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(71) Applicant: **UI EVOLUTION INC.** [US/US]; 13555 Bellevue/Redmond Rd, Suite 250, Bellevue, WA 98005 (US).

(72) Inventor: **NAKAJIMA, Satoshi**; 4902 166th Ct., NE, Redmond, WA 98052 (US).

(74) Agents: **AUYEUNG, Aloysius, T., C.** et al.; Schwabe, Williamson & Wyatt, P.C, 10260 SW Greenburg Road, Suite 820, Portland, OR 97223 (US).

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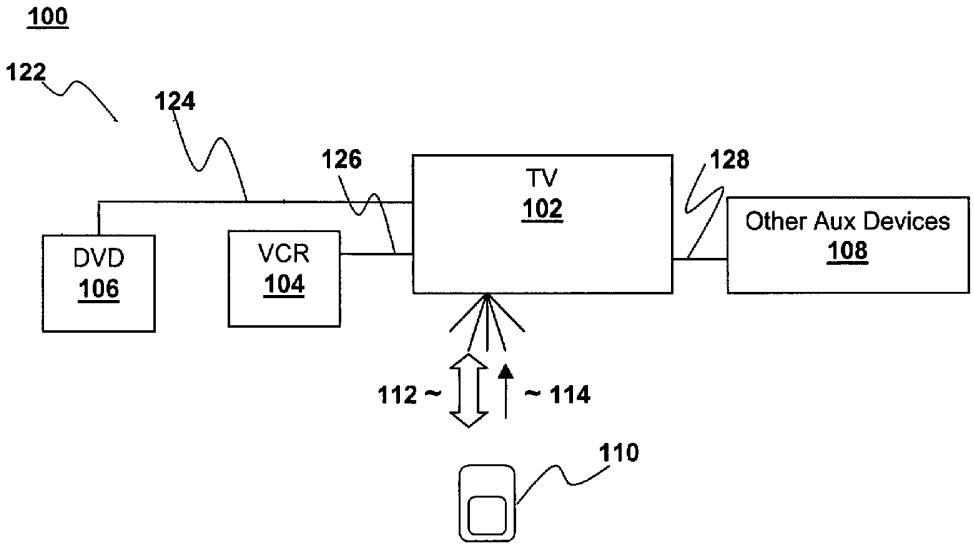
(54) Title: FIELD EXTENSIBLE CONTROLLEE SOURCED UNIVERSAL REMOTE CONTROL METHOD AND APPARATUS



(57) Abstract: A remote control device (110) receives the user interface display for controlling a primary controllee electronic device (102) from the primary controllee device itself. The remote control device (110) may also receive the user interface displays for controlling an auxiliary controllee electronic device (104-108) from the primary controllee electronic device, which in one embodiment, generates the user interface display in response to specifications received from the auxiliary controllee electronic display. A user controls the controllee devices using the user interfaces provided to the remote control device (110). In response, control commands are provided to the primary controllee electronic device, including commands for the auxiliary controllee device(s). The primary controllee device relays the commands to the auxiliary controllee device(s). Alternatively, commands for the auxiliary controllee devices may be provided to the auxiliary controllee devices directly.

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Field Extensible Controllee Sourced Universal Remote Control Method and Apparatus

FIELD OF INVENTION

The present invention relates to the field of remotely controlling electronic devices. More specifically, the present invention relates to a field extensible, controllee sourced universal remote control method and apparatus for remotely controlling electronic devices, such as television (TV), set-top box, video cassette recorder (VCR), digital versatile disk (DVD) player, and so forth.

BACKGROUND OF THE INVENTION

Advances in technology, in particular in the entertainment field, have increased the number of electronic devices within a typical household. For example, an increasing number of households have sophisticated entertainment systems that may include various electronic devices such as a television, a cable set-top box, a VCR, a DVD player, home theatre audio devices, and so forth. Commonly, a separate and distinct remote control is provided for controlling each of these electronic devices, resulting in a user having to juggle several remote controls.

In order to alleviate the problem of having to deal with multiple remote controls, a universal remote control (universal remote) is often used. A universal remote is a remote control device equipped with the control codes of multiple electronic devices known at the time of design and manufacturing of the universal remote.

However, universal remote controls suffer from a number of disadvantages. First of all, because the plethora of electronic devices available to an average consumer are made by many different manufacturers, and most manufacturers employ proprietary control commands to control their electronic devices, as result, universal remotes are typically equipped to handle a large set of control codes. Accordingly, a user typically has to program into the universal remote a particular device code for each electronic device to be controlled, to identify the manufacturer of the electronic device, and therefore

the control codes to be used to control the electronic device, before the universe remote can be used. Thus, many users find universal remote controls less than desirable.

Further, the number of electronic devices supported by a universal remote is limited to the electronic devices known to the manufacturer of the universal remote (or elected to support by the manufacturer) at the time the universal remote is made. New models of devices or new devices employing new control commands not known or programmed into the universal remote at the time the universal remote is manufactured are not supported by the universal remote. This shortcoming adds to the less than desirable user experience of universe remotes, especially for the leading edge consumers who readily adopt new models of electronic devices or new electronic devices.

Thus, an improved method for controlling electronic devices is desired.

BRIEF DESCRIPTION OF DRAWINGS

The invention is illustrated by way of example and not by way of limitation in the figures of the accompanying drawings, in which the like references indicate similar elements and in which:

FIGURE 1 illustrates an overview of the invention, in accordance with one embodiment;

FIGURE 2 illustrates methods of the invention in further details, in accordance with one embodiment;

FIGURES 3a-3c illustrate a perspective view of an exemplary field extensible universal remote of the present invention, and exemplary display states of controllee sourced control end user interface displayed thereon, in accordance with one embodiment;

FIGURE 4 illustrates an end user interface implementation technique suitable for use to practice the present invention, in accordance with one embodiment;

FIGURES 5-7 illustrate one each, an internal component view of a remote control, a primary controllee electronic device, and an auxiliary

controllee electronic device, in accordance with one embodiment of the invention; and

FIGURE 8 illustrates an XML like specification approach suitable for use to practice the end user interface specification aspect of the present invention, in accordance with one embodiment.

DETAILED DESCRIPTION OF THE INVENTION

The present invention includes a field extensible, controllee sourced universal remote control method and apparatus for remotely controlling electronic devices, such as TV, VCR, DVD players, and other electronic devices of the like. The present invention advantageously enables a basic generic remote control to be progressively enhanced, and field extended to function as a universal remote for a number of electronic devices incorporated with the teachings of the present invention, even if the electronic devices are new models or new devices introduced after the design and manufacturing of the basic generic remote control, thereby improving a user's remote control experience.

In the following description, for ease of understanding, various aspects of the invention will be described with a TV as the primary controllee electronic device. However, it will be apparent to those skilled in the art that the invention may be practiced with only some or all aspect of the invention, and with other electronic devices, such as a cable set-top box as the primary controllee electronic device. For purposes of explanation, specific numbers, materials and configurations are set forth in order to provide a thorough understanding of the invention. However, it will also be apparent to one skilled in the art that the invention may be practiced without the specific details. In other instances, well-known features are omitted or simplified in order not to obscure the invention.

Parts of the invention will be presented using terms such as user interfaces, buttons, and so forth, commonly employed by those skilled in the art to convey the substance of their work to others skilled in the art. The term "controllee electronic device" refers the object electronic devices controlled by the universal remote. Parts of the description will be presented in terms of

operations performed by a computing device, using terms such as clicking, determining, rendering, and so forth. As well understood by those skilled in the art, these quantities and operations take the form of electrical, magnetic, or optical signals capable of being stored, transferred, combined, and otherwise manipulated through mechanical, electrical and/or optical components of a computer system. The term computer system includes general purpose as well as special purpose computing machines, systems, and the like, that are standalone, adjunct or embedded.

Various operations will be described as multiple discrete steps in turn, in a manner that is most helpful in understanding the invention. However, the order of description should not be construed as to imply that these operations are necessarily order dependent. In particular, these operations need not be performed in the order of presentation.

Reference throughout this specification to "one embodiment" or "an embodiment" means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the invention. Thus, the appearances of the phrases "in one embodiment" or "in an embodiment" in various places throughout this specification are not necessarily all referring to the same embodiment or invention. Furthermore, the particular features, structures, or characteristics may be combined in any suitable manner in one or more embodiments.

Overview

FIGURE 1 illustrates an overview of the invention, in accordance with one embodiment. Shown in **FIG. 1** is an exemplary entertainment system **100** including a primary controllee electronic device, TV **102**, various auxiliary controllee electronic devices **104-108** (hereinafter, simply auxiliary devices) coupled to TV **102**, and a new type of universal remote control **110** of the present invention, that is field extensible. TV **102** and auxiliary devices **104-108** are incorporated with the teachings of the present invention, i.e. advantageously providing field extensible universal remote **110** with the control end user interface displays to control TV **102** and auxiliary devices **104-108**, to

enable field extensible universal remote **110** to function as a universal remote, and be used by a user to remotely control TV **102** as well as its auxiliary devices **104-108**.

As will be described in more details below, the control end user interface displays for controlling auxiliary devices **104-108** are advantageously provided to field extensible universal remote **110** through TV **102**. That is, the control end user interface displays for controlling auxiliary devices **104-108**, more specifically, for the embodiment, the specifications of their substantive contents, are first provided to TV **102**, which in turn generates the control end user interface displays, and provides them to field extensible universal remote **110**.

As illustrated, auxiliary devices **104-108** may include VCR **104**, DVD player **104**, as well as other auxiliary device **108** of like kind. Auxiliary device **108** of like kind may include cable set-top box, home theatre audio control unit, video camera and so forth. While for ease of understanding, entertainment system **100** is shown to include only TV **102** and three other electronic devices **104-108**, as will be readily apparent from the description to follow, the present invention may be practiced with entertainment system **100** having any number of electronic devices, of any type, properly incorporated with the teachings of the present invention, including but not limited to, electronic devices such as lighting controls, heating ventilation air-conditioning (HVAC) controls, and so forth.

For the embodiment, auxiliary devices **104-108** are correspondingly coupled to TV **102** through cablings **124-128** as well as through "medium" **122**. Cablings **124-128** represent convention cabling between auxiliary devices **104-108** and TV **102**. Medium **122** represents a number of wireless as well as wire based medium known in the art. In one embodiment, medium **122** represents an Infrared Data Association (IrDA) standard based optical connection. In another embodiment, medium **122** represents a Bluetooth or IEEE 802.11 based electro-magnetic wireless connection. In yet another embodiment,

medium **122** represents a serial, a parallel, a Universal Serial Bus (USB) or an IEEE 1394 high performance serial bus based electrical connection.

Field extensible universal remote **110** and TV **102** are shown to be coupled to each other in a preferred arrangement, through an IEEE 802.11 based wireless communication connection **112** (for provisioning the control end user interfaces), and an IrDA standard based wireless optical connection **114** (for transmitting control commands to the controllee electronic devices **102-108**). However, as with medium **122** coupling TV **102** to other auxiliary devices **104-108**, field extensible universal remote **110** and TV **102** may be coupled to each other via other wireless or wired, optical, electro-magnetic or electrical connections.

In each of these embodiments, a corresponding appropriate communication protocol, i.e. a wireless or wire based, optical, electro-magnetic or electrical communication protocol is employed to facilitate communication between auxiliary devices **104-108** and TV **102**, in particular, the provision of the earlier described specifications of the substantive contents of control end user interface displays for controlling auxiliary devices **104-108** to TV **102**.

As will be described in more detail below, in certain embodiments, the corresponding communication protocol is also employed to facilitate relaying of the corresponding control commands from TV **102** to auxiliary devices **104-108**.

In selected embodiments, when the auxiliary device is an electronic device that provides video signals to TV **102**, such as VCR **104** or DVD **106**, the auxiliary device may be coupled to TV **102** only through conventional cabling **124** or **126**, without employing the additional "data" coupling of "medium" **122**. In these embodiments, the specifications for the control end user interface displays may be provided employing a message based communication protocol embedded in a video protocol. For example, the specifications for the substantive contents of the control end user interface displays may be transmitted in accordance with a predetermined message protocol embedded in the vertical blank intervals of the video signals transmitted in accordance with the NTSC, PAL or SECAM standard.

Methods

FIGURE 2 illustrates the field extensible controllee sourced universal remote control methods of the present invention in further details, in accordance with one embodiment. As illustrated, when a field extensible universal remote **110** is first introduced to control an entertainment system **100** (or re-introduced after losing all or part of the controllee sourced control end user interface for controlling the electronic devices, due to power lost or other reasons), field extensible universal remote **110** broadcast discovery messages **202** to locate a proximately located primary controllee electronic device (for the embodiment, that is TV **102**). The broadcast may be triggered through explicit user control (e.g. in response to the user's selection of a particular control key or a pre-determined selection pattern of one or more control keys of universal remote **110**). The broadcast may be made in accordance with any one of a number of discovery protocols known in the art, e.g. targeting a predetermined port a primary controllee electronic device would be listening.

As illustrated, upon "hearing" the discovery broadcast, a primary controllee device such as TV **102** responds by acknowledging the broadcast, **204**, and for the embodiment, assigns a network address to universal remote **110**. In alternate embodiment, a device identifier may be assigned and used instead.

Subsequently, at a later point in time (during an initialization/re-initialization process or when a new auxiliary device is introduced), field extensible universal remote **110** issues a request **206** to update its collection of control end user interfaces. In one embodiment, the request includes an enumeration of the control end user interfaces that are already in possession by field extensible universal remote **110**, and their corresponding versions, thus allowing TV **102** to merely responds with only the missing or replacement versions of the applicable control end user interfaces. During initialization or re-initialization, the enumeration would be "empty". Similarly, the request may be triggered through explicit user control (e.g. in response to the user's selection of a particular control key or a pre-determined selection pattern of one

or more control keys of universal remote **110**). In one embodiment, the request is transmitted in pre-determined message format known to TV **102**.

Upon receipt of the request, as alluded to earlier, TV **102** determines the amount of upgrades needed, based on the enumerated control end user interfaces that are already in possession by the field extensible universal control **110**, and responds with the missing or newer versions of the control end user interfaces **208** for controlling itself and the coupled auxiliary devices **104-108**.

Thereafter, having been provided with the proper control end user interfaces, a user may interact with the provided interface to cause control commands **210** to be issued to control TV **102** and the coupled auxiliary devices **104-108**. In one embodiment, control commands **210** are directly provided to each of the controlled devices, TV **102** and auxiliary devices **104-108**, through e.g. the earlier described IrDA standard based optical connection. In alternate embodiments, control commands **210** are accepted by TV **102**, and either responded to by TV **102** if they are directed to TV **102**, or routed to the appropriate coupled auxiliary devices **104-108** (commands **222**). For these embodiments, it would not be necessary for the auxiliary devices **104-108** to be equipped to accept commands in the medium over which field extensible universal remote **110** transmits the control commands, as the control commands may be relayed back to the auxiliary device through the same medium the auxiliary device provides its control end user interface specification to TV **102**. Therefore, only TV **102**, i.e. the primary controllee electronic device, needs to be so equipped.

Over on the "other" side, between TV **102** and an auxiliary device, e.g. one of devices **104-108**, in like manner, when the auxiliary device is first introduced in the operating environment, at an appropriate point in time during initialization, the auxiliary device would broadcast a discovery message **212** to locate a proximately located primary controllee electronic device.

For the embodiment, in like manner, upon "hearing" the discovery broadcast, TV **102** acknowledges the broadcast **214**, and assigns a network

address **214** to the "new" auxiliary device. Similarly, in alternate embodiments, a device identifier may be assigned and used in lieu of network addresses.

Upon having been assigned a network address, for the embodiment, the "new" auxiliary device requests TV **102**, **216**, to "relay" its control end user interface to field extensible universal remote **110**. In one embodiment, as will be described in more detail below, a control end user interface is constituted in a form having a number of display states, display cells and display state transition rules. Further, a "new" auxiliary device is merely required to provide TV **102** with specifications specifying the substantive contents of the control end user interface. In response, TV **102** would generate the executable code for the control end user interface. Further, in various embodiments, the specifications are advantageously expressed, employing an XML like specification language (as shown in **Fig. 8**). XML is known in the art. Thus, this XML like approach to specifying the substantive contents of a control end user interface is well within the ability of one skilled in the art, accordingly will not be further described.

Still referring to **Fig. 2**, in response to the "relay" request, TV **102** acknowledges the request **218**, instructing the "new" auxiliary device to specify its control end user interface. Upon receiving the approval to provide the specification, the "new" auxiliary device provides TV **102** with specifications **220**, specifying the substantive contents of the control end user interface for controlling the "new" auxiliary device.

In one embodiment, the exchanges between TV **102** and the "new" auxiliary device also include specifying whether TV **102** is to listen to and relay control commands targeted for the "new" auxiliary device, to the "new" auxiliary device. If so, in addition to updating field extensible universal remote **110** with the control end user interface to control the "new" auxiliary device, the next time remote **110** requests for an update to its control end user interface collections, TV **102** further adds the "new" auxiliary device to the list of auxiliary devices on whose behalf it is to listen and relay control commands targeted for the respective auxiliary devices.

Field Extensible Universal Remote and Control End User Interface

FIGURES 3a-3c illustrate a perspective view of a field extensible universal remote and various control end user interfaces rendered thereon, in accordance with one embodiment. Shown in **FIG. 3a**, is field extensible universal remote **110** having control buttons **301-304**, wireless receiver/transmitter **313**, and touch screen LCD **312**. Control buttons **301-304** are employed to facilitate functions that are common to remote controls, including but not limited to power on/off, and the earlier described discovery broadcasts and update requests. Wireless receiver/transmitter **313** is employed to transmit and receive signals, including the earlier described broadcast and acknowledgement messages, as well as control commands. LCD **320** is employed to facilitate rendering of the provided control end user interface to enable a user to interact with the provided control end user interfaces to control TV **102** and auxiliary devices **104-108**.

Illustrated in **FIG. 3a** is an exemplary initial display state of a control end user interface for controlling TV **102** rendered on touch screen LCD **312**. For the embodiment, the initial display state is a graphical representation of TV **102**. The graphical representation of a TV **102** coveys to a user (not shown) that it may interact with a series of control end user interfaces associated with the graphical representation to control TV **102**. The subsequent displays are rendered based on the user interactions.

FIGURE 3b illustrates another exemplary display state of the collections of user interface displays for controlling a number of electronic devices. The exemplary display state reflects that VCR **104**, DVD **106** and home theatre audio control unit **108** have all provided their control end user interface specifications to TV **102**, which in turn has generated the corresponding control end user interfaces, and provided the generated corresponding control end user interfaces to field extensible universal remote **110**, in response to update requests from remote **110**. The update requests may have been requested by a user of remote **110**, when the user adds each of the corresponding electronic device to the entertainment environment.

As illustrated, the exemplary display state of the composite control end user interface includes graphic representations of each of the devices, TV **102**, VCR **104**, DVD **106** and home theatre audio control unit **108**.

FIGURE 3c illustrates yet another exemplary display state of the control end user interface in response to the user interacting with the initial display state. As shown, for the embodiment, once the user interacts with the initial display state (e.g. by selecting the graphical representation of TV **102** rendered on LCD **320** of field extensible universal remote **110**), the next display state is displayed for the user on the touch screen LCD **112**. For the exemplary control end user interface, the next display state includes graphical representations of various control buttons **332-334** for controlling the various operational characteristics of TV **102**. These control buttons may include e.g. "buttons" for volume control, channel selection, menu display and forth. For example, one of the menu buttons may be a menu button for selecting a type of sound for TV **102** (i.e., stereo, mono, surround, theater, etc.). If the user presses the menu button for selecting type of sound to control, another control display for controlling sound type is rendered as the user interface. Control of other operating characteristics of TV **102** may also be facilitated in like manners. The operating characteristics may include but are not limited to picture brightness, picture contrast, picture colors, and so forth.

Similarly, control of operating conditions and/or characteristics of other auxiliary devices **104-108** may also be likewise facilitated. The operating characteristics may include but are not limited to play, stop, pause, fast forward, rewind, and so forth.

End User Interface Displays

Referring now to **FIGURE 4**, wherein a block diagram illustrating a manner in which the control end user interfaces for controlling TV **102** or one of the auxiliary devices **104-108** may be organized, and sent to field extensible universal remote **110**, in accordance with one embodiment, is shown. As illustrated, an end user interface **402** for controlling TV **102** or one of the auxiliary devices **104-108** is provisioned from TV **102** to field extensible

universal remote **110** in the form of a number of display state definitions **406**, correspondingly defining instantiations of the control end user interface for various display states. Each instantiation of the control end user interface for a display state is constituted with a number of display cells **404**. For the embodiment, the display cells **404** include elements of the control end user interface, such as titles, icons for user selections (e.g. the up and down arrows for volume control) and the associated control commands to be issued (e.g. volume up or volume down). A display cell including display elements, such as a title, or other persistently displayed elements, such as power on/off, and volume control, may be associated, and therefore displayed in multiple display states. Further, the display state definitions include display state transition rules **410**, specifying conditions governing transitions between the defined display states (i.e. instantiations of the user interface) as a user interacts with the end user interface to control TV **102** and auxiliary devices **104-108**. For example, the control end user interface is to be transitioned from the display state illustrated by **Fig. 3b** to the display state illustrated by **Fig. 3c**, when the graphic representation of TV **102** of the display state of **Fig. 3b** is selected by a user.

During operation, the current display state, and accordingly the current instantiation of the end user interface is locally determined by field extensible universal remote **110**. Accordingly, after the transfer of display state definitions **206** (including display cells **208** and display state transition rules **210**), except for instances where control commands are to be issued from field extensible universal remote **110** to TV **102** or one of auxiliary devices **104-108**, minimal interactions or data transmissions are necessary between field extensible universal remote **110** and TV **102** or the other auxiliary devices **104-108**.

Provisional of a locally controlled end user interface having display states, display cells and display state transition rules is the subject matter of co-pending U.S. Patent Application, entitled "Display State and/or Cell Based User Interface Provision Method and Apparatus", filed September 14, 2000, having

common inventorship with the present invention. The specification of which is hereby fully incorporated by reference.

FIGURE 5 illustrates an internal component view of the relevant elements of field extensible universal remote **110**, in accordance with one embodiment. As shown, field extensible universal remote **110** includes processor **502** and non-volatile memory **504**. The processing power of processor **502** and the size of non-volatile memory **504** may vary depending on the performance design point, i.e. the total complexity of the control end user interfaces of the controllee electronic devices supported. Obviously, high performance processor and large size memory are to be employed for higher performance design points, while lower performance processor and smaller size memory may be employed for lower performance design point.

Additionally, for the embodiment, field extensible universal remote **110** includes GPIO **506**, video adapters **508** and communication interfaces **510**. In particular, for the embodiment, communication interfaces **510** include an IEEE 802.11 based wireless communication interfaces for communicating with the primary controllee electronic device, TV **102**, for the provisions of the control end user interfaces of the various controllee electronic devices TV **102** and auxiliary devices **104-108**, and an IrDA standard based optical communication interface for directly transmitting the control commands to the controllee electronic devices. The elements are coupled to each other via system bus **514**, which represents one or more buses. In the case of multiple buses, they are bridged by one or more bus bridges (not shown).

Each of these elements performs its conventional functions known in the art. In particular, non-volatile memory **504** is employed to store a copy of the programming instructions implementing the earlier described broadcast, request and command issuance functions of field extensible universal remote **110**. In one embodiment, the programming instructions are C instructions, compiled for execution in a Palm OS execution environment having core execution services, such as memory allocations, interrupt and/or exceptions handling and so forth.

Primary Controllee Electronic Device (e.g TV **102**)

FIGURE 6 illustrates an internal component view of the relevant elements of a primary controllee electronic device, such as TV **102**, in accordance with one embodiment. As shown, the relevant elements of TV **102** include processor **602** and system memory **604**. Similarly, the processing power of processor **602** and the size of system memory **604** may be vary depending on the performance design point, i.e. the number of auxiliary devices on whose behalf it can "relay" their control end user interfaces, and if applicable, control commands. Obviously, high performance processor and large size memory are to be employed for higher performance design points, while lower performance processor and smaller size memory may be employed for lower performance design points.

Additionally, TV **102** includes mass storage devices **606** (such as hard drive, CDROM and so forth), GPIO **607**, video adapter **608** and communication interfaces **610** (such as serial, parallel, USB or IEEE 1394 based wired interfaces, Bluetooth/IEEE 802.11 based wireless interfaces, and/or IrDA standard based optical interfaces). The elements are coupled to each other via system bus **614**, which represents one or more buses. In the case of multiple buses, they are bridged by one or more bus bridges (not shown).

Each of these elements performs its conventional functions known in the art. In particular, system memory **604** and mass storage **606** are employed to store a working copy and a permanent copy of the programming instructions implementing the earlier described functions of TV **102**, i.e. acceptance of control end user interface specifications from auxiliary devices **104-108**, generation of their control end user interfaces, and provisions of the generated control end user interfaces, as well as acceptance of control commands targeted for itself and relay of control commands targeted for applicable ones of auxiliary devices **104-108**.

In one embodiment, the programming instructions are C instructions, compiled for execution in a Linux execution environment having core execution

services, such as memory allocations, interrupt and/or exceptions handling and so forth.

Auxiliary Controllee Electronic Devices

FIGURE 7 illustrates an internal component view of the relevant elements of an auxiliary controllee electronic device (such as VCR **104** or DVD **106**), in accordance with one embodiment. As shown, auxiliary controllee electronic device **104/106/108** includes processor **702** and non-volatile memory **704**. Again, the processing power of processor **702** and the size of non-volatile memory **704** may be vary depending on the performance design point, i.e. the complexity of the control end user interface. Obviously, high performance processor and large size memory are to be employed for higher performance design points, while lower performance processor and smaller size memory may be employed for lower performance design points.

Additionally, auxiliary controllee electronic device **104/106/108** includes includes GPIO **710**, and communication interfaces **712** (such as serial, parallel, USB or IEEE 1394 based wired interfaces, Bluetooth/IEEE 802.11 based wireless interfaces, and/or IrDA standard based optical interfaces). The elements are coupled to each other via system bus **714**, which represents one or more buses. In the case of multiple buses, they are bridged by one or more bus bridges (not shown).

Each of these elements performs its conventional functions known in the art. In particular, non-volatile memory **704** is employed to store a copy of the programming instructions implementing the earlier described control end user interface related functions of an auxiliary electronic device incorporated with the teachings of the present invention.

In one embodiment, the programming instructions are C instructions, compiled for execution in a Linux execution environment having core execution services, such as memory allocations, interrupt and/or exceptions handling and so forth.

Advantages

Thus, it can been from the above description, a universal remote equipped with the described relevant elements, may be progressive enhanced, and field extended, as a universal remote to control a plethora of controllee electronic devices, endowed with the teachings of the present invention, regardless of whether the controls for controlling the controllee electronic device are known at the time the universal remote is designed and manufactured.

As a result, a user of the field extensible universal remote of the present invention is substantially alleviated with the burden of identifying the controllee electronic device to the field extensible universal control. The complexity and burden of enabling the field extensible universal control to control with the various controllee electronic devices, including new versions or new devices are shifted to the designed and manufacturers of these devices.

Accordingly, a user may enjoy a much more user friendly experience in using the field extensible universal control of the present invention, to control electronic devices endowed with the teachings of the present invention.

Conclusion and Epilog

Thus, an improved field extensible, controllee sourced universal remote control method and apparatus has been described. As set forth earlier, those skilled in the art will recognize that the invention is not limited by the details described, instead, the invention can be practiced with modifications and alterations within the spirit and scope of the appended claims. The description is thus to be regarded as illustrative instead of restrictive on the invention.

CLAIMS

What is claimed is:

1. In a controllee electronic apparatus, a method of operation comprising:

providing a remote control with a first collection of user interface displays for controlling the controllee electronic apparatus;

receiving first control commands from said remote control, resulting from said provided first collection of user interface displays being used by a user of said remote control; and

controlling operation of said controllee electronic apparatus in accordance with said received first control commands.

2. The method of claim 1, wherein said providing to a remote control with a first collection of user interface displays for controlling the controllee electronic apparatus comprises providing the remote control with a first collection of user interface displays having a plurality of display states and associated display state transition rules.

3. The method of claim 1, wherein said providing to a remote control with a first collection of user interface displays for controlling the controllee electronic apparatus comprises providing the remote control with a first collection of user interface displays having a plurality of display cells.

4. The method of claim 1, wherein said providing to a remote control with a first collection of user interface displays for controlling the controllee electronic apparatus comprises providing the remote control with the first collection of user interface displays through a selected one of a wireless optical connection in accordance with a wireless optical communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol, and a wired electrical connection in accordance with a wired communication protocol.

5. The method of claim 4, wherein the first collection of user interface displays is provided to the remote control through an infrared based optical

connection, using an IrDA standard based wireless optical communication protocol.

6. The method of claim 4, wherein the first collection of user interface displays is provided to the remote control through a wireless eletro-magnetic communication connection, using a selected one of a Bluetooth and an IEEE 802.11 standard based wireless communication protocol.

7. The method of claim 4, wherein the first collection of user interface displays is provided to the remote control through a wired electrical connection that is a selected one of a serial connection, a parallel connection, a USB connection, and a IEEE 1394 based connection, using a message based communication protocol.

8. The method of claim 1, wherein said receiving of first control commands from the remote control comprises receiving said first control commands from the remote control through a selected one of a wireless optical connection in accordance with a wireless optical communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol and a wired electrical connection in accordance with a wired communication protocol.

9. The method of claim 1, wherein said first control commands comprise control commands for controlling a plurality of operation characteristics of said controllee electronic apparatus, and said plurality of operation characteristics comprise selected ones of power on/off, channel selections, audio volume, picture brightness, and picture color.

10. The method of claim 1, wherein said method further comprises providing said remote control with a second collection of user interface displays for controlling an auxiliary controllee electronic device coupled to said controllee electronic apparatus.

11. The method of claim 10, wherein said providing to the remote control with a second collection of user interface displays for controlling the auxiliary controllee electronic device comprises providing the remote control with a

second collection of user interface displays having a plurality of display states and associated display state transition rules.

12. The method of claim 10, wherein said providing to the remote control with a second collection of user interface displays for controlling the auxiliary controllee electronic device comprises providing the remote control with a second collection of user interface displays having a plurality of display cells.

13. The method of claim 10, wherein said providing to the remote control with a second collection of user interface displays for controlling the auxiliary controllee electronic device comprises providing the remote control with the second collection of user interface displays through a selected one of a wireless optical connection in accordance with a wireless optical communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol, and a wired electrical connection in accordance with a wired communication protocol.

14. The method of claim 10, wherein said method further comprises

receiving from said auxiliary controllee electronic device specifications of the substantive contents of said second collection of user interface displays; and

generating said second collection of user interface displays in accordance with said received specifications.

15. The method of claim 14, wherein said receiving of specifications of the substantive contents of said second collection of user interface displays comprises receiving from said auxiliary controllee electronic device an XML based specification.

16. The method of claim 14, wherein said receiving of specifications of the substantive contents of said second collection of user interface displays comprises receiving the specifications of the substantive contents of said second collection of user interface displays from the auxiliary controllee electronic device through a selected one of a wireless optical connection in accordance with a wireless optical communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol,

and a wired electrical connection in accordance with a wired communication protocol.

17. The method of claim 16, wherein the specifications of the substantive contents of said second collection of user interface displays are received from the auxiliary controllee electronic device through a video connection, using a message based communication protocol embedded within a video protocol.

18. The method of claim 10, wherein said method further comprises

receiving second control commands from said remote control, resulting from said provided second collection of user interface displays being used by said user of said remote control; and

controlling operation of said auxiliary controllee electronic device in accordance with said received second control commands.

19. The method of claim 18, wherein said receiving of second control commands from the remote control comprises receiving said second control commands from the remote control through a selected one of a wireless eletro-magnetic connection in accordance with a wireless communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol, and a wired electrical connection in accordance with a wired communication protocol.

20. The method of claim 18, wherein said controlling of the operation of the auxiliary controllee electronic device comprises relaying the received second commands to the auxiliary controllee electronic device.

21. The method of claim 20, wherein said relaying of the received second control commands comprises relaying the received second control commands through a selected one of a wireless optical connection in accordance with a wireless optical communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol, and a wired electrical connection in accordance with a wired communication protocol.

22. The method of claim 10, wherein said auxiliary controllee electronic device is a selected one of a videocassette recorder (VCR), a digital versatile disk (DVD) player, a home theatre audio control unit, and a video camera.

23. The method of claim 22, wherein said second control commands comprise control commands for controlling a plurality of operation characteristics of said auxiliary controllee electronic device, and said plurality of operation characteristics comprise selected ones of power on/off, play, fast forward, reverse, pause, stop, audio volume, picture brightness, and picture color.

24. The method of claim 1, wherein said controllee electronic apparatus is a TV.

25. The method of claim 1, wherein said controllee electronic apparatus is a selected one of a set top box, a DVD player, a VCR .

26. In a auxiliary controllee electronic device coupled to a primary controllee electronic device, a method of operation comprising:

providing specifications for a collection of user interface displays for controlling the auxiliary controllee electronic device to the primary controllee electronic device for the primary controllee electronic device to generate and provide the collection of user interface displays to a remote control;

receiving control commands from said remote control, resulting from said provided collection of user interface displays being used by a user of said remote control; and

controlling operation of said auxiliary controllee electronic device in accordance with said received control commands.

27. The method of claim 26, wherein said providing of specifications for a collection of user interface displays for controlling the auxiliary controllee electronic device comprises providing specifications for a collection of user interface displays having a plurality of display states and associated display state transition rules.

28. The method of claim 26, wherein said providing of specifications for a collection of user interface displays for controlling the auxiliary controllee electronic device comprises providing specifications for a collection of user interface displays having a plurality of display cells.

29. The method of claim 26, wherein said providing of specifications for a collection of user interface displays for controlling the auxiliary controllee electronic device comprises providing an XML based specification specifying the substantive contents of the collection of user interface displays.

30. The method of claim 26, wherein said providing of specifications of a collection of user interface displays for controlling the auxiliary controllee electronic device comprises providing the specifications of the collection of user interface displays from the auxiliary controllee electronic device to the primary controllee electronic device through a selected one of a wireless optical connection in accordance with a wireless optical communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol, a wired electrical connection in accordance with a wired communication protocol.

31. The method of claim 26, wherein the specifications for the collection of user interface displays are provided from the auxiliary controllee electronic device to the primary controllee electronic device through a video connection, using a message based communication protocol embedded within a video protocol.

32. The method of claim 26, wherein said receiving of the control commands comprises receiving the control commands directly from the remote control through a selected one of a wireless optical connection in accordance with a wireless optical communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol, and a wired electrical connection in accordance with a wired communication protocol.

33. The method of claim 26, wherein said receiving of the control commands comprises receiving the control commands indirectly via said primary controllee electronic device through a selected one of a wireless optical connection in accordance with a wireless optical communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol, and a wired electrical connection in accordance with a wired communication protocol.

34. The method of claim 26, wherein said auxiliary controllee electronic device is a selected one of a videocassette recorder (VCR), a digital versatile disk (DVD) player, a home theatre audio control unit, and a video camera.

35. The method of claim 34, wherein said control commands comprise control commands for controlling a plurality of operation characteristics of said auxiliary controllee electronic device, and said plurality of operation characteristics comprise selected ones of power on/off, play, fast forward, reverse, pause, stop, audio volume, picture brightness, and picture color.

36. The method of claim 26, wherein said primary controllee electronic device is a TV.

37. The method of claim 26, wherein said primary controllee electronic device is a selected one of a set top box, a DVD player and VCR player.

38. In a remote control , a method of operation comprising:

receiving from a primary controllee electronic device a first collection of user interface displays for controlling a primary controllee electronic device;

facilitating usage of the first collection of user interface displays by a user to control the primary controllee electronic device; and

providing first control commands to the primary controllee electronic device to control the primary controllee electronic device in response to said usage of the first collection of user interface displays.

39. The method of claim 38, wherein said receiving of a first collection of user interface displays for controlling the primary controllee electronic device comprises receiving a first collection of user interface displays having a plurality of display states and associated display state transition rules.

40. The method of claim 38, wherein said receiving of a first collection of user interface displays for controlling the primary controllee electronic device comprises receiving a first collection of user interface displays having a plurality of display cells.

41. The method of claim 38, wherein said receiving of the first collection of user interface displays for controlling the primary controllee electronic device comprises receiving the first collection of user interface displays to control the

primary controllee electronic device through a selected one of a wireless optical connection in accordance with a wireless optical communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol, a wired electrical connection in accordance with a wired communication protocol.

42. The method of claim 38, wherein said providing of the first control commands comprises providing the first control commands to the primary controllee electronic device through a selected one of a wireless optical connection in accordance with a wireless optical communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol, a wired electrical connection in accordance with a wired communication protocol.

43. The method of claim 38, wherein said first control commands comprise control commands for controlling a plurality of operation characteristics of said primary controllee electronic device, and said plurality of operation characteristics comprise selected ones of power on/off, channel selections, audio volume, picture brightness, and picture color.

44. The method of claim 38, wherein the method further comprises

receiving a second collection of user interface displays from the primary controllee electronic device for controlling an auxiliary controllee electronic device coupled to the primary controllee electronic device;

facilitating usage of the second collection of user interface displays by a user to remotely control the auxiliary controllee electronic device; and

providing second control commands either directly or indirectly to the auxiliary controllee electronic device to control the auxiliary controllee electronic device in response to said usage of the second collection of user interface displays.

45. The method of claim 44, wherein said providing of a second collection of user interface displays for controlling the auxiliary controllee electronic device comprises providing a second collection of user interface displays having a plurality of display states and associated display state transition rules.

46. The method of claim 44, wherein said providing of a second collection of user interface displays for controlling the auxiliary controllee electronic device comprises providing a second collection of user interface displays having a plurality of display cells.

47. The method of claim 44, wherein said providing of the second collection of user interface displays for controlling the auxiliary controllee electronic device comprises providing the second collection of user interface displays from the primary controllee electronic device to the remote control through a selected one of a wireless optical connection in accordance with a wireless optical communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol, a wired electrical connection in accordance with a wired communication protocol.

48. The method of claim 44, wherein said providing of the second control commands comprises providing the second control commands through a selected one of a wireless optical connection in accordance with a wireless optical communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol, and a wired electrical connection in accordance with a wired communication protocol.

49. The method of claim 44, wherein said auxiliary controllee electronic device is a selected one of a videocassette recorder (VCR), a digital versatile disk (DVD) player, a home theatre audio control unit, and a video camera.

50. The method of claim 49, wherein said second control commands comprise control commands for controlling a plurality of operation characteristics of said auxiliary controllee electronic device, and said plurality of operation characteristics comprise selected ones of power on/off, play, fast forward, reverse, pause, stop, audio volume, picture brightness, and picture color.

51. The method of claim 38, wherein said primary controllee electronic device is a TV.

52. The method of claim 38, wherein said primary controllee electronic device is a selected one of a set top box, a DVD player and a VCR player.

53. A controlle electronic apparatus comprising:

first means to provide a remote control with a first collection of user interface displays for controlling the controllee electronic apparatus, and to receive first control commands from said remote control, resulting from said provided first collection of user interface displays being used by a user of said remote control; and

second means to control operation of said controllee electronic apparatus in accordance with said received first control commands.

54. The apparatus of claim 53, wherein said first means provides the remote control with a first collection of user interface displays having a plurality of display states and associated display state transition rules.

55. The apparatus of claim 53, wherein said first means provides the remote control with a first collection of user interface displays having a plurality of display cells.

56. The apparatus of claim 53, wherein said first means provides the remote control with the first collection of user interface displays through a selected one of a wireless optical connection in accordance with a wireless optical communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol, and a wired electrical connection in accordance with a wired communication protocol.

57. The apparatus of claim 56, wherein said first means provides the remote control with the first collection of user interface displays through an infrared based optical connection, using an IrDA standard based wireless optical communication protocol.

58. The apparatus of claim 56, wherein said first means provides the remote control with the first collection of user interface displays through a wireless eletro-magnetic communication connection, using a selected one of a Bluetooth and an IEEE 802.11 standard based wireless communication protocol.

59. The apparatus of claim 56, wherein said first means provides the remote control with the first collection of user interface displays through a wired electrical connection that is a selected one of a serial connection, a parallel

connection, a USB connection, and a IEEE 1394 based connection, using a message based communication protocol.

60. The apparatus of claim 53, wherein said first means receives said first control commands from the remote control through a selected one of a wireless optical connection in accordance with a wireless optical communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol and a wired electrical connection in accordance with a wired communication protocol.

61. The apparatus of claim 53, wherein said first control commands comprise control commands for controlling a plurality of operation characteristics of said controllee electronic apparatus, and said plurality of operation characteristics comprise selected ones of power on/off, channel selections, audio volume, picture brightness, and picture color.

62. The apparatus of claim 53, wherein said first means further provides said remote control with a second collection of user interface displays for controlling an auxiliary controllee electronic device coupled to said controllee electronic apparatus.

63. The apparatus of claim 52, wherein said first means provides the remote control with a second collection of user interface displays having a plurality of display states and associated display state transition rules.

64. The apparatus of claim 62, wherein said first means provides the remote control with a second collection of user interface displays having a plurality of display cells.

65. The apparatus of claim 62, wherein said first means provides the remote control with the second collection of user interface displays through a selected one of a wireless optical connection in accordance with a wireless optical communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol, and a wired electrical connection in accordance with a wired communication protocol.

66. The apparatus of claim 62, further comprising

third means to receive from said auxiliary controllee electronic device specifications of the substantive contents of said second collection of user interface displays; and

fourth means to generate said second collection of user interface displays in accordance with said received specifications.

67. The apparatus of claim 66, wherein said third means receives from said auxiliary controllee electronic device an XML based specification.

68. The apparatus of claim 66, wherein said third means receives the specifications from the auxiliary controllee electronic device through a selected one of a wireless optical connection in accordance with a wireless optical communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol, and a wired electrical connection in accordance with a wired communication protocol.

69. The apparatus of claim 68, wherein said third means receives the specifications from the auxiliary controllee electronic device through a video connection, using a message based communication protocol embedded within a video protocol.

70. The apparatus of claim 62, wherein

said first means further receives second control commands from said remote control, resulting from said provided second collection of user interface displays being used by said user of said remote control; and

said second and third means further cooperate to control operation of said auxiliary controllee electronic device in accordance with said received second control commands.

71. The apparatus of claim 70, wherein said third means receives said second control commands from the remote control through a selected one of a wireless eletro-magnetic connection in accordance with a wireless communication protocol, a wireless eletro-magnetic connection in accordance

with a wireless communication protocol, and a wired electrical connection in accordance with a wired communication protocol.

72. The apparatus of claim 70, wherein said second and third means cooperate to relay the received second commands to the auxiliary controllee electronic device.

73. The apparatus of claim 72, wherein said second and third means cooperate to relay the received second control commands through a selected one of a wireless optical connection in accordance with a wireless optical communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol, and a wired electrical connection in accordance with a wired communication protocol.

74. The apparatus of claim 62, wherein said auxiliary controllee electronic device is a selected one of a videocassette recorder (VCR), a digital versatile disk (DVD) player, a home theatre audio control unit, and a video camera.

75. The apparatus of claim 74, wherein said second control commands comprise control commands for controlling a plurality of operation characteristics of said auxiliary controllee electronic device, and said plurality of operation characteristics comprise selected ones of power on/off, play, fast forward, reverse, pause, stop, audio volume, picture brightness, and picture color.

76. The apparatus of claim 53, wherein said controllee electronic apparatus is a TV.

77. The apparatus of claim 53, wherein said controllee electronic apparatus is a selected one of a set top box, a DVD player, a VCR .

78. An auxiliary controllee apparatus comprising:

first means to provide specifications for a collection of user interface displays for controlling the auxiliary controllee electronic device to a primary controllee electronic device for the primary controllee electronic device to generate and provide the collection of user interface displays to a remote control;

second means to receive control commands from said remote control, resulting from said provided collection of user interface displays being used by a user of said remote control; and

third means to control operation of said auxiliary controllee electronic device in accordance with said received control commands.

79. The apparatus of claim 78, wherein said first means provides to said primary controllee electronic apparatus, specifications for a collection of user interface displays having a plurality of display states and associated display state transition rules.

80. The apparatus of claim 78, wherein said first means provides to said primary controllee apparatus, specifications for a collection of user interface displays having a plurality of display cells.

81. The apparatus of claim 78, wherein said first means provides to said primary controllee electronic apparatus, an XML based specification specifying the substantive contents of the collection of user interface displays.

82. The apparatus of claim 78, wherein said first means provides the specifications of its collection of user interface displays to the primary controllee electronic device through a selected one of a wireless optical connection in accordance with a wireless optical communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol, a wired electrical connection in accordance with a wired communication protocol.

83. The apparatus of claim 78, wherein said first means provides the specifications for its collection of user interface displays to the primary controllee electronic device through a video connection, using a message based communication protocol embedded within a video protocol.

84. The apparatus of claim 78, wherein said second means receives the control commands directly from the remote control through a selected one of a wireless optical connection in accordance with a wireless optical communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol, and a wired electrical connection in accordance with a wired communication protocol.

85. The apparatus of claim 78, wherein said second means receives the control commands indirectly via said primary controllee electronic device through a selected one of a wireless optical connection in accordance with a wireless optical communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol, and a wired electrical connection in accordance with a wired communication protocol.

86. The apparatus of claim 78, wherein said apparatus is a selected one of a videocassette recorder (VCR), a digital versatile disk (DVD) player, a home theatre audio control unit, and a video camera.

87. The apparatus of claim 86, wherein said control commands comprise control commands for controlling a plurality of operation characteristics of said auxiliary controllee electronic apparatus, and said plurality of operation characteristics comprise selected ones of power on/off, play, fast forward, reverse, pause, stop, audio volume, picture brightness, and picture color.

88. The apparatus of claim 78, wherein said primary controllee electronic device is a TV.

89. The apparatus of claim 78, wherein said primary controllee electronic device is a selected one of a set top box, a DVD player and VCR player.

90. A field extendable remote control apparatus comprising:

first means to receive from a primary controllee electronic device a first collection of user interface displays for controlling a primary controllee electronic device;

second means to facilitate usage of the first collection of user interface displays by a user to control the primary controllee electronic device; and

third means to provide first control commands to the primary controllee electronic device to control the primary controllee electronic device in response to said usage of the first collection of user interface displays.

91. The apparatus of claim 90, wherein said first means receives from the primary controllee electronic device a first collection of user interface displays having a plurality of display states and associated display state transition rules.

92. The apparatus of claim 90, wherein said first means receives from the primary controllee electronic device a first collection of user interface displays having a plurality of display cells.

93. The apparatus of claim 90, wherein said first means receives the first collection of user interface displays from the primary controllee electronic device through a selected one of a wireless optical connection in accordance with a wireless optical communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol, a wired electrical connection in accordance with a wired communication protocol.

94. The apparatus of claim 90, wherein said third means provides the first control commands to the primary controllee electronic device through a selected one of a wireless optical connection in accordance with a wireless optical communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol, a wired electrical connection in accordance with a wired communication protocol.

95. The apparatus of claim 90, wherein said first control commands comprise control commands for controlling a plurality of operation characteristics of said primary controllee electronic device, and said plurality of operation characteristics comprise selected ones of power on/off, channel selections, audio volume, picture brightness, and picture color.

96. The apparatus of claim 90, wherein

said first means further receives a second collection of user interface displays from the primary controllee electronic device for controlling an auxiliary controllee electronic device coupled to the primary controllee electronic device;

said second means further facilitates usage of the second collection of user interface displays by a user to remotely control the auxiliary controllee electronic device; and

said third means further provides second control commands either directly or indirectly to the auxiliary controllee electronic device to control the auxiliary controllee electronic device in response to said usage of the second collection of user interface displays.

97. The apparatus of claim 96, wherein said first means receives from the primary controllee electronic apparatus a second collection of user interface displays having a plurality of display states and associated display state transition rules.

98. The apparatus of claim 96, wherein said first means receives from the primary controllee electronic apparatus a second collection of user interface displays having a plurality of display cells.

99. The apparatus of claim 96, wherein said first means receives said second collection of user interface displays from the primary controllee electronic device through a selected one of a wireless optical connection in accordance with a wireless optical communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol, a wired electrical connection in accordance with a wired communication protocol.

100. The apparatus of claim 96, wherein said third means provides the second control commands through a selected one of a wireless optical connection in accordance with a wireless optical communication protocol, a wireless eletro-magnetic connection in accordance with a wireless communication protocol, and a wired electrical connection in accordance with a wired communication protocol.

101. The apparatus of claim 96, wherein said auxiliary controllee electronic device is a selected one of a videocassette recorder (VCR), a digital versatile disk (DVD) player, a home theatre audio control unit, and a video camera.

102. The method of claim 101, wherein said second control commands comprise control commands for controlling a plurality of operation characteristics of said auxiliary controllee electronic device, and said plurality of operation characteristics comprise selected ones of power on/off, play, fast forward, reverse, pause, stop, audio volume, picture brightness, and picture color.

103. The apparatus of claim 90, wherein said primary controllee electronic device is a TV.

104. The apparatus of claim 90, wherein said primary controllee electronic device is a selected one of a set top box, a DVD player and a VCR player.

FIGURE 1

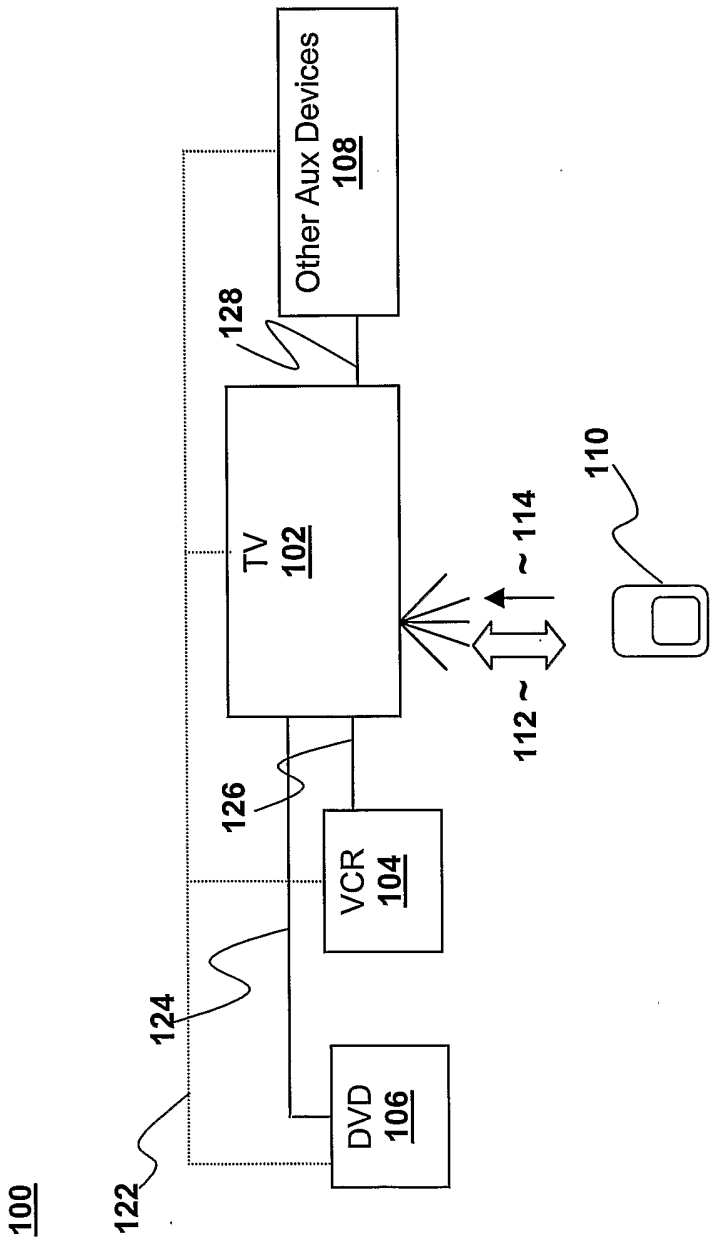
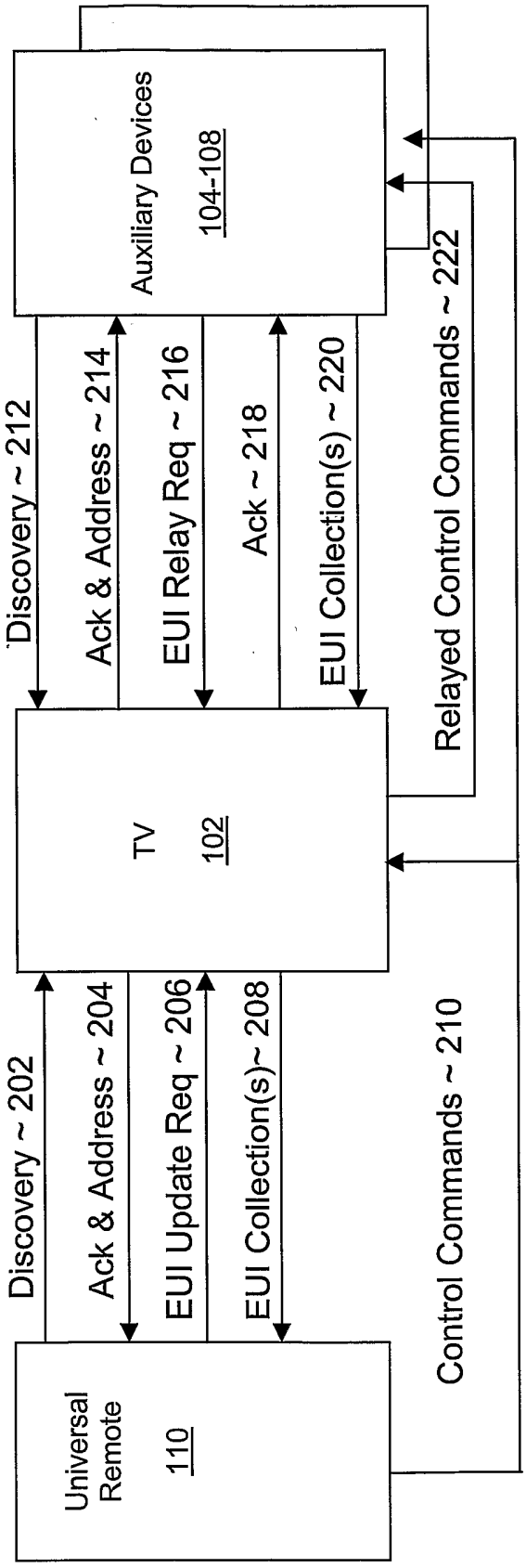

100
122
124
126
128
DVD 106
VCR 104
TV 102
Other Aux Devices 108
112
114
110

FIGURE 2


Auxiliary Devices
104-108
TV
102
Universal Remote
110
Discovery ~ 212
Ack & Address ~ 214
EUI Relay Req ~ 216
Ack ~ 218
EUI Collection(s) ~ 220
Relayed Control Commands ~ 222
Discovery ~ 202
Ack & Address ~ 204
EUI Update Req ~ 206
EUI Collection(s)~ 208
Control Commands ~ 210

FIGURES 3a

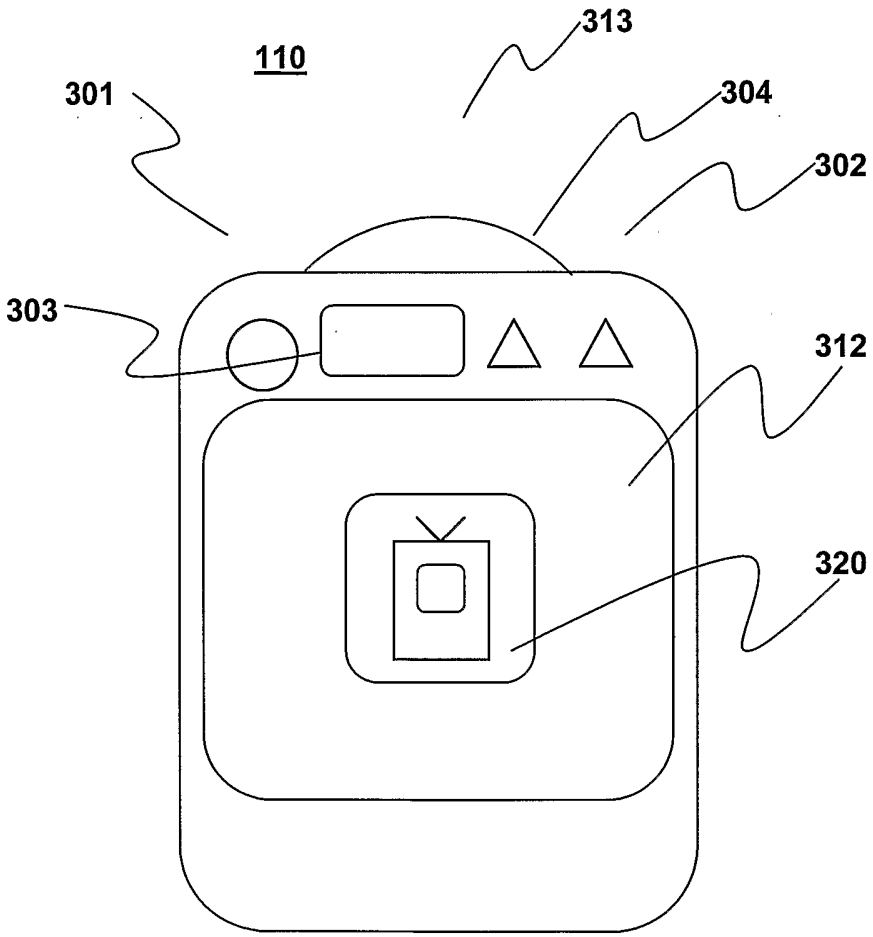


FIGURE 3b

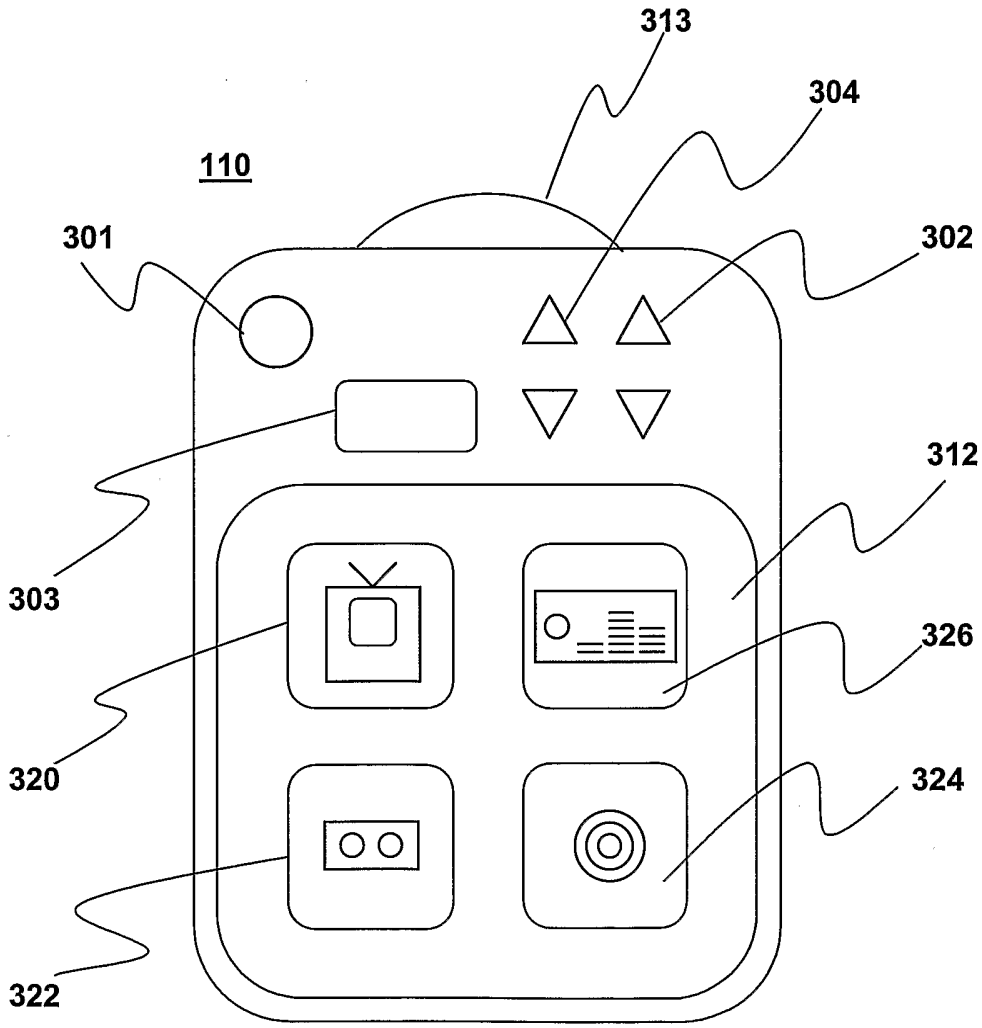


FIGURE 3c

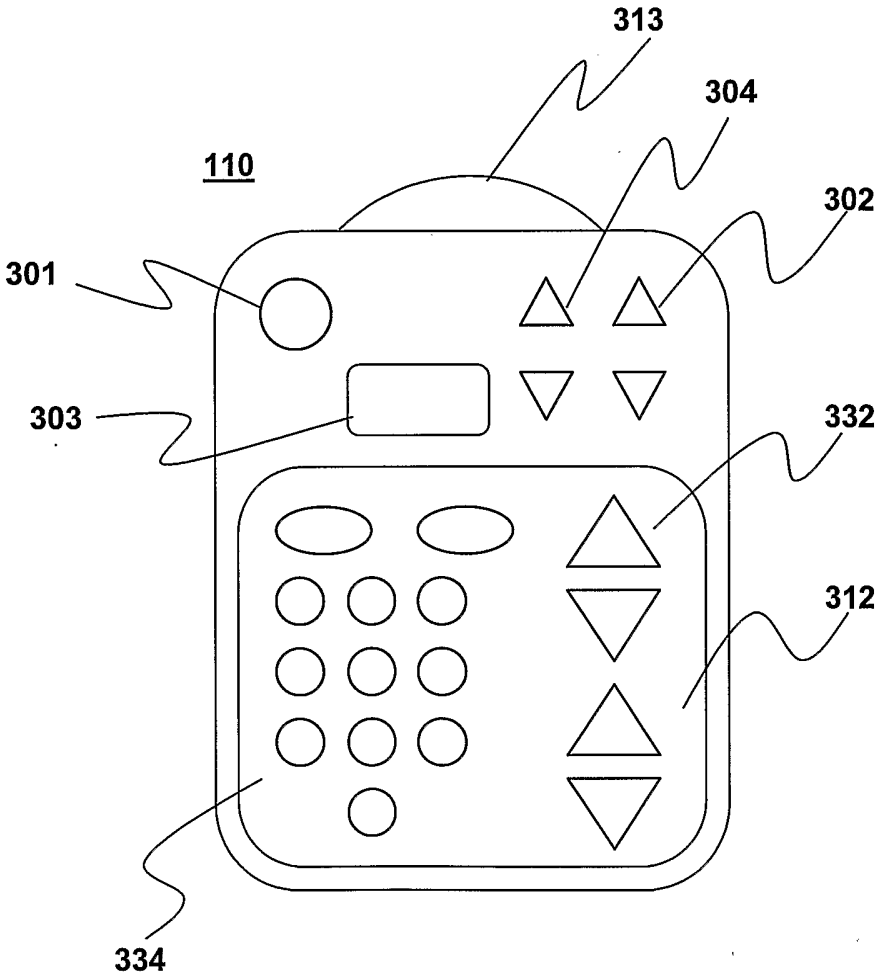


FIGURE 4

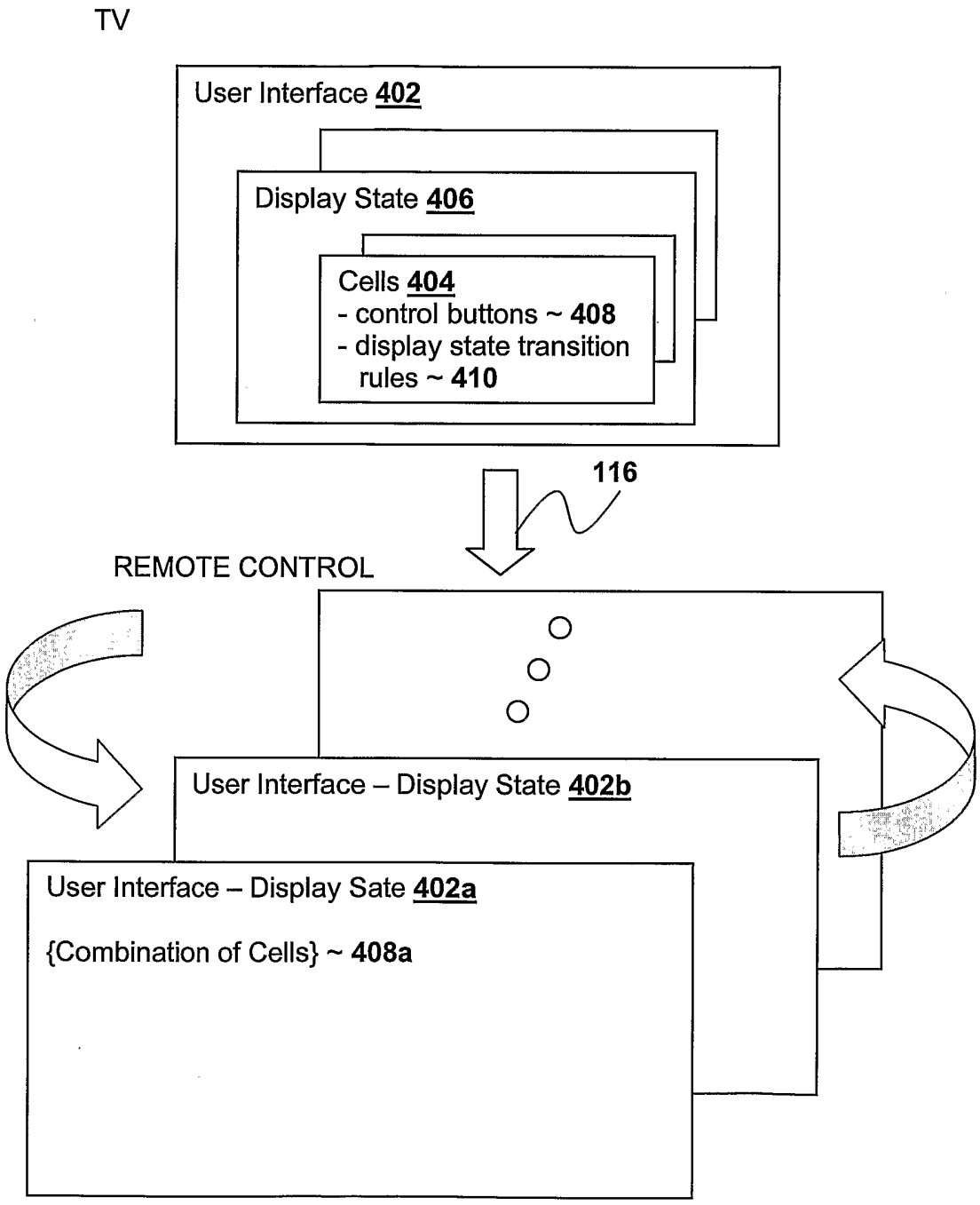

TV
User Interface 402
Display State 406
Cells 404
- control buttons ~ 408
- display state transition rules ~ 410
116
REMOTE CONTROL
User Interface – Display State 402b
User Interface – Display Sate 402a
{Combination of Cells} ~ 408a

FIGURE 5

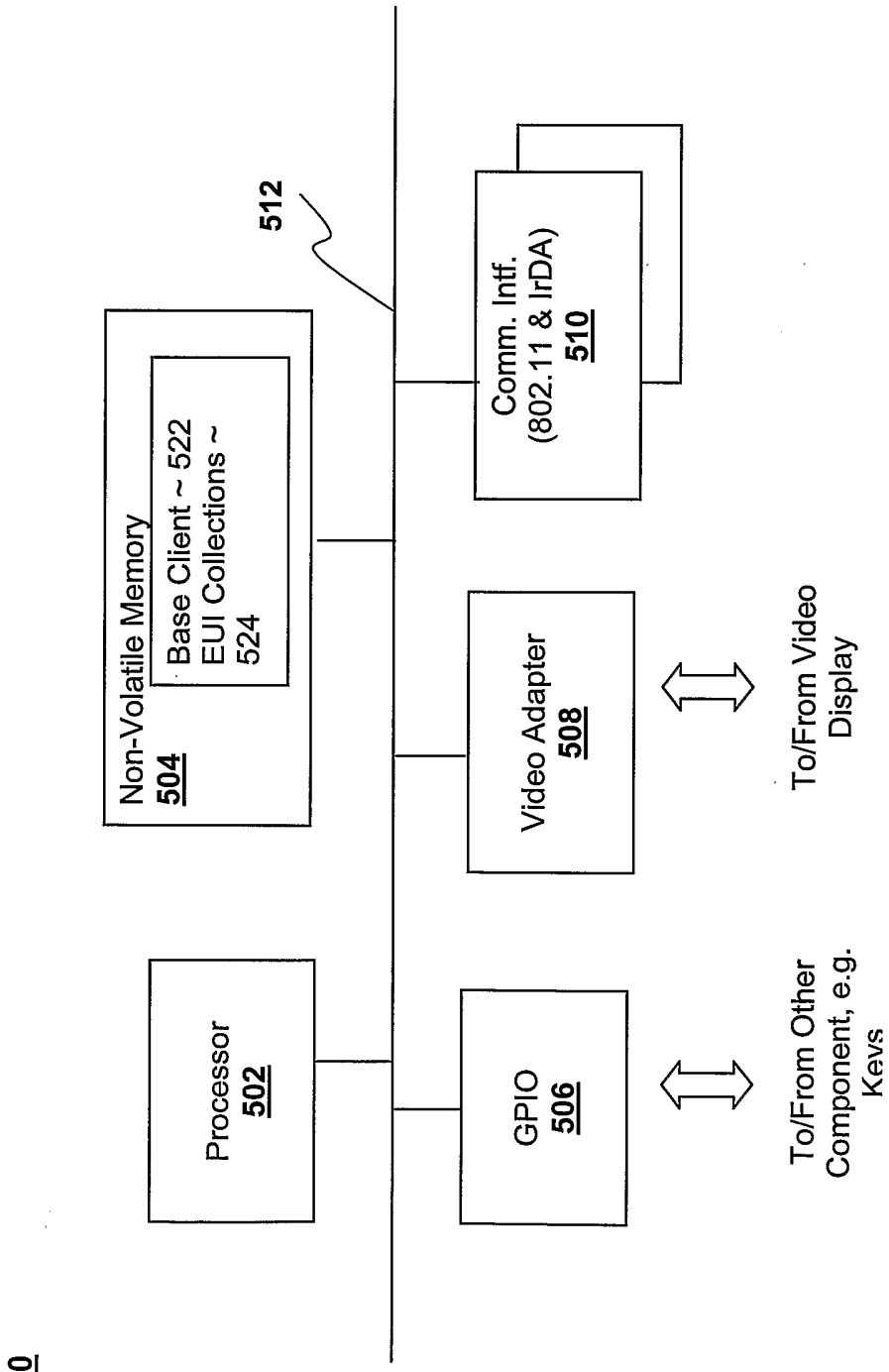

110
512
Non-Volatile Memory
504
Base Client ~ 522
EUI Collections ~
524
Comm. Intf.
(802.11 & IrDA)
510
Video Adapter
508
To/From Video
Display
Processor
502
GPIO
506
To/From Other
Component, e.g.
Keys

FIGURE 6

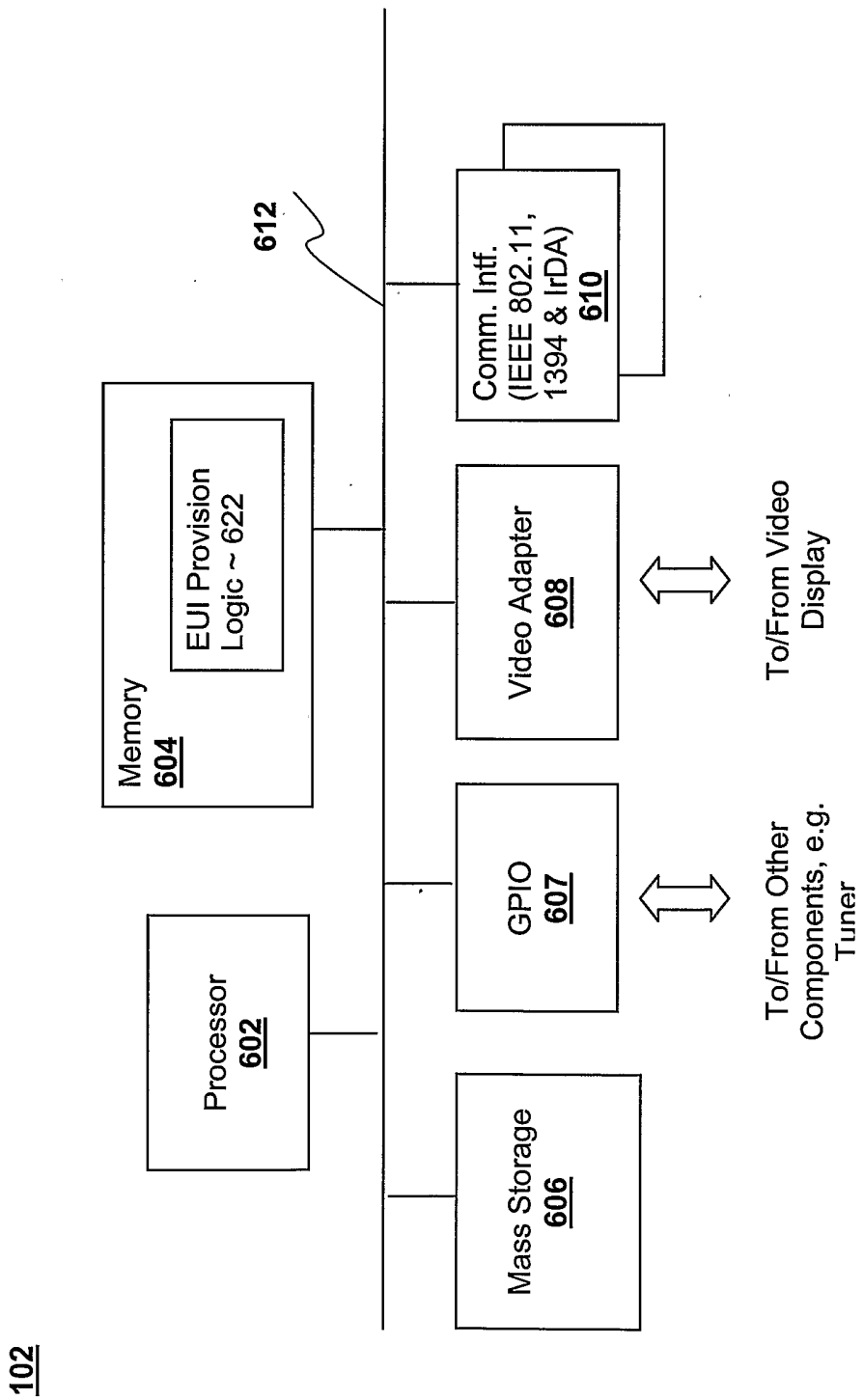

102
612
Memory
604
EUI Provision
Logic ~ 622
Processor
602
Mass Storage
606
GPIO
607
Video Adapter
608
Comm. Intf.
(IEEE 802.11,
1394 & IrDA)
610
To/From Other
Components, e.g.
Tuner
To/From Video
Display

FIGURE 7

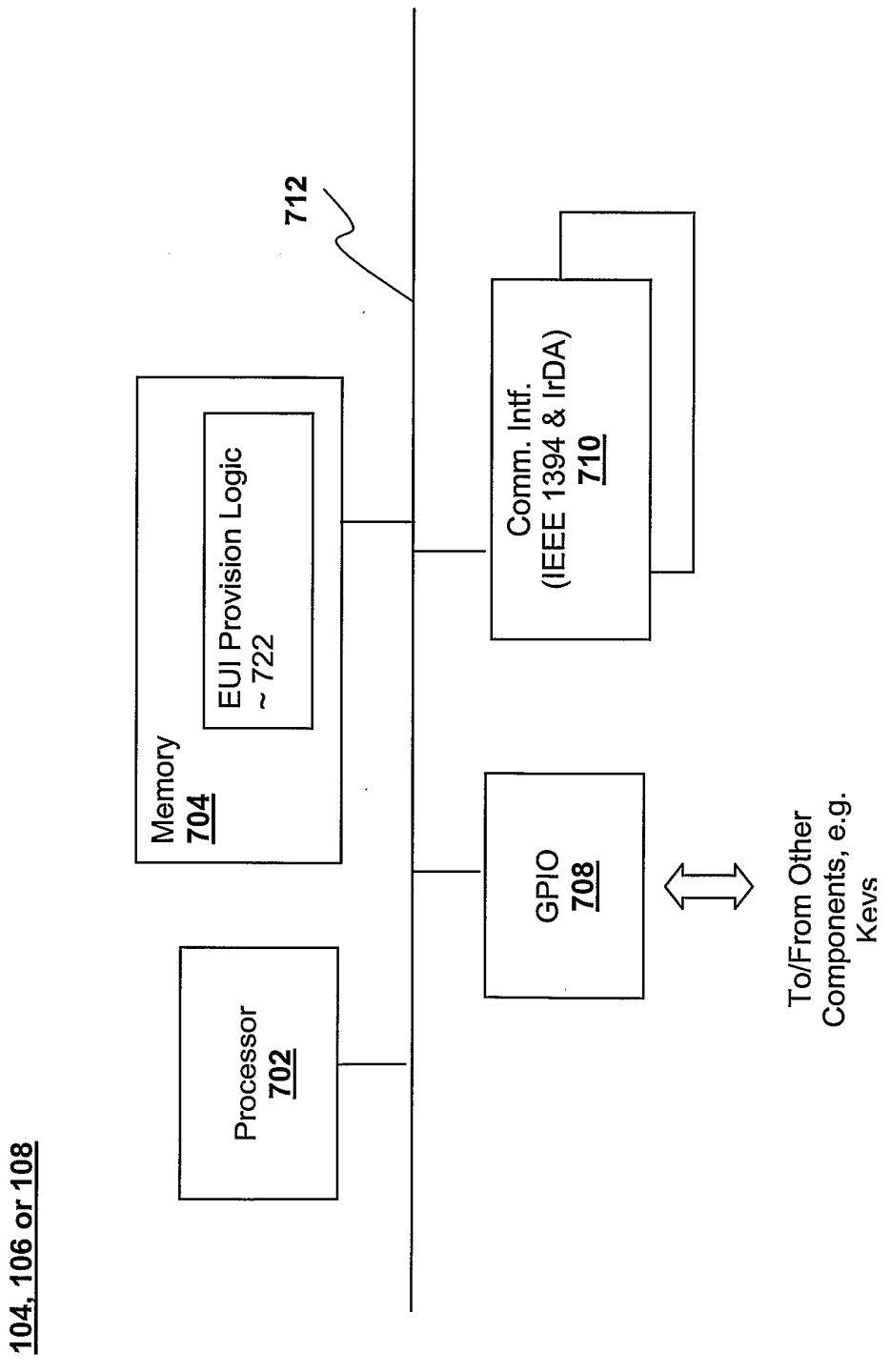

104, 106 or 108
712
Memory
704
EUI Provision Logic
~ 722
Processor
702
Comm. Intf.
(IEEE 1394 & IrDA)
710
GPIO
708
To/From Other
Components, e.g.
Keys

FIGURE 8

<Display State S1> ~ 802a
    <Display Cell C1> ~ 804a
        ....
    </End Display Cell C1>
    <Display Cell C2> ~ 804b
        ....
    </End Display Cell C2>

    <Transition R1> Display State x </End Transition R1> ~ 806a
    <Transition R2> Display State y </End Transition R2> ~ 806b

</End Display State S1>

<Display State S1> ~ 802b
    <Display Cell C1> ~ 804a
        ....
    </End Display Cell C1>
    <Display Cell C2> ~ 804c
        ....
    </End Display Cell C2>

    <Transition R3> Display State x </End Transition R3> ~ 806c
    <Transition R4> Display State z </End Transition R4> ~ 806d

</End Display State S1>

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US02/37394

A. CLASSIFICATION OF SUBJECT MATTER
IPC(7) : H04N 5/445,44; H04L 17/02, G08C 19/00
US CL : 348/734, 725, 731; 340/825.69,825.72, 825.25,825.19; 341/176,173; 455/151.1,154.1
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 348/734, 725, 731; 340/825.69,825.72, 825.25,825.19; 341/176,173; 455/151.1,154.1

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EAST

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y,P	US 6,407,779 B1 (HERZ) 18 June 2002, Col. 7, lines 14-57	1-104
Y	US 6,160,491 A (KITAO et al.) 12 December 2000, col. 5, line 53 through col.7, line 55).	1-104
A,P	US 6,437,836 B1 (HUANG et al.) 20 August 2002, see Abstract	1,26,38

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
07 February 2003 (07.02.2003)	07 MAR 2003
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703)305-3230	Authorized officer Paulos M. Natnael Telephone No. (703) 305-0019

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