# QUANTIFYING THE LEARNING EFFECT IN HUMAN PERFORMANCE MODELS

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ABSTRACT. *Learning effect widely exists in human-computer interaction (HCI) processes, however, there is no human performance model that takes them into account. In this paper, therefore, we propose two new models that reflect the effect of the learning effect on movement time in pointing tasks. These two models are based on the SH-Model, which takes account of both system and human effects for pointing task evaluation. According to the minimum AIC method, it can be seen that this new model is more effective for experimental data that latently involve the component of learning effect. In other words, if the SH-Model is extended to reflect the learning effect factor, it can produce more reliable, accurate and comprehensive results.*
**Keywords:** Human performance model, Learning effect, Fitts' law, SH-Model

1. **Introduction.** With the advancement of interaction techniques between humans and computers, including robots [23], a lot of interaction techniques have been proposed to improve the interaction process, This is especially true of human performance in pointing tasks [10, 14, 25, 6, 11, 20] because pointing tasks have occupied a dominant position in the field of human-computer interaction (HCI) since graphic user interfaces (GUIs) became ubiquitous. All techniques aim to help users acquire targets more or less effectively or accurately under different conditions. However, it is not adequate to merely present new interaction techniques without a thorough comparative evaluation that clearly indicates in what circumstances some of them can work better. Thus, it is essential to evaluate the human performance of each technique, i.e. to verify the effectiveness of each technique. Otherwise it cannot really be known whether a particular technique is suitable for any particular HCI application. Up to now, the most widely used model for pointing task evaluation has been Fitts' law [8].

Fitts' law is a basic mathematical tool or theoretical framework which is extensively used in HCI studies [1, 3, 9, 18, 26] because it is thought to precisely model human performance and the index of difficulty ($ID$) of pointing tasks as a simple linear equation as follows:

$$MT = a + bID \tag{1}$$