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Wong et al.

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(54) **MEDIA AUTHORING AND PRESENTATION**

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G06F 3/00 (2006.01)

(52) **U.S. Cl.** **715/731**; 715/721

(58) **Field of Classification Search** 715/720, 715/719, 769, 716, 721–726, 764, 968, 512, 715/530, 501.1, 500, 730–732; 707/104.1, 707/2, 3, 102
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,421,332	A	6/1995	Ishii et al.	
5,616,876	A	4/1997	Cluts	
5,774,591	A	6/1998	Black et al.	
5,802,361	A	9/1998	Wang et al.	
5,893,095	A	4/1999	Jain et al.	
6,366,296	B1	4/2002	Boreczky et al.	
6,389,467	B1	5/2002	Eyal	
6,490,370	B1	12/2002	Krasinski et al.	
6,526,411	B1	2/2003	Ward	
6,567,980	B1 *	5/2003	Jain et al.	725/61
6,642,940	B1	11/2003	Dakss et al.	
6,721,706	B1	4/2004	Strubbe et al.	
6,721,741	B1	4/2004	Eyal et al.	
6,721,952	B1	4/2004	Guedalia et al.	
6,792,573	B1 *	9/2004	Duncombe	715/500.1
6,813,745	B1 *	11/2004	Duncombe	715/500.1
6,877,002	B2	4/2005	Prince	
6,933,433	B1	8/2005	Porteus et al.	
6,993,532	B1	1/2006	Platt et al.	
7,080,392	B1	7/2006	Geshwind	
7,089,239	B1	8/2006	Baer et al.	
7,111,009	B1	9/2006	Gupta et al.	
7,113,999	B2	9/2006	Pestoni et al.	
7,283,992	B2	10/2007	Liu et al.	
7,319,806	B1	1/2008	Willner et al.	
7,383,314	B1	6/2008	Yoon et al.	
2001/0010523	A1	8/2001	Sezan et al.	
2001/0053275	A1	12/2001	Adachi et al.	

(Continued)

OTHER PUBLICATIONS

OA Dated Dec. 31, 2008 for U.S. Appl. No. 11/009,115, 24 pages.

(Continued)

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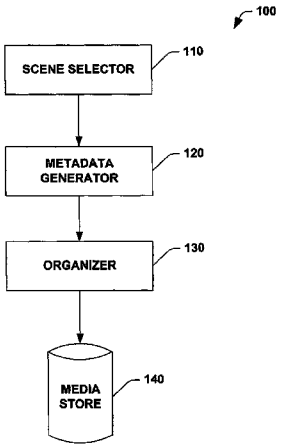
(57) **ABSTRACT**

A system and method for facilitating non-linear viewing of media is provided. The system facilitates non-linear viewing of media by providing a scene selector that scans a digitized media and selects a scene in the digitized media and a metadata generator that produces metadata associated with the scenes and relates the metadata to the selected scene. With the scenes annotated with metadata, a playlist generator can generate a playlist of related scenes based on user inputs like queries and a playlist updater can adapt the playlist based on user reaction to the displayed scenes. The scenes can be displayed on a variety of devices exhibiting various levels of intelligence. The displays can be distributed as can the system.

29 Claims, 18 Drawing Sheets



U.S. PATENT DOCUMENTS

2001/0053277 A1 12/2001 Jun et al.
2002/0010759 A1 1/2002 Hitson et al.
2002/0033842 A1* 3/2002 Zetts 345/719
2002/0116517 A1 8/2002 Hudson et al.
2002/0138630 A1 9/2002 Solomon et al.
2002/0186236 A1 12/2002 Brown et al.
2003/0117428 A1 6/2003 Li et al.
2004/0123725 A1 7/2004 Kim
2006/0048058 A1 3/2006 O'Neal et al.

OTHER PUBLICATIONS

OA Dated Feb. 17, 2009, for U.S. Appl. No. 11/009,142, 31 pages.
OA dated Jan. 17, 2010 from U.S. Appl. No. 11/009,142.

* cited by examiner

FIG. 1

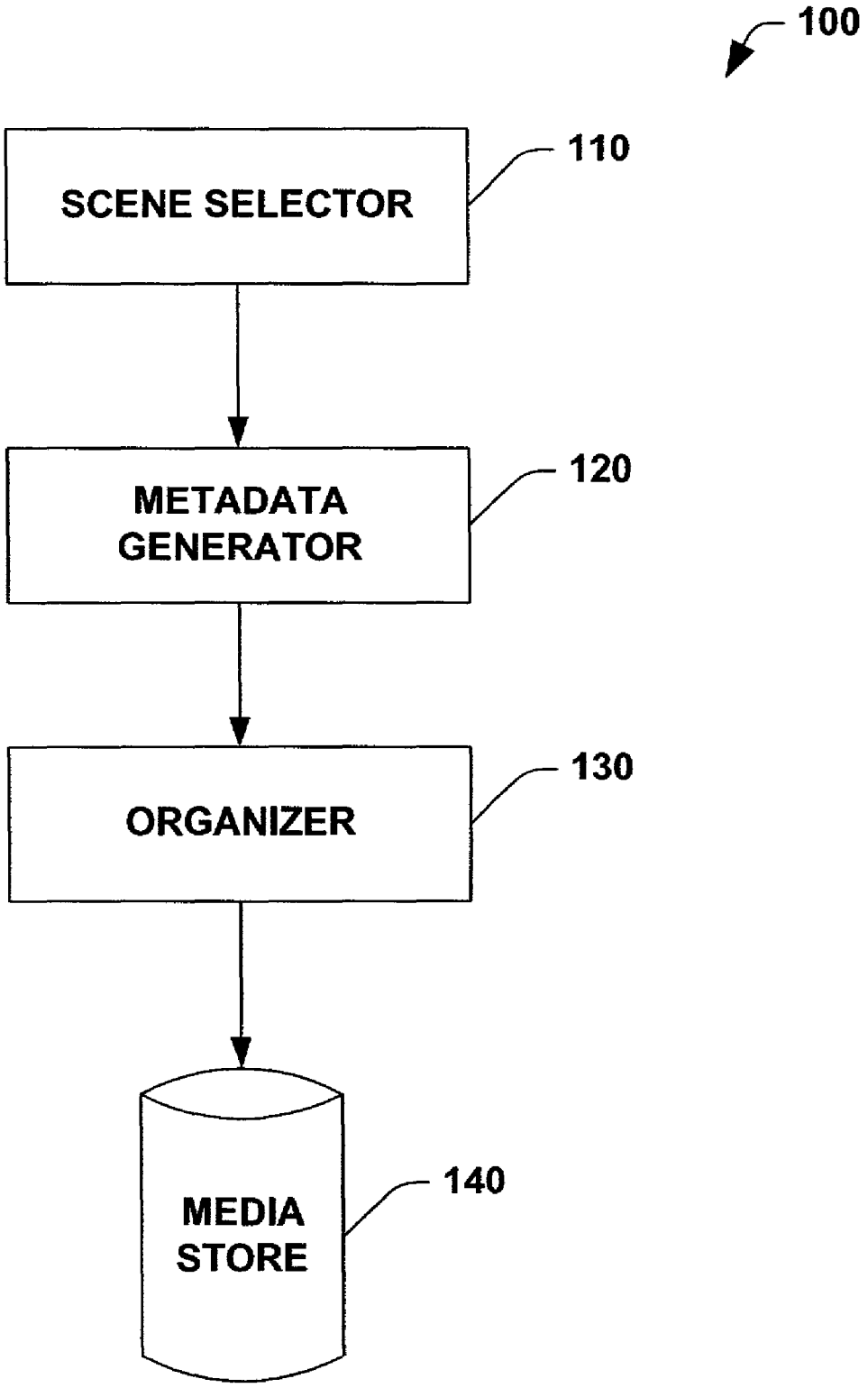

100
SCENE SELECTOR
110
METADATA GENERATOR
120
ORGANIZER
130
MEDIA STORE
140

FIG. 2

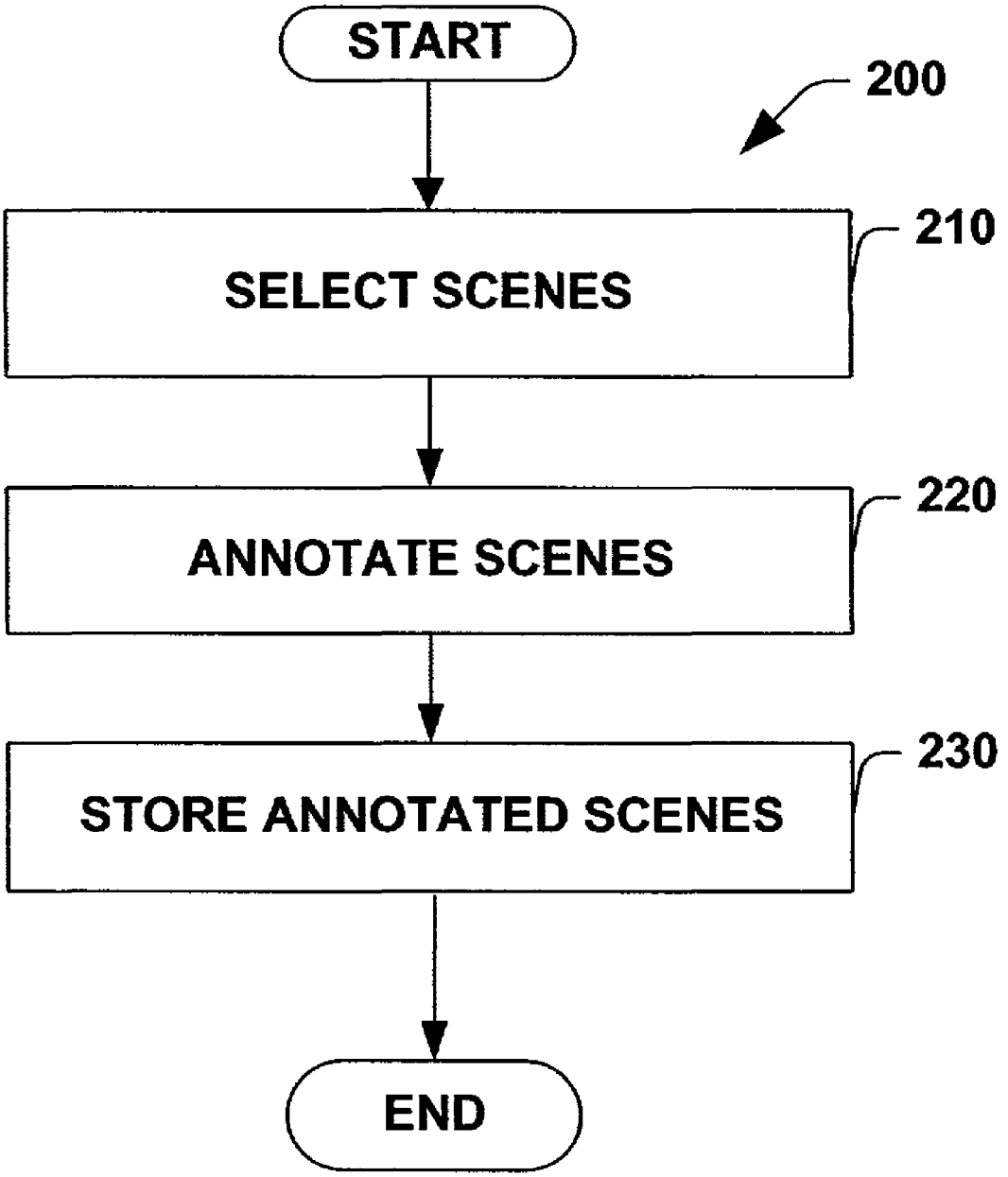

START
200
SELECT SCENES
210
ANNOTATE SCENES
220
STORE ANNOTATED SCENES
230
END

FIG. 3

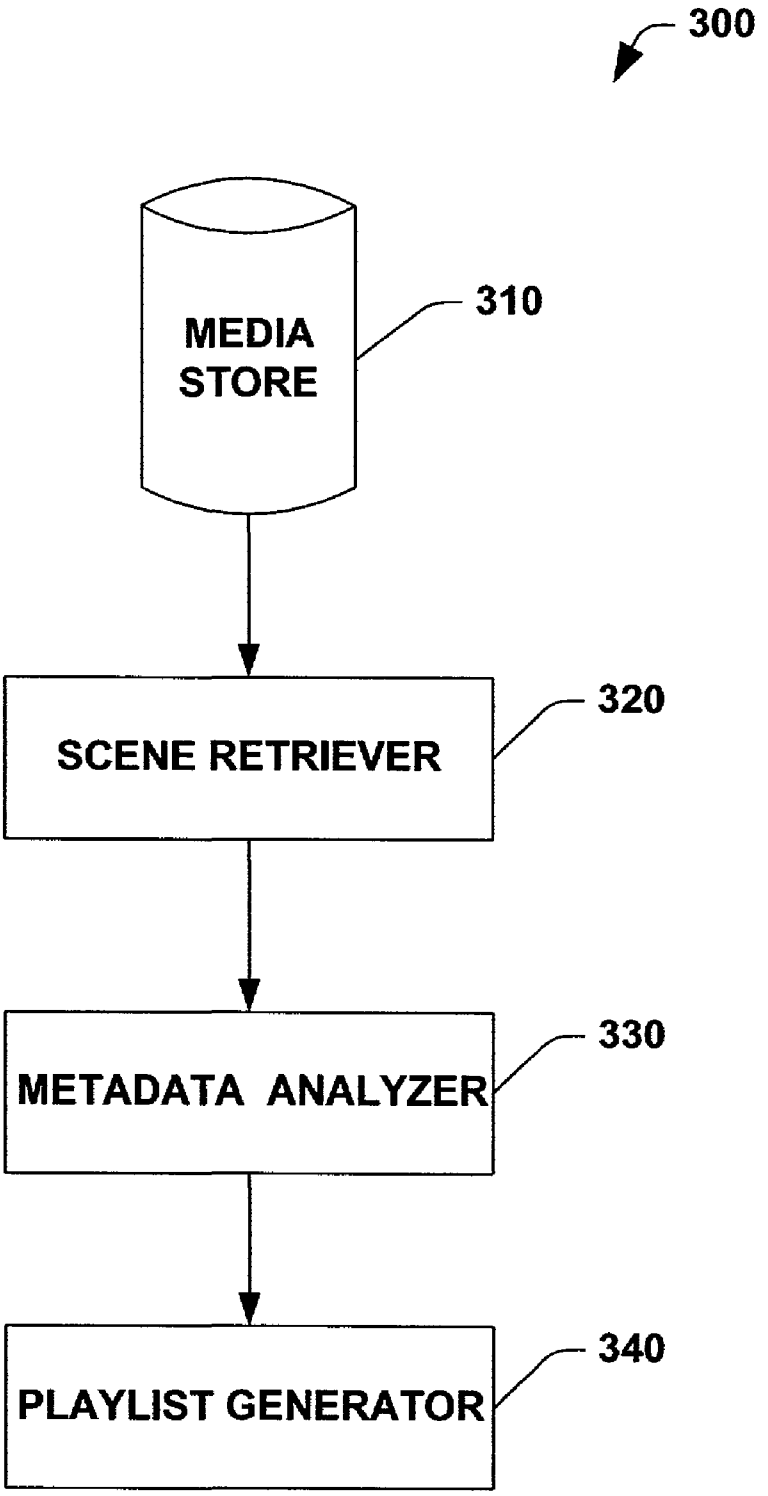

300
MEDIA STORE
310
SCENE RETRIEVER
320
METADATA ANALYZER
330
PLAYLIST GENERATOR
340

FIG. 4

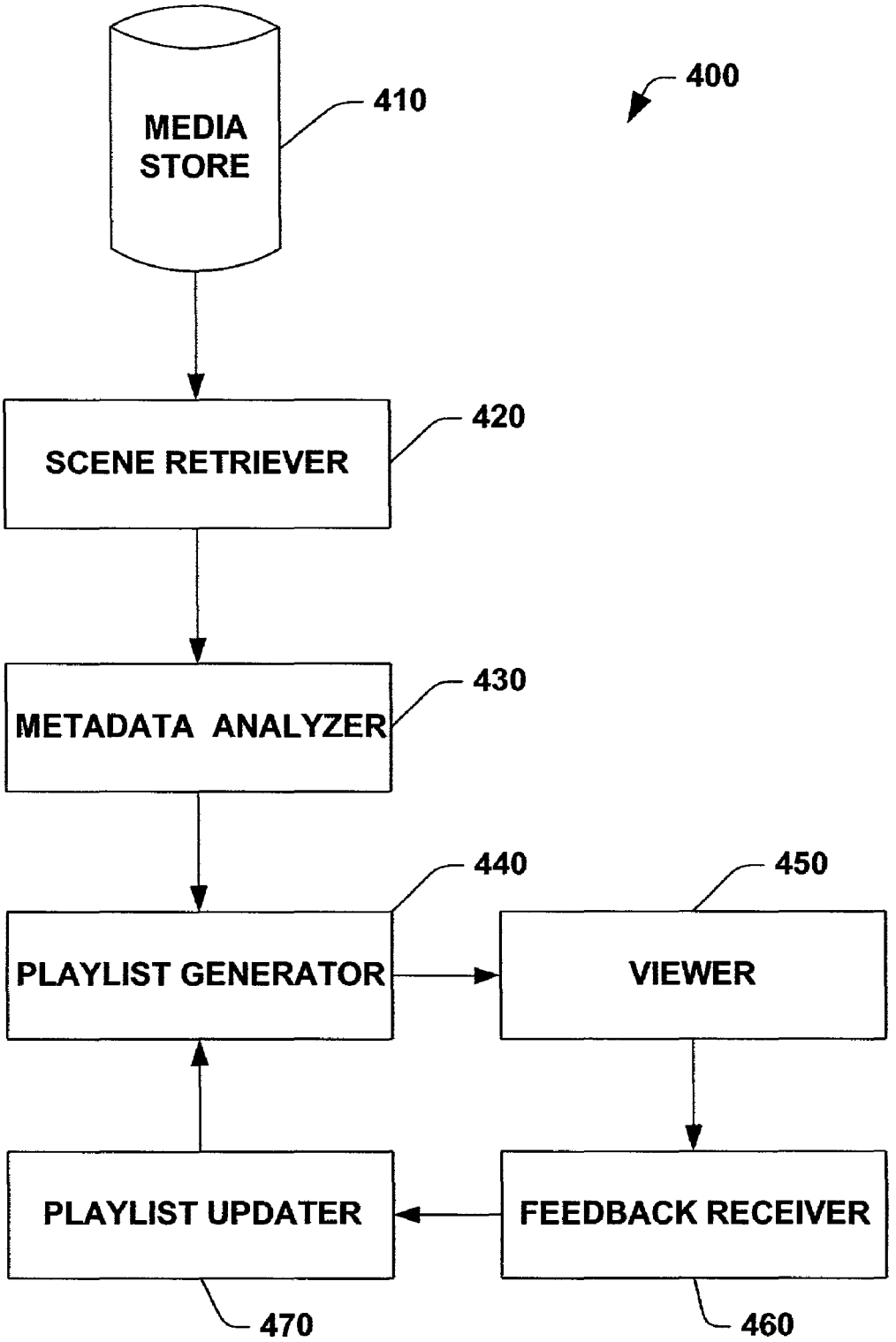

400
MEDIA STORE
410
SCENE RETRIEVER
420
METADATA ANALYZER
430
PLAYLIST GENERATOR
440
VIEWER
450
PLAYLIST UPDATER
470
FEEDBACK RECEIVER
460

FIG. 5

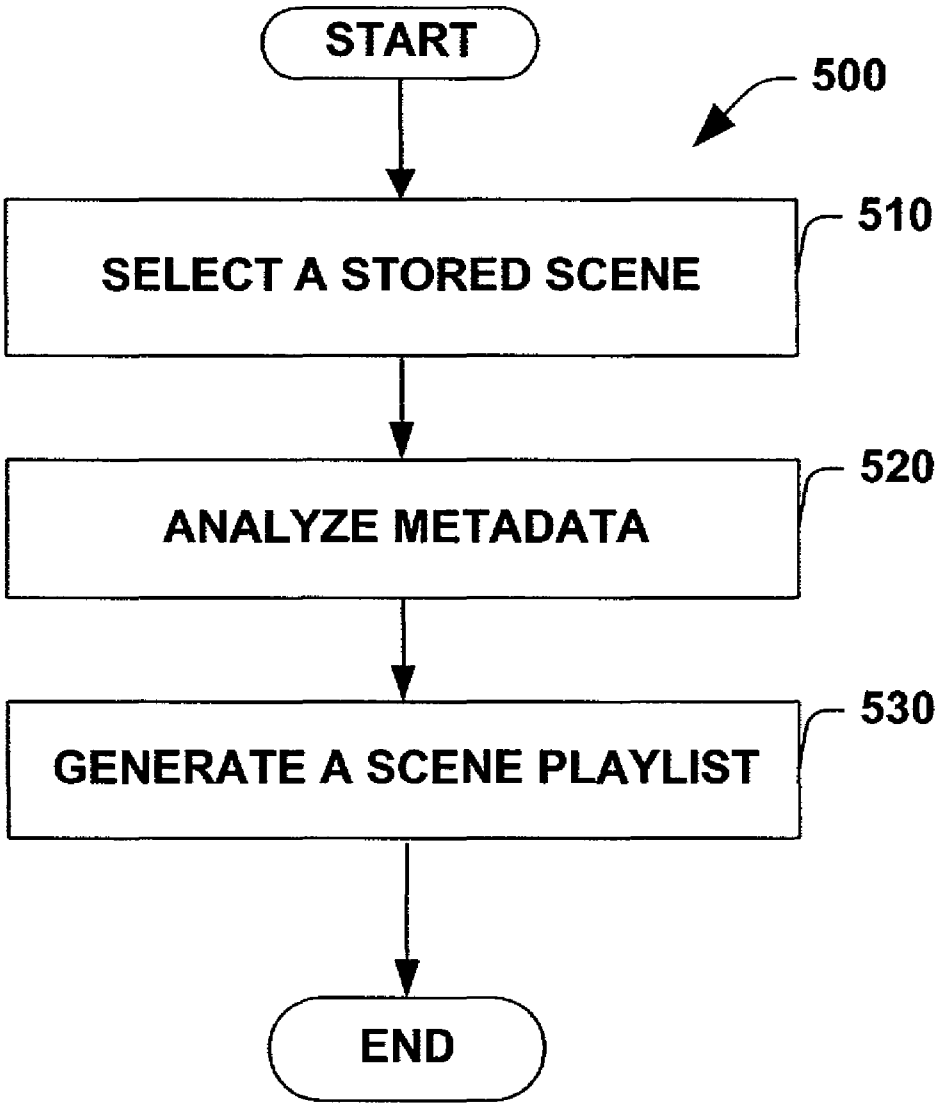

START
500
SELECT A STORED SCENE
510
ANALYZE METADATA
520
GENERATE A SCENE PLAYLIST
530
END

FIG. 6

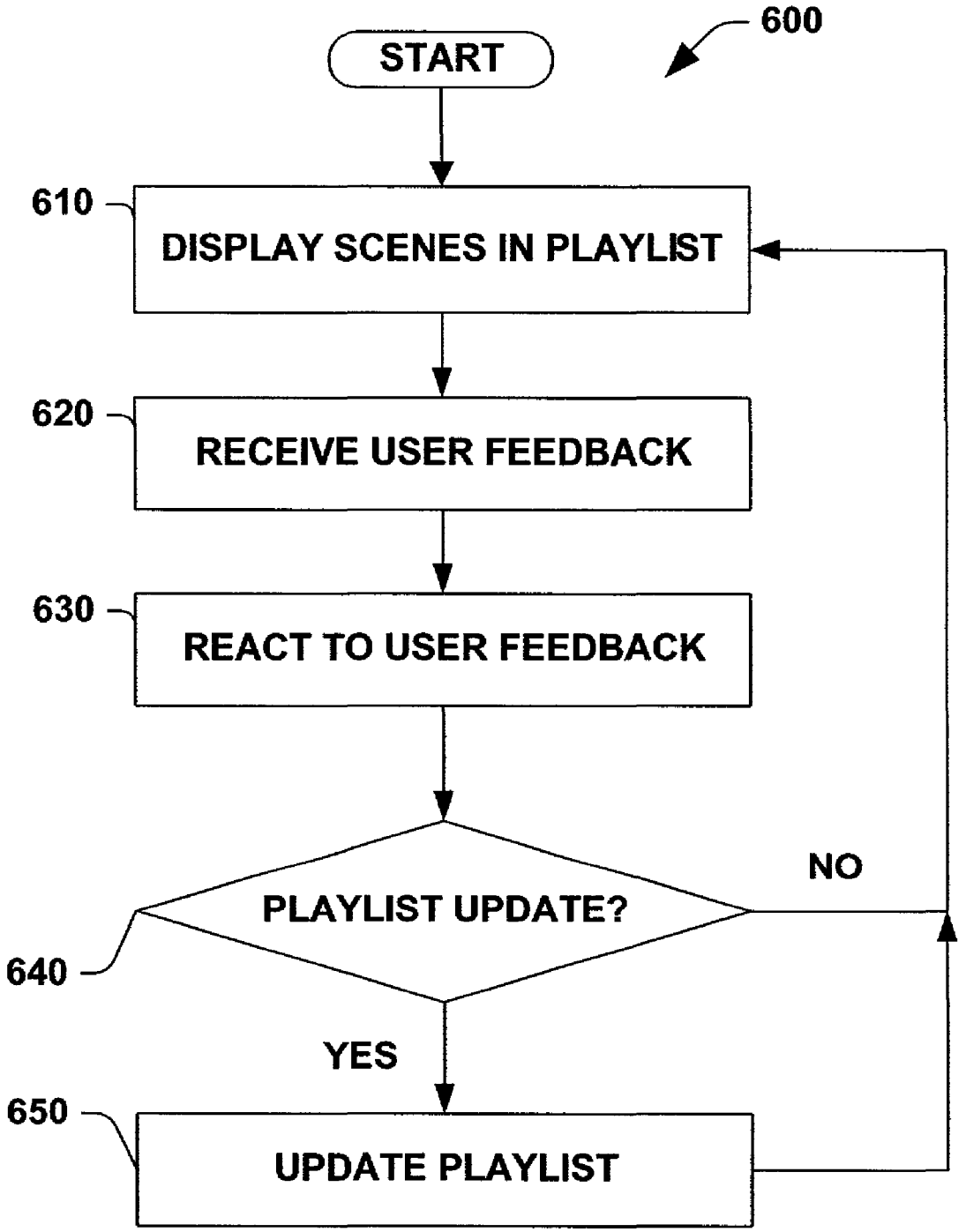

600
START
610
DISPLAY SCENES IN PLAYLIST
620
RECEIVE USER FEEDBACK
630
REACT TO USER FEEDBACK
PLAYLIST UPDATE?
NO
640
YES
650
UPDATE PLAYLIST

FIG. 7

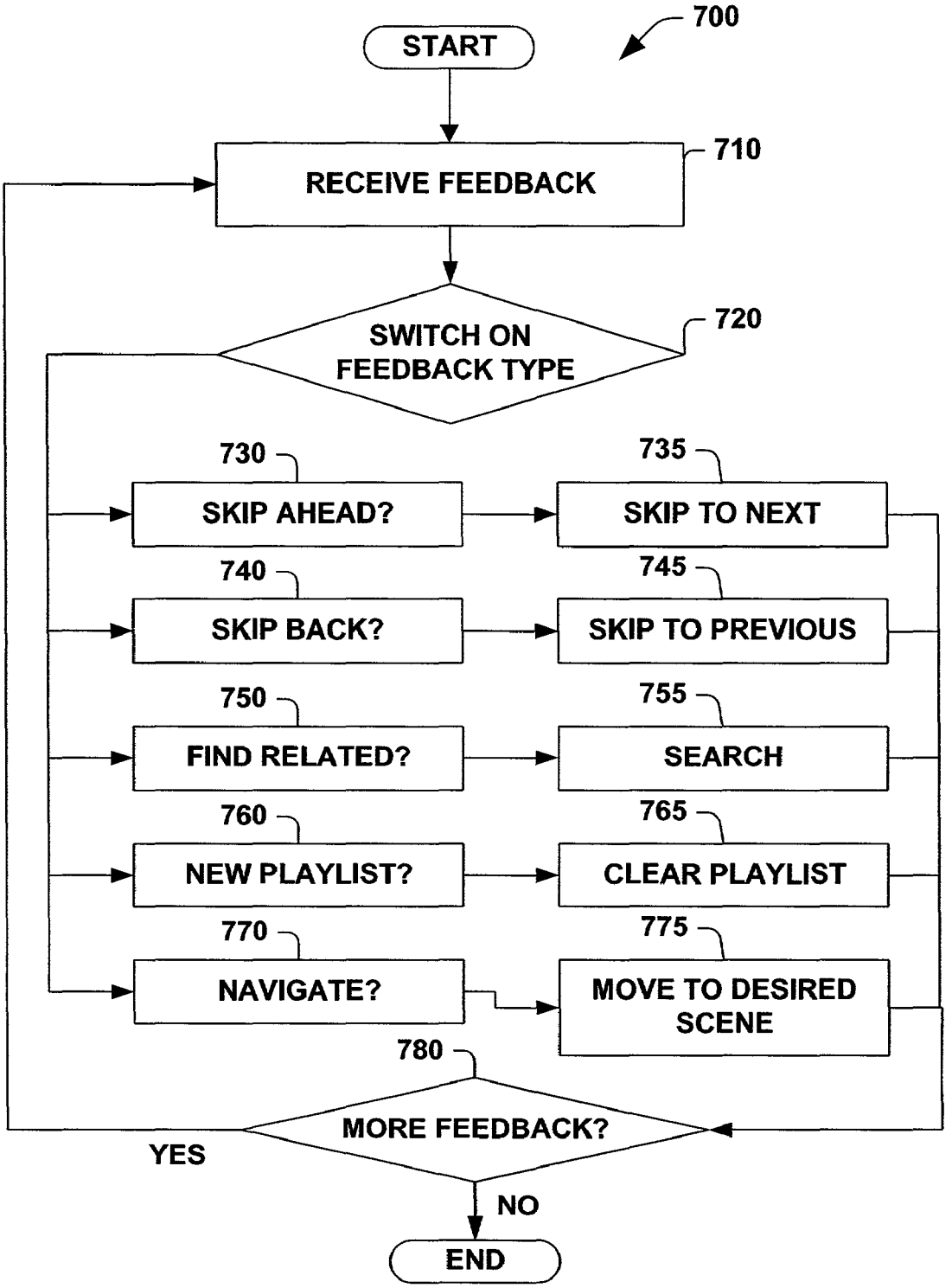

700
START
710
RECEIVE FEEDBACK
720
SWITCH ON FEEDBACK TYPE
730
SKIP AHEAD?
735
SKIP TO NEXT
740
SKIP BACK?
745
SKIP TO PREVIOUS
750
FIND RELATED?
755
SEARCH
760
NEW PLAYLIST?
765
CLEAR PLAYLIST
770
NAVIGATE?
775
MOVE TO DESIRED SCENE
780
MORE FEEDBACK?
YES
NO
END

FIG. 8

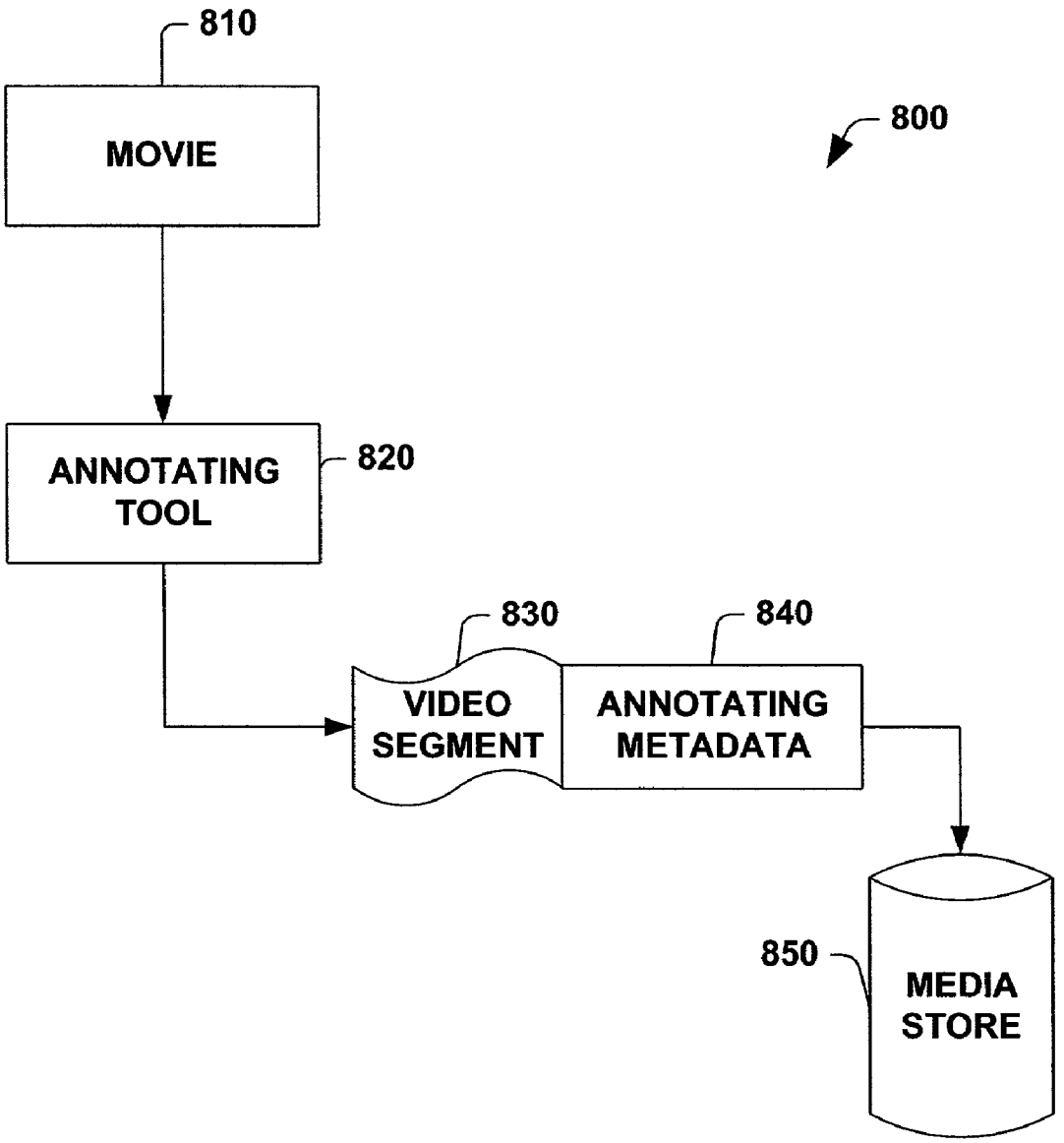

810
MOVIE
800
ANNOTATING TOOL
820
830
840
VIDEO SEGMENT
ANNOTATING METADATA
850
MEDIA STORE

FIG. 9

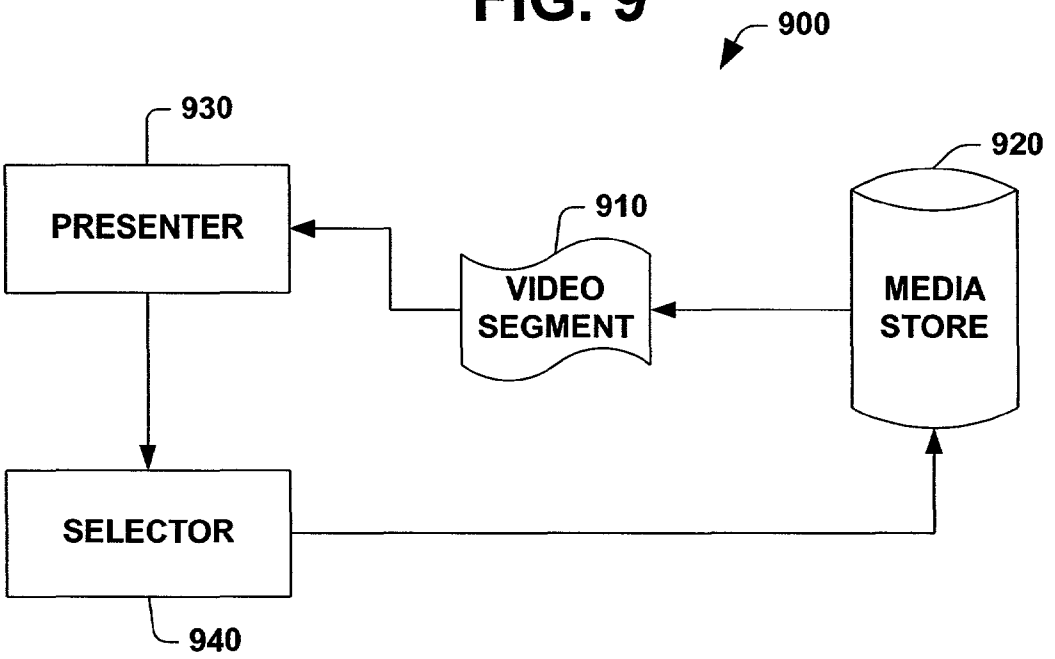

900
930
PRESENTER
910
VIDEO SEGMENT
920
MEDIA STORE
SELECTOR
940

FIG. 10

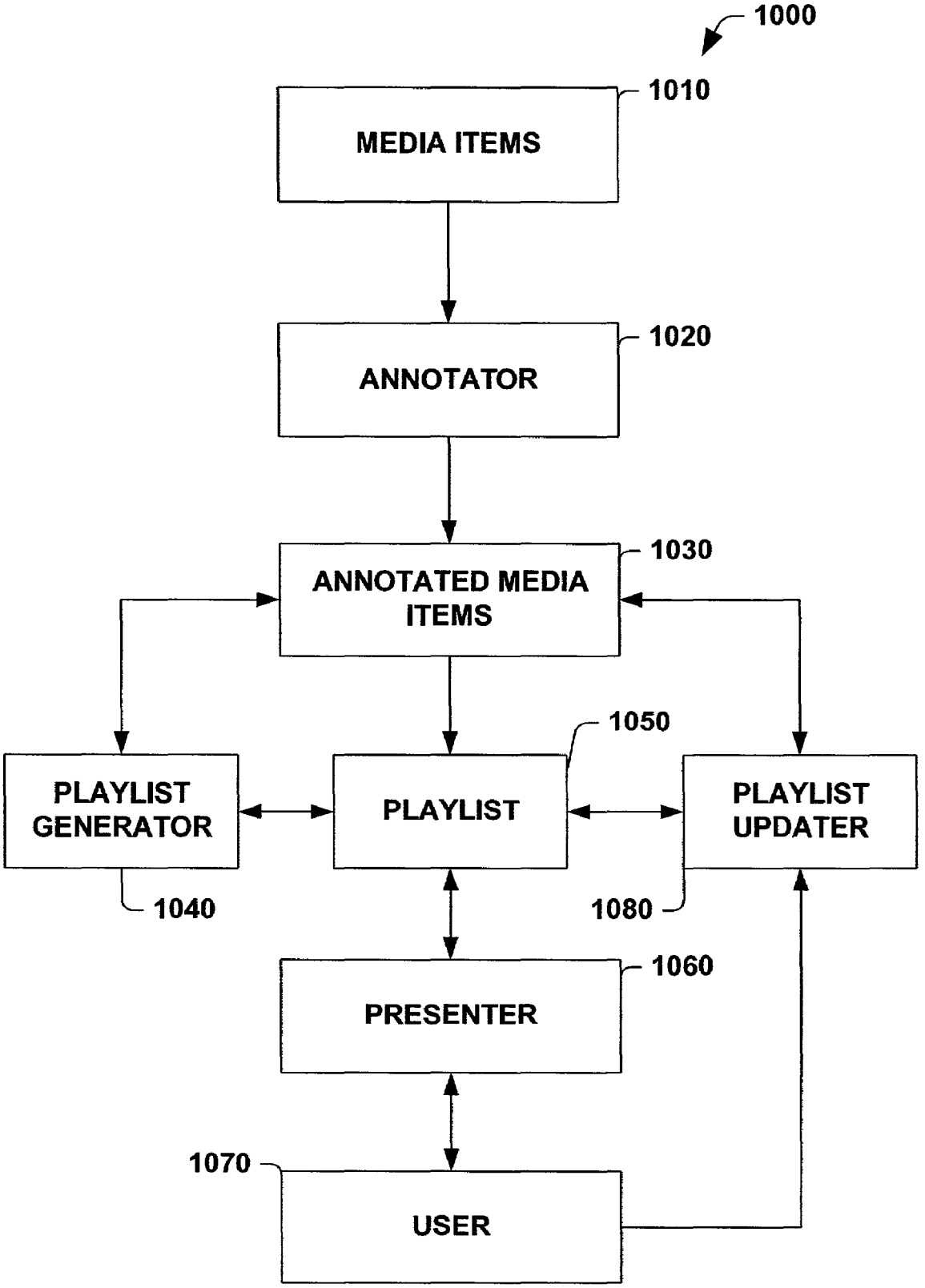

1000
1010
MEDIA ITEMS
1020
ANNOTATOR
1030
ANNOTATED MEDIA ITEMS
1050
PLAYLIST GENERATOR
PLAYLIST
PLAYLIST UPDATER
1040
1080
1060
PRESENTER
1070
USER

FIG. 11

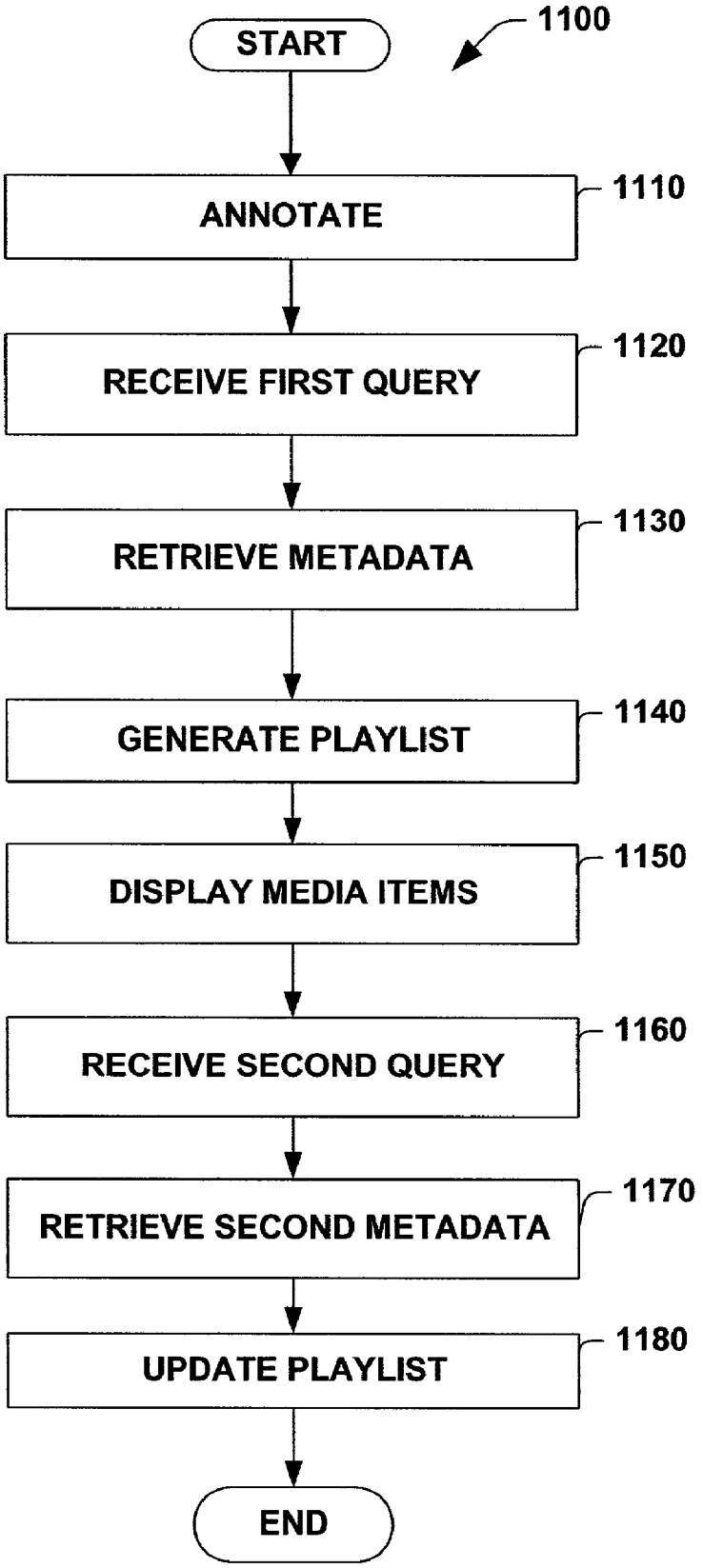

1100
START
ANNOTATE
1110
RECEIVE FIRST QUERY
1120
RETRIEVE METADATA
1130
GENERATE PLAYLIST
1140
DISPLAY MEDIA ITEMS
1150
RECEIVE SECOND QUERY
1160
RETRIEVE SECOND METADATA
1170
UPDATE PLAYLIST
1180
END

FIG. 12

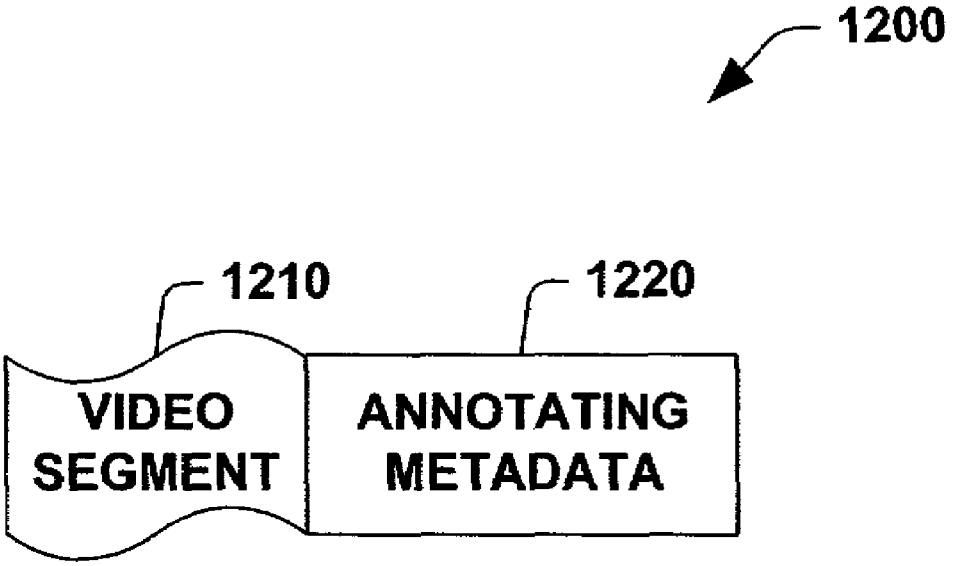


FIG. 13

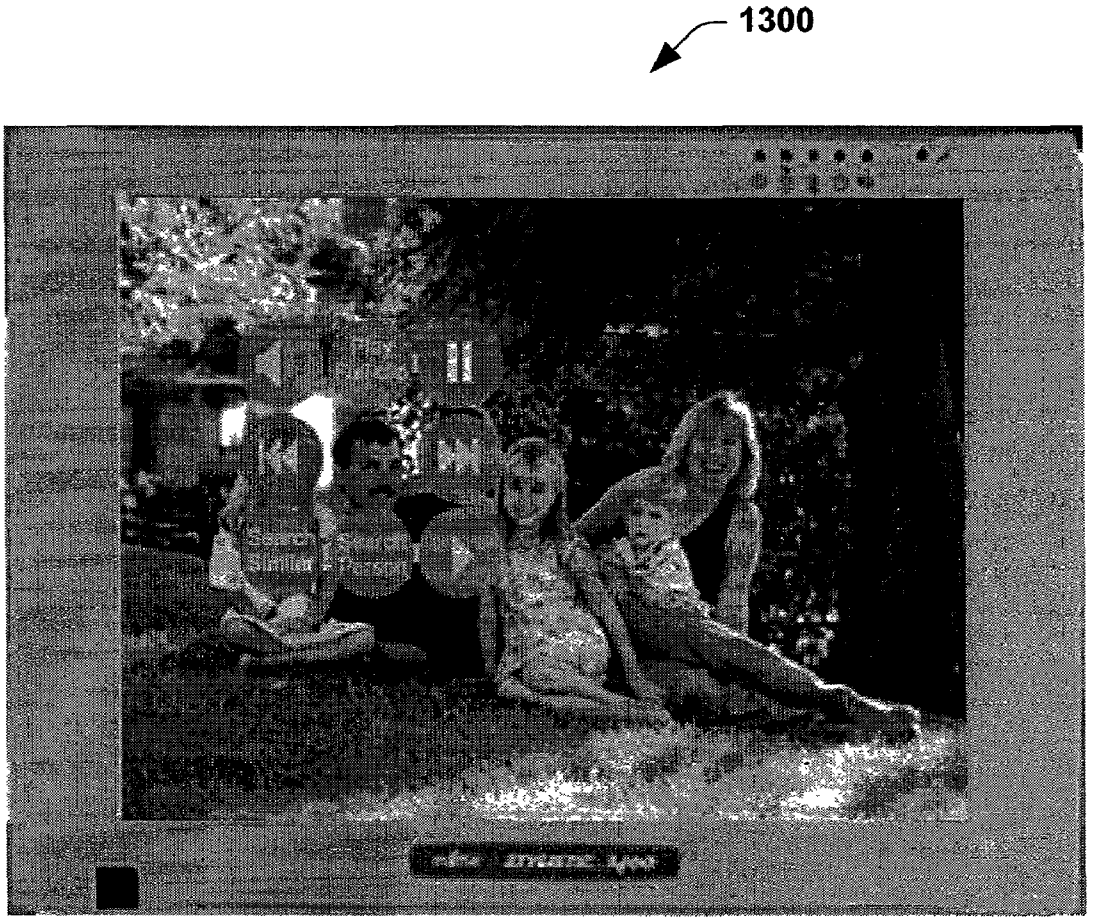


FIG. 14

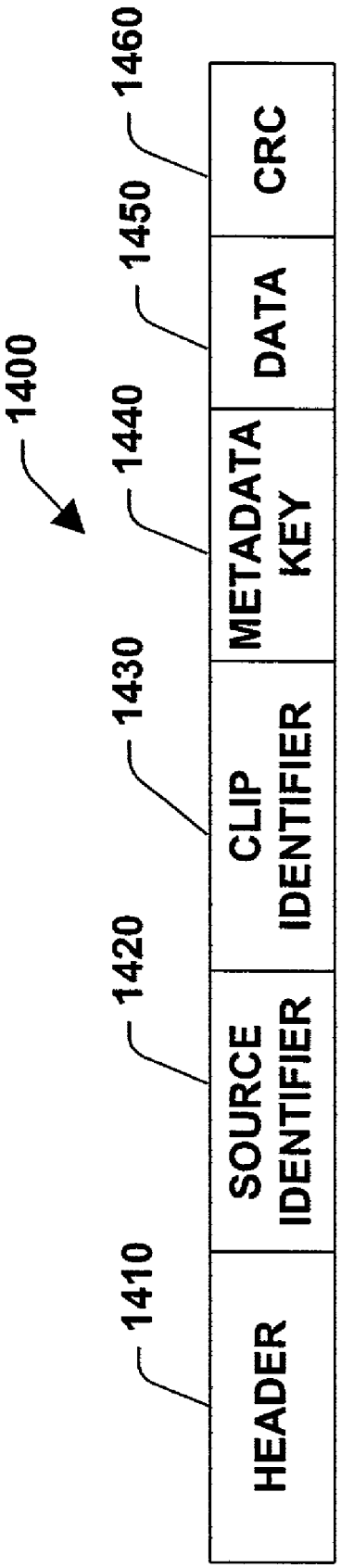

1400
1410
HEADER
1420
SOURCE IDENTIFIER
1430
CLIP IDENTIFIER
1440
METADATA KEY
1450
DATA
1460
CRC

FIG. 15

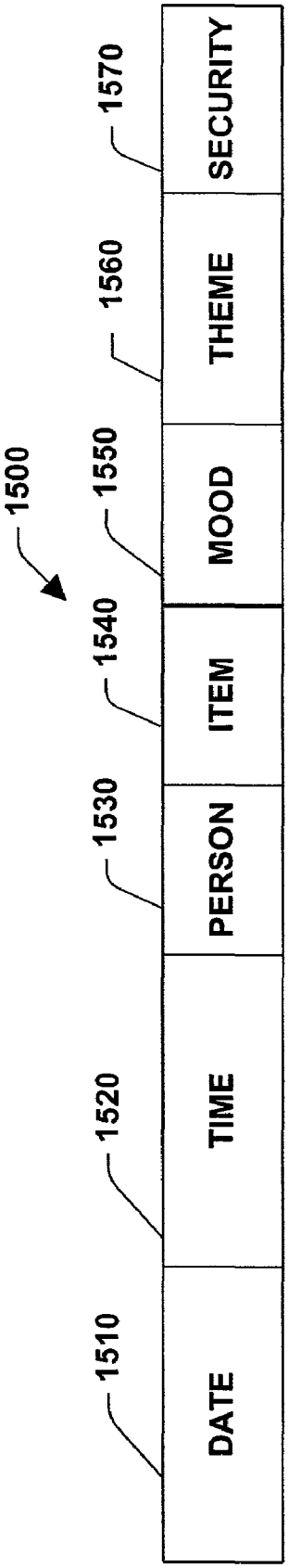
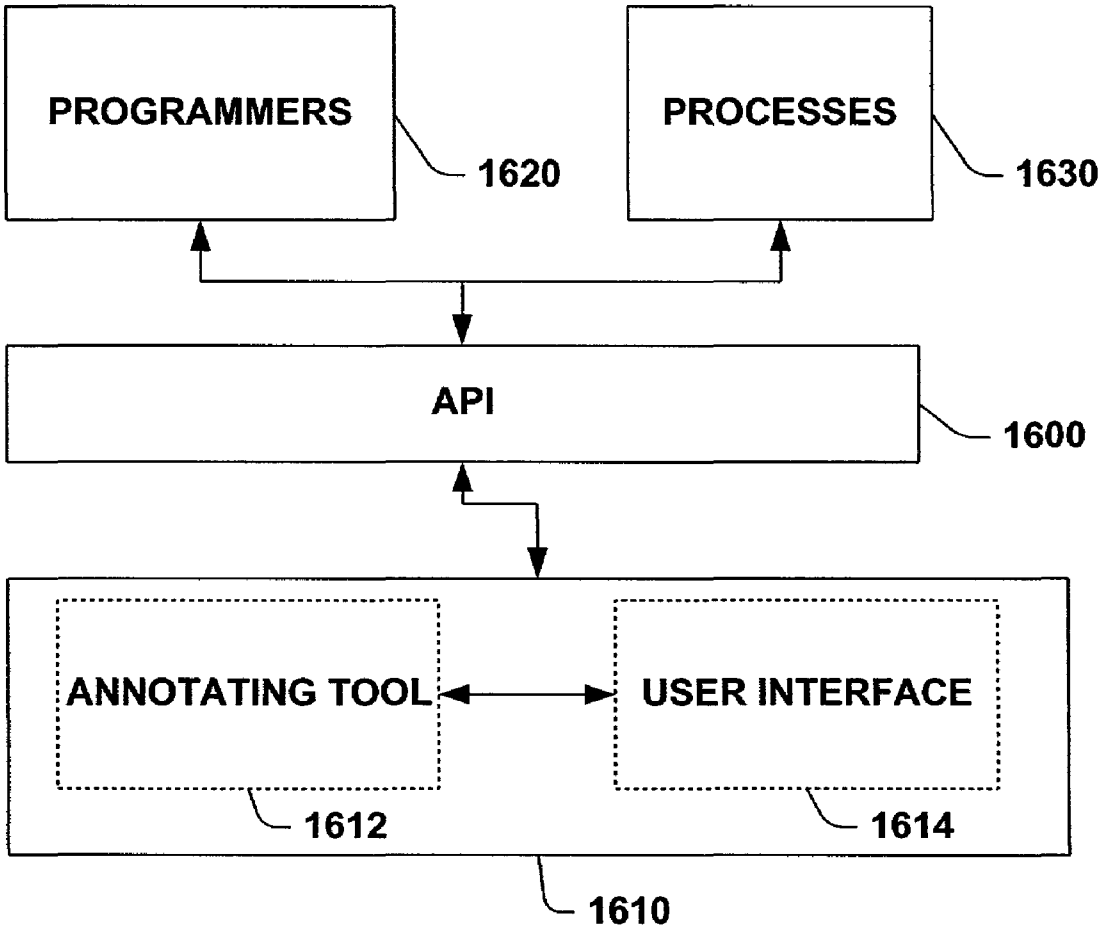

1500
1510
DATE
1520
TIME
1530
PERSON
1540
ITEM
1550
MOOD
1560
THEME
1570
SECURITY

FIG. 16


PROGRAMMERS
1620
PROCESSES
1630
API
1600
ANNOTATING TOOL
USER INTERFACE
1612
1614
1610

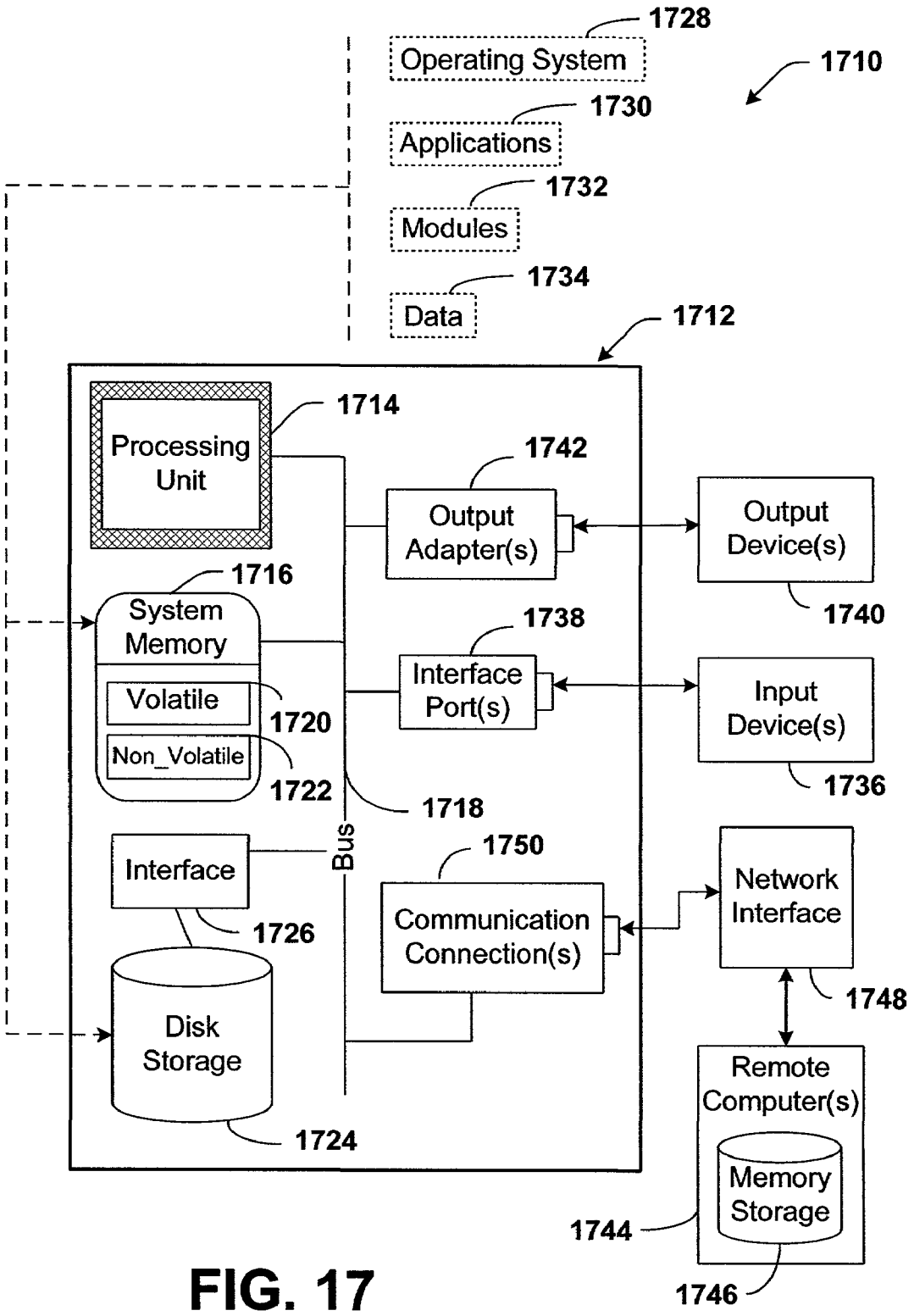
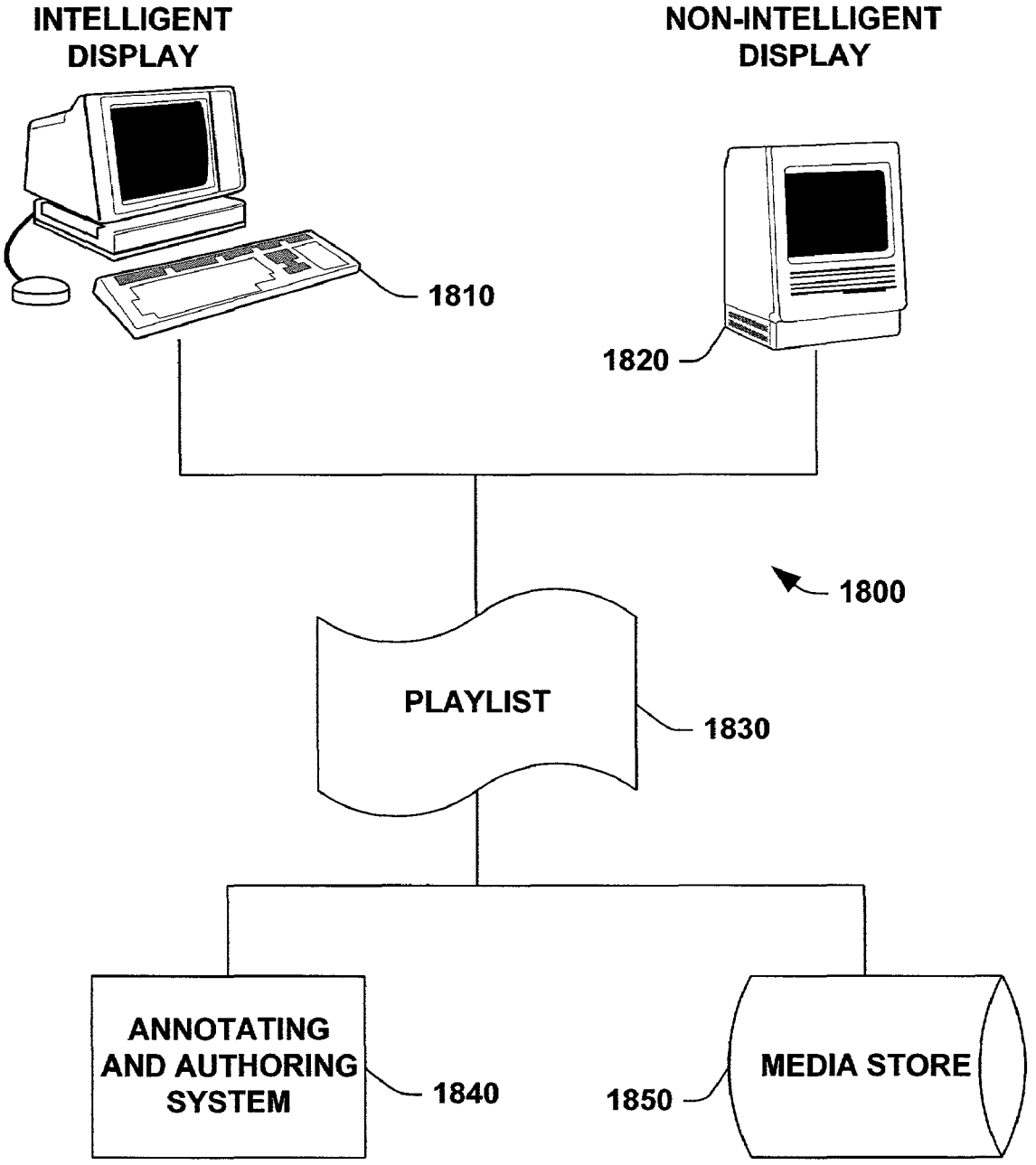

1728
Operating System
1710
1730
Applications
1732
Modules
1734
Data
1712
1714
Processing Unit
1742
Output Adapter(s)
Output Device(s)
1740
1716
System Memory
1738
Interface Port(s)
Input Device(s)
Volatile
1720
Non_Volatile
1722
1736
1718
Bus
Interface
1750
Network Interface
1726
Communication Connection(s)
1748
Disk Storage
Remote Computer(s)
Memory Storage
1724
1744
1746

FIG. 17

FIG. 18


INTELLIGENT DISPLAY
NON-INTELLIGENT DISPLAY
1810
1820
1800
PLAYLIST
1830
ANNOTATING AND AUTHORING SYSTEM
1840
1850
MEDIA STORE

MEDIA AUTHORING AND PRESENTATION

TECHNICAL FIELD

The present invention relates generally to viewing annotated digital media and more particularly to non-linear viewing of related scenes that are annotated with metadata.

BACKGROUND OF THE INVENTION

Conventional home video viewing systems have been underutilized due to problems including, but not limited to, the difficulty of digitizing video and/or still images, complicated user interfaces and time consuming editing. For example, if a home videographer takes a two hour video, upon subsequent review there may only be ten minutes of interesting video (that are distributed between four shorter clips) that the person wants to watch or to have available to watch later. However, selecting the scenes in which the ten minutes appear, digitizing that ten minutes, editing the desired ten minutes, and arranging the shorter clips into an enjoyable, accessible presentation has conventionally been difficult. With the appearance of more and more digital cameras, both still and video, a system that facilitates simpler, faster and more widely available enjoyment of home video is desired.

SUMMARY OF THE INVENTION

The following presents a simplified summary of the invention in order to provide a basic understanding of some aspects of the invention. This summary is not an extensive overview of the invention. It is not intended to identify key or critical elements of the invention or to delineate the scope of the invention. Its sole purpose is to present some concepts of the invention in a simplified form as a prelude to the more detailed description that is presented later.

The present invention relates to a media authoring and presentation system that delivers media clip highlights (e.g., pictures, video and audio clips) to selected local and remote, active and passive connected display devices. The short media clips play randomly and each media clip is a point of entry to full length versions of those media clips stored in a media data store. The media clips serve as points of entry to facilitate non-linear viewing of additional related media from a media data store. The media is stored in a data store that facilitates accommodating multiple media types. The media is annotated with metadata that facilitates non-linear retrieval and viewing of the media. Thus, the system can continuously analyze the media to facilitate intelligent search and retrieval of related content from the data store.

Digitizing, storing and retrieving related scenes is facilitated by a user interface that simplifies selecting scenes, navigating within a media store of scenes and creating a playlist of scenes. Additionally, an application programming interface is provided that simplifies programmatic control of and access to the unannotated media and/or metadata annotated media, which facilitates automating scene selection, scene organization and scene retrieval. Information concerning the annotated scenes can be transmitted between two or more computer components in a system and thus data packets adapted to transmit such data are provided. Such data packets can be related to a data structure that stores the media and the annotating metadata associated with the media.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram of a system for annotating media that facilitates non-linear viewing of media, in accordance with an aspect of the present invention.

FIG. **2** is a flow chart illustrating a method for annotating media that facilitates non-linear viewing of media, in accordance with an aspect of the present invention.

FIG. **3** is a block diagram of a system for generating a playlist of annotated media that facilitates non-linear viewing of media, in accordance with an aspect of the present invention.

FIG. **4** is a block diagram of a system that facilitates non-linear viewing of media and receiving user feedback to selected media, in accordance with an aspect of the present invention.

FIG. **5** is a flow chart illustrating a method for annotating media that facilitates non-linear viewing of media, in accordance with an aspect of the present invention.

FIG. **6** is a flow chart illustrating a method for non-linear viewing of media and receiving user feedback to select media, in accordance with an aspect of the present invention.

FIG. **7** is a flow chart illustrating a method for processing user feedback that facilitates non-linear viewing of media, in accordance with an aspect of the present invention.

FIG. **8** is a block diagram illustrating a system for annotating media and storing such annotated media, in accordance with an aspect of the present invention.

FIG. **9** is a block diagram illustrating a system for viewing annotated media and receiving feedback concerning such annotated media, in accordance with an aspect of the present invention.

FIG. **10** is a block diagram illustrating a system for authoring and presenting media, in accordance with an aspect of the present invention.

FIG. **11** is a flow chart illustrating a method for authoring and presenting media, in accordance with an aspect of the present invention.

FIG. **12** illustrates a data structure employed in accordance with an aspect of the present invention.

FIG. **13** is a sample screen shot illustrating a user interface employed in accordance with an aspect of the present invention.

FIG. **14** illustrates a sample data packet employed in accordance with an aspect of the present invention.

FIG. **15** illustrates another sample data packet employed in accordance with an aspect of the present invention.

FIG. **16** illustrates an application programming interface employed in accordance with an aspect of the present invention.

FIG. **17** illustrates an example operating environment in which the present invention may function.

FIG. **18** illustrates an additional operating environment in which the present invention may function.

DETAILED DESCRIPTION

The present invention is now described with reference to the drawings, where like reference numerals are used to refer to like elements throughout. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It may be evident, however, to one skilled in the art, that the present invention may be practiced without

these specific details. In other instances, well-known structures and devices are shown in block diagram form in order to facilitate description of the present invention.

As used in this application, the term "computer component" is intended to refer to a computer-related entity, either hardware, a combination of hardware and software, software, or software in execution. For example, a computer component may be, but is not limited to being, a process running on a processor, a processor, an object, an executable, a thread of execution, a program and a computer. By way of illustration, both an application running on a server and the server can be computer components. One or more computer components can reside within a process and/or thread of execution and a computer component can be localized on one computer and/or distributed between two or more computers.

FIG. **1** is a block diagram of a system **100** for annotating media that facilitates non-linear viewing of media. The system **100** includes a scene selector **110** that scans through a digitized media and selects a scene to be annotated. Once a scene has been selected, then a metadata generator **120** produces a metadata associated with the selected scene and relates that metadata to the selected scene. For example, a data structure can be populated with one or more pieces of metadata, and a pointer to the selected scene can be stored in the data structure to establish the relationship between the selected scene and the metadata. Once the metadata has been generated, then an organizer **130** places the selected scene, the metadata and relating data (e.g., pointers, references, indices) in a media store **140** in a manner that facilitates non-linear retrieval, and thus non-linear viewing of one or more scenes stored in the media store **140**.

The digitized media can be produced by a home videographer in various forms including, but not limited to, video and still images, with and/or without audio. Such digitized media can be stored, for example, on disks, memory sticks, other memories, compact disks (CDs), digital versatile disks (DVDs) and the like.

When the media includes more than one scene, (e.g., a home video with ten scenes), the scene selector **110** receives a digitized media and processes through the available scenes on the digitized media. The scene selector **110** can select a scene to annotate in various ways. By way of illustration and not limitation, the scene selector **110** may scan an input digitized media and select a scene to annotate based on recognizing a face in the scene. When face recognition is employed to select a scene, the metadata generator **120** can then annotate the scene with data associated with the recognized face. For example, a face identification number can be stored in the metadata, as can various data evaluated by the face recognizer (e.g., distance between eyes, distance between other facial reference points). By way of further illustration, the scene selector **110** can select a scene based on recognizing an item in the scene. For example, a videographer may be interested in viewing only the scenes in which a white car appears. Thus, the scene selector **110** scans the digitized media and select scenes in which a white car appears. Then, the metadata generator **120** annotates the scene with metadata concerning the white car. In both the face recognition example, and the white car recognition example, standard metadata can be generated. Such standard metadata can include, but is not limited to, the date of the scene, the time of the scene, the videographer, the length of the scene, the longer media from which the scene was retrieved, and so on. Similarly, the scene selector **110** can also select scenes based on methods including, but not limited to, voice recognition, color recognition, mood recognition and theme recognition. When a scene is selected through such methods, both method specific metadata and standard metadata are generated and associated with the scene.

The methods by which a scene can be selected can be adapted over time to respond to inputs from a user concerning whether the identified scene is one in which the user is actually interested. For example, in the white car example, while the scene selector may identify a scene in which a white SUV appears and a scene in which a white sedan appears, the user may only be interested in scenes including the white SUV. Thus, the user can provide an input to the scene selector **110** that adapts the item matching method and/or the scene selector **110** to make it more likely that scenes including a white SUV will be selected and to make it less likely that scenes including a white sedan will be selected. The effect of such adaptations can be temporary or more permanent, based, for example, on user configuration of the system **100** and/or any of its components.

The metadata produced by the metadata generator **120** can include, but is not limited to a date, a time, a length, a subject, a mood, a theme, a color, a person name, a set of person names, an item name and a set of item names associated with the scene. One or more pieces of such metadata can be generated for each scene. For example, a first scene may include both a face that is interesting to a user and a white car that is interesting to a user while a second scene may only include the white car. Thus, the metadata generator **120** can produce more metadata for the first scene than for the second scene. Therefore, the data structure employed to store the metadata associated with the scenes can vary in length based on the amount and/or type of metadata associated with a scene. It is to be appreciated that the scene selector **110**, the metadata generator **120** and the organizer **130** can be computer components, as that term is defined herein.

In view of the exemplary systems shown and described herein, methodologies, which can be implemented in accordance with the present invention will be better appreciated with reference to the flow diagrams of FIGS. **2**, **5**, **6**, **7**, and **11**. While for purposes of simplicity of explanation, the illustrated methodologies are shown and described as a series of blocks, it is to be understood and appreciated that the present invention is not limited by the order of the blocks, as some blocks may, in accordance with the present invention, occur in different orders and/or concurrently with other blocks from that shown and described herein. Moreover, not all illustrated blocks may be required to implement a methodology in accordance with the present invention. Furthermore, additional and/or alternative methodologies may employ additional blocks, not illustrated herein. In one example of the present invention, such methodologies can be implemented as computer executable instructions that can be stored on computer readable media including, but not limited to, disks, memories and carrier waves.

FIG. **2** is a flow chart illustrating a method **200** for annotating media that facilitates non-linear viewing of media. The method **200** begins at **210** by selecting a scene from a set of digitized media scenes (e.g., a home video). The digitized media can include, but are not limited to, video images and still images. Such media can include one or more scenes, where a scene is a segment of a longer work, and where a scene may include one or more persons, items and voices and may be identified as having a mood, a theme and/or a dominant color, for example. Furthermore, a scene can also be identified with respect to the amount of action in the scene (e.g., x items move at least y distance in z period of time, x, y and z being integers), and the amount of audio excitement in the scene (e.g., m audio level changes with a maximum audio

level above a threshold of n decibels, m and n being integers). Given the rich set of parameters upon which a scene may be selected, the method **200** may select scenes either manually and/or automatically. When a scene is selected manually by a user, the user may interact with a user interface that facilitates identifying the beginning and ending point for a scene and which further facilitates producing metadata associated with the scene (e.g., time, theme, faces, items). When a scene is automatically selected by the method **200**, such scene selection may be performed by processes including, but not limited to, face recognition, item recognition, voice recognition, theme recognition, color recognition, motion detection and the like. Depending on the process employed to select a scene, process specific metadata can be generated (e.g., the identity of the voice that caused a scene to be selected) and the selected scene can be annotated with such process specific metadata at **220**. Furthermore, regardless of the process employed to select a scene, generic metadata can be generated and the scene can be annotated with such generic metadata at **220**. The generic metadata can include, but is not limited to, a scene identifier, a videographer identifier, a length of a scene, a subject matter for a scene and the like.

At **230**, the annotated scene and the metadata are stored in a manner that facilitates non-linear retrieval of the annotated scene. Non-linear retrieval relates to locating scenes not in the order in which they appeared in a longer digitized media or the order in which they are stored, but in a manner, for example, where a first scene from the end of a longer first digitized media may be viewed first followed by a second scene from the start of the first digitized media followed by a third scene from the middle of a second digitized media and a fourth scene from the middle of the first digitized media. Thus, rather than starting a first home video at its beginning and watching it linearly, (e.g., from start to finish) then starting a second home video and watching it from start to finish, the present invention facilitates retrieving scenes from various locations from various digitized media. Such non-linear viewing is facilitated by the storage method employed at **230**, which can include, but is not limited to, storing the selected scene and the annotating metadata in at least one of a database and a datacube, where the scene and/or the annotating metadata include references to each other.

FIG. **3** illustrates a system **300** for generating a playlist of annotated media that facilitates non-linear viewing of media. The system **300** includes a media store **310** in which digitized media scenes and annotating data are stored. The media store **310** can be, for example, a database, a data cube, an array, a file, a list, a tree and so on. The system **300** includes a scene retriever **320** that retrieves one or more scenes and one or more pieces of annotating metadata associated with the one or more scenes from the media store **310**. By way of illustration, the scene retriever **320** can make an SQL (Structured Query Language) query to a database, where the SQL query requests scenes in which a certain voice appears. By way of further illustration, the scene retriever **320** can also examine elements and/or attributes stored in an XML file acting as the media store **310**. The SQL and XML examples are provided as illustrations and are not intended to limit the methods in which the scene retriever **320** can retrieve a scene and/or annotating metadata from the media store **310**.

The system **300** includes a metadata analyzer **330** that analyzes annotating metadata. The result of the analysis performed by the metadata analyzer **330** is an identification of one or more relationships involving the annotating metadata. Such relationships can occur between process specific metadata (e.g., facial recognition metadata) and between generic metadata (e.g., video date). By way of illustration, the metadata analyzer **330** may analyze metadata for substantially all scenes that include facial recognition metadata and determine which scenes share a common face. By way of further illustration, the metadata analyzer **330** can analyze metadata for substantially all scenes shot by a common videographer and determine which scenes share a common and/or related theme (e.g., outdoor scenes, action scenes). While two relationships are identified, it is to be appreciated that the metadata analyzer **330** can identify a variety of relationships.

The system **300** also includes a playlist generator **340** that evaluates the relationships identified by the metadata analyzer **330** and produces a playlist of related scenes. For example, the playlist generator **340** may produce a playlist that includes a variety of scenes that substantially all include a common face, or that substantially all include at least one face from an identified set of faces. Whether to include a scene in a playlist can be determined by analyzing, for example, a similarity value produced by the metadata analyzer **330** for a relationship that it identified. By way of illustration, voice recognition may not produce a digital (e.g., yes/no) identification of whether a voice that appears in a first scene is the same voice that appears in a second scene. The voice recognition may instead produce a confidence value concerning the likelihood that two voices belong to the same speaker. Thus, the metadata analyzer **330** can compute a similarity score between two scenes based, at least in part, on the confidence value from the voice recognition. Then, the playlist generator **340** can include scenes that score above a pre-determined, configurable threshold. In one example of the present invention, the playlist generator **340** can present options to a user concerning whether a scene should be included in a playlist. Then, based on the user accepting or rejecting the offered scene, the playlist generator **340** can be adapted via machine learning techniques to make it more or less likely that a similar scene will be offered for inclusion in the playlist. It is to be appreciated that the scene retriever **320**, the metadata analyzer **330** and the playlist generator **340** can be computer components.

The system **300** can produce one or more playlists. For example, a first user may configure the scene retriever **320** to retrieve a first set of scenes from the media store **310** (e.g., scenes including fast motion) while a second user may configure the scene retriever **320** to retrieve a second set of scenes from the media store **310** (e.g., scenes in which a dog appears). Given the two different sets of scenes retrieved by the scene retriever **320**, the metadata analyzer **330** can perform different analyses and identify different relationships. Thus, the playlist generator **340** can produce different playlists based on the different processing performed by the scene retriever **320** and the metadata analyzer **330**.

FIG. **4** illustrates a system **400** that facilitates non-linear viewing of media and receiving user feedback concerning the viewed media. The system **400** includes a viewer **450** for viewing a scene identified in a playlist. The system **400** also includes a feedback receiver **460** that receives a feedback concerning the viewed scene. The viewer **450**, feedback receiver **460**, and playlist updater **470** can be computer components. Based on the feedback, the playlist updater **470** updates the playlist. In addition to the viewer **450**, the feedback receiver **460** and the playlist updater **470**, the system **400** includes a media store **410** that is substantially similar to the media store **310** (FIG. **3**), a scene retriever **420** that is substantially similar to the scene retriever **320** (FIG. **3**), a metadata analyzer **430** that is substantially similar to the metadata analyzer **330** (FIG. **3**) and a playlist generator **440** that is substantially similar to the playlist generator **340** (FIG. **3**).

The viewer **450** can be, for example, an active device that can not only identify and/or receive the scene to be displayed from the playlist, but which can also manipulate the scene (e.g., crop scene, rotate scene, slow action, speed action). The viewer **450** can also be, for example, a passive device that simply displays the scene it receives without any additional processing. Furthermore, the viewer **450** can be an intelligent device that performs processing on the received scene (e.g., color correction, digital data reconstruction, decompression, color conversions, voice translation). The viewer **450** can also be, for example, a non-intelligent device that simply displays the data it receives. While four examples of viewers **450** are described, it is to be appreciated that such examples are merely illustrative and are not intended to limit the present invention.

Given the rich variety of viewers **450**, a correspondingly rich set of user feedbacks can be provided to the feedback receiver **460**. By way of illustration, the feedback can include, but is not limited to, a touch input, a typed input, a mouse input, a voice input and/or a facial expression input concerning the viewed scene. For example, if the viewer **450** is a touch screen, then a user can interact with a touch screen oriented user interface to indicate feedback concerning a current scene that is being viewed. Such a feedback can include, but is not limited to, a command to skip ahead in the playlist, a command to skip back in the playlist, a command to generate a new playlist, a command to find scenes similar to the current scene and a command to play a longer scene related to the current scene. Thus, the non-linear viewing of scenes is facilitated and the ease of use of home video viewing is improved.

By way of illustration, after the operation of the scene retriever **420**, the metadata analyzer **430**, and the playlist generator **440**, the viewer **450** may display scenes identified in a playlist. The user watching the viewer **450** may watch several related scenes and then decide that a certain scene should not be included in the list. Thus, the user may interact with the viewer **450** and/or the feedback receiver **460** and indicate that the scene should be removed from the playlist. For example, the user may click on a "remove scene" button on a graphical user interface. By way of further illustration, the user watching the viewer **450** may watch several related scenes in a playlist and may have a strong emotional (e.g., joy) reaction to three of the scenes. An intelligent, active viewer **450** and/or feedback receiver **460** may recognize the emotional reaction via, for example, facial expressions, and determine that the playlist should be updated to include similar scenes and to remove scenes that do not generate a joyous reaction. Thus, the playlist updater **470** can receive inputs from the feedback receiver **460** to add scenes to the playlist, to remove scenes from the playlist and so on. When an input to add a scene to the playlist is encountered, the playlist updater **470** can invoke processing in the playlist generator **440**, the metadata analyzer **430** and the scene retriever **420**, for example, to find, retrieve, analyze and include scenes in the playlist. By way of further illustration, a user watching a scene on the viewer **450** may decide that a certain scene is interesting and that the user would like to see the entire available digitized media from which the scene was retrieved. Such entire available digitized media may not be the original digitized media. For example, the original digitized media may have been edited to remove certain content, to slow down certain portions, to correct colors, to increase/decrease the volume of audio in certain portions and/or to add effects, and so on. The metadata associated with a scene included in a playlist can include references to the longer digitized media from which the scene was retrieved, which facilitates non-linear viewing of media. The metadata associated with a scene can also include references to other similar scenes (e.g., same faces, same voices, same items) and/or other longer digitized media from which such scenes were taken.

Thus, a user can watch a scene, see a face of a friend, and decide to watch other scenes in which that friend's face appears. Conventionally, such viewing would be difficult, if not impossible to perform, requiring the user to linearly watch a series of tapes from start to finish, which would include an abundance of material not related to the face of the friend in whom the user is interested. By employing the metadata annotated scenes provided by the present invention, a user can interact with a scene (e.g., frame a face and click on the face) and be presented with a new playlist of scenes that include that face. As the user watches the new playlist of scenes, the user can further interact with a scene and request a longer presentation associated with a scene. While watching the longer presentation, the user may hear a long-forgotten but familiar voice and decide to watch scenes that include that voice. The present invention facilitates retrieving such scenes and presenting a new playlist for user perusal. This sample session illustrates one example of the non-linear viewing of home video that is facilitated by the present invention.

While a playlist can be updated directly by user inputs, the present invention is not so limited. In one example, the playlist updater **470** can update the playlist based on factors including, but not limited to, a usage data, a feedback command and a time stamp. For example, if a certain scene has been viewed more than a pre-determined, configurable number of times, the playlist updater **470** can begin to "age out" the scene (e.g., progressively show the scene less frequently) so that the scene does not become stale to the user. Furthermore, the playlist updater **470** can monitor the calendar and manipulate the playlist based on the calendar and date metadata associated with a scene. By way of illustration, as Thanksgiving approaches, the playlist updater **470** can cause more scenes that were shot around previous Thanksgiving days to be included, while removing scenes that were filmed in May, June and July. By way of further illustration, as the birthday of a loved one approaches, the playlist updater **470** can cause more scenes that include the loved one to be included in the playlist, and can remove scenes that are unrelated to the loved one.

FIG. **5** is a flow chart that illustrates a method **500** for annotating media to facilitate non-linear viewing of media. The method **500** includes, at **510**, selecting a stored annotated scene, at **520**, analyzing the annotating metadata associated with the selected scene, and at **530**, generating a playlist of scenes by evaluating relationships between metadata associated with one or more scenes.

At **510**, selecting a stored scene can be based, for example, on the presence of a face in the scene, on the absence of a face in the scene, on the presence of an item in the scene, on the absence of an item in the scene, on the presence of a voice in the scene, on the absence of a voice in the scene, on a mood of the scene, on the theme of the scene, and the like. While face, item, voice, theme and mood are provided as examples at **520**, it is to be appreciated that other selection criteria can be employed by the present invention.

At **520**, analyzing metadata associated with a scene involves computing a similarity score for metadata that hold information concerning, for example, a present face, a present item, a present voice, a mood and a theme. By way of illustration, a first scene may be annotated with first metadata items that identify a first set of faces appearing in the scene and a second scene may be annotated with second metadata items that identify a second set of faces appearing in the second scene. At **530**, the number of matching faces and the

confidence value for such possible matches can be computed into a scene similarity score that is then employed to determine whether to include a scene in a playlist.

At **530**, a playlist is generated. In one example of the present invention, the playlist includes the scene and a reference to metadata associated with the scene. In another example of the present invention, the playlist includes references to scenes and related metadata. In yet another example of the present invention, the playlist includes both a reference to a scene and a reference to metadata associated with the scene. Thus, it is to be appreciated that the playlist is not limited to containing only one type of data.

FIG. **6** illustrates a method **600** for non-linear viewing of media and receiving user feedback to select media. At **610**, a scene stored in a playlist is displayed. In one example of the present invention, a scene is a segment of a longer video, however the present invention is not so limited. For example, a scene can also be a still image or an entire short video. At **620**, the method receives a user feedback related to the displayed scene. For example, the user may click on a button to indicate that the user wants to see a longer media associated with the displayed scene or the user may type a command indicating that the displayed scene should be removed from the playlist. While a mouse click and a keyboard command are described, the present invention is not so limited. The user feedback received at **620** can take forms including, but not limited to, a touch input, a typed input, a mouse input, a voice input and a facial expression input.

At **630**, the method **600** can take an action based on the user feedback. For example, the method **600** can take actions including, but not limited to, moving forward in the playlist, moving backward in the playlist, searching for related media, and displaying a media item related to the scene. In some cases, the user feedback received at **620** and responded to at **630** may require the playlist to be updated. For example, if the user feedback indicates that the user would like to see more scenes that include a voice heard in a displayed scene, then this warrants an update to the playlist. Thus, at **640** a determination is made concerning whether the playlist is to be updated. If the determination at **640** is YES, then at **650** the playlist is updated based, at least in part, on the user feedback, otherwise processing returns to **610**. Updating the playlist can include, by way of illustration, and not limitation, adding a scene to the playlist, removing a scene from the playlist, reordering scenes in a playlist and altering the frequency with which scenes in the playlist are displayed.

FIG. **7** illustrates one sample method **700** for processing user feedback that facilitates non-linear viewing of media. The method **700** includes, at **710**, receiving a feedback related to a viewed media scene. As noted in connection with FIG. **6**, the user feedback can be received from a variety of user input devices (e.g., touch screen, keyboard, mouse, expression determiner) in a variety of forms (e.g., click, menu selection, command, monitored expression) and can convey a variety of desired actions (e.g., skip ahead, skip back, add scene, remove scene). Thus, at **720** a switch is made based on the command encoded in the user feedback. Possible switch blocks are described at **730** through **770**.

At **730**, a determination is made concerning whether the user feedback commands skipping ahead in the playlist. If the determination is YES, then at **735**, the next scene in the playlist is presented. At **740**, a determination is made concerning whether the user feedback commands skipping back in the playlist. If the determination is YES, then at **745**, the previous scene in the playlist is presented. At **750**, a determination is made concerning whether the feedback commands finding scenes related to the displayed scene. If the determination at **750** is YES, then at **755** a search for related scenes is undertaken. Such a search can be performed on parameters including, but not limited to, faces, items, voices, colors, moods, themes and the like. Such parameters can be retrieved, for example, from metadata associated with the viewed scene and can be searched for in metadata associated with other scenes.

At **760**, a determination is made concerning whether the user feedback commands creating a new playlist. If the determination is YES, then at **765**, the existing playlist is cleared and a method to create a new playlist is invoked. At **770**, a determination is made concerning whether the user feedback commands navigating within a playlist. If the determination at **770** is YES, then at **775**, a next desired scene is selected as the scene to display next from the playlist. At **780**, a determination is made concerning whether there is any more user feedback. If the determination at **780** is YES, then processing returns to **710**, otherwise processing can conclude. While FIG. **7** illustrates five possible user feedbacks, it is to be appreciated that the present invention can employ a greater and/or lesser number of such feedbacks.

FIG. **8** illustrates a system **800** for annotating media and storing such annotated media. The system **800** includes a media store **850** (e.g., media database) that stores a playlist, video segments, and annotating metadata associated with the video segments. A video segment **830** and an annotating metadata **840** can be related together by an annotating tool **820**. The annotating tool **820** receives digitized media as input. For example, the annotating tool **820** can accept a movie **810** as input. The annotating tool **820** can then produce the annotating metadata **840** and associate it with a video segment **830** parsed out of the movie **810**.

In one example of the system **800**, the annotating metadata **840** can include, but is not limited to, a date identifier that identifies the date when the video was taken, a time identifier that identifies a time when the video was taken, a videographer identifier that identifies who took the video, a face identifier that identifies one or more faces in the video, an item identifier that identifies one or more items in the video, a voice identifier that identifies one or more voices in the video, a mood identifier that identifies one or more moods associated with the video, and a theme identifier that identifies one or more themes associated with the video.

In one example of the present invention, the annotating metadata **840** is generated manually by a user. For example, the user can create the annotating metadata topic (e.g., mood, theme) and then assign a value for the metadata topic (e.g., happy, Veteran's day). In another example of the present invention, the annotating metadata **840** is generated automatically by a computer component. Such a computer component generates the annotating metadata **840** based, at least in part, on face recognition processing, item recognition processing, voice recognition processing, mood recognition processing and theme recognition processing.

In yet another example of the system, the annotating tool **820** is adapted by a machine learning technique based, at least in part, on a user input concerning the annotating metadata **840** generated by the annotating tool **820**. For example, the annotating tool **820** can generate a value for a metadata topic (e.g., happy for mood), yet the user may determine that the mood is actually "ecstatic". Thus, the user can reconfigure one or more configurable parameters associated with the annotating tool **820** to make it more likely that the annotating tool **820** would identify the scene and similar scenes as "ecstatic" rather than "happy". Such configurable parameters may be threshold values for a neural network, a count of scene emotion identifiers (e.g., number of smiles per minute, num-

ber of different smiling people), and the like. It is to be appreciated that the annotating tool **820** can be a computer component.

FIG. **9** illustrates a system **900** for viewing annotated media and receiving feedback concerning such annotated media. The system **900** includes a media store **920** that stores metadata annotated, displayable items. For example, the media store **920** can store one or more video segments **910** that have metadata associated with them. The media store **920** can be, for example, a database, a data cube, a list, an array, a tree and a file, among other things. In one example of the present invention, the media store **920** is a database that can be accessed by SQL. In another example of the present invention, the media store **920** stores XML files.

The system **900** also includes a presenter **930** that presents displayable items retrieved from the media store **920**. The presenter **930** can be an active and/or passive display that does or does not have local intelligence. In one example of the present invention, the presenter **930** presents a first displayable item from the media store **920** and then the system **900** accepts feedback concerning which displayable item should be displayed next. The feedback can be, for example, a spoken word, a keystroke, a mouse click, and a facial expression. Such feedback facilitates viewing scenes in an order desired by the user rather than linearly from start to finish in a predetermined order, providing advantages over conventional systems.

To facilitate such non-linear viewing, the system **900** also includes a selector **940** that selects a second displayable item from the media store **920** based, at least in part, on a relationship between a metadata associated with the first displayed item and a metadata associated with the second displayable item. Thus, the order in which video segments are viewed can depend on user reaction to displayed video segments. It is to be appreciated that the presenter **930** and the selector **940** can be computer components.

FIG. **10** illustrates a system **1000** for authoring and presenting media. The system **1000** includes an annotator **1020** that receives a set of media items **1010** and annotates the media items **1010** with metadata. Such metadata annotated media items **1030** facilitate retrieving media items related by the metadata. For example, if a user desires to watch scenes that include two or more faces that match the faces in a selected scene, then the metadata can be examined to determine matches between the metadata and to facilitate retrieving such related scenes.

The system **1000** also includes a playlist generator **1040** that generates a playlist **1050** of annotated media items **1030**. Such annotated media items **1030** may be related, for example, by a first metadata retrieved in response to a first query. By way of illustration, a user may have generated an SQL query to an SQL database to retrieve scenes in which a favorite dog appears. Thus, the playlist **1050** can contain media items related by the metadata associated with scenes that include metadata indicating the presence of the favorite dog.

The system **1000** also includes a presenter **1060** for presenting annotated media items **1030** identified in the playlist **1050**. The presenter **1060** can be, for example, an intelligent device (e.g., personal computer) or a dumb device (e.g., standard television). While a user watches media items identified in the playlist **1050**, the user may decide to watch different videos and/or to update the playlist **1050**. In deciding to watch different videos, and/or to watch complete versions of displayed scenes, the user may generate a second query that retrieves a second set of metadata responsive to the second query. Thus, the system **1000** includes a playlist updater **1080** that updates the playlist **1050** based, for example, on the second metadata retrieved in response to a second query. Since the second metadata was responsive to a query, and the query was generated as a response to viewing a first scene that had related first metadata, the second metadata can be related to the first metadata, which facilitates faster retrieval of related scenes by limiting the amount of metadata that is searched. In one example of the present invention, the annotator **1020**, playlist generator **1040**, playlist updater **1080** and presenter **1060** are computer components.

FIG. **11** illustrates a method **1100** for authoring and presenting media. The method **1100** begins at **1110** where the method **1100** annotates a set of media items with metadata to facilitate metadata based retrieval of one or more of the set of media items. For example, scenes that include a certain voice can be annotated with metadata that indicates that there is an identified voice available and the identity of that voice. At **1120**, the method **1100** receives a first query. The first query is employed to identify one or more media items based on a relationship between a media item and a metadata item and/or value. For example, the first query may request scenes in which a certain voice is present. Thus, at **1130**, the method **1100** can retrieve a first metadata responsive to the first query. For example, pointers to metadata blocks that include the desired voice can be retrieved.

At **1140**, the method **1100** generates a playlist of media items related by one or more metadata items in the first metadata. For example, while a first number of scenes may include an identified voice, at **1140**, the method **1100** may select the scenes where the identified voice appears at least ten percent of the time. Thus, the playlist will contain voice identification related metadata items. After the playlist has been generated, at **1150**, media items listed in the playlist will be displayed. A user watching the media items in the playlist can generate a feedback concerning which media item they wish to view next. Thus, at **1160**, the method **1100** receives a second query related to identifying a media item by a relationship between the media item and a metadata. For example, while viewing a scene in which the desired voice appears, the user may see an item (e.g., a snowman) that prompts the user to desire to view different videos (e.g., snow covered, holiday theme videos in which the desired voice appears). Thus, the user can generate a second query to retrieve such videos. The query can cause an examination of metadata associated with video scenes and retrieval, at **1170**, of a second metadata responsive to the second query. When the second metadata responsive to the second query has been retrieved, then at **1180**, the playlist can be updated based, at least in part, on that second metadata. While a linear flow is depicted in FIG. **11**, it is to be appreciated that the method **1100** may loop.

FIG. **12** illustrates a data structure **1200** employed in a system that facilitates non-linear viewing of media items. The data structure **1200** has a first field that holds a media item, for example, a video segment **1210**. While a video segment **1210** is illustrated, it is to be appreciated that the media item may be a full length video, a video scene, a still image, a combination of scenes and/or images, and the like. Additionally and/or alternatively, the first field can hold a reference to a memory location or locations where such videos, scenes, images and the like are stored. The data structure **1200** also includes a second field that holds a metadata item related to the media item, for example an annotating metadata **1220**. This metadata facilitates activities including, but not limited to, identifying the media item, locating the media item and locating a related media item.

The data structure **1200** is merely exemplary and it is to be appreciated that numerous other structures are contemplated that provide for organizing and/or storing a plurality of data types conducive to facilitating the non-linear viewing of related media scenes in connection with the subject invention. Any such data structure suitable for employment in connection with the present invention is intended to fall within the scope of the appended claims. Such data structures can be stored in computer readable media including, but not limited to, memories, disks and carrier waves.

FIG. **13** is a sample screen shot illustrating a user interface **1300** that facilitates non-linear viewing of related media scenes. The user interface **1300** depicts a scene wherein a number of family members are viewed. In the example user interface **1300**, the image is displayed on a touch screen. In the depicted simulated screen shot, a user has touched the user interface **1300** on the face of the father. The user interface **1300** has, therefore, framed the face with buttons that facilitate adapting the scene and/or a playlist in which the scene appears. By way of illustration, in the sample user interface **1300**, a button that symbolizes a speaker is presented in the top left hand corner of the frame around the father's face. Such a button can be employed, for example, to turn on or off the audio associated with a scene. By way of further illustration, a right facing equilateral triangle is presented in the lower right hand corner of the frame around the father's face. Such a button can be employed, for example, to skip ahead to the next scene in a playlist. While the user interface **1300** is depicted on a touch screen, it is to be appreciated that the depicted buttons could be "pressed" by methods including, but not limited to, touching, keyboard command, voice input, mouse input, and the like. Furthermore, while eight buttons are depicted in user interface **1300**, it is to be appreciated that a greater and/or lesser number of buttons and/or other graphical user interface elements can be employed in accordance with the present invention.

Thus, in one example of the present invention, a computer system that facilitates non-linear viewing of media includes a graphical user interface that has a display and a selection device. The display may be, for example, an active or passive, intelligent or non-intelligent device. The graphical user interface supports a method of providing and selecting from a set of graphic user interface elements on the display. The graphical user interface elements can include, but are not limited to, buttons, menus, sliders, drop down boxes, frames, halos, radio buttons, check boxes, and the like. The graphical user interface can retrieve a set of graphic user interface elements where the interface elements represent one or more actions action associated with facilitating the non-linear display of media items. For example, an element can be associated with skipping ahead or skipping back in a playlist. The graphical user interface displays the set of interface elements on the display and receives an interface element selection signal that indicates which of the set of interface elements has been chosen by a user. In response to the interface element selection signal, the graphical user interface initiates processing to facilitate non-linear viewing of media.

FIG. **14** illustrates a sample data packet **1400** employed to transfer information between various computer components associated with the present invention. The data packet **1400** includes a header field **1410** that includes information such as the length and type of packet. For example, the header field **1410** may indicate whether the packet **1400** is a packet type that requires a response from the receiving device. A source identifier **1420** holds data concerning the location from which the data packet originated (e.g., media store, annotating tool). The data packet **1400** also includes a clip identifier **1430** that facilitates identifying a clip. The identifier can be, for example, a 128 bit integer that uniquely identifies a clip, or, in another example, can be a text string (e.g., file pathname).

The data packet **1400** also includes a metadata key **1440** that facilitates retrieving metadata associated with the clip identified in the clip identifier field **1430**. For example, while the clip identifier **1430** may be a primary key accessible in an SQL database, the metadata key **1440** may be a secondary key similarly accessible in the SQL database or a separate primary key in a second database. The data packet **1400** includes a data field **1450** in the packet **1400** that includes various information that is intended to be communicated to the receiving computer component. The data packet **1400** ends with a cyclical redundancy check (CRC) field **1460** that serves as an error detecting field whereby a receiving device can determine if it has properly received a packet **1400**. While six fields are illustrated in data packet **1400**, it is to be appreciated that a greater and/or lesser number of fields can be employed in packets utilized by the present invention.

Another example data packet may be transmitted between a computer component implementing an annotating tool and a media store. Such a data packet (not illustrated) may include, for example, a first field that stores a clip identifier that identifies a portion of a media. The identifier may be, for example, a globally unique identifier that facilitates locating the clip regardless of storage location. The example data packet can also include a second field that stores a metadata key that identifies an annotating metadata associated with the clip identified by the clip identifier. Again, such metadata key may be a globally unique identifier that facilitates retrieving the metadata from various distributed media stores. The data packet can also include a third field that stores data associated with the clip identified by the clip identifier. Such data may be, for example, the clip, or a longer work from which the clip was derived.

Yet another data packet adapted to be transmitted between a user interface and a playlist updater to facilitate the non-linear viewing of a media can include a first field that stores a clip identifier that identifies a portion of a media, the clip identifier is substantially similar to the clip identifier described in the other data packets. The data packet can also include a second field that stores a requested user action concerning the portion identified by the clip identifier. For example, the second field can store commands to add a scene to a playlist, remove a scene from a playlist and to search for related scenes. The data packet can also include a third field that stores metadata associated with the portion identified by the clip identifier. Such metadata can be employed to retrieve one or more clips according to the requested user action.

FIG. **15** is a schematic illustration of sub-fields **1500** within the data field **1450** (FIG. **14**). The sub-fields **1500** discussed are merely exemplary and it is to be appreciated that a greater or lesser number of fields could be employed with various types of data germane to facilitating non-linear viewing of media in accordance with the present invention.

The sub-fields **1500** include a date field **1510** that can hold information concerning the date when a media item was filmed. A time field **1520** can hold information relating to the time when the media item was filmed, and/or, for example, the length, in periods of time, of a media item. A person field **1530** can hold information concerning people who are recognized in the scene. Such recognition may have occurred, by, for example, voice recognition and/or face recognition. Similarly, an item field **1540** can hold information concerning items that are recognized in the scene. Other fields include, but are not limited to, a mood field **1550**, a theme field **1560**, and a security field **1570**. The security field **1570** can hold, for

example, identifiers associated with users who are permitted to view the media related to the data packet **1500**.

Referring now to FIG. **16**, an application programming interface (API) **1600** is illustrated providing access to a system **1610** that includes an annotating tool **1612** and a user interface **1614**. The API **1600** may be employed, for example, by programmers **1620** and/or processes **1630** to gain access to processing performed by the system **1610**. Similarly, the API **1600** may be employed to provide data values to the system **1610** and/or retrieve data values from the system **1610**. Thus, in one example of the present invention, a set of application program interfaces can be embodied on a computer-readable medium. The interfaces can be executed by a computer component to gain access to an annotating tool that is employed to annotate media in a manner that facilitates non-linear retrieval of the media. Such interfaces can include, but are not limited to, a first interface that receives media information, a second interface that receives annotation information associated with the media, and a third interface that receives user interface information associated with the order in which media will be displayed.

In order to provide additional context for various aspects of the present invention, FIG. **17** and the following discussion are intended to provide a brief, general description of a suitable operating environment **1710** in which various aspects of the present invention may be implemented. FIG. **18** provides an additional and/or alternative operating environment in which the present invention can operate. While the invention is described in the general context of computer-executable instructions, such as program modules, executed by one or more computers or other devices, those skilled in the art will recognize that the invention can also be implemented in combination with other program modules and/or as a combination of hardware and software. Generally, however, program modules include routines, programs, objects, components, data structures, etc. that perform particular tasks or implement particular data types. The operating environment **1710** is only one example of a suitable operating environment and is not intended to suggest any limitation as to the scope of use or functionality of the invention. Other well known computer systems, environments, and/or configurations that may be suitable for use with the invention include but are not limited to, personal computers, hand-held or laptop devices, multiprocessor systems, microprocessor-based systems, programmable consumer electronics, network PCs, minicomputers, mainframe computers, distributed computing environments that include the above systems or devices, and the like.

With reference to FIG. **17**, an exemplary environment **1710** for implementing various aspects of the invention includes a computer **1712**. The computer **1712** includes a processing unit **1714**, a system memory **1716**, and a system bus **1718**. The system bus **1718** couples system components including, but not limited to, the system memory **1716** to the processing unit **1714**. The processing unit **1714** can be any of various available processors. Dual microprocessors and other multiprocessor architectures also can be employed as the processing unit **1714**.

The system bus **1718** can be any of several types of bus structure including the memory bus or memory controller, a peripheral bus or external bus, and/or a local bus using any variety of available bus architectures including but not limited to 8-bit bus, Industrial Standard Architecture (ISA), Micro-Channel Architecture (MSA), Extended ISA (EISA), Intelligent Drive Electronics (IDE), VESA Local Bus (VLB), Peripheral Component Interconnect (PCI), Universal Serial Bus (USB), Advanced Graphics Port (AGP), Personal Computer Memory Card International Association bus (PCMCIA), and Small Computer Systems Interface (SCSI).

The system memory **1716** includes volatile memory **1720** and nonvolatile memory **1722**. The basic input/output system (BIOS), containing the basic routines to transfer information between elements within the computer **1712**, such as during start-up, is stored in nonvolatile memory **1722**. By way of illustration, and not limitation, nonvolatile memory **1722** can include read only memory (ROM), programmable ROM (PROM), electrically programmable ROM (EPROM), electrically erasable ROM (EEPROM), or flash memory. Volatile memory **1720** includes random access memory (RAM), which acts as external cache memory. By way of illustration and not limitation, RAM is available in many forms such as synchronous RAM (SRAM), dynamic RAM (DRAM), synchronous DRAM (SDRAM), double data rate SDRAM (DDR SDRAM), enhanced SDRAM (ESDRAM), Synchlink DRAM (SLDRAM), and direct Rambus RAM (DRRAM).

Computer **1712** also includes removable/nonremovable, volatile/nonvolatile computer storage media. FIG. **17** illustrates, for example a disk storage **1724**. Disk storage **1724** includes, but is not limited to, devices like a magnetic disk drive, floppy disk drive, tape drive, Jazz drive, Zip drive, LS-100 drive, flash memory card, or memory stick. In addition, disk storage **1724** can include storage media separately or in combination with other storage media including but not limited to an optical disk drive such as a compact disk ROM device (CD-ROM), CD recordable drive (CD-R Drive), CD rewritable drive (CD-RW Drive) or a digital versatile disk ROM drive (DVD-ROM). To facilitate connection of the disk storage devices **1724** to the system bus **1718**, a removable or non-removable interface is typically used such as interface **1726**.

It is to be appreciated that FIG. **17** describes software that acts as an intermediary between users and the basic computer resources described in suitable operating environment **1710**. Such software includes an operating system **1728**. Operating system **1728**, which can be stored on disk storage **1724**, acts to control and allocate resources of the computer system **1712**. System applications **1730** take advantage of the management of resources by operating system **1728** through program modules **1732** and program data **1734** stored either in system memory **1716** or on disk storage **1724**. It is to be appreciated that the present invention can be implemented with various operating systems or combinations of operating systems.

A user enters commands or information into the computer **1712** through input device(s) **1736**. Input devices **1736** include, but are not limited to a pointing device such as a mouse, trackball, stylus, touch pad, keyboard, microphone, joystick, game pad, satellite dish, scanner, TV tuner card, digital camera, digital video camera, web camera, and the like. These and other input devices connect to the possessing unit **1716** through the system bus **1718** via interface port(s) **1738**. Interface port(s) **1738** include, for example, a serial port, a parallel port, a game port, and a universal serial bus (USB). Output device(s) **1740** use some of the same type of ports as input device(s) **1736**. Thus, for example, a USB port may be used to provide input to computer **1712**, and to output information from computer **1712** to an output device **1740**. Output adapter **1742** is provided to illustrate that there are some output devices **1740** like monitors, speakers, and printers among other output devices **1740** that require special adapters. The output adapters **1742** include, by way of illustration and not limitation, video and sound cards that provide a means of connection between the output device **1740** and the system bus **1718**. It should be noted that other devices

and/or systems of devices provide both input and output capabilities such as remote computer(s) **1744**.

Computer **1712** can operate in a networked environment using logical connections to one or more remote computers, such as remote computer **1744**. The remote computer **1744** can be a personal computer, a server, a router, a network PC, a workstation, a microprocessor based appliance, a peer device or other common network node and the like, and typically includes many or all of the elements described relative to computer **1712**. For purposes of brevity, only a memory storage device **1746** is illustrated with remote computer **1744**. Remote computer **1744** is logically connected to computer **1712** through a network interface **1748** and then physically connected via communication connection **1750**. Network interface **1748** encompasses communication networks such as local-area networks (LAN) and wide-area networks (WAN). LAN technologies include Fiber Distributed Data Interface (FDDI), Copper Distributed Data Interface (CDDI), Ethernet/IEEE 802.3, Token Ring/IEEE 802.5 and the like. WAN technologies include, but are not limited to, point-to-point links, circuit switching networks like Integrated Services Digital Networks (ISDN) and variations thereon, packet switching networks, and Digital Subscriber Lines (DSL).

Communication connection(s) **1750** refers to the hardware/software employed to connect the network interface **1748** to the bus **1718**. While communication connection **1750** is shown for illustrative clarity inside computer **1712**, it can also be external to computer **1712**. The hardware/software necessary for connection to the network interface **1748** includes, for exemplary purposes only, internal and external technologies such as, modems including regular telephone grade modems, cable modems and DSL modems, ISDN adapters, and Ethernet cards.

FIG. **18** illustrates an additional operating environment **1800** in which the present invention may function. The environment **1800** is a distributed environment wherein various computer components and/or data stores of the present invention are distributed between various locations. For example, the system **1800** includes an intelligent display **1810** that can be located at a first location and a non-intelligent display **1820** that can be located at a second location. While a single intelligent display **1810** and a single non-intelligent display **1820** are displayed, it is to be appreciated that a greater number of such displays can be employed with the present invention and that such displays can be located at distributed locations.

The displays **1810** and **1820** display media items identified in a playlist **1830**. The playlist **1830** is generated by an annotating and authoring system **1840** and refers to media items that are stored in a media store **1850**. While a single annotating and authoring system **1840** is illustrated, it is to be appreciated that cooperating computer components can be employed to implement the annotating and authoring system **1840**. Thus, the computer components can be distributed between various processors, processes, threads, and locations. Similarly, while a single media store **1850** is illustrated, it is to be appreciated that a distributed data storage can be employed with the present invention. Thus, in one example of the present invention, media items identified in the playlist **1830** can be stored at different locations, in different formats and retrieved by different methods.

What has been described above includes examples of the present invention. It is of course, not possible to describe every conceivable combination of components or methodologies for purposes of describing the present invention, but one of ordinary skill in the art will recognize that many further combinations and permutations of the present invention are possible. Accordingly, the present invention is intended to embrace all such alterations, modifications and variations that fall within the spirit and scope of the appended claims. Furthermore, to the extent that the term "includes" is used in either the detailed description or the claims, such term is intended to be inclusive in a manner similar to the term "comprising", as comprising is interpreted as a transitional word in a claim.

What is claimed is:

1. A system that monitors reaction to a media scene, comprising:

a scene retriever that retrieves a scene from a media store and retrieves from the media store annotating metadata associated with the scene;

a metadata analyzer that analyzes the annotating metadata of the retrieved scene together with annotating metadata of at least one other scene in the media store in order to identify a relationship;

a playlist generator that evaluates the relationship and produces a playlist of related scenes retrieved from the media store based on the relationship;

a viewer that displays the playlist of related scenes;

a feedback receiver that monitors passive feedback in response to the playlist displayed by the viewer, the passive feedback comprises at least a user's emotional reaction as inferred by monitoring the user's facial expression using an image capture device and recognizing the user's emotional reaction via the monitored facial expressions; and

a playlist updater that updates the playlist based at least in part on the passive feedback.

2. The system of claim **1**, the viewer is an active or intelligent device that performs a manipulation of at least one scene in the playlist prior to display.

3. The system of claim **2**, the manipulation is at least one of cropping the scene, rotating the scene, increasing the play speed, decreasing the play speed, color correction, digital data reconstruction, decompression, color conversions, or voice translation.

4. The system of claim **1**, the feedback receiver further receives active feedback associated with the playlist displayed by the viewer, the active feedback is at least one of a touch input, a typed input, a mouse input, or a voice input.

5. The system of claim **4**, the active feedback comprises at least one of a command to skip ahead in the playlist, a command to skip back in the playlist, a command to generate a new playlist, a command to find scenes similar to the current scene, or a command to play a longer scene related to the current scene.

6. The system of claim **1**, the scene retriever retrieves the scene based at least in part on a value stored in the associated annotating metadata.

7. The system of claim **4**, wherein the playlist updater updates the playlist based additionally on the active feedback.

8. The system of claim **1**, the playlist generator populates the playlist with related scenes based at least in part on a value stored in the annotating metadata for each respective scene.

9. The system of claim **1**, the playlist updater updates the playlist based on at least one of a usage data, a feedback command, or a time stamp.

10. The system of claim **1**, the metadata analyzer computes a similarity value for the relationship between respective scenes.

11. The system of claim **10**, the playlist generator produces the playlist of related scenes based at least in part on the similarity value.

12. The system of claim 1, further comprising at least one of the following:

a scene selector that scans a digitized media and selects a scene in the digitized media;

a metadata generator that produces metadata associated with the selected scene and relates the metadata to the selected scene; or

an organizer that places the selected scene and the metadata in a media store to facilitate non-linear viewing of one or more scenes.

13. The system of claim 12, the scene selector selects a scene based on at least one of face recognition, item recognition, voice recognition, color recognition, mood recognition, or theme recognition.

14. The system of claim 12, the scene selector selects a scene based at least in part on the passive feedback or based on an input from a user.

15. The system of claim 13, the at least one of the face recognition, item recognition, voice recognition, color recognition, mood recognition and theme recognition is adapted by a machine learning technique based at least in part on the input from the user.

16. The system of claim 12, the metadata generator produces and stores to the metadata at least one of a date, a time, a length, a subject, a mood, a theme, a color, a person name, a set of person names, an item name, or a set of item names associated with the scene.

17. A method for obtaining reactions associated with viewing of media, comprising:

accessing a scene stored in a media store;

accessing metadata associated with the scene from the media store;

analyzing the metadata associated with the scene in view of metadata associated with at least one other scene in the media store;

identifying at least one relationship between a subset of scenes in the media store based on the analysis;

generating a playlist comprising the subset of scenes based on the identified relationship;

presenting the playlist to a user;

recording passive feedback from the user as the playlist is presented, the passive feedback comprising at least an inferred emotional reaction by the user as recognized by reading the user's facial expressions using an image capture device; and

updating the playlist based at least on the passive feedback.

18. The method of claim 17, further comprising receiving active feedback from the user as the scene is presented.

19. The method of claim 18, the act of receiving active feedback further comprises receiving at least one of a touch input, a typed input, a mouse input, or a voice input.

20. The method of claim 18, further comprising at least one of the following acts:

analyzing at least one of the passive feedback or active feedback;

evaluating a relationship between the metadata and either one of the passive feedback or the active feedback; or

generating a playlist of stored scenes based upon the relationship.

21. The method of claim 20, the act of generating a playlist comprises at least one of selecting a scene based on the presence of a face in the scene, selecting a scene based on the absence of a face in the scene, selecting a scene based on the presence of an item in the scene, selecting a scene based on the absence of an item in the scene, selecting a scene based on a voice in the scene, selecting a scene based on the absence of a voice in the scene, selecting a scene based on a mood of the scene and selecting a scene based on the theme of the scene.

22. The method of claim 21, the act of evaluating a relationship further comprises computing a similarity score for the relationship based upon the metadata that comprises information concerning at least one of a present face, a present item, a present voice, a present mood, or a present theme.

23. The method of claim 21, the act of generating a playlist further comprises placing a scene identifier in the playlist.

24. The method of claim 20, the act of generating a playlist further comprises creating a playlist of disparate scenes based at least one of the passive feedback or the active feedback.

25. The method of claim 17, the act of updating the playlist comprises at least one of adding a scene to the playlist or removing a scene from the playlist.

26. The method of claim 20, further comprising navigating the playlist based upon at least one of the passive feedback, the active feedback, additional passive feedback, or additional active feedback.

27. The method of claim 26, the act of navigating the playlist comprises at least one of moving forward in the playlist, moving backward in the playlist, or displaying a media item related to the scene.

28. The method of claim 20, further comprising navigating the scene based upon at least one of the passive feedback, the active feedback, additional passive feedback, or additional active feedback.

29. The method of claim 28, the act of navigating the scene comprises at least one of moving forward in the scene, moving backward in the scene, changing the rate of scene traversal, pausing the scene, or displaying a media item included in the scene.

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