(Index of Difficult) vs Mean Time. The ID is a function of width and distance of target. It is formulated to be ID = log2(2d/w).

We see the time increasing linearly as the ID increases, therefore the fitt's law holds on this data recorded with a mouse on a computer. Clicking a bigger button is an easier task than clicking a smaller or narrower button. Also if the target is closer to the edges, one can quickly move the pointer in a direction, since the boundaries prevent futher movement.

A personal observation is, as the task proceeds, you get better at clicking the target, therefore the beginning tries are usually slower. This is a possible reason for large range variation in an ID.

Another observation is that the width of target has greater correlation with accuracy, than the distance, even though the time comes around to be same. This can be further investigated with more accuracy data with the same ID, but varying width and distance.

3.

- In a GUI on a desktop computer with a mouse, selecting a button in the lower left quadrant of the screen.

  Ans: Here we have a target with a certain size(a button, usually square), and a distance in a direction to move from the center of the screen. Therefore this condition is well suited for Fitts law. Also because this is a traditional screen and mouse interaction where Fitt's law has been observed to be applicable.

- In a GUI on a desktop computer with a mouse, dragging a vertical scrollbar in a window, once the user has executed the mouse down action.

  Ans: Yes Fitt's Law would be applicable. The parameters in consideration are size of the scrollbar, and the distance of scrollbar from the current mouse position. There are limitations on the width here, which can't be much since it's a vertical scrollbar. Once the scrollbar has been grabbed, then the distance to drag the scrollbar would depend on the length of the page.

- In a GUI on a desktop computer with a mouse, clicking on a button on the bottom border of the screen.

  Ans: Here Fitt's law is not applicable. The reason for this is there are screen limitations which prevent the movement of mouse pointer. Therefore here users can quickly drag the mouse, with the pointer automatically stopping at the bottom, and then click the button. Still the size of button would matter in the users accuracy to press it.

- On a touch-based ebook reader, used two-handed, swiping with the index finger to go to the next page.

  Ans: The Fitt's law would apply here because there is a area defined to be swiped (which is our button in this case). Usually these "buttons" are 2 halves of the screen when swiped would move in 2 directions (forward or backward depending on swipe direction). An observation is that holding the reader using both hands, swiping using thumb would be easier than using index finger.

- Shaking a cell phone up and down as a cancellation gesture.

  Ans: Fitt's law is applicable. Here the parameters are intensity of shake, and the up and down distance, which are analogous to size and distance of a button in a common use case. Hence greater the range of intensity of the shake, lesser time and better accuracy. The distance also when short can be more permissible, taking less time.

- On a mobile handheld touch device, used one-handed with right hand, selecting a button with the thumb at the upper left part of the screen.

Ans: Fitt's law is applicable. The thumb acts as a pointer, like a mouse, and the button size, and distance of the button from the center of the screen, are the main parameters. There are constraints for the button placement, which would depend on the screen size, resolution, device size. There are limitations in touch based devices that area below the thumb region would be less approachable, as well as extreme edges. Reaching for the edges is easy in mouse based interaction, because of the boundary, but in touch this is not the case.

- In a system that supports 3D in-air gesture recognition, bringing the two index fingers together.

  Ans: In 3d systems there are no edges which can prevent the movement of cursor, hence Fitt's law becomes complicated in gesture or touch based systems. The size can be thought of as the distance the fingers need to be to be considered "together". The distance will be the length of the gesture. This gesture is slightly similar to the pinch to zoom in 2d. In both there are multiple cursors being moved.

- On a mobile handheld touch device, using a one-handed pinch gesture to zoom out of a map display.

  Ans: Here the pinch target is the size, and the zoom gesture with the fingers is the distance. If the pinch target is smaller, it will require more time to accurately get to it, and for zooming more (more distance), it would take more time, because the gesture would be longer. Also here the cursor is not one, but two (or more) fingers, moving in opposite direction.

  Reference Literature: https://dl.acm.org/citation.cfm?id=2493221