AUTO-BLANKING SCREEN FOR DEVICES HAVING MULTI-LAYER DISPLAYS

TECHNICAL FIELD

[0001] The present invention relates generally to processor-based devices having multi-layer displays and more specifically to the blanking of a screen within such a multi-layer display.

BACKGROUND

[0002] Display technologies have progressed at a rapid rate in recent years, with the advent of plasma displays, flat panel displays, three-dimensional ("3-D") simulating displays and the like. Such advanced displays can be used for televisions, monitors, and various other electronics and processor-based devices. Processor-based gaming machines adapted to administer a wager-based game are but one particular example of the kind of specialized electronic devices that can benefit from the use of such new and improved display technologies.

[0003] Recent advances in such display technologies include the development of displays having multiple layers of screens that are "stacked" or otherwise placed in front or back of each other to provide an overall improved visual presentation on a single combined display unit. Examples of such multi-layer displays include those that are commercially available from PureDepth, Inc. of Redwood City, Calif. The PureDepth technology incorporates two or more liquid crystal display ("LCD") screens into one physically combined display unit, where each LCD screen is separately addressable to provide separate or coordinated images between the LCD screens. Many of the PureDepth display systems include a high-brightened backlight, a rear image panel, such an active matrix color LCD, a diffuser, a refractor, and a front image plane, which devices are laminated to form a device "stack."

[0004] The multiple LCD screens in these units are stacked at set distances. As well as using a binocular depth cue, PureDepth units also feature intrinsic motion parallax, where the x and y distance changes between objects displayed on different planes depending on viewing angle. In addition, separate focal planes may literally be brought in and out of focus depending on the focal length of the lens in the eye of a viewer. Further details regarding the basic nature of such multi-layer displays and techniques of solving issues that are specific to such displays can be found at, for example, U.S. Patent Publication Nos. 20060103951 and 20050206582, both of which are incorporated by reference for these general purposes.

[0005] The basic nature of a multi-layer display using stacked screens strongly encourages at least some form of coordination between the various images on the multiple screens. While various images on each separate screen might be clear and comprehensible if each screen were used separately in a traditional single screen display format, independent and uncoordinated images and/or text on these screens when stacked together can result in an unintelligible mess to a viewer. Such independent and uncoordinated images and/or text tend to obscure or completely block each other in numerous locations, making the combined visual presentation dark and largely unreadable.

[0006] Such issues involving independent and uncoordinated images and/or text can arise, for example, when the multiple display screens are all controlled by various PC based video cards. While the use of relatively complex display modes that account for the specialized nature of a stacked multi-layer display will typically be acceptable, displayed images and/or text in DOS, BIOS, VESA modes and potentially other more basic video modes can be duplicated across multiple screens in the stack at the same time, with such multiple, stacked and uncoordinated images and/or text being difficult to read as a result. Other video modes that are not particular adapted for or readily usable with such a multi-layer display screen arrangement may also be unfriendly with respect to such multi-layer displays. Some examples of the problems that can arise when the stacked screens of a multi-layer display occur in a basic video mode outputting uncoordinated images and/or text during a diagnostics process, or during the start or boot up process in the associated processor-based device. In such instances, it can be difficult or impossible to view or comprehend all of the images and/or texts being shown by the various screens in the multi-layer stack.

[0007] While existing designs and systems for multi-layer displays have been adequate in the past, improvements are certainly welcomed and encouraged. In light of the foregoing, it is thus desirable to develop improved multi-layer displays that do not suffer from image and/or text duplication or blocking when one or more of the subject display screens is in a basic or otherwise unfriendly video mode.

SUMMARY

[0008] It is an advantage of the present invention to provide improved multi-layer displays that do not suffer from image and/or text duplication or blocking when one or more of the subject display screens is in a basic or otherwise unfriendly video mode. This can be accomplished at least in part through the automatic blanking of one or more of the display screens in the multi-layer display whenever the multiple screens would otherwise present visual displays that are in conflict or would not otherwise be coordinated. In many embodiments, this can involve the use of a display controller including a display signal analyzer configured to analyze incoming display signals for one or more screen blanking criteria.

[0009] In various embodiments of the present invention, a multi-layer display apparatus is provided. This multi-layer display apparatus can include a logic device adapted to transmit display signals, a display controller configured to receive one or more of the transmitted display signals, and first and second display screens in communication with the display controller and adapted to present first and second graphical displays thereupon based upon the transmitted display signal or signals. The second display screen can be positioned behind the first display screen such that the first and second graphical displays thereon are adapted to combine for a single visual presentation to a viewer thereof. The display controller can include a display signal analyzer configured to analyze the display signal or signals for one or more screen blanking criteria, and the display controller can be adapted to facilitate the presentation of a substantially blank display on one of the first and second display screens whenever one of the screen blanking criteria is present with respect to the transmitted display signal or signals.

[0010] In various embodiments, an apparatus to automatically blank one display screen within a multi-layer display device is provided. Such an apparatus can include a means for receiving at least one display signal, a means for analyzing the at least one display signal for one or more screen blanking