US 20090040385A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2009/0040385 A1

(43) Pub. Date: Feb. 12, 2009

Staker et al.

(54) METHODS AND SYSTEMS FOR CONTROLLING VIDEO COMPOSITING IN AN INTERACTIVE ENTERTAINMENT SYSTEM

(75) Inventors: **Allan Robert Staker**, Long Beach, CA (US); **Heather Clayton Staker**, Long Beach, CA (US)

Correspondence Address:
KNOBBE MARTENS OLSON & BEAR LLP
2040 MAIN STREET, FOURTEENTH FLOOR
IRVINE, CA 92614 (US)

(73) Assignee: **MEGAMEDIA, LLC**, New York City, NY (US)

(21) Appl. No.: **12/256,374**

(22) Filed: **Oct. 22, 2008**

Related U.S. Application Data

(63) Continuation of application No. 10/836,729, filed on Apr. 30, 2004.

(60) Provisional application No. 60/467,480, filed on May 2, 2003.

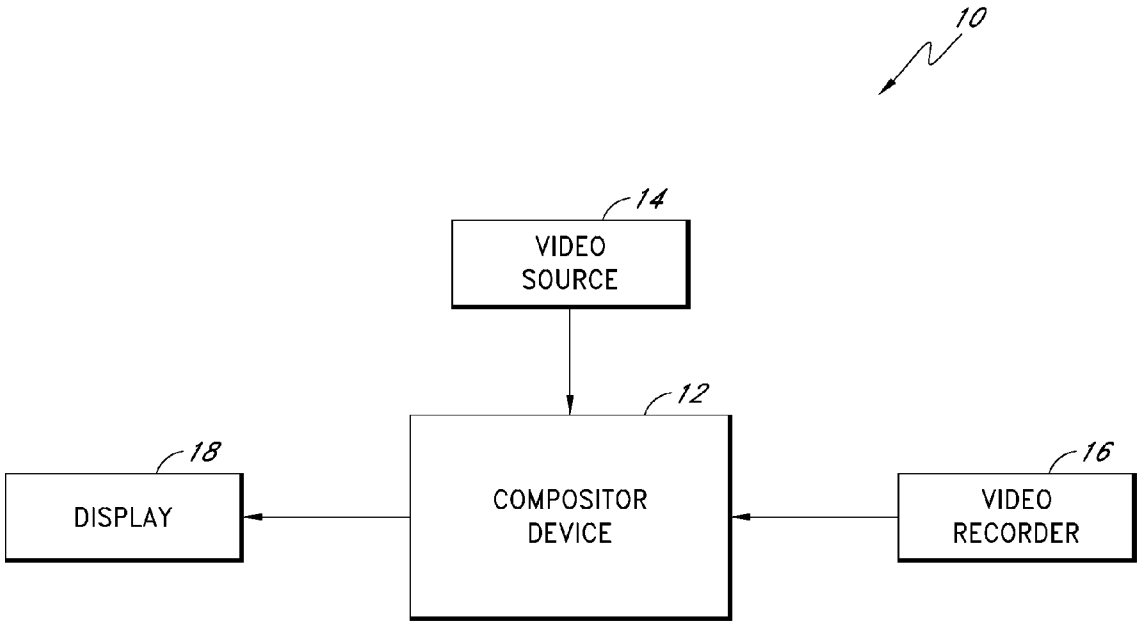
Publication Classification

(51) **Int. Cl.**
H04N 9/74 (2006.01)

(52) **U.S. Cl.** **348/584**; 348/E09.055

(57) **ABSTRACT**

An interactive video compositing device includes a chroma-key mixer, video switcher and control circuitry. The chroma-key mixer generates a composite image by combining a real-time image, such as one captured by a video recorder, with a prerecorded video image, such as a movie. The composite image includes the modified real-time image superimposed, or overlaid, onto the prerecorded image. The video switcher automatically selects either the composite image or the pre-recorded image to be output to a display. The control circuitry controls the video switcher and other outputted signals based on data file information that corresponds to content of the prerecorded image or media. For example, the data files may contain information relating to the presence (or absence) of a particular character in a movie scene, thus allowing for the output and display, at appropriate times, of the real-time composite image instead of the prerecorded image.



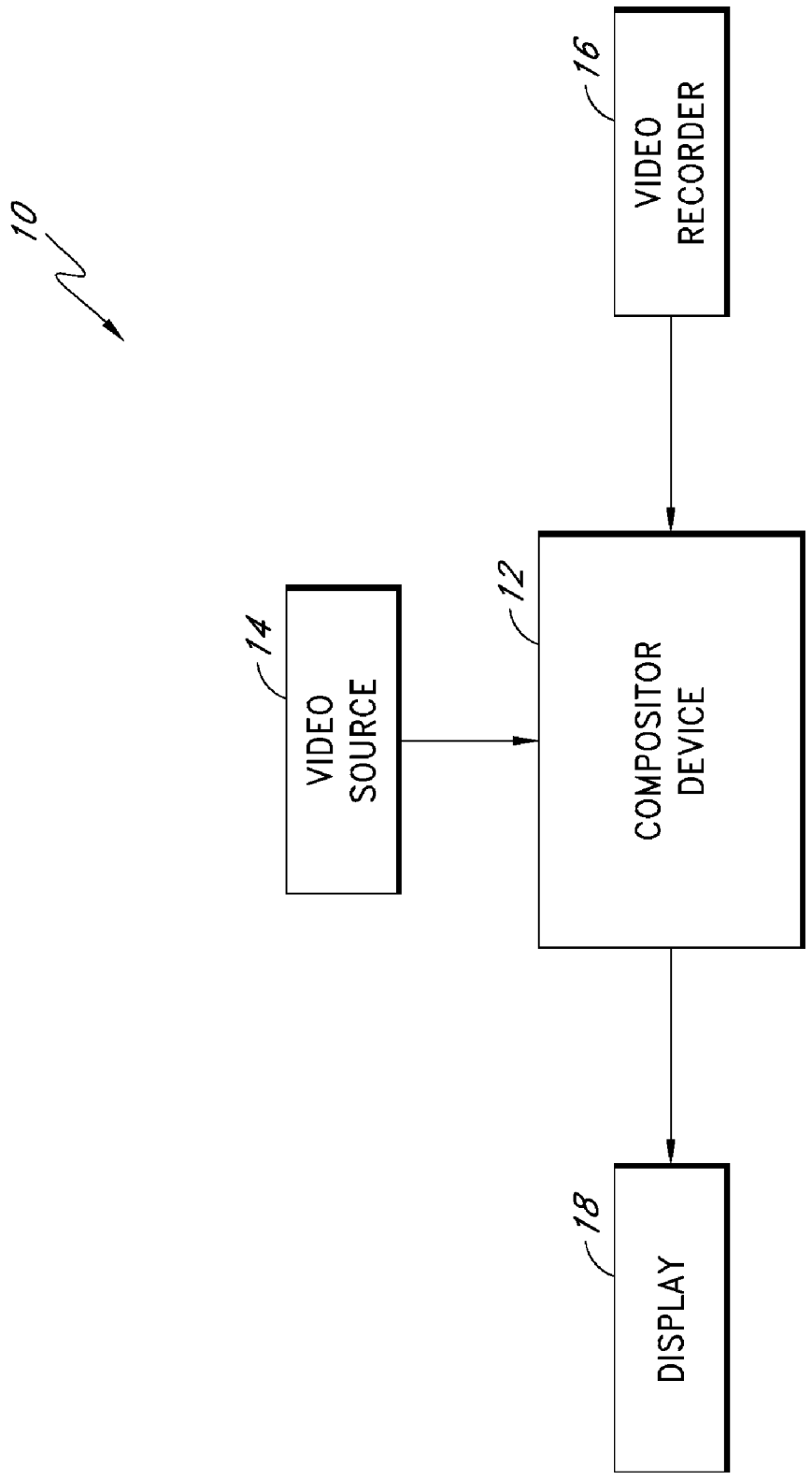

10
16
VIDEO RECORDER
12
COMPOSITOR DEVICE
14
VIDEO SOURCE
18
DISPLAY

FIG. 1

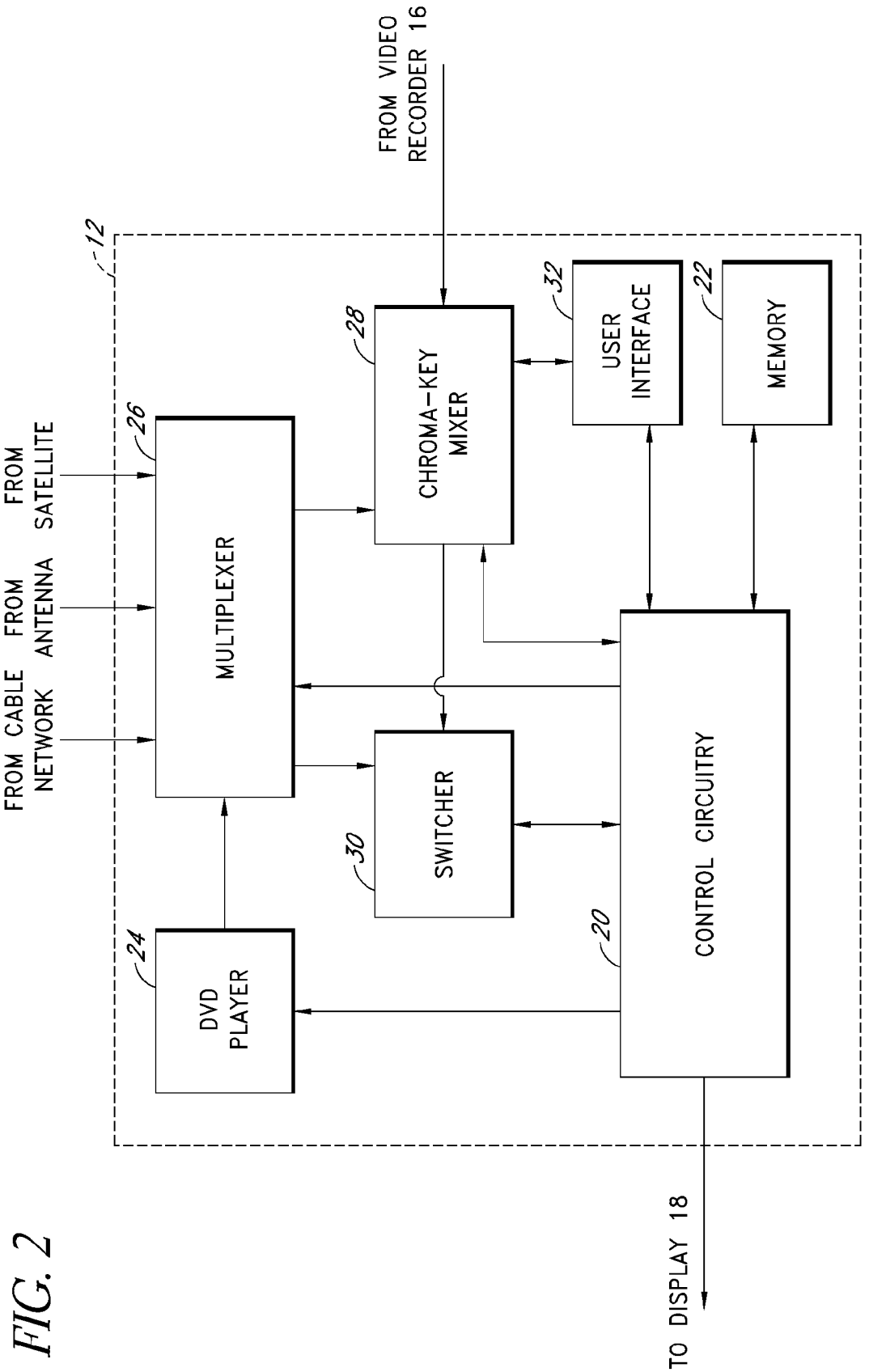

FROM VIDEO RECORDER 16
12
32
USER INTERFACE
22
MEMORY
28
CHROMA-KEY MIXER
26
FROM SATELLITE
FROM ANTENNA
FROM CABLE NETWORK
MULTIPLEXER
SWITCHER
30
CONTROL CIRCUITRY
20
24
DVD PLAYER
TO DISPLAY 18

FIG. 2

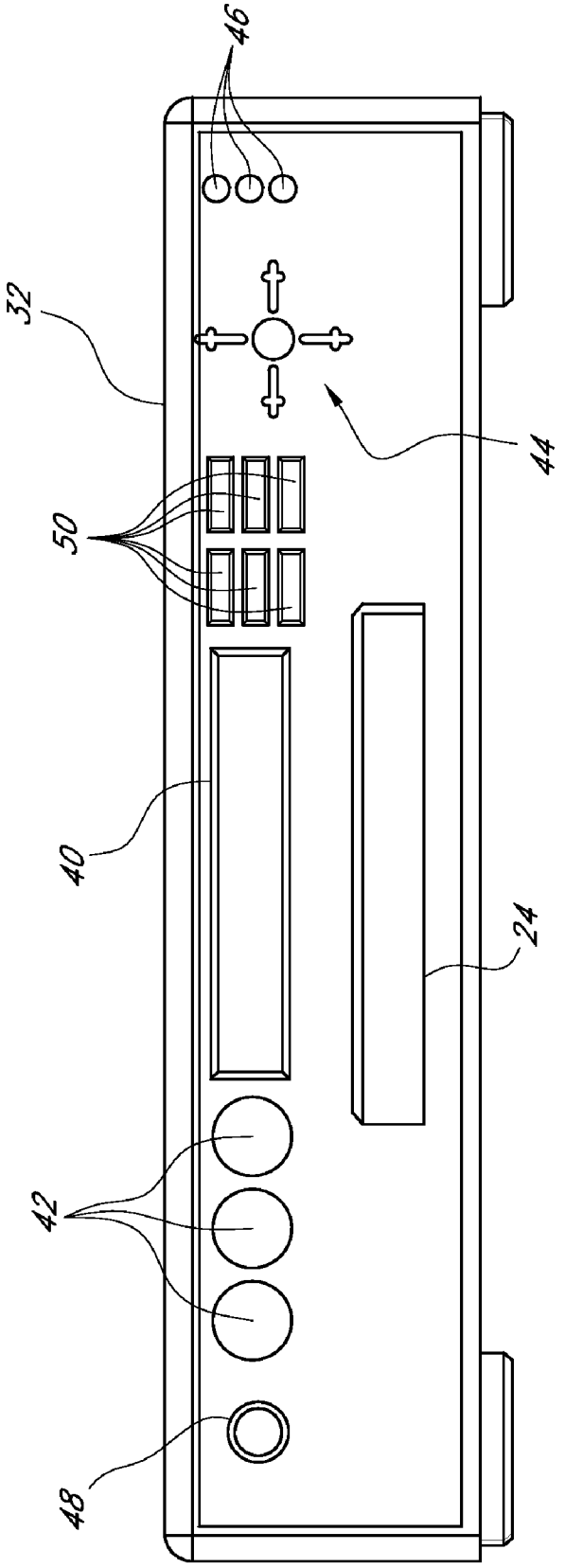


FIG. 3

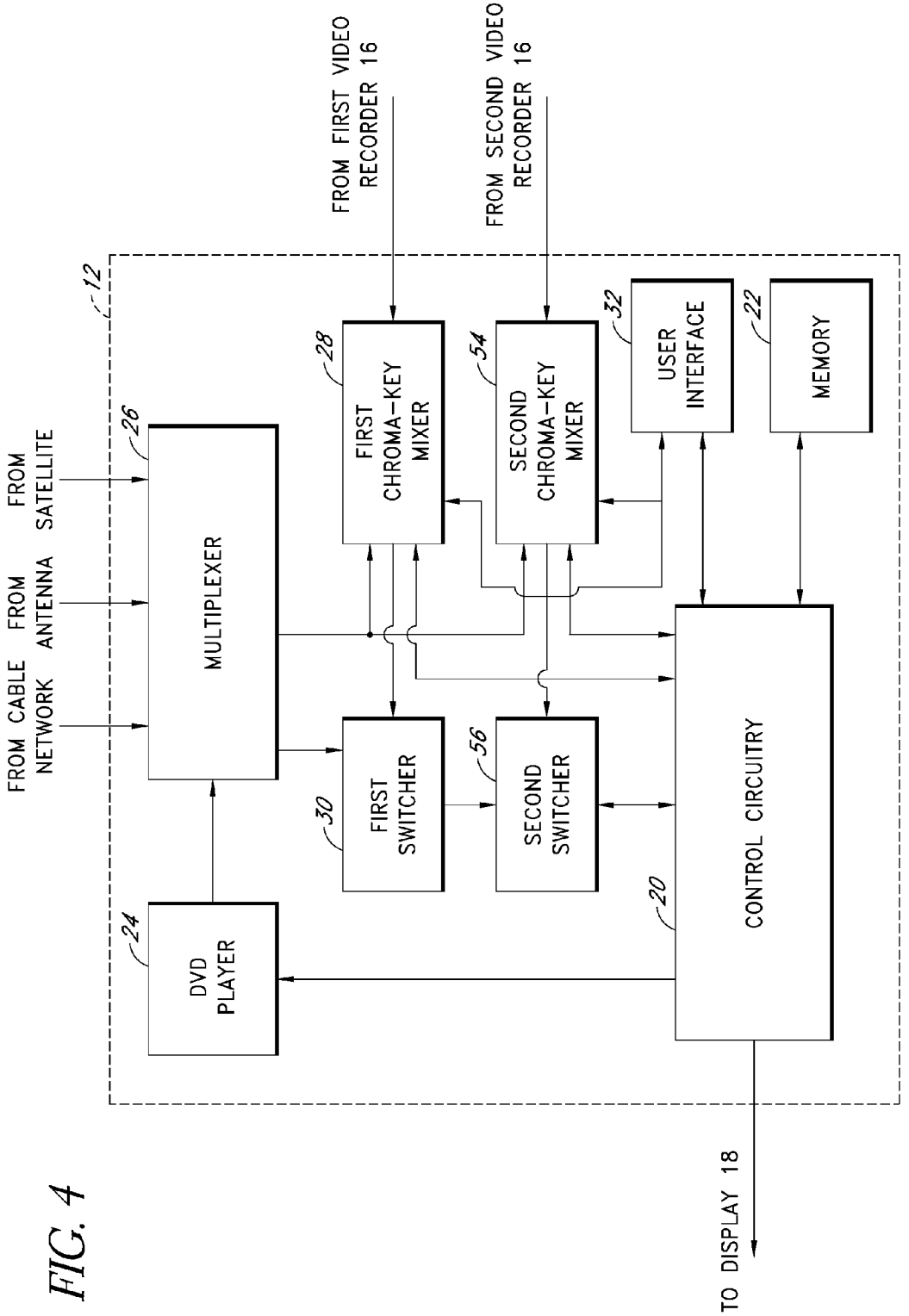

FROM FIRST VIDEO RECORDER 16
FROM SECOND VIDEO RECORDER 16
12
FROM SATELLITE
FROM ANTENNA
FROM CABLE NETWORK
26
MULTIPLEXER
28
FIRST CHROMA-KEY MIXER
54
SECOND CHROMA-KEY MIXER
32
USER INTERFACE
22
MEMORY
30
FIRST SWITCHER
56
SECOND SWITCHER
20
CONTROL CIRCUITRY
24
DVD PLAYER
TO DISPLAY 18

FIG. 4

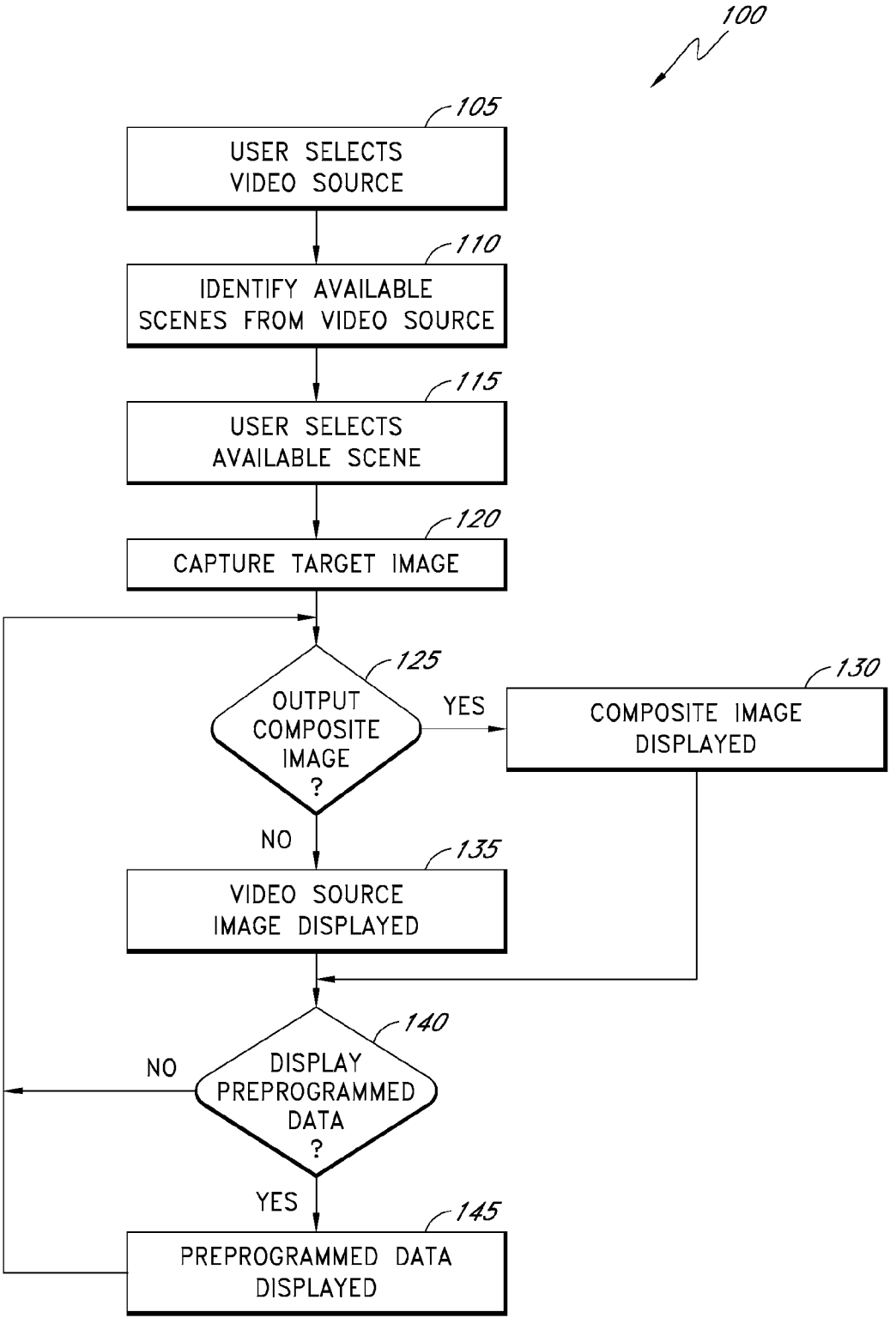

100
105
USER SELECTS VIDEO SOURCE
110
IDENTIFY AVAILABLE SCENES FROM VIDEO SOURCE
115
USER SELECTS AVAILABLE SCENE
120
CAPTURE TARGET IMAGE
125
OUTPUT COMPOSITE IMAGE ?
YES
130
COMPOSITE IMAGE DISPLAYED
NO
135
VIDEO SOURCE IMAGE DISPLAYED
140
DISPLAY PREPROGRAMMED DATA ?
NO
YES
145
PREPROGRAMMED DATA DISPLAYED

FIG. 5

METHODS AND SYSTEMS FOR CONTROLLING VIDEO COMPOSITING IN AN INTERACTIVE ENTERTAINMENT SYSTEM

REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of, and claims priority benefit under 35 U.S.C. §120 from, U.S. patent application Ser. No. 10/836,729, filed Apr. 30, 2004, which claims the benefit of priority under 35 U.S.C. §119(e) of U.S. Provisional Application No. 60/467,480, filed on May 2, 2003, and entitled "INTERACTIVE SYSTEM FOR REAL-TIME CHROMA KEY COMPOSITING," the entirety of each of which is incorporated herein by reference and is to be considered part of this specification.

BACKGROUND

[0002] 1. Field

[0003] Preferred embodiments of the invention relate to a system and method for signal compositing, and more particularly, to a system and method for interactive video compositing.

[0004] 2. Description of the Related Art

[0005] Interactive entertainment is a popular leisure activity for people across the globe. One favorite activity for many is karaoke, which temporarily turns lay persons into "stars" as they sing the lyrics to a favorite song. Karaoke machines play the music of a selected song while simultaneously displaying the song lyrics to a user, thus allowing the user to sing along with the background music.

[0006] Another favorite leisure activity for millions is watching movies. Billions of dollars are spent each year on ticket sales for new box office hits. In addition, an increasing number of people are beginning to view movies at home. One popular technology that has been recently adopted is the digital video disk (DVD) technology. Movies are recorded in digital format onto a disk that allows for repeated viewings at the convenience of the user. The sound and picture quality of DVDs, along with the convenient features that accompany digital media, have made DVDs a popular replacement to standard video cassette technology.

[0007] However, movie watching has predominantly been a passive activity. That is, one either travels to a theater or inserts a disk into a DVD player and sits back to watch the movie. Though one may watch the same movie repeatedly, each time the same characters appear and recite the same lines and perform the same actions. As of yet, one has not been able to act out his or her favorite scene while appearing to be in the movie itself in a real-time manner.

SUMMARY

[0008] Accordingly, there is a need for an interactive system that allows for video images to be inserted into a prerecorded video, such as a movie. In one embodiment of the present invention, chroma-key technology is used to produce a composite video image, wherein it appears that a target image, such as one captured by a video camera, is superimposed in real time onto a prerecorded image. The compositing process is managed by internal circuitry and data files that direct when and how the real-time image is inserted into the prerecorded image.

[0009] In one embodiment, an interactive video compositing device includes a mixer, video switcher and control circuitry. The mixer utilizes chroma-key technology to remove a chroma element from a real-time video image. The mixer combines the modified image with a prerecorded video image to form a composite image, which includes the modified real-time image overlaid on the prerecorded image. The video switcher automatically selects either the composite image or the prerecorded image to be output to a display. This selection is managed by the control circuitry and is based on data file information that corresponds to the content of scenes of the prerecorded image. For example, the data files may contain information relating to the presence (or absence) of a particular character in the movie scene, thus allowing for the output of the real-time composite image instead of the prerecorded image at appropriate times.

[0010] In another embodiment of the invention, a system for real-time, chroma-key compositing comprises a first input structured to receive a first video signal; a second input structured to receive a second video signal; a chroma-key mixer coupled to the first input and to the second input, wherein the chroma-key mixer is structured to output a composite signal comprising portions of the first video signal and portions of the second video signal; a data file associated with the first video signal, wherein the data file has at least first reference data and second reference data; and a switcher that selects between outputting the composite signal and outputting the first video signal, wherein the switcher outputs the composite signal at a time identified by the first reference data, and wherein the switcher outputs the first video signal at a time identified by the second reference data.

[0011] In another embodiment, a reference data system used for video compositing comprises first reference information associated with a first video signal; second reference information associated with the first video signal; and a video switcher configured to switch between outputting either the first video signal or a composite signal that includes portions of the first video signal and portions of a second video signal, wherein the video switcher outputs the composite signal at a time identified by the first reference information, and wherein the video switcher outputs the first video signal at a time identified by the second reference information.

[0012] In another embodiment of the invention, a software program comprises code for controlling the superimposing of a real-time image onto a prerecorded image, wherein said code identifies portions of the prerecorded image during which the real-time image is to be superimposed onto the prerecorded image.

[0013] In another embodiment, a system for real-time video compositing comprises a means for generating a composite signal by chroma-key mixing a first video signal and a real-time second video signal; and a means for switching between the selection of the first video signal and the selection of the composite signal, wherein the means for switching is controlled according to reference information stored in at least one data file that relates to the first video signal.

[0014] In another embodiment, a method for video compositing comprises receiving a first video signal having multiple frames; receiving a second video signal; creating a composite signal by chroma-key mixing the first video signal and the second video signal; and selectively switching, with a video switcher, between outputting the first video signal and outputting the composite signal, wherein said selective switching is performed automatically and is based on a control signal received by the video switcher, wherein the control

signal is derived at least in part from prerecorded data that corresponds to frames of the first video signal.

[0015] In another embodiment, a method for coordinating the display of multiple signals comprises receiving a first signal; receiving a second signal; forming a composite signal comprising portions of the first signal and portions of the second signal; receiving with a switcher the first signal and the composite signal; receiving reference data that corresponds to portions of the first signal; and switching between displaying the first signal and displaying the composite signal, wherein the timing of said switching is based on information contained in the reference data.

[0016] In another embodiment, a method for creating a data file used for controlling the superimposing of video images comprises identifying a portion of a first video image during which a second video image is to be superimposed onto the first video image, said first video image portion having a beginning frame and an ending frame; recording in a data file first information that identifies said beginning frame; and recording in the data file second information that identifies said ending frame.

[0017] For purposes of summarizing the invention, certain aspects, advantages and novel features of the invention have been described herein. It is to be understood that not necessarily all such advantages may be achieved in accordance with any particular embodiment of the invention. Thus, the invention may be embodied or carried out in a manner that achieves or optimizes one advantage or group of advantages as taught herein without necessarily achieving other advantages as may be taught or suggested herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] FIG. **1** illustrates a real-time video compositing system according to one embodiment of the invention.

[0019] FIG. **2** is a block diagram of one embodiment of a compositor device.

[0020] FIG. **3** illustrates a user interface of one embodiment of a compositor device.

[0021] FIG. **4** is a block diagram of an embodiment of a compositor device that is structured to receive input from two video recorders.

[0022] FIG. **5** is a flow chart depicting one embodiment of an interactive video compositing process.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0023] The features of the system and method will now be described with reference to the drawings summarized above. Throughout the drawings, reference numbers are re-used to indicate correspondence between referenced elements. The drawings, associated descriptions, and specific implementation are provided to illustrate embodiments of the invention and not to limit the scope of the invention.

[0024] In addition, methods and functions described herein are not limited to any particular sequence, and the steps or states relating thereto can be performed in other sequences that are appropriate. For example, described steps or states may be performed in an order other than that specifically disclosed, or multiple steps or states may be combined in a single step or state.

[0025] FIG. **1** illustrates one embodiment of a real-time video compositing system **10**. The compositing system **10** is used to selectively superimpose images. These images may comprise images that can be viewed in real-time, prerecorded images, or a combination thereof. For example, the compositing system **10** may superimpose a real-time image onto an image that has been prerecorded, such as a movie. The compositing system **10** generally comprises a compositor device **12**, a video source **14**, a video recorder **16**, and a display **18**. In the depicted embodiment, the compositor device **12** receives inputs signals from the video source **14** and the video recorder **16** and outputs a signal to the display **18**.

[0026] The term "compositing" as used herein is a broad term and is used in its ordinary sense and includes without limitation the superimposing or combining of multiple signals, such as, for example, video and/or audio signals, to form a composite signal. The term "compositor" refers to any device or system, implemented in hardware, software, or firmware, or any combination thereof, that performs in whole or in part a compositing function.

[0027] The term "real time" as used herein is a broad term and is used in its ordinary sense and includes without limitation a state or period of time during which some event or response takes place. A real-time system or application produces a response to a particular stimulus within a certain response time. For example, a device processing data in real time may process the data as it is received by the device. A real-time signal is one that is capable of being displayed, played back, or processed within a particular time after being received or captured by a particular device or system. In one embodiment, this particular time is on the order of one millisecond. In other embodiments, the particular time may be longer than one millisecond. For example, the particular time may be on the order of hundreds of milliseconds. In other embodiments of the invention, the particular time may be less than one millisecond. For example, the particular time may be on the order of microseconds. In yet other embodiments of the invention, "real time" refers to events simulated at a speed similar to the speed at which the events would occur in real life.

[0028] The video source **14** includes any device, system or technology used to generate, receive, capture, read, supply or store video data. In another embodiment, the video source **14** may generate an audiovisual signal that includes a video portion that can be processed to produce a video signal (e.g., to produce a visual image) and an audio portion that can be processed to produce an audio signal (e.g., sound at a level high enough to be heard by a human ear). For example, in one embodiment of the invention, the video source **14** comprises a digital video disk (DVD) player. In another embodiment, the video source **14** comprises a memory that stores data representing video content. In yet other embodiments of the invention, the video source **14** may comprise a device that receives a video transmission, such as through a cable network, a satellite dish, an antenna, or a network. For example, the video source **14** may comprise a television, a video cassette recorder (VCR), a CD+G player or a digital video recorder.

[0029] In other embodiments of the invention, the compositing system **10** may include multiple video sources **14**, each being coupled to the compositor device **12**. In such an embodiment, the compositing system **10** may comprise a multiplexer or a switch that selects a signal from one of multiple video sources **14**. For example, in one embodiment, the compositing system **10** comprises a DVD player that reads data from a DVD and a cable box that receives a video transmission over a coaxial cable line. A two-input multi-

plexer may then be used to select between a signal from the DVD player and a signal from the cable box.

[0030] The video source **14** may be coupled to the compositor device **12** by any medium that provides for video signal transmission. For example, the video source **12** may be coupled to the compositor device **12** through an RCA cable, an S-cable, a coaxial cable, Ethernet, wireless technologies and the like. One with skill in the art will also recognize that the video source **14** may supply audio content along with video content. This audio content may be delivered on the same or different mediums as the video content.

[0031] FIG. **1** depicts an embodiment of the invention wherein the video source **14** is external to the compositor device **12**. In other embodiments of the invention, the video source **14** may be internal to the compositor device **12**. For example, the compositor device **12** may comprise a DVD player or may comprise a memory having stored video data. In yet other embodiments, the compositing system **10** may comprise at least one video source **14** that is internal and at least one video source **12** that is external to the compositor device **12**.

[0032] With continued reference to FIG. **1**, the compositing system **10** includes the video recorder **16**. The video recorder **16** comprises any device, system or technology that is capable of converting real-time video images into an electronic signal, such as a digital or an analog signal. In one embodiment, the video recorder **16** is capable of the real-time conversion of and transmission of video images. In one embodiment, the video recorder **16** is a video camera. For example, the video recorder **16** may comprise a camcorder, such as an analog camcorder or a digital camcorder. The video recorder **16** may be coupled to the compositor device **12** through an RCA cable, an S-cable, a coaxial cable, Ethernet, wireless technologies and the like.

[0033] In other embodiments of the invention, the compositing system **10** may include multiple video recorders **16**, each being coupled to the compositor device **12**. For example, multiple video cameras may be coupled to the compositor device **12**. In addition, the video recorder **12** may be internal or external to the compositor device **12**.

[0034] The compositing system **10** also comprises the display **18**. The display **18** receives an output signal from the compositor device **12** and converts the output signal to at least a video image. For example, in one embodiment of the invention, the display **18** comprises a television that is coupled to the compositor device **12** through RCA cables. In other embodiments, the display **18** may include a video projector, a monitor or the like and may be coupled to the compositor device **12** through any medium that provides for video signal transmission, as has been previously described.

[0035] In other embodiments of the invention, the display **18** may also be used to provide instructions or data to the user or users of the compositing system **10**. For example, menu selections or command prompts may be displayed to the user through the display **18**. In addition, dialogue prompts, such as are used in general karaoke machines may be portrayed on the display **18** so as to assist a user in reciting the appropriate lines.

[0036] In other embodiments of the invention, the compositing system **10** may comprise multiple displays **18**. The display **18** may also be internal or external to the compositor device **12**. For example, the compositor device **12** may include a screen that portrays a video image to the user. Such a screen would allow a user to have visual feedback as to the final output of the compositing system **10** without having to look at an external display.

[0037] In one embodiment, the compositing system **10** may also comprise a media storage device (not shown) that stores the signal output by the compositor device **12**. For example, the compositor system **10** may comprise a memory configured to store in digital form a copy of the output signal that is sent to the display **18**. In another embodiment, the compositing system **10** may output a signal only to the media storage device instead of the display **18**. In such an embodiment, the output video and audio content could be stored for later playback on another device. In yet other embodiments, the media storage device may be included with the display **18**.

[0038] FIG. **2** illustrates a block diagram of one embodiment of the compositor device **12**. The compositor device **12** allows a user to selectively overlay images in real time onto a second video image, such as prerecorded video content. In one embodiment, the compositor device **12** comprises control circuitry **20**, a memory **22**, a DVD player **24**, a multiplexer **26**, a chroma-key mixer **28**, a switcher **30** and a user interface **32**.

[0039] In one embodiment, the components of the compositor device **12** are modules that comprise logic embodied in hardware or firmware, or that comprise collection of software instructions written in a programming language, such as, for example C++. A software module may be compiled and linked into an executable program, installed in a dynamic link library, or may be written in an interpretive language such as BASIC. It will be appreciated that software modules may be callable from other modules or from themselves, and/or may be invoked in response to detected events or interrupts. Software instructions may be embedded in firmware, such as an EPROM or EEPROM. It will be further appreciated that hardware modules may be comprised of connected logic units, such as gates and flip-flops, and/or may be comprised of programmable units, such as programmable gate arrays or processors. For example, in one embodiment, the functions of the compositor device **12** may be implemented in whole or in part by a personal computer or other like device.

[0040] It is also contemplated that the components of the compositor device **12** need not be integrated into a single box. The components can be separated into several subcomponents or can be separated into different devices that reside at different locations and that communicate with each other, such as through a wired or wireless network, or the Internet. Multiple components may be combined into a single component. It is also contemplated that the components described herein may be integrated into a fewer number of modules. One module may also be separated into multiple modules.

[0041] The control circuitry **20** manages the operation of components of the compositor device **12**. In one embodiment, the control circuitry **20** is a special purpose microprocessor. In other embodiments, the control circuitry **20** may be implemented as an application-specific integrated circuit (ASIC). In yet other embodiments, the control circuitry **20** may be implemented as one or more modules, which modules may be configured to execute on one or more processors. The modules may comprise, but are not limited to, any of the following: hardware or software components such as software object-oriented software components, class components and task components, processes, methods, functions, attributes, procedures, subroutines, segments of program code, drivers,

firmware, microcode, applications, algorithms, techniques, programs, circuitry, data, databases, data structures, tables, arrays, variables, or the like.

[0042] The control circuitry **20** communicates with the memory **22**. The memory **22** may comprise any buffer, computing device, or system capable of storing computer instructions and data for access by another computing device or a computer processor, such as, for example, the control circuitry **20**. In one embodiment, the memory **22** comprises random access memory (RAM). In other embodiments, the memory **22** may comprise other integrated and accessible memory devices, such as, for example, read-only memory (ROM), programmable ROM (PROM), and electrically erasable programmable ROM (EEPROM). In another embodiment, the memory **22** comprises a removable memory, such as a floppy disk, a compact disk (CD), a ZIP® disk, a DVD, a removable drive or the like.

[0043] In one embodiment, the memory **22** stores data files that include data or information regarding the content of particular media. In one embodiment, a data file or a group of related data files contains information specific to a particular movie or prerecorded video footage. For example, data files for a particular movie may be referenced by using the movie's unique serial number. The information contained in the data files may identify scenes or segments of the particular movie or video that have been catalogued as being suitable for video compositing. The data files may also contain content relating to dialogue prompts for particular characters, menu options, and other data relating to scenes available for video compositing.

[0044] In one embodiment, the data files contain reference information that identifies particular frames or points in a video source that may be later used in the compositing process. For example, in one embodiment the reference information is used by the composting device **12** to identify the frames of a movie scene in which a particular character is present. In one embodiment, the reference information may be used to trigger multiple signals for use in the compositing process. For example, the reference information may contain both beginning and ending reference points, wherein the beginning reference point indicates the commencement of a particular feature in the video source, such as the entrance of a character into a scene, and wherein the ending reference point identifies the ending of a particular feature, such as when the character leaves the scene.

[0045] The term "reference information" as used herein is a broad term and is used in its ordinary sense and includes without limitation any type, or combination of types, of data that stores or contains information regarding particular media. For example, as described above, reference information may comprise reference points that identify scenes containing particular characters. However, reference information is not limited to such reference points. In other embodiments of the invention, reference information may comprise code, symbols, alphanumeric information, or the like that represent a song, a particular event, or a particular image that is contained or represented in particular media, such as an audiovisual signal.

[0046] In one embodiment, data files may be stored in the memory **22**. For example, data files stored in the memory **22** may contain information relating to the individual frames of a particular movie, such as Star Wars. In one embodiment, the preprogrammed data files associated with Star Wars would identify scenes in the movie that have been selected as being suitable as a background scene for video compositing. The data files may identify when a particular character, such as Darth Vader®, is present in a specific scene. This data file information allows for the user to chose between pre-selected scenes and facilitates the generation of a signal by the control circuitry **20** to be used in coordinating and creating a composite video signal. The data files may be preprogrammed in the memory **22**. In other embodiments, the data files may be later saved in the memory **22** by the user.

[0047] In other embodiments, the data files need not be stored in the memory **22**. The data files may be generated in real time, generated on the fly, derived or received from an external source or device, or generated by the compositor device **12** itself. For example, data files for particular media could be downloaded from the Internet, transferred from a removable storage medium, or even programmed by the user. The data files may also be embedded in a closed-caption signal or be saved on a DVD, such as in a bonus material section, that contains the corresponding movie.

[0048] Although the memory **22** is depicted as being external to the control circuitry **20**, in other embodiments of the invention, the memory **22** may be internal to the control circuitry **20**. For example, the memory **22** may exist as a cache in the control circuitry **20**. The memory **22** may also be external to the compositor device **12**. For example, in one embodiment, the memory **22** comprises an external hard drive. The memory **22** may also comprise multiple memory devices for storing data or information.

[0049] The DVD player **24** is one embodiment of a video source for the compositor device **12**. The DVD player **24** functions as a general purpose DVD player and outputs video and audio content stored on a DVD to the multiplexer **26**. The DVD player **24** also includes a counter that adjusts itself based on which frame of the DVD is being read. For example, the DVD counter may correlate each frame of the DVD with a specific time code relating to the media stored on the DVD. This counter enables the DVD player **24** to jump to, identify or read specific frames of video content stored on DVDs. The DVD player **24** also reads DVD serial numbers so as to identify the media content contained by the particular DVD and may communicate the serial number to the control circuitry **20**.

[0050] The functioning of the DVD player **24** may be controlled by the control circuitry **20**, which loads appropriate data files from the memory **22**. For example, when a Star Wars DVD is placed in the DVD player **24**, the DVD player reads the serial number of the DVD and communicates the number to the control circuitry **20**. The control circuitry **20** uses the serial number to find the appropriate data files stored in the memory **22**. The data files identify the media content of the DVD as being the Star Wars movie and also identify which scenes, or frames, are to be played by the DVD player **24**. In this way, the control circuitry **20** is able to manage the functioning of the DVD player **24**.

[0051] In one embodiment of the invention, the DVD player **24** also reads DVDs that contain data as opposed to a movie or a video. For example, in one embodiment, the DVD player **24** is used to read DVDs that contain data files that are associated with several movies or videos, which data files may be copied to the memory **22**.

[0052] With continued reference to FIG. **2**, other video sources, such as external video sources, may communicate with the compositor device **12**. In one embodiment, the multiplexer **26** is configured to accept signals from multiple exter-

nal sources as well as from the DVD player **24**. For example, the multiplexer **26** is shown as being structured to receive signals from the DVD player **24**, a cable network, an antenna and a satellite. In other embodiments, the multiplexer **26** may be configured to receive fewer or more signals. For example, multiplexer **26** may be configured to receive a streaming video over the Internet or data from a cable box. The multiplexer **26** may also be configured to receive auxiliary signals from an external DVD player or a VCR.

[0053] The multiplexer **26** is structured to select one of multiple input signals, the selection being based on a control signal. In one embodiment, the control circuitry **20** supplies the control signal to the multiplexer **26**. In another embodiment, the multiplexer **26** automatically selects the signal from the DVD player **24** when a DVD is inserted therein and selects the signal from the other available signals when no DVD is present in the DVD player **24**. For example, in one embodiment, the user may input a selection through the user interface **32**.

[0054] As shown in FIG. **2**, one embodiment of the multiplexer **26** outputs the selected signal to the chroma-key mixer **28** and the switcher **30**. In other embodiments of the invention, other switching devices or routers may be used in place of the multiplexer **26** to select between multiple input signals and to communicate the selected signal to other components. In other embodiments of the invention, the multiplexer **26** may receive signals from other video sources. The multiplexer **26** may also be coupled to more or fewer video sources than are depicted in FIG. **2**.

[0055] The term "chroma-key" as used herein is a broad term and is used in its ordinary sense and refers to without limitation a system, device, or process that is used to create an effect wherein at least one color or hue in a video image is eliminated or substituted for with a different image. For example, a chroma-key technique, also referred to as color separation overlay, may utilize a mixer or like device to substitute a color, such as blue or green, in one video image for portions another video image.

[0056] The chroma-key mixer **28** receives, as inputs, signals from the multiplexer **26** and from the video recorder **16**. The chroma-key mixer **28** processes these two input signals to form an output composite signal, which is communicated to the switcher **30**. The chroma-key mixer **28** may also receive control signals from the control circuitry **20** or from the user interface **32**.

[0057] In one embodiment of the invention, the chroma-key mixer **28** is used to create special visual effects that utilize the combination of two video signals to produce one composite image. In particular, the chroma-key mixer **28** is used to produce a composite image wherein it appears the subject from one video source, such as footage being captured by a video camera, is inserted into the footage from another video source, such as a movie on a DVD. This mixing by the chroma-key mixer **28** may be accomplished in real time.

[0058] In one embodiment, the chroma-key mixer **28** produces a composite image by subtracting a chroma element or elements from the real-time image, such as an image being captured by the video recorder **16**. The chroma element comprises at least one color that has been pre-selected or that is selected by the user, which color is used in the background for the video-recorded image. Upon receiving the real-time signal, the chroma-key mixer **28** removes the chroma element (the background) from the video recorded image, leaving only the image of the target subject.

[0059] For example, in so-called "green screening," a target subject is positioned in front of a solid green screen. The image of the target subject is then captured by a video recorder and transmitted as a signal to the chroma-key mixer **28**. The chroma-key mixer **28** subtracts the chroma element (green) from the video recorder signal. This leaves only the image of the target subject along with "blank" portions where the real-time image had contained the chroma element. The chroma-key mixer **28** then replaces the subtracted, or blank, portions of the real-time image with portions of the image contained by the signal from the multiplexer **26**, which signal contains scenes from a movie on a DVD. As a result of the signal processing, it appears that the target subject image, which is a real-time image, is present in a movie or other prerecorded video, thus forming a composite image. In other words, the composite image is made up of at least two video components: a foreground image, which consists of the non-chroma element portions of the video recorder signal, and a background image, which consists of the signal received from the multiplexer **26**.

[0060] Though this example describes the functioning of one embodiment of the chroma-key mixer **28**, one with skill in the art will recognize that there exist other processes that may be used to produce a composite signal. For example, the chroma-key mixer **28** may directly substitute portions of the video source signal for the chroma-element portions of the real-time video signal. In another embodiment of the invention, the chroma-element portions of the real-time video signal are made transparent by the chroma-key mixer **28**. This allows the non-chroma element portions of the real-time video signal to be layered on top of the video source signal to create the composite image.

[0061] Though the example given above has been in reference to an embodiment of the invention utilizing green as the chroma element, other colors may be used. For example, blue or red may be designated as the chroma element. In addition, multiple shades of the same color may be identified as chroma elements, allowing for a finer tuning of the composite image by the chroma-key mixer **28**. For example, in one embodiment of the invention, the user is able to select portions (or colors) of the real-time image that the user wishes to remove or make transparent by designating the colors as chroma elements.

[0062] The chroma-key mixer **28** may perform the above-described process through various techniques. For example, in one embodiment of the invention, the chroma-key mixer **28** utilizes digital processing to create the composite image. In other embodiments, the chroma-key mixer **28** may create the composite image through optical techniques or through the use of analog real-time circuits that are known in the art. In yet other embodiments, the chroma-key mixer **28** comprises a luminance key mixer, which performs video compositing based on the brightness of portions of an image instead of color.

[0063] In the embodiment of the invention depicted in FIG. **2**, the chroma-key mixer **28** outputs the composite signal to the switcher **30**. The switcher **30** also receives the output signal of the multiplexer **26**. The function of the switcher **30** is to select a single output signal from multiple input signals. For example, in one embodiment, the switcher **30** selects between the signal from the multiplexer **26** and the composite signal from the chroma-key mixer **28**. The switcher **30** makes its determination based on communications with the control circuitry **20**. In particular, the operation of the switcher **30** is

managed by the control circuitry **20** based on the information contained in the data files, such as reference information regarding the beginning and ending reference points.

[0064] In one embodiment, the control circuitry **20** cross-references each frame of a prerecorded video with the beginning and ending reference points contained in the data files corresponding to the specific video being played. When the DVD counter, whose value relates to the specific frame being played, matches or correlates with a beginning reference point value, the switcher **30** is automatically instructed to select the composite signal from the chroma-key mixer. As a result, a target image being captured by the video recorder **16** is "inserted" or superimposed in the prerecorded video scene. When the DVD counter matches or correlates with an ending reference point, the switcher **30** is automatically instructed to select the signal from the multiplexer **26**, thus removing the image of the target subject from the prerecorded video scene.

[0065] For example, suppose a user wants to insert himself or herself for Darth Vader® in a video clip from Star Wars, which is being played by the DVD player **24**. First, the data files for the movie Star Wars that contain information relating to the video footage of Darth Vader® are accessed by the control circuitry **20**. During frames not containing video footage of Darth Vader®, the signal from the multiplexer **26** (which comes from the DVD player. **24**) is selected by the switcher **30**, which signal may be shown by the display **18**. Viewers of the display **18** will see the normal footage from the Star Wars movie. The signal from the multiplexer **26** is selected by the switcher **30** until the control circuitry **20** instructs the switcher **30** to select the composite signal from the chroma-key mixer **28**. This switching to the composite signal occurs when video footage of Darth Vader® is contained in the video source signal. The control circuitry **20** can identify the footage containing Darth Vader® by cross-referencing the relevant beginning and ending reference points from the data files. The beginning reference points identify the points or times in the movie when Darth Vader® enters a scene. As a result, when a beginning reference point matches or correlates with the DVD counter, which identifies a particular point of time or frame in the movie, the control circuitry **20** instructs the switcher **30** to select as an output the composite signal from the chroma-key mixer **28**. Instead of seeing Darth Vader® on the display **18**, viewers see in his place the image of the real-time target subject, which is being captured by the video recorder **16**.

[0066] The ending reference points identify the points or times in a movie when Darth Vader® leaves a movie scene. When an ending reference point matches or correlates with the DVD counter, the control circuitry **20** then instructs the switcher **30** to select as an output the signal from the multiplexer **26**. As a result, the target image, which is being captured by the video recorder **16**, is not shown on the display **18**.

[0067] The reference information, therefore, is used in one embodiment of the invention to automatically control the switching process between the signal from the video source **14** and the composite signal from the chroma-key mixer **28**. For example, in one embodiment of the invention the reference information comprises beginning and ending reference points that correspond to the presence of a particular character in a movie or that indicate other points when it would be desirable to superimpose a real-time target image on a prerecorded image. The reference information of the data files may also be used to manage the audio components of the signals received from the multiplexer **26** and the video recorder **16**. For example, in one embodiment, the control circuitry **20** instructs the switcher **30** to: (1) include only the audio component of the signal from the multiplexer **26** in the output signal, (2) include only the audio component of the signal from the video recorder **16** in the output signal, or (3) include both the audio components of the signals from the multiplexer **26** and the video recorder **16** in the output signal.

[0068] In another embodiment, the reference information is also used to manage the display of voice prompts, such as are used in karaoke files. For example, the reference information may indicate when to show voice prompts for a particular character when the character enters a scene. The reference information may also indicate when to remove or not display voice prompts for the particular character. In such an embodiment of the invention, the reference information corresponding to voice prompts may be located in the same data file as, or in a separate data file from, the reference information corresponding to video or audio components of the video source.

[0069] Although, the terms "beginning reference points" and "ending reference points" are used herein to describe the functioning of the compositing system **10**, one with skill in the art will recognize that the beginning and ending reference points may be structurally and functionally equivalent. For example, in one embodiment, reference points stored in the data files are not identified as beginning or ending reference points. The reference points may be used by the control circuitry **20** to output a signal that causes the switcher **30** to change its state no matter what state the switcher was operating in previously.

[0070] With continued reference to FIG. **2**, the depicted embodiment of the compositor device **12** comprises the user interface **32**. The user interface **32** comprises any interface that accepts input from a user and/or conveys information to a user. In one embodiment, the user interface **32** is coupled to the chroma-key mixer **28** and to the control circuitry **20**. In other embodiments, the user interface **32** may be coupled to more or fewer components of the compositor device **12**. For example, the user interface may be directly coupled to the DVD player **24** to control the operation of the DVD player without the use of the control circuitry **20**.

[0071] One embodiment of the user interface **32** is illustrated in FIG. **3**. The user interface **32** comprises a front tray portion of the DVD player **24**, a display **40**, editing controls **42**, cropping/chroma controls **44** and a camera input display **46**. In other embodiments of the invention, the user interface **32** may comprise more or fewer components. For example, the user interface **32** may operate without the display **40** or without the editing controls **42**.

[0072] The display **40** conveys to the user information regarding the operation of the compositor device **12**. For example, the display **40** may depict information regarding the tracks of an inserted DVD (either by time or by frame number), the chroma color selections, the data files (such as the film title or the tracks/scenes available for substitution) and other information to assist the user. In one embodiment, the display **40** is a light emitting diode (LED) display. In other embodiments, the display **40** is a liquid crystal display (LCD). The display **40** may convey information through the use of graphics, characters, or both.

[0073] The cropping/chroma controls **44** allow a user to allow a user to modify in real time the video image being captured by the video recorder **16** so that the image conforms to the prerecorded video scene in which the image is inserted.

In one embodiment, the cropping/chroma controls **44** allow the user to select the chroma element or elements to be subtracted from the captured video image. Such selection may be made by selecting the name of a particular color or by selecting a visual representation of the color that is shown on the user interface display **40** or the external display **18**.

[0074] The cropping/chroma controls **44** also allow the user to crop the captured video image such that it "fits" in the prerecorded background image. These controls may be used to zoom out or zoom in on a target subject in order to adjust the size of the target subject to be in proportion with other objects in the prerecorded scene on to which the target subject is superimposed.

[0075] Other embodiments of the invention may contain other controls for modifying the captured video. For example, the user interface **32** may comprise a color saturation control that adjusts the color level of the captured video. This allows for a color image to be adjusted so as to blend in a black and white background.

[0076] The camera input display **46** identifies the video recorders **16** that are connected to the compositor device **12** and that are available to capture video for processing. For example, if multiple video recorders **16** were coupled to the compositor device **12**, then multiple lights of the camera input display **46** may be illuminated. In other embodiments of the invention, the camera input display **46** identifies when the video being captured by one of the video recorders **16** is being processed and output to the display **18**. In other embodiments of the invention, the user interface **32** does not include the camera input display **46**.

[0077] In one embodiment, the user interface **32** also comprises controls that are generally found on CD/DVD players. For example, the user interface comprises a power button **48** to turn the machine on and off. The user interface also comprises DVD/CD controls **50**, such as play, rewind, fast forward, stop, pause, eject and the like, that are used to control the operation of the DVD player **24**.

[0078] In one embodiment, the user interface **32** also includes a remote control input (not shown). The remote control input may accept instructions or data that are transmitted to the user interface **32** from one or more remote control devices. These instructions may correspond to controls that are present on the user interface **32** or may include more or fewer instructions that enable the user to manage the operation of the compositor device **12**.

[0079] Though FIG. **3** depicts one implementation of the user interface **32**, other types of user interfaces may be used in other embodiments. For example, the user interface **32** may comprise a touch screen that both displays information to a user and accepts input from the user. In other embodiments, the user interface **32** may accept instructions through voice recognition or may be coupled to another system or device, such as a keyboard or personal computer, that accepts input from a user. In yet other embodiments, the compositor device **12** operates without a user interface **32**. In such embodiments, a user interface may be incorporated into the display **18**. For example, display **18** may show on-screen instructions to a user or accept commands inputted by the user.

[0080] As shown by the embodiment of the compositor device **12** in FIG. **2**, the control circuitry **20** manages the content of the signal outputted to the display **18**. In one embodiment, the output of the switcher **30** is coupled to the control circuitry **20**. In such an embodiment, the control circuitry **20** may select to output the signal from the switcher **30** or may output other video content that is stored in the memory **22**. For example, in one embodiment, prerecorded scenes are stored in the memory **22**, and upon input from the user, the control circuitry **20** outputs these scenes instead of the signal from the switcher **30**. In another embodiment, the control circuitry **20** is used to overlay information such as subtitles or dialogue prompts over the signal from the switcher **30**. In yet other embodiments of the invention, the output of the switcher **30** is coupled to the display **18** without intervention by the control circuitry **20**.

[0081] In yet other embodiments of the invention, the compositor device **12** includes input/output ports (not shown) that interface with external systems or devices. For example, the compositor device **12** may comprise a serial port, a universal serial bus (USB), a firewire port, or the like that can be used to download data files from a personal computer or handheld device.

[0082] FIG. **4** is a block diagram of an embodiment of the invention wherein the compositor device **12** is structured to receive input from multiple video recorders. As can be seen in FIG. **4**, the compositor device **12** includes the same components as the embodiment of the compositor device **12** depicted in FIG. **2**. The compositor device **12** of FIG. **4** additionally comprises a second chroma-key mixer **54** and a second switcher **56**.

[0083] In one embodiment, the second chroma-key mixer **54** functions similarly to the first chroma-key mixer **28**. In particular, the second chroma-key mixer **54** receives, as inputs, signals from the multiplexer **26**, the first chroma-key mixer **28** and a second video recorder **16**. The second chroma-key mixer **54** may also receive instructions from the control circuitry **20**. Like the first chroma-key mixer **28**, the second chroma-key mixer **54** removes the chroma element from a real-time image, such as captured by the second video recorder, and combines the modified real-time image with another signal to form a composite signal. In an embodiment having two video recorders, the second chroma-key mixer **54** may combine the real-time image captured by the second video recorder with either the prerecorded video from the multiplexer **26** or the composite signal outputted by the first chroma-key mixer **28**. The second chroma-key mixer **54** then outputs a second composite signal to the second switcher **56**.

[0084] In other embodiments, the second chroma-key mixer **54** may be external to the compositor device **12**. In yet other embodiments, portion of the second chroma-key mixer **54** may be external to the compositor device **12** and portions of the second chroma-key mixer **54** may be internal to the compositor device **12**.

[0085] The second switcher **56** functions similarly to the first switcher **30**. In one embodiment, the second switcher **56** receives, as inputs, signals from the first switcher **30** and from the second chroma-key mixer **54**. The second switcher **56** selects between these inputs based upon instructions received from the control circuitry **20**. The second switcher **56** may output a signal to the control circuitry **20** or to the display **18**. In one embodiment of the invention, the content of the output signal of the second switcher **56** may be: (1) the prerecorded signal from the multiplexer **26**, (2) the composite signal from the first chroma-key mixer **28** having portions of an image from the first video recorder, (3) the second composite signal from the second chroma-key mixer **54** having portions of an image from the second video recorder, or (4) the second

composite signal from the second chroma-key mixer **54** having portions of images from the first video recorder and from the second video recorder.

[0086] The operation of one embodiment of the video compositing system will now be described. FIG. **5** illustrates one embodiment of an interactive video compositing process **100**. The compositing process **100** begins with State **105**. At State **105**, the user selects a video source that the user wants to use as a background image for a final composite image. For example, the user may insert a favorite movie into the DVD player **24**.

[0087] After the user has selected a particular video source, the compositing process **100** continues with State **110**. At State **110**, data files associated with the video source are accessed by the compositor device **12**. For example, when a DVD is inserted into the DVD player **24**, the serial number of the DVD is communicated to the control circuitry **20**, which uses the serial number to identify and access the appropriate prerecorded data files. The data files identify scenes recorded on the DVD that have been catalogued as being suitable for chroma key substitution. In one embodiment of the invention, the suitable scenes are identified by the data files stored in the memory **22** of the compositor device **12**. These data files may have been preprogrammed in the memory **22**, may have been downloaded or saved from another source, or may be saved on the selected DVD, such as in the bonus materials section of the DVD. In one embodiment, the scenes catalogued as being available for chroma-key substitution generally contain video footage of a character for which a user can substitute his or her own image. In one embodiment, the data files comprise reference information that identifies which scenes of the DVD contain video footage of the particular character.

[0088] The available scenes are communicated to the user, such as through the display **40** of the user interface **32**. In another embodiment, the available scenes may be communicated through an external display, such as display **18**. At State **115**, the user selects an available scene into which the user wants to superimpose or "insert" a real-time image. In one embodiment, the user makes the selection through the user interface **32**, such as through a remote control.

[0089] After the user selects an available scene, the compositing process **100** proceeds with State **120**. At State **120**, the video recorder **16** is used to capture a target image. This target image is the image that is used to overlay, or be inserted into, in real time, the scenes from the video source. The target image is preferably positioned in front of an evenly lit, solid colored background, which color represents the chroma element. For example, in one embodiment of the invention wherein the selected chroma element is green, the target image is positioned in front of a "green screen." Other colors or types of backgrounds may be used that enable the background to be later "removed" when forming a composite image with scenes from the video source.

[0090] In one embodiment, a video camera is utilized to capture the target image and convert the image into a signal that is input into the chroma-key mixer **28** of the compositor device **12**. It should be recognized that, along with a video image, an audio signal may also be recorded by the video camera and input into the compositor device **12**.

[0091] The chroma-key mixer **28** of the compositor device **12** creates a composite image through the processes that have been previously discussed. In one embodiment, the chroma-key mixer **28** removes the chroma element from the image captured by the video camera, leaving only the video image of the target image. Then, corresponding portions of the image from the video source are used to fill in the removed portions of the video recorded image, thus forming a composite image that appears to have the target image inserted into scenes from the video source.

[0092] In another embodiment, the chroma element portions of the video-captured image are made transparent, such as through digital processing, leaving only the target image. The modified video-captured image is then layered on top of the video source image. As a result, portions from the background video source image that are located underneath the top layer target image are not seen on the display of the composite image. However, portions of the background video source image located underneath the transparent portions of the top layer (those portions that had contained the chroma element) are viewable.

[0093] The compositing process **100** then moves to State **125**. At State **125**, it is determined whether the video source image or the composite image is to be selected as the output image. In one embodiment, this selection of the output image is made by the switcher **30**. The control of this selection may be performed automatically (without user interaction) by the compositor device **12** using information from the prerecorded data files, or the user may control the operation of the switcher **30** through the user interface **32**. For example, the control circuitry **20**, based upon the beginning and ending reference points contained in the data files, may instruct the switcher **30** when to output the video source image and when to output the composite image that has the target image overlaid on the video source image. In another embodiment, the user may also manually control when such switching occurs. Such manual control allows the user more freedom to create desired scenes or special effects.

[0094] If at State **125**, the switcher **30** is instructed to select the composite image, the compositing process **100** moves to State **130**. At State **130**, the composite image is shown on the display **18**. Viewers of the display **18** will observe the real-time target image inserted into the prerecorded footage from the video source. For example, viewers may see the target image replacing a character in a movie playing on the DVD player **24**. After State **130**, the compositing process **100** moves to State **140**.

[0095] If at State **125**, the switcher **30** is instructed to select the video source image, the compositing process **100** moves to State **135**. At State **135**, the image from the video source is shown on the display **18**. After State **135**, the compositing process **100** then proceeds to State **140**.

[0096] At State **140**, it is determined whether or not preprogrammed data is to be displayed instead of the video source image or the composite image. Such preprogrammed data may include, for example, prerecorded scenes that are stored in the memory **22**. In one embodiment, the prerecorded scenes comprise video clips that users may want to insert in order make the displayed scenes appear more interactive or to appear more life-like. For example, prerecorded video clips having various forms of feedback from judges could be inserted after a target subject has acted out a scene (which was observed by the viewers of the display **18**). In one embodiment, different video clips are selected to be displayed based on input given by the viewers.

[0097] If preprogrammed data is to be displayed, the compositing process **100** moves to State **145**. At State **145**, the preprogrammed data is communicated to the display **18**. In one embodiment, the control circuitry **20** manages which

signal is communicated to the display **18**. In another embodiment, a multiplexer or other similar device may be used to select which signal is output to the display **18**. The length of time that the preprogrammed data is displayed may be directly controlled by the user or may be a set length of time, such as, for example, until the end of the particular video clip. Upon completion of State **145**, the compositing process **100** returns to State **140**. If preprogrammed data is not to be displayed, the compositing process **100** returns to State **125** to determine whether the video source image or the composite image is to be displayed.

[0098] One with skill in the art will recognize that the compositing process **100** illustrated in FIG. **5** is only one example of the functioning of the compositing system **10**. For example, in other embodiments of the invention, the compositing process **100** may include more or fewer states, or states may be combined or executed in a different order. For example, additional states may be added that illustrate the separate control of audio signals and video signals. In other embodiments, preprogrammed data may be displayed at the beginning of the compositing process **100** or upon the selection of a particular video source for playback.

[0099] The compositing system **10** may be particularly useful with preprogrammed video that is easily adapted to allow for user interaction. For example, to help further illustrate an embodiment of the compositing process **100**, assume that the user selects a DVD that has recorded scenes from the television talent show American Idol. Data files corresponding to video segments of the DVD are stored in the memory **22** of the compositor device **12**. Upon insertion of the DVD, the user is provided with options of scenes that are available for user interaction. For example, the user may have the option to select different scenes in which the user may "perform" in front of the judges or an audience.

[0100] Through the user interface **32**, the user selects a scene for video compositing. For example, the user may pick a scene in which a contestant is performing by signing a song in front of the judges. A user whose image is going to be substituted into the American Idol footage is positioned in front of the video recorder **16** with a green screen serving as the background. The individual then performs as if he or she was actually participating on the American Idol program, the performance of the individual being captured by the video recorder **16** and converted to a signal communicated to the compositor device **12**.

[0101] The display **18** shows video and audio from the American Idol program. During the American Idol scenes that would normally contain footage of the participant on the actual program, the image of the individual being recorded by the video recorder **16** is substituted in real time for the participant. As a result, it appears to viewers of the display **18** that the individual is actually participating on the American Idol program. The timing of the substitution of images is determined by the reference information recorded in the data files, which process has been described previously. In addition, the user may also manually control which images are output to the display **18**.

[0102] Audio signals that are captured by the video recorder **16** are also output through the display **18**. Like the video images, the substitution of the real-time audio signals from the video recorded footage may occur at appropriate points in the American Idol scenes, such as when the participant is performing or singing. The audio substitution need not occur at the same times as the video substitution. For example, there may exist portions of American Idol footage that contain the voice of the participant but that do not contain the video image of the participant. Again, the substitution of the audio signals may be automatically controlled by the compositor device **12** based on the data file information and/or may be manually controlled by the user.

[0103] After the performance, viewers have the option to rate the performance of the individual who has been inserted into the program. These viewer ratings may be used to select the display of prerecorded video clips having feedback from the judges on American Idol. For example, prerecorded video clips of good reviews, bad reviews, and average reviews may be stored in the memory **22** of the compositor device **12**. The viewers then have the option of inputting their opinions of the performance, such as through remote controls communicating with the user interface **32**. If the viewers rate the performance by the individual as being generally poor, then the compositor device **12** selects the playback of video clips that include the judges being critical of the performance. On the other hand, if the users rate the performance as being generally good, then the compositor device **12** selects the playback of video clips that give positive feedback from the judges.

[0104] In other embodiments of the invention, the above-described American Idol program may be stored entirely in the memory **22** of the compositor device **12** without the use of a DVD. In yet other embodiments, the compositor device **12** may include a monitor that display the appropriate voice prompts to the user, which prompts correspond to portions of the American Idol program. For example, the compositor device **12** may include a CD+G input or player that reads files and outputs a display having voice prompts.

[0105] Although embodiments described herein have related generally to real-time video compositing with sources such as movies, television programs and the like, other embodiments of the invention may utilize any source of video, audio, or a combination thereof. For example, in another embodiment of the invention, the compositor device may accept video or audio input from a video game system. Such would allow a user to "insert" himself or herself into the video game and to interact with objects therein.

[0106] While certain embodiments of the inventions have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the inventions. Indeed, the novel methods and systems described herein may be embodied in a variety of other forms; furthermore, various omissions, substitutions and changes in the form of the methods and systems described herein may be made without departing from the spirit of the inventions.

What is claimed is:

1. A method for coordinating the display of multiple signals, the method comprising:

accessing a first signal comprising video content having multiple frames;

accessing a second signal comprising a video image of a participant;

forming a combined video signal comprising at least a portion of the first signal and at least a portion of the second signal, wherein the combined video signal is configured to cause the display of the video image of the participant in place of a scene element of the video content;

accessing reference data that corresponds to the first signal, the reference data comprising first reference data that identifies a first frame of the multiple frames in which

the scene element is associated with a scene of the video content, and wherein the reference data comprises second reference data that identifies a second frame of the multiple frames in which the scene element is no longer associated with the scene of the video content; and

switching between displaying the first signal and displaying the combined video signal, wherein a timing of said switching is based on the reference data such that the combined video signal is selected at a first time identified by the first reference data whereby the participant appears in the scene in place of the scene element, and such that the first signal is selected at a second time identified by the second reference data whereby the participant no longer appears in the scene of the video content.

2. The method of claim **1**, wherein the video image of the participant comprises a real-time image of the participant.

3. The method of claim **2**, wherein said switching is performed in real time.

4. The method of claim **1**, wherein said accessing the second signal comprises receiving the second signal via a network.

5. The method of claim **4**, further comprising accessing a third signal comprising a second video image of a second participant.

6. The method of claim **5**, wherein the combined video signal comprises at least portions of the first, second and third signals.

7. The method of claim **6**, wherein the reference data comprises third reference data that identifies a third frame of the multiple frames in which a second scene element is associated with the scene of the video content.

8. The method of claim **1**, wherein the first signal further comprises a first audio signal that corresponds to the video content.

9. The method of claim **8**, wherein the second signal comprises a second audio signal that corresponds to audio of the participant, wherein at the first time identified by the first reference data the second audio signal is associated with the combined video signal.

10. The method of claim **1**, wherein said forming the combined video signal comprises overlaying the at least the portion of the second signal on the first signal.

11. The method of claim **1**, wherein the scene element comprises an actor or actress of the video content.

12. A system for providing interactive entertainment, the system comprising:

a first input configured to receive a first signal, the first signal comprising video content including a plurality of frames representing a scene;

a second input configured to receive a second signal, the second signal comprising an image of a participant; and

a processor in communication with the first input and the second input, the processor being configured to combine at least a portion of the first signal and at least a portion of the second signal, wherein the portion of the second signal comprises the image of the participant,

the processor being further configured to receive first reference data that identifies a first frame of the plurality of frames in which a scene element appears in the scene of the video content and to receive second reference data that identifies a second frame of the plurality of frames in which the scene element no longer appears in the scene of the video content,

and the processor being further configured to output the combined signal at a first time identified by the first reference data such that the participant appears in the scene as the scene element and to output the first video signal at a second time identified by the second reference data such that the participant no longer appears in the scene.

13. The system of claim **12**, wherein the image comprises a real-time image of the participant.

14. The system of claim **12**, wherein the second input is configured to receive the second signal via a network.

15. The system of claim **12**, wherein the processor is further configured to adjust one or more attributes of the image of the participant when forming the combined signal.

16. The system of claim **15**, wherein the one or more attributes comprises a size of the image of the participant.

17. The system of claim **15**, wherein the one or more attributes comprises a color of the image of the participant.

18. The system of claim **12**, wherein the video content comprises at least one of movie content, video game content and television program content.

19. The system of claim **12**, wherein the scene element comprises a character of the video content.

20. A system for providing interactive entertainment, the system comprising:

means for receiving a first video signal, the first video signal comprising video content including a plurality of frames, the plurality of frames representing a scene;

means for receiving a second video signal, the second video signal comprising a video image of a participant; and

processing means for combining the first video signal and at least a portion of the second video signal, wherein the portion of the second video signal comprises the video image of the participant, and wherein the combined signal comprises a combined video signal with the participant as a character in the scene,

wherein the processing means further receives first reference data that identifies a first frame of the plurality of frames in which the character appears in the scene of the video content and receives second reference data that identifies a second frame of the plurality of frames in which the character exits the scene of the video content,

wherein the processing means further outputs the combined signal at a first time identified by the first reference data such that the participant appears in the scene as the character, and outputs the first video signal at a second time identified by the second reference data such that the participant no longer appears in the scene.

* * * * *