(19)(CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Method of Scrolling a Display Window

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ABSTRACT

A method of scrolling a display window which employs a continuously increasing rate of scrolling over time, such as an exponential curve.

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METHOD OF SCROLLING A DISPLAY WINDOW

BACKGROUND OF THE INVENTION

This invention relates to a method of scrolling a display window displayed on a computer screen.

Figure 1 shows an example known in the art of a display window with controls for scrolling the window. Figure 1 shows a display window as they appear on the Apple Computer, Inc. Macintosh family of computers. (Macintosh is a Registered Trademark of Apple Computer, Inc.)

In Figure 1, the display window has a viewing area 10 in which text or graphical objects are displayed. Across the top of the window are a title bar 12, title 14, and a close box 16. Across the right side of the window are a scroll bar 20, having a scroll arrow 22 for upward scrolling, a scroll box 24, and a scroll arrow 26 for downward scrolling. A size box 28 allows adjustment of the window size. Across the bottom of the window are a scroll bar 30 for horizontal scrolling of the active window area 10, and a size box 32 for adjusting the size of the window. Various parts of the window can be controlled or adjusted by use of a pointing device, such as a mouse, which moves a cursor on the display. A button on the mouse can be used to select or "click" on the controls or boxes of the window.

Scroll bar 20 is used to control which part of a document or object is shown in the viewing area 10. The position of the scroll box 24 within the scroll bar 20 represents the relative location of the portion of the document currently visible inside the viewing area 10 to the entire document. As the user uses the scroll bar 20 to move the document under the viewing area 10, the position of the scroll box 24 moves correspondingly. If the document can fit entirely within the viewing area 10, the scroll bars become inactive, and are not displayed.

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There are three ways to move the document under the window: by sequential scrolling, page by page scrolling, and by directly positioning the scroll box.

In sequential scrolling, the user clicks on a scroll arrow 22 or 26 to see more of the document in the direction of the scroll arrow, so it moves the document in the opposite direction from the arrow. For example, when the user clicks the top scroll arrow 22, the document moves down, bringing the view closer to the top of the document. The scroll box 24 moves toward the arrow being clicked.

Each click in a scroll arrow 22, 26 causes movement a distance of one unit in the chosen direction, with the unit of distance being appropriate to the application: one line for a word processor, one row or column for a spreadsheet, and so on. Within a document, units should always be the same size, for smooth scrolling. Pressing and holding down on the scroll arrow causes continuous movement in its direction.

In page by page scrolling, clicking the mouse anywhere in the gray area of the scroll bar advances the document in steps window by window through the document. The scroll box, and the document view, move toward the place where the user clicked. Clicking below the scroll box, for example, brings the user the next window toward the bottom of the document. Pressing in the gray area of the scroll bar 20 keeps windows flipping by until the user releases the mouse button, or until the location of the scroll box 24 catches up to the location of the pointer. Each window is the height or width of the window, minus one unit overlap (where a unit is the distance the view scrolls when the scroll arrow is clicked once).

In both the above schemes, the user moves the document incrementally until it's in the proper position under the window; as the document moves, the scroll box 24 moves accordingly. The user can also move the document directly to any position simply by moving the scroll box 24 to the corresponding position in the scroll bar 20. In directly positioning the scroll box 24, the user drags it along the scroll bar 20; an outline of the scroll box 24 follows the pointer. When the mouse button is released, the scroll box 24 jumps to the position last held by the outline, and the document

jumps to the position corresponding to the new position of the scroll box 24.

When sequential or page by page scrolling is used, two methods of controlling the speed of the scrolling of the display window are known:

(1). Scrolling speed is set to a constant rate. However, this may be too fast for fine positioning of a document in the window, and be too slow for traversing a long distance in a long document.

(2). Employ a linear acceleration of scrolling over time. Scrolling begins at a slow rate, which is suitable for fine positioning, and the scrolling rate increases as the scrolling continues. Eventually a maximum rate is reached at which a long distance in a long document can be traversed in a timely manner. However with a linear acceleration it can take a significant period of time to transition from the minimum starting speed to the maximum ending speed, since the differences between these rates can be quite large. In fact, it is desirable that the differences between these rates be quite large, providing the least possible rate for fine positioning, and the maximum rate which can be sustained by the computer for the maximum rate.

Neither of these methods of controlling the speed of the scrolling of the display window have proven to be entirely satisfactory, and other methods of incorporating additional "speed controls" have also proven to be clumsy and unsatisfactory.

SUMMARY OF THE INVENTION

This invention provides a method of scrolling a display window displayed on a computer screen. Scrolling begins at a minimum value suitable for fine positioning. The rate of scrolling automatically accelerates as the user continues a scroll, at a continually increasing rate (e.g., exponential). The rate of scrolling quickly reaches a maximum value suitable for travel over long distances. The transition between the minimum and maximum values of scroll speed occurs quickly compared to linear acceleration, and occurs without abrupt changes in speed

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