POINTING GESTURE BASED COMPUTER NOTE PAD PAGING AND SCROLLING INTERFACE

This is a continuation of application Ser. No. 08/357,707 filed Dec. 14, 1994, which is a continuation of application Ser. No. 07/868,013 filed Apr. 13, 1992, which issued as U.S. Pat. No. 5,398,310 on Mar. 14, 1995.

BACKGROUND OF THE INVENTION

The present invention relates generally to the manipulation of images on a computer screen, and more particularly to methods for manipulating images on the screen of a pen-based computer system.

A pen-based computer system is a small, often hand-held, computer system where the primary method for inputting data includes a "pen" or stylus. A typical pen-based computer system is housed in a generally rectangular enclosure, and has a dual-function display assembly providing a viewing screen along one of the planar sides of the enclosure. The dual-function display assembly serves as both an input device and an output device. When operating as an input device, the display assembly senses the position of the tip of the stylus on the viewing screen and provides this positional information to the computer's central processing unit (CPU). Some display assemblies can also sense the pressure of the stylus on the screen to provide further information to the CPU. When operating as an output device, the display assembly presents computer-generated images on the screen.

The dual-function display assemblies of pen-based computer systems permit users to operate the computer as a computerized notepad. For example, graphical images can be input into the pen-based computer by merely moving the stylus on the surface of the screen. As the CPU senses the position and movement of the stylus, it generates a corresponding image on the screen to create the illusion that the stylus is drawing the image directly upon the screen. With suitable recognition software, text and numeric information can also be entered into the pen-based computer system in a similar fashion.

Users often want to input more than one screen-full of information into their computer systems. To accomplish this, computer systems of the prior art have adopted two different input and display techniques. With a first technique, the screen images are treated as "pages" of a notepad. Users can then either sequentially access pages by "flipping" back or forth through the notepad, or they can jump to a particular page by page number. A second technique is to consider the screen of the display assembly to be a "window" on a long, continuous scroll of paper. The "scroll" is moved past the imaginary window (or the window is moved along the scroll) to provide a partial display of the contents of the scroll on the computer screen.

Both of these techniques have their advantages and disadvantages. The paging technique has the disadvantage of having a fixed page size which is usually equal to the size of the computer's screen. In consequence, if an image is too big to fit on one page, it must be divided to fit on two or more separate pages. While this is not particularly limiting for text, it makes the handling of large graphical images difficult. On the positive side, "paging" tends to be an intuitive way for users to access multiple screens of information. Users are familiar with the use of conventional books, notebooks, and notepads, all of which are essentially page

based artifacts. An example of the intuitive nature of paging involves visually locating an image which was created on a particular page of memory. If, for example, a user knows that he drew a particular image in the lower right-hand corner of a page, he can quickly "flip" through the multiple pages while fixing his eyes on the lower right-hand corner of the screen to quickly spot the appropriate image.

The advantages and disadvantages of the scrolling technique are almost precisely the reverse of the advantages and disadvantages of the paging technique. An advantage of the scrolling technique is that images of virtually any length can be created. A disadvantage of the scrolling technique is that it is less intuitive than the paging technique. Using the previous example, finding a particular image by scrolling tends to be more difficult than finding the image by paging. This is due, in part, to the fact that when scrolling through the images stored in the computer, a particular desired image can be located at any vertical location on the screen, requiring a user to visually search a much larger image area. Also, with the scrolling technique it is more difficult for a user to know his or her relative location in a document. For example, with the paging technique a user might intuitively know that a desired image is about on page twelve, or is about two thirds of the way through the document. This type of intuitive knowledge is more difficult to achieve with the scrolling technique.

A further disadvantage of the scrolling technique is that it is inherently slow since images on the screen must not be moved so fast that they cannot be viewed. This can make the viewing of large amounts of data by scrolling techniques a time consuming process.

Yet another disadvantage of scrolling techniques is that there is no clear division between adjacent but unrelated images. For example, if a user first writes a letter and then makes a sketch, it would be desirable to make a clear division between these two unrelated items. This disadvantage also applies to a lesser extent to paging techniques when two or more unrelated items are placed on a single page.

SUMMARY OF THE INVENTION

In the present invention, images are grouped into note areas which form part of a continuous scroll. These notes are manipulated by: (a) generating an initial note area on the screen of a computer display; (b) dividing the initial note area into a number of contiguous note areas in response to one or more division gestures implemented by a pointing device, where each division gesture creates a header bar on the screen which visually separates two adjacent note areas; (c) modifying the size of a selected note area in response to a sizing gesture made to a header bar associated with the selected note area; and (d) scrolling within the note areas in response to a scrolling command.

The initial note area is provided with a header bar which preferably includes the date of creation, the note number, and other indicia. This initial note area can be considered to be of indeterminate or infinite height. Graphical, text, and data objects can be created within this initial note area.

When a user desires to make a new note, a division gesture is made on the computer display with a pointing device. For example, in a pen-based computer system a stylus can be moved substantially horizontally across the screen to indicate a division gesture. Once a division gesture is detected, the height of the preceding note is determined, and the height of the new note can be considered to be indefinite or infinite. Preferably, the division gesture creates