METHOD AND SYSTEM TO DISPLAY MEDIA CONTENT DATA

FIELD OF THE INVENTION

[0001] The present invention relates generally to the field of digital media and, more specifically, to a method and a system to display media content data on a remote control device.

BACKGROUND OF THE INVENTION

[0002] More and more homes are now being equipped with local area networks. These so-called "home networks" provide digital connectivity using either wired and/or wireless links. Examples of wired links are Ethernet and HPNA Phone Line networks. Examples of wireless links are 802.11a, 802.11b, 802.11g and the like links that may provide digital wireless connectivity throughout the home.

[0003] Further, an increasing amount of digital media (e.g., digital media such as audio and video) is being stored on personal computers or PCs. For example, in many homes music and/or video content is stored on a central PC and products are now available that allow a user to reproduce or play back this content on a different playback device (e.g. a TV set or stereo). These products may use a home network to communicate the digital content to a playback client that, in turn, communicates the digital content to a playback device such as a TV set.

SUMMARY OF THE INVENTION

[0004] A method and system is provided to display media content data for playback on a playback device. The system may include a playback unit and a remote control device. The playback unit may include a media content data storage communication interface to communicate with a media storage device thereby to receive the media content data. Further, the playback unit may include a display data processor to process the media content data and generate display metrics based on the media content data, and a bi-directional remote control communication interface. The remote control device may be used to select the digital media for playback on the playback device and include a complemental remote control communication interface for bi-directional communication with the remote control communication interface of the playback unit. Further, the remote control device may include a display screen, and a display rendering module to display the media content data on the display screen based on the display metrics.

[0005] The invention extends to a playback unit and to a remote control device. The invention also extends to a machine-readable medium including a set of instructions that, when execute by a machine, cause the machine to execute any of the methods described herein.

[0006] Other features of the present invention will be apparent from the accompanying drawings and from the detailed description that follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The invention is now described, by way of example and not limitation, with reference to the accompanying diagrammatic drawings in which like reference numerals refer to the same or similar features unless otherwise indicated.

[0008] In the drawings,

Figure 1 shows a schematic block diagram of a prior art system to control playback of digital media on a playback device;

Figure 2 shows a schematic block diagram of a system, in accordance with the invention, to control playback of digital media on a playback device;

Figure 3 shows a more detailed schematic block diagram of an exemplary remote control device and an exemplary playback unit of the system of **Figure 2**;

Figure 4 shows a schematic flow diagram of a method, in accordance with the invention, to control playback of digital media using a remote control device;

Figure 5 shows a schematic flow diagram of a method, in accordance with the invention, to control playback of digital media using a playback unit;

Figure 6 a shows schematic view of an exemplary remote control device, in accordance with the invention;

Figure 7 shows an exemplary media content hierarchy of media content data for display on a display screen of the remote control device;

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Figure 8 shows a schematic view of an exemplary user interface presented to the user on the display screen of the remote control device;

Figure 9 shows a schematic view of an exemplary user interface to present media content to the user on the display screen;

Figure 10 shows a schematic diagram of a further system, also in accordance with the invention, to control the playback of digital media residing on a plurality of media content storage devices in the exemplary form of digital media servers;

Figure 11 shows a schematic diagram of sub-sets of media content data stored on a media content storage device, a playback unit, and a remote control device;

Figure 12 shows an exemplary configuration of a playback unit used in the system of **Figure 10** showing a plurality of driver protocols;

Figure 13 shows an exemplary table of discovered media storage devices and threads to manage the discovered media storage devices;

Figure 14 shows exemplary modules of a remote control device and a playback unit, both in accordance with the invention, in which a font table is provided on the remote control device and an application that uses the font table is provided on the playback unit;

Figure 15 shows a schematic functional diagram of interaction between the playback unit and the remote control device when accessing the font table and communicating display metrics to the remote control device;

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Figure 16 shows a schematic flow diagram of a method, in accordance with the invention, to control the display of data on a remote control device remotely from a playback unit; and

Figure 17 shows a schematic flow diagram of a method, in accordance with the invention, to provide data for display on a remote control device.

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DETAILED DESCRIPTION

[0009] A method a system to display media content data for playback on a playback device is described. 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 will be evident, however, to one skilled in the art that the present invention may be practiced without these specific details.

[0010] Referring to the drawings, reference numeral 10 general indicates a system, in accordance with the prior art, to play back digital media on a playback or reproduction device 12. The system 12 includes a media content storage device 14, a playback client 16, and a remote control 18. The media content storage device 14 is typically in the form of a personal computer or PC on which audio files (e.g. music files) are stored. Audio data is typically communicated from the media content storage device 14 to the playback client 16 via a local area network 20 (e.g. a wired network connection, a wireless network connection (e.g., a wireless home network), or the like). The playback client 16 communicates selected audio files to the media player 12 via a hardwired connection 22. The media player 12 is typically a TV set or the like which has a display screen for displaying information to a user of the system 10. In use, the user may view the display screen of the TV set (see arrow 24) and, using the remote control 18, communicate with the playback client 16 to select audio for playback on the media player or playback device 12. In order to accomplish this, the playback client 16 receives the selected audio from the media content storage device 14 and communicates it to the media player or reproduction device 12.

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Accordingly, in the system 10 of the prior art, the user views some separate or independent display screen such as a TV set and uses the remote control 18 to select audio content for playback based on what is displayed on the TV set. Accordingly, in the prior art, unidirectional communication from the remote control 18 to the playback client 16 takes place and the remote control 18 does not include a display that receives media content information from the playback client 16.

[0011] Referring in particular to **Figure 2**, reference numeral 30 generally indicates a system, in accordance with the invention, to control playback of digital media on a playback or reproduction device 31. The playback device 31 may be a television set, a stereo or any other playback device for playing back media content (digital and/or analog). It should be noted that the playback device 31 may or may not include a display screen.

[0012] The system 30 includes a playback unit 32, also in accordance with the invention, and a remote control device 34, also in accordance with the invention (see also **Figure 6**). As described in more detail below, the system 30 displays content data on a display screen 36 of the remote control device 34. For example, the media content storage device 14 may store digital media in the form of music files, video files, photographs, or the like and the playback unit 32 may retrieve content data that identifies, or is associated with, the media files and communicate the content data to the remote control device 34 for display on the display screen 36. Further, as described in more detail below, the user may then select content (selected media) for reproduction or playback on the playback device 31 based on the information provided on the display screen 36. Thus, for example, the

content data may include audio track titles, album names, video clip titles, photograph tiles, and so on that reside on the media content storage device 14. It will be appreciated that the media content storage device 14 may include any server (e.g., a personal computer) that may serve digital media content. In the system 30 of **Figure 2**, the network 20 may be a wired network (e.g., using an IEEE 1394 connection or the like) or a wireless network (e.g., using 802.11 or any other wireless technology).

[0013] Referring in particular to **Figure 3**, the exemplary playback unit 32 includes a remote control communication interface 38, a media storage communication interface 40, and a playback device interface 42. Further, the playback unit 32 may include other components such as storage/memory 44, a memory buffer 46, a power unit 48, and a processor unit 50 to control operation of the playback unit 32.

[0014] The media storage communication interface 40 is typically a bi-directional communication interface such as a local area network (LAN) wireless device capable, for example, of communicating via a local area network using 802.11a, 802.11b, 802.11g or the like communication protocols. It is, however, to be appreciated that the playback unit 32 may communicate using any communication link or links (both wired and/or wireless) with any one or more digital content servers, as described in more detail below. In one embodiment, the media storage communication interface 40 is configured to communicate with a standard wireless network such as a standard wireless home network. In one embodiment, the playback device interface 42 connects the playback unit 32 to the playback device 31 via a hardwired connection. Accordingly, the playback unit 32

may include RCA, SP/DIF audio outputs, or the like. In one embodiment, the playback device interface 42 includes a digital to analogue converter for converting digital media files (e.g., MP3, JPEG, WAV, AVI, or the like) received from the media content storage device 14 to a suitable form for playback on the playback device 31. The processor unit 50 is typically a microprocessor-based controller or the like to control operation of the playback unit 32. As described in more detail below, the remote control communication interface 38 is a bi-directional communication device to allow bi-directional communication between the remote control device 34 and the playback unit 32.

[0015] The remote control device 34 includes a complemental remote control communication interface 52 to communicate in a bi-directional fashion with the remote control communication interface 38 of the playback unit 32. Further, the remote control device 34 includes a controller 54 (e.g. a microprocessor-based controller), the display screen 36 (e.g., 132x64-pixel LCD graphic display providing 5 lines of text display), and a user interface 56 (see also **Figure 6**). The user interface 56 includes navigation buttons 58 as well as other functional buttons 60 to allow a user to select and play digital media stored on the media content storage device 14. The user interface 56 and the display screen 36 allow a user to browse (e.g., by artist, album, genre, all tracks, playlist or the like) and select media content stored on the media content storage device 14. In one embodiment, the remote control device 34 includes a hand-held housing 35 which is shaped and dimensioned to render the remote control device 34 portable.

[0016] The remote control communication interfaces 38 and 52 may be radio frequency interfaces, optical interfaces (e.g. infrared), or any other

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communication interface. For example, the communication interfaces 38, 52 may be low power devices having a range suitable for use within a domestic dwelling. The display screen 36 may be an LCD display or the like suitable for displaying data in the form of text to a user so that the user may select content for playback on the playback device 31. As described in more detail below, the display screen 36 may operate in conjunction with the user interface 56 in a menu driven fashion so that media content available on the media content storage device 14 may be displayed to the user on the display screen 36 and, in response thereto, the user may then select one or more media files for playback on the playback device 31. Thus, unlike the prior art where the playback device 31 itself provides a display screen to display the media content available on the media content storage device 14 to the user, the remote control device 34, in accordance with the present invention, includes the display screen 36 for displaying media content to the user for selection.

[0017] Referring in particular to **Figure 4**, reference numeral 70 generally indicates a method, in accordance with the invention, to display and control playback of digital media using a remote control device. The method 70 may be carried out on the exemplary remote control device 34. As shown at operation 72, the remote control device 34 waits for user input via the user interface 56. When user activity or input is detected (see operation 74), the method 70 then identifies if the input from the user requires processing or if a message (e.g., requesting media content data) must be sent to the playback unit 32 (see decision operation 76). If the input received from the user requires processing, then the method 70 processes the input or request (see

operation 78) and, as shown at decision operation 80, decides whether or not the display screen 36 is to be updated (e.g., scroll through text available on the remote control device 34). If the display screen 36 does not require updating, then the method 70 returns to operation 72. If, however, the display screen 36 requires updating, then the method 70 updates the display screen 36 as shown at operation 82 and, thereafter, returns to operation 72 where it waits for further user input.

[0018] Returning to decision operation 76, when the user input requires communication with the playback unit 32, the method 70 proceeds to operation 84 and sends a request or message to the playback unit 32 and awaits a return message as shown at operation 86. For example, when the remote control device 34 requests information from the media content storage device 14 (e.g. information on the content available for playback on the playback device 31), the playback unit 32 may then communicate a media data request to the media content storage device 14 via the local area network 20 (see **Figure 2**). In response to the media data request, the media content storage device 14 may then communicate content data to the playback unit 32 which, in turn, communicates the data to the remote control device 34 (see operation 86) for display on the display screen 36. As shown at decision operation 88, the method 70 may identify whether or not further information or data is required from the playback unit 32 (and/or media content storage device 14) and, if so, the method 70 returns to operation 84. If, however, no further information or data is required from the playback unit 32, then the method 70 proceeds to operation 78 where the data is processed.

[0019] Referring in particular to **Figure 5**, reference numeral 90 generally indicates a method, in accordance to the invention, to control playback of media data using a playback unit. The method 90 may be carried out on the playback unit 32. As shown at operation 92, the playback unit 32 may await a message or data request from the remote control device 34. When a message or data request is received from the remote control device 34 (see operation 94), then a decision is made at decision operation 96 as to whether or not the playback unit 32 can process the request or whether the request should be communicated to the media content storage device 14. The media content storage device 14 may act as a server that provides the digital media to any one or more playback units 32.

[0020] Returning to operation 96, if the playback unit 32 can process the message or data request received from the remote control unit 34, then, as shown at operation 98, the playback unit 32 processes the message. As shown at decision operation 100, a determination is then made as to whether or not the remote control device 34 (e.g., its display screen 36) requires updating. If the remote control device 34 requires updating, then as shown at operation 102, appropriate data is communicated by way of, for example, a message to the remote control device 34 and, thereafter, the method 90 returns to operation 92 where it waits for further user input. If, however, no updating of the remote control device 34 is required, then, as shown at decision operation 104, a determination is made as to whether or not data is to be communicated from the playback unit 32 to the reproduction or playback device 31. For example, if the user has selected a particular media file (e.g. a music file such as an MP3 file) to be played back on the playback

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device 31, then the playback unit 32 may stream the music file (see operation 106) to the playback device 31.

[0021] As shown at decision operation 108, the method 90 then determines whether or not further digital media (e.g., further streaming) is required from the media content storage device 14 and, if so, the playback unit 32 may then send a message/request to the media content storage device 14 requesting further media content (see operation 110). An application running on the media content storage device 14 may then communicate the requested data to the playback unit 32 which then, accordingly, receives the requested media content data (see operation 112). Thereafter, as shown at decision operation 108, a determination is made whether or not further information or data is required from the media content storage device 14. If, however, no more information or data is required from the media content storage device 14, then the method 90 reverts to operation 98 where the message or data is processed. It will be appreciated that any data (e.g., media files) communicated via the system 30 may be compressed and decompressed, encoded, or the like.

[0022] Returning to decision operation 96, if the playback unit 32 does not need to process any data (and thus does not need to proceed to operation 98) but requires media content data from the media content storage device 14, then the method 90 proceeds directly to operation 110 where the playback unit 32 sends a request or message to the media content storage device 14.

[0023] In one embodiment, the media content storage device 14 is a PC including server software that manages media content stored on the PC and communicates with the playback unit 32 via the network 20. The PC may

communicate with any number of playback units 32. In one embodiment, , as described in more detail below, a single remote control device 34 can communicate with more than one playback unit 32, one at a time. In one embodiment, the remote control device 34 is an RF remote control with an operating range suitable for use in a domestic dwelling (e.g. a range of 10 about meters).

[0024] In one embodiment, operation of the remote control device may be divided into 3 main functional areas, namely, administrative, transport and navigation. Exemplary administrative functions include powering the remote control device 34 up and down, providing information on media presently being played via the reproduction or playback device 31, or the like. Exemplary transport functions include Play/Pause, Scan forward/skip, Scan backward/back, Stop, Mute, Volume up and down, Mode, or the like. Exemplary navigation functions include Menu, Music, Library, Left, Right, Down, Up, Favorites, playlists (e.g., using buttons 1-9), OK (to save settings/select items), or the like.

[0025] Reference numeral 120 (see **Figure 8**) generally indicates an exemplary graphic user interface presented to the user on the display screen 36 to select digital media stored on, and served from, the digital media storage device 14. In the exemplary embodiment shown in **Figure 8**, a user may select group descriptions such as "Favorite Playlists", "Music Library", "Setup", and "Info". It will however be appreciated that the information displayed by the graphic user interface 120 may be dependent upon the digital media available from the digital media storage device 14. As mentioned above, navigation of digital content displayed on the display

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screen 36 may be accomplished in a drill-down fashion in conjunction with the navigation buttons 58 (see **Figure 6**). For example, if the user selects the "Music Library" option 122, then a further graphic user interface 124 may be presented to the user on the display screen 36. In this menu-driven fashion, media content (e.g., music files, video files, pictures, or any other digital media) arranged in a hierarchy 126 (see **Figure 7**) may be browsed or navigated. In one embodiment, navigation functionality using the display screen 36 and the user interface 56 may resemble the navigation functionality provided on a Creative NOMAD Jukebox available from Creative Technology Ltd.

[0026] Referring in particular to **Figure 10**, reference numeral 150 generally indicates an exemplary system, in accordance with the invention, for controlling the playback of media data sourced from a plurality of media content storage devices. In the system 150, the media content storage devices are shown to be in the form of a plurality of servers 152, 154, 156, and 158. The servers 152 to 158 are connectable to one or more playback units 160, 162, and 164 via one or more networks 166, 168, and 170. Further, each playback unit 160, 162, 164 may communicate with one or more remote control devices 172, 174, and 176. The servers 152 to 158, the networks 166 to 170, the playback units 160 to 164, and the remote control devices 172 to 176 may resemble or be substantially similar to the media content storage device 14, the network 20, the playback unit 32, and the remote control device 34, respectively, as described above.

[0027] It is to be appreciated that the networks 166 to 170 need not be identical networks but may differ in nature. For example, the network 166

may be a wireless network whereas the network 168 may be a wired network. Accordingly, the playback unit 160 and the playback unit 162 may each include different media storage communication interfaces to communicate in both a wired and wireless fashion (see, for example, the media storage communication interface 40 of the playback unit 32 shown in **Figure 3**). Thus, it will be appreciated, that any combination of wired or wireless networks may form part of the system 150.

[0028] Further, a plurality of different communication protocols may be used to communicate with the servers 152 to 158 of the system 150. For example, servers 152, 154, and 156 may each use a different communication protocol when communicating via the networks 166 and 168. Thus, the server 152 may communicate using communication protocol 178 and, accordingly, playback units 160 and 162 may thus include a first driver protocol interface 184 (see also **Figure 12**) suitable for interfacing the playback units 160 and 162 via the networks 166 and 168 using the communication protocol 178. Likewise, the server 154 may communicate using a communication protocol 180 and, accordingly, the playback units 160 and 162 may include a second driver protocol interface 186. In a similar fashion, the playback unit 162 may include a third driver protocol interface 188 to communicate with the network 168 using the communication protocol 182. It will be appreciated that each playback unit 160 to 164 may thus include a plurality of different driver protocol interfaces for accommodating communication with the servers 152 to 158 that may use any one of a plurality of driver protocols (e.g., any standard communication protocol such as TCP/IP, or the like).

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[0029] As shown in **Figure 12**, each exemplary playback unit 160 to 164 may include a hardware layer 190 (see, for example, **Figure 3**), common drivers 192, for example, to interface the playback units 160 to 164 to playback devices (for example the playback or reproduction device 31 as described above), a common middleware layer 194, and playback device application code 196 that may, for example, execute the method 90 (see **Figure 5**).

[0030] In one embodiment of the invention, in order to accommodate multiple the servers 152 to 158, each playback unit 160 to 164 may include a stack for storing media content data available from an associated server. For example, the playback unit 160 may include a media content stack 200 associated with the server 152, and a media content stack 202 associated with the server 154. Likewise, the playback unit 162 may include a media content stack 200 associated with the server 152 and a media content stack 202 associated with the server 154. However, in addition to the media content stacks 200 and 202, the playback unit 162 may include one or more further media content stacks, for example, a media content stack 204 associated with the server 156. It will be appreciated that any number of media content stacks may be provided corresponding to additional servers with which a playback unit 160 to 164 is communicating.

[0031] As shown in **Figure 11**, with specific reference to the exemplary media content stack 200, in one embodiment the media content stack 200 includes a subset (e.g., N items) of media content data 206 that is available from a total amount of media content data 208 on the server 152 (e.g., A items or listings of audio and/or video items or files available for playback). Likewise, media content data provided on any one of the remote control

devices 172 to 176 may be a subset 210 (e.g. Y items) of the media content retrieved by the playback units 172 to 176. It will be appreciated that the media content data provided on the playback units 160 to 164 and the remote control units 172 to 176 can dynamically change as a user requests different media content from the servers 152 to 158. Further, the media content retrieved by each playback unit 160 to 164 may differ based on user selection and, likewise, the media content provided on each remote control device 171 to 176 may differ based on user selection.

[0032] In one embodiment of the invention, the remote control devices 172 to 176 are substantially similar to the remote control device 30 (see **Figure 2**). Each remote control device 172 to 176 may thus include a display screen 36 on which media content data (e.g., Z items) is displayed to the user. However, it will be appreciated that the display screen 36 may be limited in the amount of media content data that it can display to the user ($Z<Y<N<A$). Accordingly, in one embodiment, each remote control device 172 to 176 stores media content data received from a playback unit 160 to 164 in the media content data stack and only a portion (Z items) of the media content data that is available on the remote control unit 172 to 176 or displayed on the display screen 36. As described in more detail below, a user may then use the exemplary user interface 56 (see **Figure 6**) to scroll through media content data (e.g., text) provided in a media content stack (see, for example, the content hierarchy 126 of **Figure 7**).

[0033] In one embodiment of the invention, each playback unit 160 to 164 includes a table of discovered devices or servers 212 (see **Figure 13**) wherein data or information on all media content storage devices, such as the servers

152 to 158, is provided. Further, each playback unit 160 to 164 may include threads 214 to manage the servers 152 to 156. In particular, the exemplary playback unit 160 may use the table 212 and the threads 214 to source or retrieve media content data from the servers 152 and 154 and merge the data prior to communication thereof to the remote control device 172 (or any other remote control devices, such as the remote control device 174, with which it may be communicating). Likewise, the playback unit 162 may source media content data from the servers 152 to 156 and merge or combine the media content data received for communication to any one or more remote control devices 174 to 176. In one embodiment, the playback units 160 to 164 may thus include a merge module 216 (see **Figure 13**) for merging media content data for communication to one or more remote control devices 172 to 176. The remote control devices 172 to 176 may thus be totally ignorant of the source (e.g., which media content provider) of the media content received from an associated playback unit 160 to 164. The threads 214 may also control playback of selected media (e.g. a selected audio file) on the playback device 31.

[0034] In accordance with another aspect of the invention, a master unit such as a playback unit may control operation of a remote control device. For example, in one embodiment, the playback unit may define the "look and feel" of the remote control device, define its functional operation, and/or display format or characteristics.

[0035] Referring in particular to **Figure 14**, reference numeral 250 generally indicates an exemplary system, in accordance with the invention, for controlling the playback of digital media on a playback unit (e.g., the

playback unit 31 of **Figure 2**). The system 250 includes an exemplary playback unit 252 and an exemplary remote control device 254. The playback unit 252 and the remote control device 254 may resemble the playback unit 32 and the remote control device 34 respectively. However, the playback unit 252 includes a display data processor 256 for processing data or information (e.g., media content data) to be displayed on a display screen 258 of the remote control device 254. The display screen 258 may substantially resemble the display screen 36 and include all or any part of the functionality herein before described. As described in more detail below, the playback unit 252 of the system 250 substantially controls, or at least assists, the remote control device 254 in displaying data or information (e.g., media content data) to a user.

[0036] The remote control device 254 includes a user interface 56, a display rendering engine or module 260, a display content cache 262, and an exemplary font table 264. In one embodiment, the font table 264 includes glyph data including a set of glyphs or images that are used in the visual representation of characters on the display screen 258. As described in more detail below, in one embodiment of the system 250 the display data processor 256 is remote from, and separate from, the font table 264 that it requires to process display data for display on the display screen 258 of the remote control device 254. Accordingly, display data (e.g., glyph metrics) is communicated from the remote control device 254 to the playback unit 252 as shown by arrow 266. Thereafter, as described in more detail below, the display data processor 256 processes the media content data or any other data to be displayed on the display screen 258 based on the received display

data and communicates display control data (e.g. display metrics) to the remote control device 254 (see arrow 268). Upon receipt of the data to be displayed (e.g., the media content data), the display rendering engine 260 uses the display metrics to arrange the information or data that is displayed on the display screen 258. Thus, in one embodiment, the playback unit acting as a master unit may configure and determine how data is to appear on the display screen of the remote control device.

[0037] Reference numeral 270 (see **Figure 15**) generally indicates exemplary communications between an exemplary remote control device 254 and an exemplary playback unit 252, and the playback unit 252 and a media content storage device (such as the media content storage device 14 of **Figure 2**). As described above, user interaction via the user interface 56 may be monitored at the remote control device 254 which then communicates a user action (e.g., activation of a button or key of the user interface 56) to the playback unit 252 as shown by arrow 272. Thereafter, as described above with reference to the playback unit 32, in one exemplary embodiment a decision is made whether or not further content is required from the media content storage device 14 and, if so, a media content data request is communicated from the playback unit 252 to the media storage device 14 as shown by arrow 274. For example, if the user has requested details or data on media (e.g., audio and/or video) available from any one or more servers (e.g., the servers 152 to 158), the playback unit 252 may then request the particular media content data from the associated servers and receive a response (see arrow 276) that indicates, or provides data, on the media content available. The playback unit 252 may then identify or determine what information

needs to be displayed on the display screen 258, and suggest how the information should be displayed.

[0038] For example, if media content data such as that provided in the content hierarchy 126 of **Figure 7** is to be communicated for display on the remote control device 254, the display data processor 256 of the playback unit 252 may identify the strings or words or characters to be displayed, as well as a language in which they are to be displayed on the display screen 258. Assuming, for example, included in the data to be displayed is a song title, then the display data processor 256 may identify all the characters in the song title and, for each character (e.g., a letter of the alphabet) request glyph metrics stored in the font table 264 of the remote control device 254 (see arrow 278). The remote control device 254 may then communicate the glyph metrics that have been retrieved from the font table 264 back to the playback unit 252 (see arrow 280). Using the glyph metrics for each character in the exemplary song title, the display data processor 256 may calculate display data and display metrics (e.g., the spacing between the characters or letters, the position of the characters or letters, the size of the characters, or the like) and communicate this data to the remote control device 254 (see arrow 282). Using the display metrics, the display rendering engine 260 may then display the relevant media content data on the display screen 258. In one embodiment, the remote control device 254 acknowledges receipt of the display data and metrics as shown by arrow 284.

[0039] Referring in particular to **Figure 16**, reference numeral 300 generally indicates a method, in accordance with the invention, for displaying data on a display screen of a remote control device. In one embodiment of the

invention, the remote control device may resemble the exemplary remote control device 254 (see **Figure 14**) and, accordingly, the method 300 is described, by way of example, with reference to the remote control device 254. Further, the method 300 may employ a least some of the exemplary communications 270 of **Figure 15**.

[0040] Although the method 300 is described by way of example with reference to displaying the availability audio or any other media content on the remote control device 254, it is to be appreciated that the method may apply in any environment where a control or master unit communicates with an associated remote control device including a display screen and wherein the master unit includes a display data processor or module that communicates display metrics to the remote control device to influence the display of data on the display screen of the remote control device. Thus, in one embodiment, display processing capabilities may be transferred from the remote control device to the master unit so that the remote control device requires reduced computation or processing capabilities.

[0041] Further, the master unit (e.g., the playback unit 252) may optionally include display data or font data that it uses to determine the display metrics for communication to the remote control device. Accordingly, operations shown by arrows 278 and 280 in **Figure 15** may be avoided.

[0042] Returning to **Figure 16**, as shown at block 302, when the method 300 is used to display exemplary media content data on an exemplary remote control device 254, the playback unit 252 may retrieve requested media content data from the media content storage device that is to be displayed on the remote control device 254. The playback unit 252 and, in particular,

the exemplary display data processor 256 may then analyze the data or information (e.g., text) to be displayed. In particular, all the characters making up a string or word(s) of the information are identified. Thereafter, as shown at operation 304, the playback unit 252 communicates a query for glyph metrics of all glyphs to be displayed on the display screen 258. A glyph corresponding to each character or letter to be displayed may be retrieved from the display data or font table 264 provided on the remote control device 254 and returned to the display data processor 256 to process display configuration data or display metrics.

[0043] Thereafter, as shown at operation 306, the display data processor 256 may then, using the glyph information associated with the characters, calculate the display area required for each glyph, as well as the total number of characters or letters to be displayed on the display screen 258. Once the glyph metrics and the media content data (e.g., the string or word(s)) have been processed, the display data processor 256 may then generate or adjust the display metrics so as to enhance readability of the information or data on the display screen 258 by a user (see operation 308). In one embodiment, the display data processor 256 may adjust the spacing between glyphs, the relative size that the glyphs occupy on the display screen 258, and so on. Further, in one embodiment, the display data processor 256 may calculate a position on the display screen 258 where each particular glyph is to be located. Accordingly, the display data processor 256, using glyph metrics or information provided in a font table 264 on the remote control device 254, may calculate or determine optimum display

parameters for information or data for display on the remote control device 254.

[0044] Once the display data processor 256 has generated or defined the display metrics, for example, for enhanced readability on the display screen 258, a code for each glyph as well as the display metrics or coordinates where the particular glyph is to be displayed on the display screen 258 (see operation 310) may be communicated to the remote control device 254.

[0045] Upon receipt of the glyph code and display metrics from the playback unit 252, the display rendering engine 260 of the remote control device 254 may retrieve glyphs corresponding to the codes from the font table 264 and display them on the display screen 258 using the coordinates or display metrics calculated remotely at the playback unit 252 (see operation 312). Thereafter, the remote control device 254 may communicate an acknowledgment to the playback unit 252 to confirm that the data has been processed (see operation 314).

[0046] In certain embodiments of the invention, the display data processor 256 also performs kerning on the data to be displayed on the display screen 258. Accordingly, spacing between each character to be displayed on the display screen 258 may be adjusted thereby to enhance the readability by a user, adjust the quantum of information or number of characters displayed in a particular line on the display screen 258, or the like. Further, in one embodiment of the invention, the display rendering engine 260 may scroll data (e.g. media content data) in a horizontal fashion (marquee) on any one or more display lines that may be provided on the display screen 258. Further, both vertical and horizontal kerning may be provided by the

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display data processor 256. Accordingly, not only in a horizontal but also in a vertical fashion, the display metrics or display parameters of characters may be adjusted to enhance the amount of data displayed on the display screen 258 and/or enhance its readability.

[0047] In one embodiment of the invention, the display data processor 256 also adjusts an amount of space to leave clear around each glyph to enhance readability. Accordingly, it will be appreciated that the display data processor 256, using data retrieved from the remote control device 254, may control the display of data on the remote control device 254 thereby allowing for reduced computational complexity in the remote control device 254.

[0048] In one embodiment of the invention, when the remote control device 254 includes the display content cache 262, the display rendering engine 260 may allow vertical scrolling of media content data displayed on the display screen 258. For example, as shown in **Figure 11**, the display content cache 262 may include more data than the display screen 258 can display in a readable fashion at any one time and, accordingly, the display rendering engine 260 may thus only display a subset of the actual information (e.g., media content data) stored in the remote control unit 254. Thus, in one embodiment of the invention, the exemplary navigation buttons 58 (see **Figure 6**) may be used to scroll through media content sourced from the media content storage device 14.

[0049] It will be appreciated that in one embodiment of the invention, the layout, size and other display metrics of the information or data for display on a remote control device may be remotely determined at a master or

control device and the remote control device may merely map glyphs or any other display images to its display screen.

[0050] Referring in particular to **Figure 17**, reference numeral 350 generally indicates a method, in accordance with the invention, to control the display of data on a display screen of a remote control device. For example, the method 350 may be implemented by the display data processor 256 of the playback unit 252 and is thus described, by way of example, with reference thereto.

[0051] As shown at operation 352, the playback unit 252 may receive an indication (e.g., a key code) from the remote control unit 254 that a button or key on the exemplary user interface 56 has been pressed or activated. Thereafter, as shown at decision operation 354, the display data processor 256 may determine whether or not a scroll function is associated with the particular button or key that was activated. If no scroll function is associated with the key, then the playback unit 252 may identify a function associated with the button or key (e.g. with the code received) and execute the function (see operation 356). Examples of such functions in a media playback application include pause, play, rewind, fast-forward, stop, or the like.

[0052] If, however, a scroll function is associated with the key or button that has been pressed, then as shown at decision operation 356 the display data processor 256 may identify if the user has selected to scroll up or to scroll down. If the user has selected to scroll up, then as shown at decision operation 358, the display data processor 256 may communicate data that is to be added to a top of a display content cache (e.g., the display content cache 262). For example, data in a top 359 of the subset 210 (see **Figure 11**) of

the media content stack may be updated. In one embodiment, the display content cache may be defined by a circular buffer and the media content data update may then be added at an appropriate portion of the display content cache so that it is stored in a position towards which the user is scrolling. Accordingly, the playback unit 252 may thus, in an anticipatory fashion, provide data to the display content cache 262 which is expected to be displayed on the display screen 258 in the near future.

[0053] Returning to decision operation 356, in a similar fashion, if the display data processor 256 identifies that the user has not selected to scroll up but, instead, selected to scroll down, then the playback unit 252 communicates display data (e.g. a media content data update) to add to a bottom of the display list stored in the display content cache 262 (see operation 360). For example, data at a bottom 361 of the subset 210 of the media content stack may be updated.

[0054] Thereafter, as shown at decision operation 362, the playback unit 252 (e.g. the processing unit 50) identifies whether or not further data is required from the media content storage device (e.g., the servers) and, if so, the further data is obtained from the servers (see operation 364) whereafter the method 350 returns to operation 352 to monitor further key or button activation by the user. If, however, no further information is required from the servers, the method 350 may proceed directly from decision operation 362 to operation 352.

[0055] Thus, for example, media content data may be updated in an anticipatory fashion on the remote control device 254 by the playback unit

252. When the user scrolls up, a top of a display stack may be updated, and when a user scrolls down a bottom of a display stack may be updated.

[0056] Once a user has selected content (e.g., a audio track, video clip, or the like, it may be streamed from the media content storage device to the playback device 131 in a conventional fashion. The playback unit 32, 160 to 164, and 252 may then communicate or route the selected media to an appropriate playback device. Accordingly, the exemplary playback unit 32, 160 to 164, and 252 may include other components which are readily known to a person of skill in the art.

[0057] Thus, method and system to display media content data for playback on a playback device have been described. Although the present invention has been described with reference to specific exemplary embodiments, it will be evident that various modifications and changes may be made to these embodiments without departing from the broader spirit and scope of the invention. Accordingly, the specification and drawings are to be regarded in an illustrative rather than a restrictive sense.

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CLAIMS

What is claimed is:

1. A system to control playback of digital media on a playback device, the system including:

a playback unit including a digital media storage communication interface to communicate with a media storage device, and a bi-directional remote control communication interface; and

a separate remote control device to control the playback of the digital media on the playback device, the remote control device including

a complemental remote control communication interface for bi-directional communication with the remote control communication interface of the playback unit; and

a display screen, wherein the remote control device receives data from the playback unit for display on the display screen.

2. The system of claim 1, wherein the playback unit includes a playback device interface connectable to the playback device, the playback unit receiving the digital media from the media storage device and communicating the digital media to the playback device for playback.

3. The system of claim 1, wherein the playback unit receives content data from the media storage device and communicates the content

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data to the remote control device for display on the display screen, the content data relating to content available on the media storage device for playback on the playback device.

4. The system of claim 3, wherein the remote control device includes a user interface that allows a user to select digital media for playback on the playback device, the user interface operating in conjunction with the display screen to select the digital media.

5. The system of claim 4, wherein the user interface and the display screen operate in a menu-driven fashion, the content data being included in the menu and being sourced via the playback unit from the media storage device.

6. The system of claim 1, wherein the digital media storage communication interface is a wireless network interface to communicate with the media storage device via a wireless network.

7. The system of claim 1, which includes a plurality of media storage devices and the playback unit combines content data from different media storage devices and communicates selected combined content data to the remote control device.

8. The system of claim 7, wherein the playback unit includes a plurality of different digital media storage communication interfaces each of

which to communicate with a media storage device via a communication network, and wherein each digital media storage communication interface allows communication using a different communication protocol.

9. The system of claim 1, wherein the digital media includes at least one of audio files, video files and picture files.

10. The system of claim 1, wherein the playback unit includes a first display data cache and the remote control device includes a second display data cache, the first display data cache including a subset of media content available from the media storage device and the second display data cache including a subset of data of the first display data cache.

11. A remote control device to control playback of digital media via a playback unit that is remote from a digital storage device that provides the digital media, the remote control device including:

a remote control communication interface for bi-directional communication with a complemental remote control communication interface of the playback unit;

a display screen to display content data received from the playback unit; and

a user interface to select digital media identified by the content data on the display screen.

12. The device of claim 11, wherein media content available on the media storage device for playback on the playback device includes at least one of digital audio files, video files and picture files.

13. The device of claim 11, wherein the user interface and the display screen operate in a menu-driven fashion, the content data being included in the menu and being sourced via the playback unit from the media storage device.

14. The device of claim 11, wherein the remote control communication interface is one of an optical interface and a radio frequency interface.

15. The device of claim 11, which includes a compact housing shaped and dimensioned to be hand-held.

16. A playback unit for controlling playback of digital media under control of a separate remote control device, the playback unit including:

a digital media storage communication interface to communicate with a media storage device at which the digital media is stored; and

a bi-directional remote control communication interface to communicate content data to, and receive a media data request from, the remote control device, wherein the playback unit receives the content data communicated to the remote control device from the media storage device.

17. The playback unit of claim 16, wherein the digital media storage communication interface is a wireless network interface to communicate with a media storage device via a wireless network.

18. The playback unit of claim 16, wherein the remote control communication interface is one of a bi-directional optical interface and a radio frequency interface.

19. The playback unit of claim 16, which includes a plurality of different digital media storage communication interfaces each of which to communicate with a media storage device via a communication network, and wherein each digital media storage communication interface allows communication using a different communication protocol.

20. The playback unit of claim 19, which includes a discovered storage device table identifying media content storage devices that it discovers, and generates a corresponding processing thread for each storage device discovered, and wherein display data retrieved by each thread is combined prior to communicating it to the remote control device.

21. The playback unit of claim 16, wherein the playback unit includes a first display data cache from which display data is communicated to a second display data cache of the remote control device, the first display data cache including a subset of media content available from the media

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storage device and the second display data cache including a subset of the first display data cache.

22. A method to control playback of digital media on a playback device, the method including:

receiving content data at a playback unit, the content data relating to digital media stored on a media storage device;

communicating the content data via a bi-directional communication interface to a separate remote control device for display on a display screen of the remote control device;

monitoring user selection of selected digital media identified by the content data; and

communicating the selected digital media to the playback unit to cause the selected digital media to be played on the playback device.

23. The method of claim 22, wherein the playback unit includes a playback device interface connectable to the playback device, the method including receiving the digital media at the playback unit from the media storage device and communicating the digital media to the playback device for playback.

24. The method of claim 22, which includes monitoring user selection of the selected digital media utilizing a user interface operating in conjunction with the display screen.

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25. The method of claim 24, wherein the user interface and the display screen operate in a menu-driven fashion, the content data being included in the menu and being sourced via the playback unit from the media storage device.

26. The method of claim 22, which includes, at the playback unit, combining content data from a plurality of different media storage devices and communicating selected combined content data to the remote control device.

27. The method of claim 26, which includes communicating with different media storage devices using different communication protocols.

28. The method of claim 22, which includes storing content data in a first display data cache of the playback unit and communicating a subset of the data in the first display data cache to a second display data cache of the remote control device, the first display data cache identifying a subset of media content available from the media storage device.

29. A method to control playback of digital media from a media storage device via a playback unit using a separate remote control device, the method including:

receiving at the remote control device content data that identifies content available for playback on a playback device;

displaying the content data to a user on a display screen of the remote control device;

monitoring user selection of digital media identified by the content data; and

communicating the user selection to the playback unit to cause the selected digital media to be played on the playback device.

30. The method of claim 29, wherein the content data is provided to the user in a menu-driven fashion.

31. A method of controlling playback of digital media via a playback unit under control of a separate remote control device, the method including:

receiving a content data request from the remote control device at the playback unit;

communicating the content data request from the playback unit to a media storage device;

receiving content data from the media storage device, the content data identifying media content available at the content storage device for playback on the playback device;

communicating the media content data to the remote control device for display on the remote control device; and

receiving a user selection for playback from the remote control device that identifies selected media content and causing the selected media content to be played on the playback device.

32. The method of claim 31, which includes communicating with the media storage device via a wireless network interface.

33. The method of claim 31, which includes communicating with the remote control device via one of a bi-directional optical interface and a radio frequency interface.

34. The method of claim 31, which includes, at the playback unit, combining content data from a plurality of different media storage devices and communicating selected combined content data to the remote control device.

35. The method of claim 34, which includes communicating with different media storage devices using different communication protocols.

36. The method of claim 31, which includes storing content data in a first display data cache of the playback unit and communicating a subset of the data in the first display data cache to a second display data cache of the remote control device, the first display data cache identifying a subset of media content available from the media storage device.

37. A machine-readable medium embodying a sequence of instructions that, when executed by a machine, cause the machine to:

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receive content data at a playback unit, the content data relating to digital media stored on a media storage device;

communicate the content data via a bi-directional communication interface to a separate remote control device for display on a display screen of the remote control device;

monitor user selection of selected digital media identified by the content data; and

communicate the selected digital media to the playback unit to cause the selected digital media to be played on a playback device.

38. A machine-readable medium embodying a sequence of instructions that, when executed by a machine, cause the machine to:

receive at a separate remote control device content data that identifies content available for playback on a playback device;

display the content data to a user on a display screen of the remote control device;

monitor user selection of digital media identified by the content data; and

communicate the user selection to a playback unit to cause the selected digital media to be played on the playback device.

39. A system to control playback of digital media on a playback device, the system including:

playback means including at least one digital media storage communication interface to communicate with a media storage device, and a bi-directional remote control communication interface; and

separate remote control means to control the playback of the digital media on the playback device, the remote control means including:

a complemental remote control communication interface for bi-directional communication with the remote control communication interface of the playback unit; and

display means, wherein the remote control device receives data from the playback unit for display on the display means.

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