

**SYSTEM AND METHOD FOR NON-VISUALLY
PRESENTING MULTI-PART INFORMATION
PAGES USING A COMBINATION OF
SONIFICATIONS AND TACTILE FEEDBACK**

BACKGROUND OF THE INVENTION

[0001] 1. Field of Invention

[0002] The present invention relates generally to the field of non-visual displays. More specifically, the present invention is related to the non-visual display of multi-part information pages.

[0003] 2. Discussion of Prior Art

[0004] Visually impaired users of computers implementing graphical user interface (GUI) environments face a number of issues. These issues arise because separate content is often displayed simultaneously in different spatially located areas of the screen in these environments, while the interfaces for visually impaired users represent this content in a linearized fashion. The problems arising from displaying content in a spatially distributed manner are particularly troublesome for visually impaired users who attempt to interface with the World Wide Web.

[0005] Many pages on the World Wide Web utilize "frames," which partition the information displayed into a number of discrete segments in the user's browser in order to create complex navigation tools for the site. When the user follows a link in one of the frames, the corresponding new content typically appears in either the frame that contained the originating link or in a single different frame, but the other frames in the display usually remain unchanged. Frames pose a major difficulty to visually impaired users because, after clicking a link, it is not immediately obvious to them that only one of several frames was updated.

[0006] This change is not immediately obvious to visually impaired users because visually impaired users typically use screen readers to access the content of Web pages. These screen readers linearize the sequence of items in a layout based on the hierarchical structure of the page. As a consequence, even though only one frame has been updated, it is necessary to scan through the entire page layout and re-discover the page as a whole to determine where changes occurred.

[0007] In addition, as these methods to render the output to a visually impaired user do not provide an overall layout of the areas in which content is displayed, there is not a common frame of reference for collaboration between a sighted user and visually impaired user. The visually impaired user receives a linearized version of a page, while sighted users can perceive the layout of a page more or less as a whole. When a sighted and a visually impaired user work together on a Web page, this difference in how to perceive the layout of the page can make it quite difficult to refer to items on the screen. The concept of "in the top right corner of the screen" is not directly usable for the visually impaired user. This impairs any collaboration effort between these two types of users.

[0008] The following references are examples of the recent efforts to provide better interfaces for visually impaired users to access information, or to provide non-

visual feedback to a user generally. However, whatever the precise merits, features and advantages of the references below, none of them achieve or fulfills the purposes of the present invention.

[0009] U.S. Pat. Nos. 6,088,675 and 6,085,161 describe a system and method for auditorially representing pages encoded in a mark-up language. These references teach the presentation of the content of a Web page as a linear stream of audio information, while avoiding the visual metaphor of a screen. By avoiding the visual metaphor of a screen, a common frame of reference between sighted and visually impaired users cannot be provided.

[0010] U.S. Pat. No. 6,078,308 describes the use of force feedback in a graphical user interface environment to provide force feedback click surfaces. These feedback click surfaces are buttons, icons and other specific graphical objects. When a cursor controlled by the user moves over the surface of these specific objects, force feedback slows the movement of the input device the user is utilizing to control the cursor. By continuing to move the cursor past the feedback click surface, the object is selected, as if the user had "clicked" on it with a traditional mouse type input device. This non-visual force feedback, however, is not utilized to represent a higher-level abstract of the information displayed to allow a visually impaired user to understand and follow the overall layout of the visual representation of the information.

[0011] U.S. Pat. No. 6,125,385 describes the use of force feedback to provide effects to objects in a Web page. One such effect described is an "enclosure" effect, where a force is placed upon the input device to force the cursor into a geometrically bound area on the screen, or prevent the cursor from entering a geometrically bound area on the screen. Disclosed is the association of enclosure effects with frames of a Web page having particular objects of interest. Further disclosed is the use of a proxy server to pre-process a Web page to add force feedback effects to the Web page, prior to the page being received at the client. A specific teaching, however, of this force feedback to provide a non-visual representation of the overall layout of the visual Web page for a visually impaired user is not provided. In addition, providing information concerning the content of a frame using different non-visual feedback is not disclosed.

[0012] U.S. Pat. Nos. 5,825,308; 5,956,484; and 6,101,530 also describe the association of force feedback with graphical objects of a graphical user interface or Web page, such as an enclosure effect to attract the cursor to an object by controlling an input device. U.S. Pat. No. 5,825,308 additionally discloses the use of physical forces on the input device to increase a user's perceptual understanding of the GUI spatial landscape portrayed on a display screen. None of these references, however, describe the use of different, non-visual feedback to provide further information about the object, or about any content displayed within the object. In addition, they do not specifically teach the use of force feedback to provide a common frame of reference for sighted and visually impaired users examining visually displayed data.

[0013] U.S. Pat. No. 5,736,978 describes the use of a tactile stimulator array to provide feedback to a non-sighted user to represent a visually displayed graph. As the stimulator array is moved across a digitizer pad, pins in the tactile