

User-Centered Mouse Access Evaluation Design: Windows-Based Simulation Technology

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Abstract. This paper introduces a Windows-Based Simulation Technology (WBST) to monitor user's interaction with computer through a mouse. This design could evaluate a client's pointing and selecting proficiency by measuring the cursor movement and motion control. The simulated Windows-based task operations require the client synthesize four basic types of mouse operating skills, including clicking, cursor moving, cursor moving and clicking, and dragging. The WBST can record the positions and responses of a mouse during any specific task. It can also rebuild the recorded results of cursor moving and motion control on the screen. The WBST not only provides the clinical professionals with more detailed information to evaluate the specific difficulties of manipulating mouse for a client, but also allows engineers to design adaptive input device for the people with special needs.

Keywords: Windows-Based Simulation Technology.

1 Introduction

Mouse is the main input device for computer manipulations in the windows-based environment. For those who have difficulties to manipulate the mouse operations, the mouse would be the barrier to prevent them from the opportunities brought by the information technology. A lot of human computer interface studies, which include interacting technique in software and device hardware, explored the behavior of the motion impaired with mouse operations to design and meet what they need [1],[2],[3],[4],[5]. However, the artificial evaluation processes are tedious and hard to collect and analyze exactly what the user struggles with the mouse for some specific tasks. Our design in this study is to simulate what the Microsoft Windows Operating System works. The Windows-Based Simulation Tracing Tool can track and collect information behind the course of mouse operations for any indicated task. With the accurate analysis of quantitative data, the clinicians can efficiently understand the process of any user's cursor movement in different situations such as distances, directions, accuracy, speed, acceleration with any alternative mouse devices. Moreover, electronic engineers can more accurately design the alternative mouse for individuals with different disabilities or limitations to meet the needs in actual Windows environment.

2 Windows-Based Simulation Tracing Tool

The design of Windows-Based Simulation Tracing Tool is a windows-based simulation software design running on the Microsoft Windows platform with resolution 1024*768 (Figure 1). In order to increase the accuracy of evaluation for the mouse operations, the system simulates four types of functional performance tests which include “Operation System manipulating”, “window operating”, “word processing” and “on-screen keyboard pointing and selecting”. Each test consists of several typical evaluation tasks in Windows platform, some examples are shown in the Table 1. In the process including any failure during the task, all the locus of movement course with screen coordinates, operations of mouse and spending time are recorded to the database system which has been built into the Windows-Based Simulation Tracing Tool. Therefore the collected data after being analyzed from each subtask could show the specific difficulties that he/she met during the functional performance. The Windows-Based Simulation Tracing Tool not only reduces the traditional overload of evaluation process made by human efforts, but also provides the accurate information for the clinicians and electronic engineers to support people with special needs in the information and communication technology.

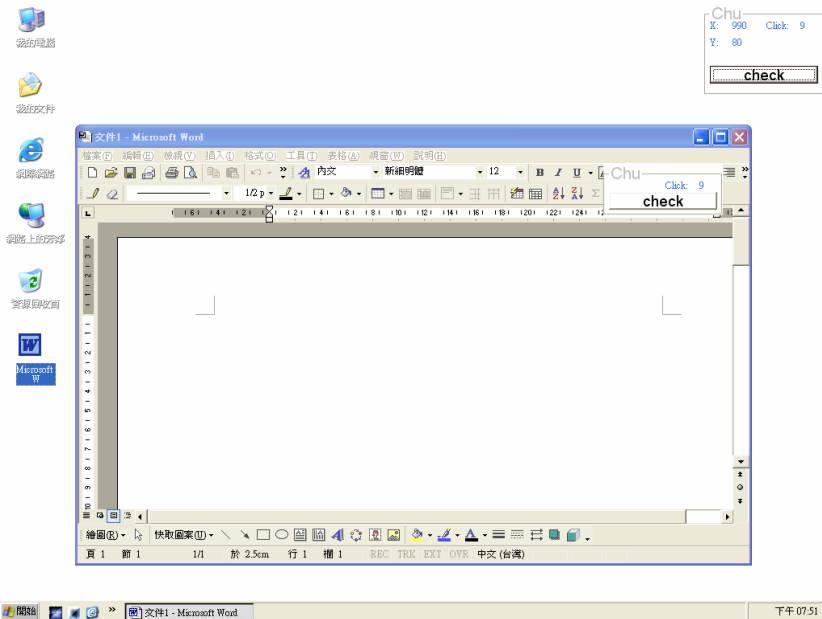


Fig. 1. Windows-Based Simulation Tracing Tool

3 Analysis Module

The Windows-Based Simulation Tracing Tool permits the clinical evaluators setting up assessment tasks to test the user’s mouse performance. The system will record the

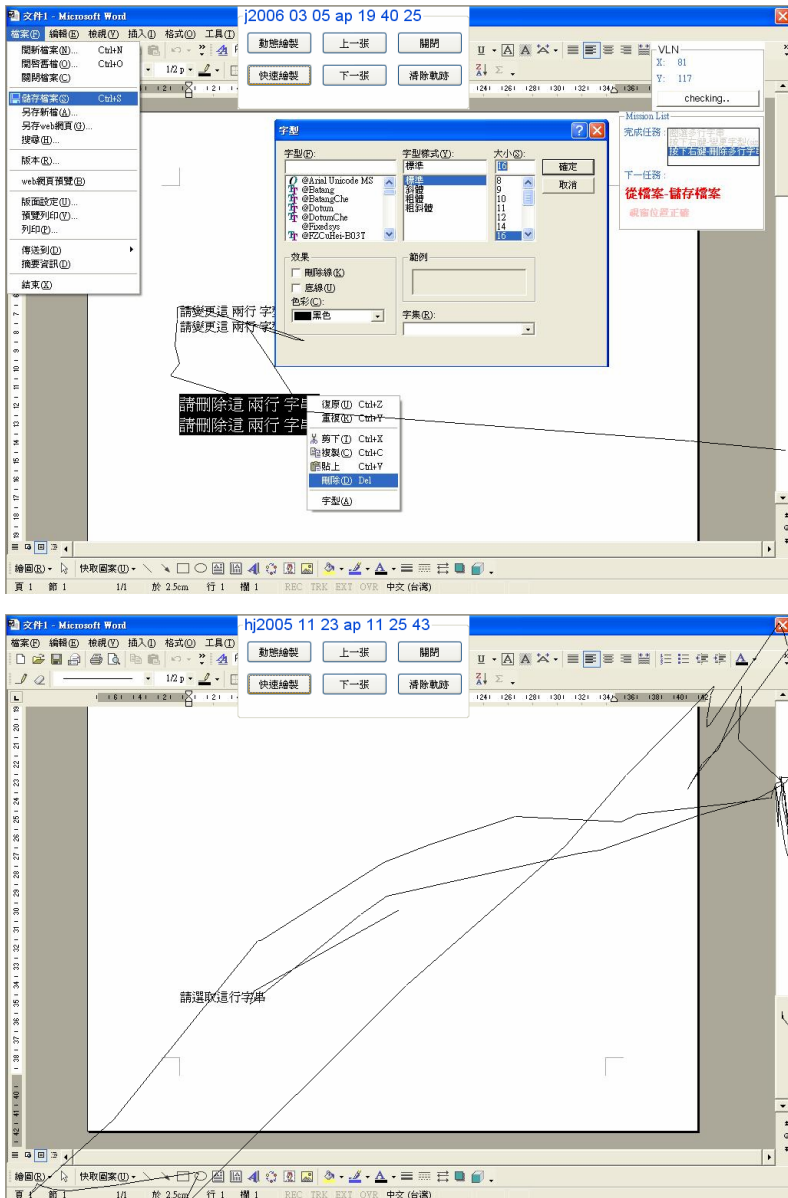


Fig. 2. Analysis Module with dynamic Viewer

detailed responses in database to provide the Analysis Module with dynamic Viewer (Figure 2) to ease the understanding of user's performance and difficulties. Windows-Based Simulation Tracing Tool can measure speed, accuracy and efficiency of each evaluation task. Speed indicates the time spent for accomplishing a single test item.

Accuracy reveals the percentage in dividing the amount of correct responses by the total trails in each task. Efficiency displays the trajectory of the cursor moving. The trajectory can respond the problems of cursor moving with acceleration information. The coordinates of cursor movement are recorded every decisecond. The coordinate data can build the pattern of each movement and probe the fluency of each movement.

Table 1. Evaluation tasks

Windows-Based Simulation Tracing Tool		
Tests & subtests	Tasks	Variables measured
■ OS manipulating		
➤ Manipulating "start menu"	Cursor moving and L-single clicking	Speed, accuracy, efficiency
➤ copying a icon and pasting it	Cursor moving, R-single clicking, and L-single clicking	
➤ executing a file on desktop	Cursor moving and L-double clicking	
➤ shutting down system	Cursor moving, L-single clicking	
■ window operating		
➤ closing a window	Cursor moving and L-single clicking	
➤ navigating(scroll)	Cursor moving and dragging	
➤ manipulating menu bar	Cursor moving and L-single clicking	
■ word processing		
➤ activating a key on screen keyboard	Cursor moving in a limited area and L-single clicking	
➤ editing a sentence	Marking a sentence and R-single clicking, targeting and L-single clicking	
■ on-screen keyboard pointing and selecting		
➤ opening on-screen keyboard	Cursor moving and L-single clicking	
➤ selecting a key	Cursor moving and L-single clicking	

4 Conclusion

The goal of this study design is to provide an efficient and accurate solution for the evaluation of mouse performance that would allow people with disabilities having opportunity to access the computers. A study of Windows-Based Simulation Tracing Tool has been conducted to the clinical service intervention. It is great to start anyone with computer access disability on Windows-Based Simulation Tracing Tool test by giving them an opportunity to find out the adaptive input device. The analyzed quantitative data can efficiently provide the accurate information for the clinicians and electronic engineers to evaluate and design the most suitable alternative mouse to the people with special needs.

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