first display layer **1302** and background imagery **1308** displayed on the second display layer **1304**. Note that the secondary displays shown and described in connection with FIGS. **4-7** may be multi-layer displays such as the multi-layer display **1300** shown in **FIG. 13** with an optional touchscreen overlaying the first display layer **1302**.

[**0115**] Multi-layer displays suitable for use in the present invention are commercially available from at least Deep Video Imaging™. Manufacturers of video controllers suitable for use with multi-layer displays available from Deep Video Imaging™ include Appian Graphics, ATI Technologies, Inc, Matrox, nVidia, and Peritek Corporation for the Microsoft® Windows®, Apple® Macintosh®, Linux, BeOS, OS/2, and Solaris™ operating system platforms.

[**0116**] In another embodiment, a multi-layer display includes three liquid crystal layers which are independently controlled by a CPU such as CPU **104** in **FIG. 1**. An infrared or imaging device is mounted on the cabinet of a gaming machine, and is controlled by a controller such as CPU **104** in **FIG. 1** to track a characteristic associated with a player, such as the player's position, angle, or movement. The controller uses the position and movement information provided by the infrared or imaging device to manipulate the three liquid crystal layers creating a 3D effect regardless of the angle at which the player is viewing the display. In addition, a 3D motion effect can be created as a player moves. For example, to "see" around an object, a player might move his head to the left or right, and as he does, the graphics displayed on the three layers are conventionally adjusted so that the imagery obscured by the object from one angle become visible to the player when viewed from the new angle. In addition, previously obscured details of the object may also be made visible (motion parallax), thus more closely approximating real-world observation of 3D objects.

[**0117**] In an embodiment, the infrared or imaging device is also used to track the time a player is in front of the gaming machine. The gaming machine also keeps track of the player's interaction with the wagering game, and combines the data from the infrared or imaging device to calculate the "time played" and "time wasted" by a player for demographics studies, and the like. For example, this tracking feature may be exploited in a new wagering game to assess its attractiveness to players before full-scale release.

[**0118**] Although a two- and three-layer multi-layer display has been described herein, the present invention also contemplates any multi-layer display having more than three layers.

[**0119**] C. Holographic Display

[**0120**] A third type of true 3D display is holographic display, also known as a holovideo display. Displaying a 3D holographic image generally requires two processes, a computational process in which a 3D description is converted into a holographic fringe pattern, and an optical process in which light is modulated by the fringe to produce a 3D image.

[**0121**] The computational process involves a rendering stage and a holographic fringe generation stage. The rendering stage involves spatially transforming polygons, lighting, occlusion processing, shading, and in some cases, rendering to 2D images. Note that if the 3D description already exists as 3D voxels, the rendering stage is unnecessary. The fringe generation stage computes a 2D holographic fringe based on the data from the rendering stage. These two computing stages can be linked under an interference-based or diffraction-specific approach, both of which are known in the art.

[**0122**] The second process is optical modulation and processing. Two holographic modulation techniques are illustrated in **FIGS. 14***a* and **14***b*, though all other techniques known in the art are contemplated by the present invention. **FIG. 14***a* is a functional block diagram of a holographic optical modulation technique using a high-resolution spatial light modulator (SLM), and **FIG. 14***b* is a functional block diagram of a holographic optical modulation technique using a scanned acousto-optic modulator (AOM).

[**0123**] The SLM-based holographic optical modulation technique uses an optical modulation assembly **1400**a which generally includes a computer **1402***a*, a high-resolution SLM **1404***a*, and a demagnification lens **1406***a*. The holographic fringe patterns generated in the computational process are provided by the computer **1402***a* to the SLM **1404***a*. The digital data provided by the computer **1402***a* is converted to corresponding photons by modulating light with a computed holographic fringe using the SLM **1404***a*. The modulated photons are passed through the demagnification lens **1406***a* to compensate for the disparity between the fringe sampling pitch (typically about 0.5 microns wide) and the modulation elements in the SLM (typically about 50 microns wide). In an embodiment, the SLM **1404***a* is a liquid crystal display, which operates as a phase modulator. In another embodiment, the SLM **1404***a* is a deformable micromechanical mirror device. The de-magnified, modulated photons display a 3D image **1408***a* to a viewer **1410***a*.

[**0124**] The AOM-based holographic optical modulation technique uses an optical modulation assembly **1400***b* which generally includes a computer **1402***b*, an AOM **1408***b*, an imaging lens **1410***b*, a vertical scanner **1412***b*, a horizontal scanning system **1414***b*, and an output lens **1416***b*. The computed fringes stored in the high-speed frame buffers **1404***b* of the computer **1402***b* are RF processed in an RF signal broadcasting system **1406***b* to traverse the wide aperture of the AOM **1408***b* as acoustic waves. The AOM **1408***b* phase-modulates a beam of laser light into diffracted light which is imaged and de-magnified by the imaging lens **1410***b* and output lens **1416***b*, respectively, at a plane in front of a viewer **1420***b*. The horizontal scanning system **1414***b* angularly multiplexes the image of the modulated light, and a vertical scanning mirror **1422***b* reflects diffracted light to the correct vertical position in the hologram plane. In an embodiment, the AOM **1408***b* is a three-channel (R,G,B) tellurium-dioxide Acousto-Optic Modulator.

[**0125**] Holographic displays are available from at least Icon International Images, Inc., d/b/a 3Dmirage, and Kingmaker in the United Kingdom. Other holographic displays, such as the Mark-I and the Mark-II, have been developed by the Spatial Imaging Group at the MIT Media Lab.

[**0126**] **FIG. 15** is a perspective view of a gaming machine **1500** having a holographic display **1502** that displays a 3D holographic image **1508** through a lens **1506**. The holographic image **1508** is part of the Reel'em In!® bonus game described in connection with **FIG. 3**. Note that the player