

view. The zoom levels can also be configured with a fading in or out effect by one or more processors 102 and can involve retrieving additional information from a server (not shown) over one or more network adapters 128. Beyond the examples of fabrics, any material may be replicated or simulated by ultrasound texturizing pattern 326. Airborne ultrasound feedback, similar to multitouch inputs, may also be used to change views, angles, or size of displayed shirt 324.

[0050] Still referring to displayed shirt 324, display device 302 may be elevated, indented, or texturized in accordance with examples given in U.S. application Ser. No. 12/406,273. With shirt 324 texturized on display device 302 and at a distance to an object using ultrasound, the user is given an improved realization of the composition of the shirt by combining the two enhancements.

[0051] Referring again to FIG. 3, an embodiment of the present invention provides an electronic game, such as tic-tac-toe, by projecting ultrasound pattern 328 to an object at location points 206, 208, and/or 210. As an example given in gaming applications, ultrasound pattern 328 may be projected to multiple fingers and tracked as the user tries to pinch, grab, or push an object in a game or any other simulated environment displayed on display device 302. Ultrasound pattern 328 emitted onto an object can also control scrolling or drag and drop functions of items in a game in combination with multitouch inputs detected by touch detectors 124.

[0052] In another example, ultrasound pattern 328 can be controlled by elevation, indenting, or texturizing controller 121 such that an object being tracked at location point 206, such as user's hand, can be handed off or switched to location point 208, such as a user's other hand, to be tracked. Using this process, for instance, a user may dribble a ball from one hand to another in front of display device 302. Moreover, passing of location points in space and time from 206 to 208, results in passing a location point of an object between different horizontal planes relative to display device layer 204. Alternatively, the location point may be passed on the same plane.

[0053] In another example, ultrasound pattern 328 can be used to emulate a spring like sensation to an object and simulate elasticity to a user's hand in a game or any other application. Ultrasound layer 205 can also simulate whole screen explosions, blasts, or bullets being fired at the user by turning on several ultrasound transducers for a predetermined period of time in a game or movie. Ultrasound pattern 328 may also provide a gaming feature where tilting or rotation detected by an accelerometer in sensors 126 controls ultrasound output for four dimensional motion gaming. Ultrasound pattern 328 may also define the boundaries of a virtual space or layer between location points 206, 208, and 210 and display device layer 204.

[0054] In another embodiment, ultrasound pattern 328 projected onto multiple fingers can be used to simulate a virtual joystick or pointing stick for 360 degrees rotational input by tracking the movement of the fingers by ultrasound source/detector 125. A three dimensional accelerometer can be included in sensors 126 to be used in combination with elevation, indenting, or texturizing controller 121 to project ultrasound pattern 328 in response to a programmed action in the game. Similarly, a visual haptic ultrasound mouse or track pad may be configured by projecting and controlling ultrasound pattern 328 to replicate the functionality of a mouse or track pad and provide a 4-D free space tactile user interface device.

[0055] In another embodiment, ultrasound pattern 328 can provide enhanced features for online collaboration, distance learning, online conferencing, social networking, or online dating. For instance, in response to push command on a networked computing device (not shown), which may or may not have an ultrasound enhanced display device, ultrasound pattern 328 may provide feedback to an object at location points 206, 208, and/or 210. Examples of feedback are a poke sensation similar to that on Facebook, a push sensation, a virtual handshake sensation, etc. In online conferencing, tactile inputs or gestures via ultrasound pattern 328 may be used during a video conference application for additional interaction between conversing parties. Social networking or adult entertainment applications can be enhanced by ultrasound pattern 328 providing stimulation in connection with a video, image, photo, or audio media on display device 302.

[0056] For digital imagery, ultrasound rays 327<sub>1</sub> and 327<sub>2</sub> may be used to augment, enhance, or characterize different objects in photo or image 327<sub>3</sub>. Ultrasound rays 327<sub>1</sub> and 327<sub>2</sub> may be preprogrammed into photo or image 327<sub>3</sub> by the owner for watermarking, artistic design, or the like. Ultrasound 327<sub>1</sub> and 327<sub>2</sub> may also be used to augment photo editing applications. If display device 302 is configured as a digital sign, ultrasound 327<sub>1</sub> and 327<sub>2</sub> may be used to get the attention of people walking near or viewing the photo or image 327<sub>3</sub> on the sign.

[0057] In addition, ultrasound pattern 328 may also project sensations to simulate maps, topography, geography, imagery, or location service processes in combination with GPS device 114. Ultrasound pattern 328 can simulate mountainous regions on a map by projecting an ultrasound of various heights and intensities to an object at location points 206, 208, and/or 210.

[0058] Ultrasound pattern 328 may also be used to simulate the action of picking up (i.e. cut) or drop text (i.e. paste) in an email, 3rd Generation Partnership Project (3GPP) or 3GPP2 short message service (SMS) text message, or 3GPP/3GPP2 multimedia message service (MMS) message. Ultrasound pattern 328 may also be used in connection with a PDF document, word document, excel, four dimensional (4-D) screensaver, 4-D art, 4-D drawings, 3-D imagery, a 3-D sculpture, a 4-D "etch-a-sketch", or architecture designs using scalable or vector graphics. Any of the actions given above for ultrasound pattern 328 may be used in combination with transmitting or receiving information over one or more network adapters 128.

[0059] In e-book applications, ultrasound pattern 328 can be used to replicate or simulate the edge of a page and allow a user to virtually lift or pick-up a page. Moreover, a user may be able to feel text of varying sensations provided by ultrasound pattern 328 that is hyperlinked or highlighted on an e-book page as the user moves a finger across the page.

[0060] For multitouch applications, airborne ultrasound pattern 328 may be used to simulate friction or resistance as a user moves an image by touching the screen, zooms into an image, or zooms out of an image. When zooming beyond a threshold, ultrasound pattern 328 can be used to provide resistance thereby defining boundaries and providing a warning or alarm. While scrolling, panning, or gliding, hitting a threshold level or endpoint causes an ultrasound tactile feedback or response. For scrolling momentum, the ultrasound pattern 328 may provide high intensity initially to simulate inertia and then less intensity as momentum builds. For navi-