

CPTS 543 Take Home Midterm
Annotated Bibliography (Fitts' Law)
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1. Krzysztof Gajos, (2012). Accurate measurements of pointing performance from in situ observations, *SIGCHI Conference Pages 3157-3166*

In this paper, the authors present a method for obtaining lab-quality measurements of pointing performance from unobtrusive observations of natural in situ interactions. Specifically, the authors used machine learning techniques to train a set of classifiers for different type of users. To capture and extract the movement data, they used Fitts's law to calculated *movement distance as distance from the location of the first movement event to location of the final click*, because obtain the exact position of a clicked target is impractical. As a result, the authors concluded that the user depended classifier they developed can be used to filter pointing data collected in naturalistic settings. Moreover, the authors provide us an innovative way of applying Fitts's law, which is Fitts's law not only can be applied in UI to decrease users access time, but also can be used as a powerful scientific data gathering method.

2. Morgan Dixon, James Fogarty, (2012). A General-Purpose Target-Aware Pointing Enhancement Using Pixel-Level Analysis of Graphical Interfaces. *SIGCHI Conference Pages 3157-3176*

In this paper, the authors present a general-purpose implementation of a target aware pointing technique. Specifically, they implemented Grossman and Balakrishnan's Bubble Cursor. Bubble Cursor is the fastest general pointing technique in the literature. Normally, to decrease the pointing time, people apply the standard Fitts' law such as increasing the size of target or place the target at the edge. The idea of Bubble Cursor is to advance the static Fitts's law to the dynamic level. The Bubble Cursor can identify the potential target by analyzing the item tree from Prefab, and then overlay a translucent highlight over the target. As a result, the authors concluded that the idea of Bubble Cursor can be a general strategy for implementing additional interface enhancements. As the implication of Fitts' law, the authors move the static application of the theory into dynamic field, which is that determine the target without moving to target and then dynamically select the target by overlaying a highlight over it.

3. Shumin Zhai, Jing Kong, Xiangshi Ren (2012). Speed-accuracy trade-off in Fitts' law tasks – On the equivalency of actual and nominal pointing precision *International Journal of Human-Computer Studies* Volume 61, Issue 6, Pages 823-856

The authors hold an opinion which is that operating with different speed or accuracy biases, performers may utilize more or less area than the target specifies, introducing another subjective layer of speed-accuracy tradeoff relative to the task specification. In this paper, the authors used 4 experiments to illustrate and support their theory. As a result, they point out that through their experiments and investigation, the relationship of speed and accuracy depends on the two layers tradeoffs (between index of difficulty based on the nominal target width and generic index of difficulty). As a implication, their work suggest ways to accurately measure Fitts' law parameters, which help researchers and UI designers to use Fitts' law more accurate and efficient.

4. Dugald Ralph Hutchings. (2012). An Investigation of Fitts' Law in a Multiple-Display Environment *SIGCHI Conference* Pages 3181-3184

In this paper, Dugald presents the design and analysis of a Fitts' law experiment which is conducted in a multiple-display environment (MDE). The main purpose of the experiment is to explore whether user interface designers can reliably use Fitts' law to predict one dimensional movement time and accuracy in a two-monitor MDE when physical proximity of the monitors is unknown. According to the result of Dugald's experiments, he concluded that increasing visual distance without increasing motor distance nevertheless increases predicted movement time, as does placing a target such that its edge abuts the gap. Dugald argued that Fitts' law may underestimate difficulty of pointing task on multiple-monitor systems. From his work, some future works are suggested. One is to generalize Fitts' law model to account for MDEs.

5. Olivier Chapuis, Renaud Blanch. (2012). Fitts' Law in the Wild: A Field Study of Aimed Movements *SIGCHI Conference* Pages 3181-3184

In this paper, authors present the first field study of aimed movements in graphical user interfaces, designed to get better insight into pointing in the real (electronic) world and assess the validity of Fitts' law in the wild. They introduce the length-distance index (LDI) to take into account the fact that many movements are not straight, they also extended Fitts' law that include LDI. The goal of their research is to gain insight into real-life pointing and assess the validity of the results of controlled experiments of pointing techniques in the real world. In particular, they wanted to test the validity of Fitts' law in the wild. As a result, they introduced LDI firstly as a complementary tool to the index of difficulty in order to better understand aimed movements that are not straight. Then, they showed that Fitts' law is a good predictor of mean performance. As a implication, their work expend the Fitts' law with newly defined parameter LDI, which has better result compare to standard Fitts' law.