PUSHING A USER INTERFACE TO A REMOTE DEVICE

FIELD OF THE INVENTION

[0001] The present invention relates generally to accessories for portable media devices and in particular to allowing a portable media device to provide a user interface for controlling the media device to an accessory.

BACKGROUND OF THE INVENTION

[0002] Portable media devices allow users to store media content (music, videos, photos, audiobooks, etc.) and access stored media content from nearly anywhere. Some portable media devices also allow users to connect other devices (referred to herein as "accessories" or "accessory devices") to the portable media device, thereby enhancing some aspect of the portable media device's operation. For example, most portable media devices provide a headphone jack for listening to audio content. Some accessories provide speakers, thus allowing the user to share the sound with others, or to listen in environments where use of headphones might not be feasible (such as while driving).

[0003] In some instances, an accessory can be used to control operation of a portable media device; such accessories are referred to herein as "remote control devices." The remote control device can send commands to the portable media device indicating a user-requested operation (such as starting or pausing playback, skipping to the next track, returning to a previous track, fast-forward or rewind within a track, etc.). The portable media device can execute the requested operation, thus allowing the user to operate the portable media device without touching the portable media device. Such remote control operation can be particularly useful in situations where it is inconvenient for a user to manipulate the portable media device's interface directly. For example, portable media devices tend to be small, with relatively small controls and display screens. Thus, it can be difficult for a user to operate such a device while driving or from across a room.

[0004] Some remote control devices provide a graphical user interface (GUI) and allow the user to perform more advanced functions such as browsing a database of stored content, selecting content to play, etc. For instance, Johnson Controls International has been

developing a "Mobile Device Gateway" for use in vehicles; the system includes a connection point for a portable media device and a console that provides an audio/visual interface. But existing remote GUIs are defined and controlled by the remote control device, and consequently, they may bear little resemblance to a GUI supplied by the portable media device itself. Certain functions available on the portable media device (such as browsing or searching a database, adjusting playback settings, etc.) may be unavailable or difficult to find. Thus, a user may not be able to perform desired functions. Further, GUIs provided for the same portable media device by different remote control devices might be quite different, and the user who connects a portable media device to different accessories with remote control may find the inconsistencies frustrating.

[0005] It would, therefore, be desirable to provide a more consistent remote user interface experience.

BRIEF SUMMARY OF THE INVENTION

[0006] Embodiments of the present invention relate to providing a graphical user interface ("GUI") on a remote control accessory device, where the GUI can be defined and managed by a portable media device rather than the accessory device. The accessory device can provide a combination of user input and visual feedback devices, such as a video screen for presenting information and feedback to a user, along with buttons, knobs, touchscreen and/or touchpad for receiving user input. The portable media device can provide the accessory with an image to be displayed on the video screen; the image can include various user interface elements that can resemble or replicate a "native" GUI provided directly on the portable media device. The accessory can send information to the portable media device indicative of a user action taken in response to the displayed image; such information can indicate, for example, that a particular button was pressed or that a particular portion of a touch-sensitive display screen was touched by the user. The portable media device can process this input to identify the action requested by the user and take the appropriate action. The action may include providing to the accessory an updated GUI image to be displayed, where the updated GUI image reflects the user action.

[0007] One aspect of the invention relates to a method for controlling a portable media device using an accessory. The accessory can provide configuration information to a portable media device. The accessory can receive from the portable media device a first image signal

that specifies a first graphical user interface image and can display the first graphical user interface image on a display device of the accessory. The accessory can detect user operation of an input control of the accessory and can send to the portable media device an input signal indicating that the input control was operated. The accessory can also receive from the portable media device a second image signal that specifies a second graphical user interface image to be displayed, the second graphical user interface image reflecting the operation of the input control and can display the second graphical user interface image on the display device of the accessory.

[0008] Another aspect of the invention relates to an accessory for providing an interface to a portable media device. The accessory can include a display, a user-operable input control, an interface configured to communicate with a portable media device, and a controller coupled to the display, the user operable input control, and the interface. The display can be configured to display an image in response to a video signal received from the portable media device. The user-operable input control can be configured to generate an input signal in response to user operation of the control. The controller can be configured to receive an image signal defining a first graphical user interface image from the portable media device via the interface; to display the first graphical user interface image on the display, to receive a control signal from the user operable input control indicating a user operation, and to communicate the control signal to the portable media device via the interface.

[0009] Another aspect of the invention relates to a method for controlling a portable media device using an accessory. The portable media device can receive configuration information from the accessory. Based in part on the configuration information, the portable media device can generate a first graphical user interface image. The portable media device can send to the accessory a first image signal that specifies the first graphical user interface image; the accessory can display the first graphical user interface image on a display device of the accessory in response to the first image signal. The portable media device can receive from the accessory an input signal indicating that a user input control of the accessory was operated. Based in part on the input signal, the portable media device can generate a second graphical user interface image and can send to the accessory a second image signal that specifies the second graphical user interface image; the accessory can display the second graphical user interface image on a display device of the accessory in response to the second image signal.

[0010] Another aspect of the present invention relates to a portable media device for use with an accessory. The portable media device can include a native user interface including a display and a user input control device, an accessory interface configured to communicate with an accessory, and a processor coupled to the native user interface and the accessory interface. The processor can be configured to provide a graphical user interface image to the accessory via the accessory interface; to receive a control signal from the accessory via the accessory interface, the control signal indicating operation of an input control of the accessory in response to the graphical user interface image; and to perform a media device operation in response to the control signal.

[0011] The following detailed description together with the accompanying drawings will provide a better understanding of the nature and advantages of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. 1A illustrates a portable media device, and FIGS. 1B and 1C illustrate accessory devices with remote graphical user interfaces for the portable media device of FIG. 1A according to embodiments of the present invention.

[0013] FIG. 2 is a block diagram of a system including a portable media device and an accessory according to an embodiment of the present invention.

[0014] FIG. 3 is a flow diagram of a process that can be used to provide a remote graphical user interface for a portable media device on an accessory device according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0015] Embodiments of the present invention relate to providing a graphical user interface ("GUI") on a remote control accessory device that is defined and managed by a portable media device rather than the accessory device. The accessory device provides a combination of user input and visual feedback devices, such as a video screen for presenting information and feedback to a user, along with buttons, knobs, touchscreen and/or touchpad for receiving user input. The portable media device can provide the accessory with an image to be displayed on the video screen; the image can include various user interface elements that can resemble or replicate the GUI provided directly on the portable media device. The accessory can send information to the portable media device indicative of a user action taken in

response to the displayed image; such information can indicate, for example, that a particular button was pressed or that particular portion of a touch-sensitive display screen was touched by the user. The portable media device can process this input to identify the action requested by the user and take the appropriate action. The action may include providing to the accessory an updated GUI image to be displayed, where the updated GUI image reflects the user action.

[0016] FIGS. 1A and 1B show portable media device ("PMD") 102 and accessory 104 according to an embodiment of the present invention. In FIG. 1A, PMD 102 has a user interface that can include display screen 106 and user input device 108 (e.g., a click wheel as found on certain iPod™ media players manufactured and sold by Apple Inc., assignee of the present application). Display screen 106 can present a GUI image to the user, and the user can interact with the GUI image by operating user input device 108. Thus, for example, the user can navigate a database of stored media content, select one or more media assets to be played, control playback, and adjust settings of PMD 102. The interface provided by display screen 106 and input device 108 is referred to herein as the "native GUI" of PMD 102.

[0017] FIG. 1A shows an example of a native GUI image that can be displayed by one embodiment of PMD 102. In this example, native GUI image 101 includes an album name ("ALBUM") at the top and a listing of tracks beneath. A currently selected track ("Track 5") is highlighted. Up and down arrows 105, 107 indicate that scrolling to view additional tracks is possible, and a slider element 109 indicates the approximate position of the currently selected track within the list of tracks.

[0018] PMD 102 also has a connector 110 disposed on its bottom surface 112. Connector 110 provides a mechanical and electrical coupling to other devices.

[0019] Referring to FIG. 1B, accessory device (also referred to as "accessory") 104 can be an in-vehicle media control unit that can be installed in a dashboard of a vehicle such as an automobile, on a vehicle seat back (e.g., in an automobile or airplane), or elsewhere. Accessory 104 can include display 114 and buttons 116a-h arranged near the edges of display 114. Buttons 116 can provide "soft keys" whose function can be interpreted by accessory 104 based on what is currently displayed on display 114.

[0020] In operation, accessory 104 can play media content. For example, accessory 104 can display video content on display 114 and/or deliver the video content to another display device (e.g., on the back of a driver or passenger seat). Accessory 104 can deliver audio

content to the vehicle's speaker system. Accessory 104 can also provide control for other functionality; for example, accessory 104 may provide environmental controls (heater, air conditioning); navigation-related controls (interactive maps, driving directions); controls for a radio tuner, DVD player, or the like; and so on.

[0021] Accessory 104 can also include a docking bay 118 adapted to receive PMD 102. For example, docking bay 118 can be sized and shaped to receive at least the bottom portion of PMD 102 and can include a connector 120 that mates with connector 110 of PMD 102, thereby allowing electrical signals to be transmitted back and forth between PMD 102 and accessory 104. In an alternative embodiment, PMD 102 and accessory 104 can each be equipped with a wireless communication interface (e.g., an interface implementing Bluetooth standards), thereby allowing the two devices to exchange information without a direct physical connection being made.

[0022] In accordance with an embodiment of the present invention, when PMD 102 of FIG. 1A is connected to accessory 104 of FIG. 1B, accessory 104 can enter a "remote GUI" operating mode. In this operating mode, PMD 102 can provide a GUI image to accessory 104. Accessory 104 can display the image on display 114. This remote GUI image can be displayed as received, without modification by accessory 104, thereby allowing PMD 102 to control the look of the interface. In some embodiments, PMD 102 provides a remote GUI image that replicates the native GUI of PMD 102. In other embodiments, PMD 102 can provide a remote GUI image that conforms to a modified version of the native GUI. For example, the modified GUI may use different fonts or color schemes, or may include additional or different control options.

[0023] In FIG. 1B, display 114 of accessory 104 displays an example remote GUI image 111. Like native GUI image 101 shown in FIG. 1A, remote GUI image 111 includes an album name ("ALBUM") at the top and a listing of tracks beneath. A currently selected track ("Track 5") is highlighted. Up and down arrows 113, 115 indicate that scrolling to view additional tracks is possible, and a slider element 117 indicates the approximate position of the currently selected track within the list of tracks. Up arrow 113 and down arrow 115 are placed adjacent to buttons 116e and 116h, respectively, thereby indicating that button 116e can be used to move up the list while button 116h can be used to move down the list. As described below, the mapping of operations to buttons 116a-h can be determined by PMD 102. When a user presses one of buttons 116a-h, accessory 104 can send to PMD 102 a

signal indicating which of buttons 116a-h was pressed. PMD 102 can interpret the signal and take appropriate action. The action may include updating the remote GUI image, starting or pausing playback, modifying a setting or instructing accessory 104 to modify a setting, etc.

[0024] Remote GUI image 111 on display 114 of accessory 104 can also include additional elements not found on native GUI image 101. For example, remote GUI image 111 includes GUI elements indicating a "Play" operation (element 119) and an "Exit" operation (element 121). Elements 119 and 121 are positioned next to buttons 116a and 116d, respectively, to indicate that the corresponding operations can be invoked by pressing the adjacent button. In this example, the user can press button 116a to indicate that the currently selected track should be played. The user can press button 116d to indicate that accessory 104 should exit the remote GUI mode, allowing the user to access other functionality (e.g., navigation, climate control, etc.). Interfaces for such other functionality might or might not also be controlled by PMD 102. In some embodiments, exiting the remote GUI mode does not disconnect accessory 104 from PMD 102; for example, PMD 102 and accessory 104 can continue playing a media track while the other functionality of accessory 104 is accessed.

[0025] FIG. 1C illustrates accessory 150 according to another embodiment of the present invention. Like accessory 104, accessory 150 can be an in-vehicle media control unit. Accessory 150 includes display 152 and docking bay 154 adapted to receive a PMD such as PMD 102 of FIG. 1A. In this example, docking bay 154 includes a connector 156 that mates with connector 110 of PMD 102, thereby allowing electrical signals to be transmitted back and forth between PMD 102 and accessory 150. In an alternative embodiment, PMD 102 and accessory 150 can each be equipped with a wireless communication interface (e.g., an interface implementing Bluetooth standards), thereby allowing the two devices to exchange information without a direct physical connection being made.

[0026] Display 152 of accessory 150 has a touch-sensitive overlay such that when a user touches a portion of display 152, the touched portion can be identified, e.g., using (x, y) pixel coordinates. A user can touch an element of the displayed GUI image to select an action to be taken, as suggested by hand 158. In other embodiments, the touch-sensitive overlay of display 152 can also detect finger motions such as dragging along the surface, or opening or closing fingers.

[0027] Like accessory 104 of FIG. 1B, when PMD 102 is connected to accessory 150, accessory 150 can enter a remote GUI operating mode and can display a remote GUI image

151 provided by PMD 102. Like remote GUI image 111 in FIG. 1B, remote GUI image 151 can be a modified version of native GUI image 101 of FIG. 1A. Remote GUI image 151 includes an album name ("ALBUM") at the top and a listing of tracks beneath. A currently selected track ("Track 5") is highlighted. Up and down arrows 153, 155 indicate that scrolling to view additional tracks is possible, and a slider element 157 indicates the approximate position of the currently selected track within the list of tracks. In this instance, the user can touch an area of the screen to select the corresponding action. Thus, for example, as shown in FIG. 1C, the user (hand 158) can touch down arrow 155 to advance the selection through the list (e.g., from "Track 5" to "Track 6").

[0028] Remote GUI image 151 can also include additional elements not found on native GUI image 101. For example, remote GUI image 151 includes GUI elements indicating a "Play" operation (element 159), a "Back" operation (element 161), and an "Exit" operation (element 163). In this example, the user can touch "Play" element 159 to indicate that the currently selected track should be played. The user can touch "Back" element 161 to navigate backward in the database hierarchy (e.g., to a list of albums from which the currently displayed album was selected). The user can touch "Exit" element 163 to indicate that accessory 150 should exit the remote GUI mode, allowing the user to access other functionality (e.g., navigation, climate control, etc.). As noted above, interfaces for such other functionality might not be controlled by PMD 102. Also as noted above, exiting the remote GUI mode need not disconnect accessory 150 from PMD 102; for example, PMD 102 and accessory 150 can continue playing a media track while the other functionality is accessed.

[0029] As described below, the mapping of GUI elements to screen areas can be determined by PMD 102. When a user touches a portion of display screen 152, accessory 154 can simply send to PMD 102 a signal indicating which portion of the screen was touched (e.g., pixel coordinates of the touched location). PMD 102 can interpret the signal and take appropriate action. The appropriate action may include updating the remote GUI image, starting or pausing playback, modifying a setting or instructing accessory 104 to modify a setting, etc.

[0030] At different times, PMD 102 of FIG. 1A can be coupled to different accessories. Thus, for example, at one time PMD 102 can be coupled to accessory 104 of FIG. 1B and can provide a remote GUI suitable for use with an interface where the user input devices are

buttons 116a-h. At a different time, PMD 102 can be coupled to accessory 150 of FIG. 1C and can provide a remote GUI suitable for use with a touchscreen interface. Because the remote GUI is under the control of PMD 102, a user can interact with PMD 102 directly or through various accessories and experience a generally consistent interface from one configuration to the next. Such consistency can help to make the use of different interfaces, as well as the transition from one accessory to another, more intuitive for the user.

[0031] It will be appreciated that the systems of FIGS. 1A-1C are illustrative and that variations and modifications are possible. A variety of portable media devices may be used, not limited to PMD 102, and the native GUI may vary from one device to the next. For instance, some PMDs may provide touch-screen interfaces, graphic representations of content listings (e.g., incorporating images of album covers), animated GUI images, or other features not specifically illustrated herein. Some PMDs may also incorporate other functionality in addition to media asset storage, search, and playback. Examples include personal information management (e.g., calendar, contacts); telephony (e.g., via mobile phone network); Internet connectivity (e.g., via wireless communication protocols such as the IEEE 802.11 family of standards); maps and navigation; and so on. The PMD may provide remote GUI interactivity for any or all of its functions, and the combination of functions available may vary depending on the accessory. (For example, to avoid driver distraction, it might be desirable to disable Internet browsing or video playback in a moving automobile.)

[0032] A remote GUI mode can be provided in a variety of accessories. For example, in addition to in-vehicle systems, a PMD interface with remote GUI can be provided in a console on an exercise machine (such as a treadmill, stationary bicycle, or the like), in an in-flight entertainment console of a commercial or private airplane, in a home entertainment system incorporating a video device such as a television (e.g., using a set top box or an integrated component of the video display device to provide an interface to the PMD), and so on.

[0033] FIG. 2 is a block diagram of system 200 according to an embodiment of the present invention. System 200 can include PMD 202 (e.g., implementing PMD 102 of FIG. 1A) and accessory 220 (e.g., implementing accessory 104 of FIG. 1B or accessory 150 of FIG. 1C).

[0034] PMD 202 in this embodiment can provide media player capability. PMD 202 can include processor 204, storage device 206, user interface 208, and accessory input/output (I/O) interface 214. Processor 204 in this embodiment can be a programmable processor that

executes programs to implement operations such as playback of media tracks and browsing a database of stored media assets, as well as a native GUI to provide user control over the implemented operations. Processor 204 can also implement a remote GUI program that generates remote GUI images for accessory 220 and processes user input forwarded by accessory 220, as described below.

[0035] Storage device 206 may be implemented, e.g., using disk, flash memory, or any other non-volatile storage medium. In some embodiments, storage device 206 can store a database of media assets (also referred to herein as "tracks"), such as audio, video, still images, or the like, that can be played by PMD 202, together with metadata descriptive of each track. Metadata can include, e.g., a media type (audio track, video track, audio book, still image, etc.); an asset title; a name of an artist or performer associated with the asset; composer or author information; asset length; chapter information; album information; lyrics; information about associated artwork or images; description of the asset; and so on. Other information, including programs to be executed by processor 204, can be stored in storage device 206.

[0036] User interface 208 may include one or more input controls 207 such as a touch pad, touch screen, scroll wheel, click wheel, dial, button, keypad, microphone, or the like, as well as display screen 209. Other components, such as an audio output section (not explicitly shown) can also be included. A user can view native GUI images generated by processor 204 on display screen 209 and can operate input controls 207 based on the displayed image to invoke the functionality of PMD 202. Processor 204 can process the user input and take appropriate action, including updating the native GUI image on display screen 209. Thus, user interface 208 and processor 204 can provide a native GUI for PMD 202.

[0037] Accessory I/O interface 214 can allow PMD 202 to communicate with various accessories. For example, accessory I/O interface 214 can support connections to such accessories as an in-vehicle media system or the like. In one embodiment, accessory I/O interface 214 includes a 30-pin connector corresponding to the connector used on iPod™ products manufactured and sold by Apple Inc. or one or more other connectors, such as a Universal Serial Bus ("USB") or FireWire connector. Alternatively or additionally, accessory I/O interface 214 can include a wireless interface (e.g., Bluetooth or the like). Accessory I/O interface 214 can allow PMD 202 to communicate with accessory 220 or another accessory.

[0038] Accessory 220 includes controller 224, one or more input controls 222, display 232, PMD I/O interface 226, environmental and status input interface 228, and audio output section 230. Controller 224 can include, e.g., a microprocessor or microcontroller executing program code to perform various functions such as digital audio decoding, analog or digital audio and/or video processing, and the like. Input controls 222 can include, e.g., a touch pad, touch screen, scroll wheel, click wheel, dial, button, keypad, microphone, or the like. Display 232 can be used to present operational or control information as well as video content to the user; in some embodiments, display 232 can be implemented as a multi-screen display system, and the images shown on different screens might be the same or different. Thus, for example, one screen can be used for operational or control information while another screen is used for presenting video content. In still other embodiments, operational or control information can be overlaid or composed with video content, allowing a user to view both simultaneously on the same screen.

[0039] Accessory 220 can be operable in a "local GUI" mode as well as a remote GUI mode. In the local GUI mode, controller 224 can generate GUI images to be displayed on display 232 and can receive and process user input from input controls 222, thereby allowing a user to control various operations of accessory 220. In the remote GUI mode, GUI images can be generated by processor 204 of PMD 202, delivered via accessory I/O interface 214 and PMD I/O interface 226 to controller 224, and displayed on display 232. Controller 224 can detect user operation of input controls 222 and send corresponding signals to PMD 202 via PMD I/O interface 226 and accessory I/O interface 214. Processor 204 of PMD 202 can process the signals to determine what action the user has requested; depending on the user request, processor 204 can generate an updated remote GUI image to be displayed by display 232, generate other instructions to controller 224, or invoke other operations of PMD 202 (such as beginning or ending playback, searching the database of stored assets, etc.).

[0040] Audio output device 230, which can be implemented, e.g., as one or more integrated circuits, provides the capability to output audio. For example, audio output device 230 can include one or more speakers or driver circuits and connectors for external speakers, thereby enabling audio to be presented to a user. In one embodiment, controller 224 can receive audio signals from PMD 202 via PMD I/O interface 226 and can provide the signals with or without further processing to audio output device 230; audio output device 230 can transform the signals as appropriate for presentation to the user.

[0041] Environmental and status input interface 228 can include communication pathways to other systems of the equipment in which accessory 220 is installed, allowing these systems to provide accessory 220 with information about the operating environment and/or status. For example, if accessory 220 is installed in an automobile, environmental status input interface 228 may receive information indicating whether the automobile's headlights are on or off, what gear the vehicle is currently in, whether a parking brake is engaged, current vehicle speed, etc. If accessory 220 is installed in an exercise machine, environmental status input interface 228 may receive information indicating whether the machine is in use and information about the current status of a workout when one is in progress. Accessory 220 can provide this information to PMD 202, and PMD 202 can use the information to customize the remote GUI images and functionality to the operating environment, as described below.

[0042] Accessory 220 can be any accessory that provides a display and one or more associated user input controls. Examples include in-vehicle media units that can be mounted, e.g., in a dashboard or seat back, consoles that may be provided on exercise equipment, airplane in-flight entertainment systems (e.g., mounted in a seatback, armrest, or console unit), home entertainment systems, and so on. In one embodiment, PMD I/O interface 226 includes a 30-pin connector that mates with the connector used on iPod™ products manufactured and sold by Apple Inc. PMD I/O interface 226 can also include other types of connectors, e.g., Universal Serial Bus (USB) or FireWire connectors. Alternatively, PMD I/O interface 226 can include a wireless interface (e.g., Bluetooth or the like).

[0043] It will be appreciated that the system configurations and components described herein are illustrative and that variations and modifications are possible. The PMD and/or accessory may have other capabilities not specifically described herein. Further, while the PMD and accessory are described herein with reference to particular blocks, it is to be understood that these blocks are defined for convenience of description and are not intended to imply a particular physical arrangement of component parts. Further, the blocks need not correspond to physically distinct components. Embodiments of the present invention can be realized in a variety of devices including electronic devices implemented using any combination of circuitry and software.

[0044] Accessory I/O interface 214 of PMD 202 and PMD I/O interface 226 of accessory 220 allow PMD 202 to be connected to accessory 220 and subsequently disconnected from

accessory 220. As used herein, PMD 202 and accessory 220 are "connected" whenever a communication channel between accessory I/O interface 214 and PMD I/O interface 226 is open and are "disconnected" whenever the communication channel is closed. Connection can be achieved by physical attachment (e.g., between respective mating connectors of PMD 202 and accessory 220), by an indirect connection such as a cable, or by establishing a wireless communication channel. Similarly, disconnection can be achieved by physical detachment, disconnecting a cable, powering down accessory 220 or PMD 202, or closing the wireless communication channel. Thus, a variety of communication channels may be used, including wired channels such as USB, FireWire, or universal asynchronous receiver/transmitter ("UART"), or wireless channels such as Bluetooth.

[0045] Regardless of the particular communication channel, as long as PMD 202 and accessory 220 are connected to each other, the devices can communicate by exchanging commands and data according to a protocol. The protocol defines a format for sending messages between PMD 202 and accessory 220. For instance, the protocol may specify that each message is sent in a packet with a header and an optional payload. The header provides basic information (e.g., a start indicator, length of the packet, and a command to be processed by the recipient), while the payload provides any data associated with the command; the amount of associated data can be different for different commands, and some commands may provide for variable-length payloads. In some embodiments, the commands may be defined such that a particular command is valid in only one direction. The packet can also include error-detection or error-correction codes as known in the art.

[0046] The protocol can define a number of "lingoes," where a "lingo" is a group of related commands that can be supported (or unsupported) by various classes of accessories. In one embodiment, a command can be uniquely identified by a first byte identifying the lingo to which the command belongs and a second byte identifying the particular command within the lingo. Other command structures may also be used. It is not required that all accessories, or all PMDs to which an accessory can be connected, support every lingo defined within the protocol.

[0047] In some embodiments, every accessory 220 and every PMD 202 that are designed to be interoperable with each other support at least a "general" lingo that includes commands common to all such devices. The general lingo can include commands enabling the PMD and the accessory to identify and authenticate themselves to each other and to provide general

information about their respective capabilities, including which (if any) other lingoes each supports. The general lingo can also include authentication commands that the PMD can use to verify the purported identity and capabilities of the accessory (or vice versa), and the accessory (or PMD) may be blocked from invoking certain commands or lingoes if the authentication is unsuccessful.

[0048] A command protocol supported by PMD 202 and accessory 220 can include a "remote GUI" lingo (or other group of commands) that can be used to communicate commands and data related to permitting a user to control the operation of PMD 202 via a remote GUI provided on accessory 220. The remote GUI lingo can include commands that accessory 220 can send to PMD 202 to provide information about the configuration of 232 and input controls 222, as well as environmental information (such as where accessory 220 is installed, operational status of a vehicle or other equipment in or on which accessory 220 is installed, etc.). The remote GUI lingo can also include commands used by PMD 202 to deliver GUI image data to accessory 220 and commands used by accessory 220 to forward user input signals to PMD 202. Examples are described below.

[0049] Commands that can be used to implement a remote GUI according to an embodiment of the invention will now be described. In one embodiment, the commands can include commands usable to provide a PMD with information about the configuration of an accessory's display device and user input control(s). The commands can also include commands usable to provide the PMD with information about the environment in which the accessory operates and any special requirements of the accessory, such as logos or other content to be included in the remote GUI image. The commands can also include a command used to send remote GUI image data to the accessory and a command used to send user input information to the PMD.

[0050] In some embodiments, a *SetDisplayInfo* command can be sent by accessory 220 to PMD 202 to provide information about display 232. In one embodiment, the information can include any or all of: the display dimensions (e.g., in pixels) of a display device, color depth information for the display device (e.g., whether the display is color or black and white, the number of distinct color values supported, etc.); the display format of the display device (e.g., analog or digital input); and the refresh rate of the display device. It is to be understood that any other information useful to configuring an image may be provided to PMD 202. In some embodiments, accessory 220 may provide multiple display devices, and the information

provided to PMD 202 may include the number of display devices as well as separate configuration information for each display device.

[0051] In some embodiments, a *SetControlInfo* command can be sent by accessory 220 to PMD 202 to provide information about the type, number and location of user input controls 222. In one embodiment, the command can first identify the number of controls. Then, for each control, the command can identify the type (e.g., button, knob, touchscreen) and approximate location of the control.

[0052] In some embodiments, a *SetEnvInfo* command can be sent by accessory 220 to PMD 202 to provide information about the environment in which accessory 220 operates. For instance, the environmental information can include information as to where accessory 220 is installed, e.g., vehicle dashboard, airplane in-flight entertainment system; exercise equipment console, home entertainment system, etc.

[0053] In some embodiments, a *SetEnvImage* command can be sent by accessory 220 to PMD 202 to provide an image element that can be included in a remote GUI image. For example, the image element might be a logo associated with the manufacturer or provider of accessory 220 (or of a vehicle or other equipment in which accessory 220 is installed). As described below, PMD 202 can reserve an area of the remote GUI image for displaying an accessory-supplied image.

[0054] In some embodiments, a *SetStatusInfo* command can be sent by accessory 220 to PMD 202 to provide information about the status of the operating environment. For example, if accessory 220 is installed in an automobile dashboard, status information may include information such as whether the automobile is in motion (or in gear); whether it is day or night (e.g., whether the automobile's headlights are off or on); whether navigational route guidance is in progress; etc. If accessory 220 is installed in an exercise machine such as a treadmill, status information may include information such as whether the machine is currently in use as well as workout data such as elapsed or remaining time, calories burned, heart rate, current speed, or the like. As described below, status information provided by the accessory can be used by PMD 202 to augment the remote GUI images with status information, to adjust the appearance of the remote GUI images based on the current status, and/or to limit access to certain features (such as video playback) in a status-dependent manner.

[0055] In some embodiments, a *RemoteGUIImageData* command can be sent by PMD 202 to accessory 220 to deliver pixel data for a remote GUI image to accessory 220. The command can include pixel data for a portion or all of display 232. In some embodiments, a command packet may have a maximum size, which can limit the amount of pixel data that can be sent with a single *RemoteGUIImageData* command. In this case, PMD 202 can use multiple *RemoteGUIImageData* commands to send the pixel data; each command may include a parameter identifying the portion of the display to which the pixel data applies. Any format suitable for sending pixel data, including compressed formats, can be used. In other embodiments, accessory I/O interface 214 of PMD 202 can incorporate a video output interface, which can be analog or digital, and the remote GUI image can be delivered to accessory 220 through the video output interface rather than by sending commands.

[0056] In some embodiments a *ProcessUserInput* command can be sent by accessory 220 to PMD 202 to indicate the detection of user input in response to a remote GUI image. The command can include data indicating, e.g., which user control was operated and, if applicable, what operation was performed. For instance, for accessory 104 of FIG. 1B, the *ProcessUserInput* data can indicate which one of buttons 116a-h was pressed. For accessory 150 of FIG. 1C, the *ProcessUserInput* data can indicate pixel coordinates of a location on the screen that was touched by the user. For a user input device that can be manipulated in multiple ways (e.g., turning a knob either clockwise or counterclockwise or dragging a finger across a suitably configured touchscreen), the *ProcessUserInput* data can also indicate which manipulation of the input device was detected.

[0057] In some embodiments, an *EnterRemoteGUIMode* command can be sent from accessory 220 to PMD 202 (or vice versa) to initiate remote GUI mode operation, and an *ExitRemoteGUIMode* command can be sent from PMD 202 to accessory 220 (or vice versa) to terminate remote GUI mode operation.

[0058] It will be appreciated that the commands described herein are illustrative and that variations and modifications are possible. In some embodiments, PMD 202 can maintain a list of configuration data for known remote-GUI-enabled accessories, e.g., in storage device 206. Each configuration can be associated with a particular accessory identifier, such as manufacturer plus model name, an arbitrarily assigned code, or the like. Instead of sending configuration information commands as described above, accessory 220 can send an

identification command that provides the accessory identifier. PMD 202 can then access the stored configuration data for the accessory. This can result in faster and more efficient setup.

[0059] In other embodiments, the first time a particular accessory such as accessory 220 connects to PMD 202, the accessory can use the *SetDisplayInfo* and *SetControlInfo* commands described above to establish its configuration. PMD 202 can then assign the accessory a unique identifier, provide the assigned identifier to the accessory, and store the configuration information in storage device 206 in association with the identifier. On subsequent reconnections, the accessory can send an identification command with the unique identifier to PMD 202, and PMD 202 can access the stored configuration information.

[0060] In any of the above-described commands, information can be sent as a structured data field, e.g., with certain bytes associated with certain information types. Alternatively, the command may include a bitmask parameter used to identify the type of information being delivered, and the data can be interpreted by the recipient in accordance with the bitmask.

[0061] Further, the set of commands can also include commands sent by PMD 202 to request any of the available information types, as well as commands sent by PMD 202 to acknowledge receipt of the information-setting commands from accessory 220. In some embodiments, some information can be sent by accessory 220 either in response to a request from PMD 202 or without waiting for a request, e.g., in response to changed conditions. For instance, if accessory 220 is installed in a vehicle with automatic transmission, accessory 220 might send a *SetStatusInfo* command when it detects that the vehicle is shifted into or out of Park. Alternatively, accessory 220 might monitor the vehicle's speed and send a *SetStatusInfo* command reporting the current speed, either periodically or when it detects that the vehicle's speed crosses above or below a predetermined threshold. In one embodiment, video operation can be enabled or disabled depending on whether the vehicle's speed is above or below the threshold; the threshold can be set to zero or a slow speed such as 5 miles per hour.

[0062] FIG. 3 is a flow diagram of process 300 that can be used to provide a remote GUI for PMD 202 on accessory device 220 according to an embodiment of the present invention. Process 300 starts (step 302) when accessory 220 becomes connected to PMD 202. At step 304, accessory 220 is identified and authenticated. Conventional techniques for identifying and authenticating an accessory, e.g., by exchanging commands and associated data, can be used. Step 304 can also include determining whether remote GUI mode is to be

entered; for example, accessory 220 can send the *EnterRemoteGUIMode* command described above.

[0063] At step 306, accessory 220 can provide configuration, environment and/or status information to PMD 202. In one embodiment, any combination of the *SetDisplayInfo*, *SetControlInfo*, *SetEnvInfo*, and *SetStatusInfo* commands described above can be used. Accessory 220 can also provide an accessory-specific (or environment-specific) image element to PMD 202, e.g., using the *SetEnvImage* command described above. In some embodiments, some or all of the configuration and environment information for accessory 220 can be pre-stored in PMD 202 as described above, and step 306 may include PMD 202 using the accessory identification obtained during step 304 to access the pre-stored configuration and environment information. Accessory 220 can also supplement or override any pre-stored information with new information using the commands described above.

[0064] At step 308, PMD 202 generates an initial remote GUI image using the information provided at step 306. In one embodiment, PMD 202 can apply various rules to adapt the native GUI image to the configuration of accessory 220 and/or to the status or environment of accessory 220. Such rules can be incorporated into a control program executed by processor 204 to generate remote GUI images.

[0065] For instance, the remote GUI can be adapted to the particular configuration of the accessory's display 232. For example, the size (in pixels) of accessory display 232 of FIG. 2 might be different from the size of PMD display 209. PMD 202 can modify the native GUI image by changing the size of image elements, changing the number of elements displayed, or both. Further, the aspect ratio (height to width) of accessory display 232 may be different from that of PMD display 209, and PMD 202 may arrange the elements of the remote GUI image to optimize use of the available space. In still another example, the color depth of accessory display 232 might also be different from that of PMD display 209, and PMD 202 can adjust the color settings for various image elements to produce a visually pleasing appearance.

[0066] Additionally, as noted above, accessory 220 may supply an image element to PMD 202. PMD 202 can determine a size and position for the accessory-supplied image element with in the remote GUI image. The element might be small, such as a logo in a corner of the display area, or it can be larger as desired.

[0067] The remote GUI can also be adapted to the particular configuration of the accessory's user input controls 222. For example, if accessory input control 222 provides a touch screen (e.g., as shown in FIG. 1C), GUI elements can be placed anywhere within the active area of the touch screen. If accessory input control 222 provides an array of buttons (e.g., as shown in FIG. 1B), active GUI elements can be placed near the button that is mapped to that element. PMD 202 can determine the mapping of GUI elements to buttons or other input controls and arrange the elements accordingly within the display area.

[0068] In some embodiments, PMD 202 can adapt the remote GUI to the environment of accessory 220. For example, if accessory 220 is incorporated into a dashboard console for an automobile, it may be desirable to adapt the remote GUI image for ease of use by a driver. Accordingly, PMD 202 can select different fonts or font sizes to make remote GUI elements and displayed information larger and easier to read. PMD 202 may also simplify the GUI, e.g., omitting animations or reducing the number and/or complexity of GUI elements, to minimize driver distraction. In contrast, for an accessory that is mounted on an exercise machine, user distraction may be less of a concern, and PMD 202 can provide complex or animated remote GUI images.

[0069] In another example, the native GUI of PMD 202 may use a light background with dark text and highlighting. This can provide good visibility in daylight, but when driving at night, the resulting brightness might be distracting. In some embodiments PMD 202 can adapt the color scheme depending on whether accessory 220 is in day or night mode — e.g., selecting bright text and dark backgrounds for nighttime use, or dark text and bright backgrounds for daytime use. Day or night mode can be selected based on status information provided by accessory 220, or in some embodiments, the remote GUI can incorporate a user-settable option to select day or night mode.

[0070] As another example, PMD 202 may use environment and/or status information to determine which options should be made available in the remote GUI. For example, PMD 202 may provide video playback capability and may be able to send video content to accessory 220 for display. But playing video on a console visible to the driver of a moving automobile is hazardous. To mitigate this hazard, accessory 220 can provide status information indicating, e.g., whether the automobile is in motion (or in gear) at a given time. PMD 202 can use this status information to determine whether it is safe to allow video playback. If not, video playback options can be omitted from the remote GUI image or

shown in a disabled state. Thus, for instance, PMD 202 can enable video playback only when an automobile is in "Park," only when the parking brake is engaged, or only when the vehicle's speed is below a particular threshold (such as 5 miles per hour).

[0071] In some embodiments, PMD 202 can incorporate status information into the remote GUI. For example, if accessory 220 is incorporated into a console for an exercise machine, accessory 220 can provide PMD 202 with information about a workout in progress as noted above. PMD 202 can incorporate this information into the remote GUI image, allowing a user to monitor the progress of his or her workout while manipulating the remote GUI or playing video content. In embodiments where accessory 220 provides an image element (such as a logo), PMD 202 can incorporate the image element into the remote GUI. For example, PMD 202 may be programmed to reserve a portion of a remote GUI image for an accessory-supplied image element and may insert the accessory-supplied element into the reserved portion in any or all remote GUI images. PMD 202 can resize the accessory-supplied image element as needed to make it fit within the reserved area. (If the accessory does not supply an image element, the reserved portion can be left blank or filled with a default image element.)

[0072] Referring again to FIG. 3, at step 310, PMD 202 can send the remote GUI image to accessory 220. For example, PMD 202 can send the image using an analog or digital video output interface provided by accessory I/O interface 214 and PMD I/O interface 226 of FIG. 2. (The same video interface can also be used for delivering video content to accessory 220.) Alternatively, PMD 202 can use the *RemoteGUIImageData* command described above. At step 312, accessory 220 can display the remote GUI image. In some embodiments, accessory 220 displays the image as received and does not modify it; thus, PMD 202 can control the look and feel of the remote GUI. Steps 310 and 312 can be repeated until user input is detected; for example, PMD 202 can repeatedly send the same remote GUI image at the refresh rate of the display device of accessory 220.

[0073] At step 314, accessory 220 detects user operation of one of input controls 222. At step 316, accessory 220 can forward the user input to PMD 202, e.g., using the *ProcessUserInput* command described above. As noted above, the command can indicate which control was operated and, if applicable, the nature of the operation. Accessory 220 can forward the user input without processing it to identify a responsive action to be taken; instead, accessory 220 can simply forward an identification of the detected user action.

[0074] At step 318, PMD 202 can process the user input to determine an operation (or action) to be performed in response. At step 320, if the operation does not correspond to exiting the remote GUI mode, process 300 proceeds to step 322, where PMD 202 performs the operation requested by the user. Any operation made accessible through the remote GUI image can be performed, such as starting playback, pausing playback, adjusting settings, browsing or searching a database, and so on. Performing some operations may involve sending commands from PMD 202 to accessory 220 (e.g., to change settings such as volume, display brightness, etc.). Performing other operations (e.g., playback) may involve sending media content from PMD 202 to accessory 220. Still other operations (e.g., database queries) can be performed by PMD 202 without sending commands or content to accessory 220. At step 324, PMD 202 can generate an updated remote GUI image based on the selected operation. Process 300 can then return to step 312 to display the updated remote GUI image. It should be noted that some operations, such as playback, can be ongoing, and a playing track (or sequence of tracks) can continue to play while process 300 iterates. (Playback can be stopped, e.g., by the user selecting a pause or stop operation, which selection can be processed using process 300.)

[0075] Process 300 can continue until such time as a user selects an operation that entails exiting remote GUI mode at step 320. At that point, process 300 ends (step 326). In some embodiments, PMD 202 can signal accessory 220 that the remote GUI mode is ending, e.g., using the *ExitRemoteGUIMode* command described above. Thereafter, accessory 220 can return to its local GUI operating mode.

[0076] In some embodiments, PMD 202 can remain connected to accessory 220 after exiting remote GUI mode. Thus, PMD 202 can continue to send media content to accessory 220, so that a playing track can continue to play even after remote GUI mode is exited. Thus, for example, if accessory 220 is incorporated into a console of an exercise machine, the user may exit the remote GUI to change workout settings while a song or video continues to play. As another example, if accessory 220 is incorporated into an automobile dashboard console that also provides navigation functionality, the user can exit remote GUI mode to perform navigation operations while music continues to play.

[0077] Further, in some embodiments, the local GUI of accessory 220 can support a user input that, when selected, instructs accessory 220 to re-enter remote GUI mode. Because PMD 202 remains connected, accessory 220 can send an *EnterRemoteGUIMode* command in

response to detecting this user input. Thus, the user can enter and exit the remote GUI mode as desired, controlling PMD 202 through the remote GUI mode and controlling other features of accessory 220 through the local GUI mode.

[0078] It will be appreciated that process 300 is illustrative and that variations and modifications are possible. Steps described as sequential may be executed in parallel, order of steps may be varied, and steps may be modified or combined. Commands and communication protocols other than those described herein can be implemented to allow a portable media device to provide a remote GUI image to an accessory and to process user input responsive to the remote GUI image.

[0079] While the invention has been described with respect to specific embodiments, one skilled in the art will recognize that numerous modifications are possible. For example, although embodiments described above may make specific reference to playback of media content, a portable media device may also provide other functionality such as personal information management, mobile telephony, and so on. In other embodiments, any of this functionality can be made accessible through a remote GUI. Thus, for example, another remote GUI implementation may provide a hands-free telephone interface, e.g., for the driver of an automobile. The driver can operate the remote GUI to answer or place telephone calls, and the call can be conducted using a speaker and microphone controlled by the accessory, together with the mobile phone connection of the PMD. The remote GUI for telephony can resemble the PMD's native GUI for telephony, thus providing the user with a more intuitive interface and potentially reducing distraction related to operating an unfamiliar remote interface.

[0080] In addition, embodiments described above may make reference to a portable media device supplying the entire image that is displayed on the accessory. In one alternative embodiment, the remote GUI image supplied by the portable media device can be displayed in a portion of the accessory's display screen while image data from other sources is displayed in other portions of the screen. For example, an accessory may designate a rectangular area within the display device for the remote GUI. The portable media device can deliver pixel data (e.g., in digital or analog form) for the remote GUI area of the display while the accessory determines the pixels for the rest of the display. For example, the accessory can use a portion of the display for displaying navigation information while another portion is used for the remote GUI. For portions of the display not in the remote GUI

area, the portable media device can provide placeholder data (e.g., black pixels in an analog video stream) or no data. (If the accessory has a touchscreen as a user input control, the accessory can selectively forward user input signals indicating a touched portion of the screen to the media player based on whether the touched portion is inside or outside the remote GUI area.)

[0081] While the embodiments described above may make reference to specific hardware and software components, those skilled in the art will appreciate that different combinations of hardware and/or software components may also be used and that particular operations described as being implemented in hardware might also be implemented in software or vice versa.

[0082] Computer programs incorporating various features of the present invention may be encoded on various computer readable media for storage and/or transmission; suitable media include magnetic disk or tape, optical storage media such as compact disk (CD) or DVD (digital versatile disk), flash memory, and the like. Computer readable media encoded with the program code may be packaged with a compatible device or provided separately from other devices (e.g., via Internet download).

[0083] Thus, although the invention has been described with respect to specific embodiments, it will be appreciated that the invention is intended to cover all modifications and equivalents within the scope of the following claims.

WHAT IS CLAIMED IS:

1. A method for controlling a portable media device using an accessory, the method comprising, by the accessory:

providing configuration information to a portable media device;

receiving from the portable media device a first image signal that specifies a first graphical user interface image;

displaying the first graphical user interface image on a display device of the accessory;

detecting user operation of an input control of the accessory;

sending to the portable media device an input signal indicating that the input control was operated;

receiving from the portable media device a second image signal that specifies a second graphical user interface image to be displayed, the second graphical user interface image reflecting the operation of the input control; and

displaying the second graphical user interface image on the display device of the accessory.

2. The method of claim 1 wherein the configuration information includes a parameter indicating a characteristic of the display device of the accessory, the characteristic including one or more of a display size characteristic, a color depth characteristic, a refresh rate characteristic, or a display input format characteristic.

3. The method of claim 1 wherein the configuration information includes a parameter indicating a characteristic of the input control of the accessory, the characteristic including a type of the input control.

4. The method of claim 1 wherein the configuration information includes a parameter indicating a number of input controls present on the accessory.

5. The method of claim 1 wherein the configuration information includes an accessory identifier, the accessory identifier being usable by the portable media device to determine one or more characteristics of the display device of the accessory.

6. The method of claim 1 wherein the configuration information includes an accessory identifier, the accessory identifier being usable by the portable media device to determine one or more characteristics of the user input control of the accessory.

7. The method of claim 1 further comprising, by the accessory:

providing environment information to the portable media device, the environment information indicating an operating environment of the accessory.

8. The method of claim 1 further comprising, by the accessory:

providing status information to the portable media device, the status information indicating an operational status of a system in which the accessory is installed.

9. The method of claim 8 wherein the system is an automobile and the status information indicates whether the automobile is in a parked state.

10. The method of claim 8 wherein the system is an automobile and the status information includes information about a current speed of the automobile.

11. The method of claim 8 wherein the system is an automobile and the status information indicates whether the automobile is in a daytime or nighttime driving mode.

12. The method of claim 8 wherein the system is an exercise machine and the status information indicates whether a workout is presently in progress.

13. The method of claim 12 further comprising, by the accessory:

in the event that a workout is in progress, providing to the portable media device further status information including data about the workout.

14. The method of claim 1 further comprising, by the accessory:

providing to the portable media device an image element,

wherein the image element is included by the portable media device in the first graphical user interface image.

15. An accessory for providing an interface to a portable media device, the accessory comprising:

a display configured to display an image in response to a video signal received from the portable media device;

a user-operable input control configured to generate an input signal in response to user operation of the control;

an interface configured to communicate with a portable media device; and

a controller coupled to the display, the user operable input control, and the interface,

the controller being configured to receive an image signal defining a first graphical user interface image from the portable media device via the interface; to display the first graphical user interface image on the display, to receive a control signal from the user operable input control indicating a user operation, and to communicate the control signal to the portable media device via the interface.

16. The accessory of claim 15 wherein the user operable input control includes a touch screen overlay on the display.

17. The accessory of claim 15 wherein the user operable input control includes at least one button.

18. The accessory of claim 15 wherein the user operable input control includes at least one knob.

19. The accessory of claim 15 wherein the image signal comprises an analog video signal.

20. The accessory of claim 15 wherein the image signal comprises a digital video signal.

21. The accessory of claim 15 wherein the controller is further configured to send a user interface parameter to the portable media device and wherein the user interface image is based at least in part on the user interface parameter.

22. The accessory of claim 21 wherein the user interface parameter defines a characteristic of the display, the characteristic being one of a group of characteristics consisting of a display size, a color depth, a refresh rate, and a display input format.

23. The accessory of claim 21 wherein the user interface parameter defines a characteristic of the input control, the characteristic being one of a group of characteristics consisting of a number of input controls and a type of the input control.

24. The accessory of claim 15 wherein the controller is further configured to send accessory identification information to the portable media device and wherein the user interface image is based at least in part on the accessory identification information.

25. The accessory of claim 15 wherein the controller is further configured to send environment information to the portable media device.

26. The accessory of claim 15 wherein the interface is further configured to receive media content from the portable media device.

27. The accessory of claim 26 wherein the controller is further configured to deliver a video portion of the received media content to the display.

28. The accessory of claim 26 wherein the controller is further configured to deliver an audio portion of the received media content to a speaker system.

29. The accessory of claim 15 wherein the controller is further configured to deliver to the portable media device an image element to be incorporated into the user interface image.

30. The accessory of claim 15 wherein the controller is further configured to display the first graphical image in a first portion of the display and to display a different image in a second portion of the display device.

31. A media system comprising:

an audio device configured to produce sound;

a display configured to display images;

a user-operable input control configured to generate an input signal in response to user operation of the control;

an interface configured to communicate with a portable media device; and

a controller coupled to the audio device, the display, the user operable input control, and the interface,

the controller being configured to operate the audio device and the display to play media content delivered from the portable media device via the interface,

the controller being further configured to receive an image signal defining a first graphical user interface image from the portable media device via the interface; to display the first graphical user interface image on the display, to receive a control signal from the user operable input control indicating a user operation, and to communicate the control signal to the portable media device via the interface.

32. The media system of claim 31 wherein the media system is installed in an automobile.

33. The media system of claim 31 wherein the media system is installed in an exercise machine.

34. The media system of claim 31 wherein the media system is a home entertainment system.

35. The media system of claim 31 wherein the media system is an in-flight entertainment system for an airplane.

36. A method for controlling a portable media device using an accessory, the method comprising, by the portable media device:

receiving configuration information from the accessory;

based in part on the configuration information, generating a first graphical user interface image;

sending to the accessory a first image signal that specifies the first graphical user interface image, wherein the accessory displays the first graphical user interface image on a display device of the accessory in response to the first image signal;

receiving from the accessory an input signal indicating that a user input control of the accessory was operated;

based in part on the input signal, generating a second graphical user interface image; and

sending to the accessory a second image signal that specifies the second graphical user interface image, wherein the accessory displays the second graphical user interface image on a display device of the accessory in response to the second image signal.

37. The method of claim 36 further comprising, by the portable media device:

interpreting the input signal to determine a corresponding media device operation to be performed; and

performing the media device operation.

38. The method of claim 36 wherein the configuration information includes a parameter indicating a characteristic of the display device of the accessory, the characteristic including one or more of a display size characteristic, a color depth characteristic, a refresh rate characteristic, or a display input format characteristic.

39. The method of claim 36 wherein the configuration information includes a parameter indicating a characteristic of the input control of the accessory, the characteristic including a type of the input control.

40. The method of claim 36 wherein the configuration information includes a parameter indicating a number of input controls present on the accessory.

41. The method of claim 36 wherein the configuration information includes an accessory identifier, the accessory identifier being usable by the portable media device to determine one or more characteristics of the display device of the accessory.

42. The method of claim 36 wherein the configuration information includes an accessory identifier, the accessory identifier being usable by the portable media device to determine one or more characteristics of the user input control of the accessory.

43. The method of claim 36 further comprising:

receiving environment information from the accessory, the environment information indicating an operating environment of the accessory; and

determining at least one property of the first graphical user interface image based on the environment information.

44. The method of claim 36 further comprising:

receiving status information from the accessory, the environment information indicating an operational status of a system in which the accessory is installed; and

determining at least one property of the first graphical user interface image based on the status information.

45. The method of claim 36 further comprising, by the portable media device:

receiving from the accessory an image element; and

including the image element in the first graphical user interface image.

46. A portable media device for use with an accessory, the portable media device comprising:

a native user interface including a display and a user input control device;

an accessory interface configured to communicate with an accessory; and

a processor coupled to the native user interface and the accessory interface,

the processor being configured to provide a graphical user interface image to the accessory via the accessory interface; to receive a control signal from the accessory via the accessory interface, the control signal indicating operation of an input control of the accessory in response to the graphical user interface image; and to perform a media device operation in response to the control signal.

47. The portable media device of claim 46 wherein the graphical user interface image replicates at least a portion of the native user interface.

48. The portable media device of claim 46 wherein the accessory interface includes an analog video path configured to deliver analog video signals and wherein the processor is further configured to provide the graphical user interface image as an analog video signal.

49. The portable media device of claim 46 wherein the control signal identifies one of a plurality of input controls of the accessory as having been operated by a user.

50. The portable media device of claim 46 wherein the control signal identifies a portion of a touchscreen input control of the accessory as having been touched by a user.

51. The portable media device of claim 46 wherein the processor is further configured to receive from the accessory, via the accessory interface, accessory configuration information and to generate the graphical user interface image based at least in part on the accessory configuration information.

52. The portable media device of claim 51 wherein the accessory configuration information includes a parameter indicating a characteristic of the display device of the accessory, the characteristic including one or more of a display size characteristic, a color depth characteristic, a refresh rate characteristic, or a display input format characteristic.

53. The portable media device of claim 51 wherein the accessory configuration information includes a parameter indicating a characteristic of the input control of the accessory, the characteristic including a type of the input control.

54. The portable media device of claim 51 wherein the accessory configuration information includes a parameter indicating a number of input controls present on the accessory.

55. The portable media device of claim 51 wherein the accessory configuration information includes an accessory identifier and wherein the processor is further configured to determine one or more characteristics of the display device of the accessory based on the accessory identifier.

56. The portable media device of claim 51 wherein the configuration information includes an accessory identifier and wherein the processor is further configured to determine one or more characteristics of the user input control of the accessory base don the accessory identifier.

57. The portable media device of claim 46 wherein the processor is further configured to receive environment information from the accessory via the accessory interface, the environment information indicating an operating environment of the accessory, and to determine at least one property of the graphical user interface image based on the environment information.

58. The portable media device of claim 46 wherein the processor is further configured to receive status information from the accessory via the accessory interface, the environment information indicating an operational status of a system in which the accessory is installed, and to determine at least one property of the graphical user interface image based on the status information.

59. The portable media device of claim 46 wherein the processor is further configured to receive an image element from the accessory via the accessory interface and to include the image element in the graphical user interface image.