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| United States Patent | 12394302 |
| Kind Code | B2 |
| Date of Patent | August 19, 2025 |
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# System and method for monitoring user interactions with a universal controlling device

## Abstract

Usage of a universal controlling device is monitored by determining a current operating mode of the universal controlling device, sensing an event occurring within the universal controlling device, and storing within a memory of the universal controlling device data indicative of the event occurring in the current operating mode of the universal controlling device.

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| **Appl. No.:** | **16/519455** |
| **Filed:** | **July 23, 2019** |

## Prior Publication Data

| Document Identifier | Publication Date |
|---|---|
| US 20190347928 A1 | Nov. 14, 2019 |

## Related U.S. Application Data

continuation parent-doc US 15588143 20170505 US 10395517 child-doc US 16519455
continuation parent-doc US 14189406 20140225 US 9673925 20170606 child-doc US 15588143
us-provisional-application US 61791124 20130315

## Publication Classification

**Int. Cl.:** **G08C17/02** (20060101); **G07C3/00** (20060101); **H04H60/32** (20080101); **H04H60/33** (20080101)

**U.S. Cl.:**

CPC     **G08C17/02** (20130101); **G07C3/00** (20130101); **H04H60/32** (20130101); **H04H60/33** (20130101); G08C2201/30 (20130101); G08C2201/92 (20130101)

## Field of Classification Search

**CPC:**     G08C (17/02); G08C (2201/30); G08C (2201/92); H04H (60/33); G07C (3/00)

**USPC:**     340/12.5

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## Background/Summary

RELATED APPLICATION DATA (1) This application claims the benefit of and is a continuation of U.S. application Ser. No. 15/588,143, filed on May 5, 2017, (now U.S. Pat. No. 10,395,517) which application claims the benefit of and is a continuation of U.S. application Ser. No. 14/189,406, filed on Feb. 25, 2014, (now U.S. Pat. No. 9,673,925) which application claims the benefit of U.S. Provisional Application No. 61/791,124, filed on Mar. 15, 2013, the disclosures of which are incorporated herein by reference in their entirety.

BACKGROUND
(1) U.S. Pat. No. 7,091,898 describes a remote control device is which key use is monitored. A command key, representative of an appliance function, may be correlated to a target appliance that is determined, as a function of the monitored key use, to be the most likely intended recipient of a command to perform that appliance function. An activity key may also be programmed so as to perform a series of actions that are representative of a sequence of monitored key uses.
(2) U.S. Pat. No 7,739,432 describes a system in which keystrokes input by a user are stored in non-volatile memory together with time stamps, creating a record of keystrokes and associated time stamps. At least some of the time stamps are generated and recorded in response to receipt of specific keystroke events, such as a specific keystroke, a specific sequence of keystrokes, a keystroke following an interval of inactivity or an interval of inactivity following a keystroke. The resulting keystroke record may show sessions of keystrokes received, with a start and end time stamp for each session. An alteration record is also provided to track alterations and erasures of the keystroke record.
(3) U.S. Pat. No. 8,392,265 describes a system for collecting viewing data (or viewing habits) and automatically measuring the size of an audience viewing or watching a broadcast at any particular time. In the system, a remote control device may be adapted to collect and manage the collection of the viewing data on television audiences, including requests for the data from third parties. The data may be collected using a remote control device and then transmitted to a remote computer where it may be stored and accumulated, so that over time, the viewing habits of the user may be identified. The remote control device may also be used to allow a user to interact with the television to order a product, monetize advertising, participate in an auction and/or rate a television program.
(4) U.S. Published Application No. 2011/0282902 describes a search-enabled remote control device to facilitate viewers' ability to search through programming and/or content options and view results. In one embodiment, a viewer is able to use a traditional remote control interface to navigate through menus or selections and to display search results on screen. In another embodiment, a viewer's watching behavior and/or searching habits are tracked by the search-enabled remote control and used to develop a viewer profile, which may in turn be used to target advertisements, information and/or future programming options.

(5) Each of these publications is incorporated herein by reference in its entirety.

SUMMARY

(6) Described herein are systems and method for monitoring user interactions with a universal controlling device. The universal controlling device may monitor the most frequently used controlling device functions and store data indicative of such monitored user interactions in local memory. When the universal controlling device is connected via a wired or wireless connection with a computer, router, or the like, the data stored in the memory may be retrieved for analysis purposes. Likewise, in the event the universal controlling device is returned for replacement, refurbishment, or the like, the data stored in the memory may be retrieved for analysis purposes.

(7) A better understanding of the objects, advantages, features, properties and relationships of the systems and methods described hereinafter will be obtained from the following detailed description and accompanying drawings which set forth illustrative embodiments and which are indicative of the various ways in which the subject systems and methods may be employed.

## Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) For a better understanding of the systems and methods hereinafter described, reference may be had to preferred embodiments shown in the attached drawings in which:

(2) FIG. **1** illustrates an exemplary system in which a universal controlling device is used to control functional operations of one or more appliances and a system wherein the exemplary universal controlling device can be placed into communication with a personal computer for the purpose of retrieving data stored in the memory thereof;

(3) FIG. **2** illustrates a block diagram of exemplary components of the exemplary universal controlling device of FIG. **1**;

(4) FIG. **3** is a flow chart of an exemplary method for monitoring user interaction with the exemplary universal controlling device of FIG. **1**; and

(5) FIG. **4** is an exemplary use case diagram.

DETAILED DESCRIPTION

(6) The following describes system and methods for capturing data related to a user's interaction with a universal controlling device. By way of example, FIG. **1** illustrates an exemplary system wherein a universal controlling device **100** may be used to command functional operations of various intended target appliances such as a television **114**, an AV receiver **102**, a cable or satellite set top box **104**, a DVD player **106** and/or **108**, a game console **110**, a MP3 player **116**, a receiver **112**, etc. In the embodiment illustrated, the universal controlling device **100** communicates with such controlled devices via a unidirectional infrared (IR) link, however, as is known in the art, controlling device **100** may be capable of communicating with these appliances using any convenient IR, RF, point-to-point, or networked protocol to cause the appliances to perform operational functions, provided the control protocols and command values to be used in communicating with a desired appliance are known to the operational software of controlling device **100**.

(7) As further illustrated in FIG. **1**, universal controlling device **100** may also be periodically placed into communication with a personal computer ("PC") **118**, for example via a USB connection **120**, via a wireless connection such a WiFi, or other suitable connecting means, for example in order to initiate or perfect the configuration of controlling device **100**. To this end, a configuration application may be executed by PC **118** which application will function to upload data from the memory of the universal controlling device **100**, such as the current configuration of the universal controlling device **100** as well as data indicative of monitored user interactions with the controlling device **100**, to provide a user interface on the PC **118** for display and selection of configuration

options, and to download resulting new and/or modified configuration data to controlling device **100**. The creation of such new or modified configuration data may include the use of data stored locally on PC **118** and/or data stored on a server that is remote from PC **118** and accessed via a wide area communication network such as the Internet. As is known in the art, the configuration application executed on PC **118** may, without limitation, take the form of a local application, a Java applet, HTML statements, ActiveX controls, etc., or any combination thereof as appropriate. Further all or parts of the various steps performed in the processes involved in generating a controlling device configuration may be performed locally on PC **118** or at a Web service hosted by a remotely located server, without limitation. While described in the context of data being retrieved from the memory of the controlling device **100** during an upgrade process, it will be understood that the data may be retrieved by being directly requested from the universal controlling device **100** or the like without limitation. It will be additionally appreciated that the retrieved data can be uploaded to the remotely located server for analysis as desired.

(8) While illustrated in the context of a television **114**, an A/V receiver **102** and a set top box **104**, it is to be understood that controllable appliances may include, but are not limited to, televisions, VCRs, DVRs, DVD players, cable or satellite converter set-top boxes ("STBs"), amplifiers, CD players, game consoles, home lighting, drapery, fans, HVAC systems, thermostats, personal computers, etc. It will also be appreciated that, while in the illustrative embodiment a PC **118** is utilized to assist in the configuration of controlling device **100** and/or in the retrieval of information from the memory of the universal controlling device **100**, in alternative embodiments these functions may be performed equally well by any other appliance such as, for example, a set top box. Further, while the illustrative coupling of universal controlling device **100** to the appliance is via a wired interface **120**, it will be appreciated that in alternative embodiments other coupling means may be employed with equal success, for example wireless connections such as WiFi, Bluetooth, infrared transmission, etc.

(9) With reference to FIG. **2**, for use in commanding the functional operations of one or more intended target appliances, the universal controlling device **100** may include, as needed for a particular application, a processor **200** coupled to a ROM memory **204**, a RAM memory **202**, a key matrix **207** (e.g., hard keys, soft keys such as a touch sensitive surface overlaid on a liquid crystal (LCD) or an electroluminescent (EL) display, or some combination thereof), a transmission circuit **208** with an associated IR and/or RF emitter, a non-volatile read/write memory **206**, a means **214** to provide feedback to the user (e.g., one or more visible LEDs, LCD display, speaker, backlighting, and/or the like), a power source **216**, a wired input/output port **212** such as a serial interface, modem, USB port, etc., a wireless interface **210**, and clock and timer logic with associated crystal or resonator.

(10) As will be understood by those skilled in the art, some or all of the memories **202**, **204**, and **206** may include executable instructions (collectively, the program memory) that are intended to be executed by the processor **200** to control the operation of the universal controlling device **100**, as well as data that serves to define the aforementioned control protocols and command values to the operational software (collectively, the command data).

(11) In this manner, the processor **200** may be programmed to control the various electronic components within the universal controlling device **100**, e.g., to monitor the power supply **216**, to cause the transmission and reception of signals, control visual feedback device(s) **214**, etc. All or part of the non-volatile read/write memory **206**, for example an EEPROM, battery-backed up RAM, FLASH, Smart Card, memory stick, or the like, may additionally be used to store setup data and parameters, data indicative of monitored user interactions with the universal controlling device **100**, etc. as necessary. While the memory **204** is illustrated and described as a ROM memory, memory **204** may also be comprised of any type of readable media, such as ROM, FLASH, EEPROM, or the like. Preferably, the memories **202** and **206** are non-volatile or battery-backed such that data is not required to be reloaded after battery changes. In addition, the memories **202**,

**204** and **206** may take the form of a chip, a hard disk, a magnetic disk, an optical disk, and/or the like. Still further, it will be appreciated that some or all of the illustrated memory devices may be physically incorporated within the same IC chip as the microprocessor **200** (a so called "microcontroller") and, as such, they are shown separately in FIG. **2** only for the sake of clarity.

(12) To cause the universal controlling device **100** to perform an action, universal controlling device **100** is adapted to be responsive to events, such as a sensed user interaction with the key matrix **207**, etc. In response to an event, appropriate instructions within the program memory (hereafter the "operating program") may be executed. For example, when a function key is actuated on the controlling device **100**, the universal controlling device **100** may retrieve from the command data stored in memory **202**, **204**, and/or **206** the command value and control protocol currently assigned to the actuated function key and the currently assigned device mode to thereby transmit a command to an intended target appliance, e.g., the STB **104** or the TV **114**, in a format recognizable by the intended target appliance. It will also be appreciated that the operating program can be used not only to cause the transmission of command codes and/or data to the appliances, but also to perform local operations. While not limiting, local operations that may be performed by the universal controlling device **100** may include displaying information/data, favorite channel setup, macro key setup, function key relocation, etc. Examples of local operations can be found in U.S. Pat. Nos. 5,481,256, 5,959,751, and 6,014,092. In accordance with this disclosure, an additional local operation is the ability to monitor user interactions with the universal controlling device **100**, to store data indicative of such monitored user interactions with the universal controlling device **100**, and to upload such stored data, as applicable, to a connected appliance (or directly to an Internet server).

(13) Turning now to FIGS. **3** and **4**, in a use case of the system a user **400** (e.g., the primary actor) interacts with the universal controlling device **100** to, for example, cause the transmission of commands for controlling functional operations of an intended target device, place the universal controlling device **100** into an operating mode for identifying which command code set(s) to use when issuing transmissions of commands for controlling functional operations of an intended target device(s), etc. During such usage of the universal controlling device **100** by the user, the universal controlling device **100** will monitor the user's interactions with/events occurring within the universal controlling device **100** and store data indicative of such usage/events in its memory for later retrieval by, for example, a secondary actor **402**, such as a technician. By way of example, as soon as user starts using the universal controlling device **100** (e.g., lifts the universal controlling device, activates a key of the universal controlling device **100**, or otherwise causes the universal controlling device **100** to exit a quiescent or sleep state) a timer (e.g., a real time clock or relative time keeper) can be used, for example, to provide a time stamp to data which is indicative of the current operating mode of the universal controlling device **100**. During usage, the time at which the universal controlling device **100** is placed into other modes via activation of a mode key, e.g., the TV mode, SAT mode, etc, keys, if any, is similarly used to timestamp the relevant captured data in this same manner. Any such captured data would then be stored in the memory of the universal controlling device. Furthermore, when a user activates other keys of the universal controlling device **100** in the current operating mode of the universal controlling device **100**, e.g., the "power on" key, time stamped data indicative of such other key activations could also be stored in the memory of the universal controlling device **100**. In this manner, an accurate record is maintained of the various operating modes into which the universal controlling device **100** has been placed, the functionalities of the universal controlling device **100** that were used in this mode of operation **100**, and the times at which such actions took place (and the time in between such actions which might be indicative of, for example, how long a TV was tuned to a particular channel, how long the TV was turned on, how long the universal controlling device **100** was in a given mode of operation, or the like). Time stamped data indicative of the universal controlling device **100** being returned to a quiescent/sleep state could also be captured to provide an indication of universal controlling device

**100** idle time. Still further, time stamped data could be captured and stored for other events, such as an accelerometer sensed movement of the universal controlling device **100**, the universal controlling device **100** being in communication with an appliance or the Internet, etc. as needed for any intended purpose. Accordingly, these examples in which events are sensed and recorded are not intended to be limiting.

(14) In a further embodiment, a counter could be used to merely count the number of times a user interacted with/an event occurred within the universal controlling device **100** in, for example, a given mode of operation of the universal controlling device **100**. For example, a counter associated with a channel up command in a "TV mode" of operation can be incremented each time the user interacts with the channel up command in the "TV mode" of operation. In this example, the data indicative of a number of times a functionality was used (or event generated) in the various modes of operation of the universal controlling device **100** need not be provided with timestamps.

(15) It will additionally be appreciated that is some cases it might be desirable to capture some data using counters and/or to capture some data with timestamps. It will also be appreciated that is some cases it may not be necessary to correlate usage of a particular function or event to a given mode of operation of the universal controlling device **100** and that cumulative (as opposed to mode specific) usage data for such functionalities/events could be captured.

(16) As discussed above, when universal controlling device **100** is placed into communication with (or received at), for example, a servicing center, the data stored in the memory of the universal controlling device **100** can be retrieved therefrom. At this time, the data stored in the memory could be erased to thereby free the memory for use in storing future usage data. In cases where the memory of the universal controlling device **100** is limited, it may also be desired to store the most currently captured data while overwriting the oldest captured data.

(17) Once the data is retrieved from the memory of the universal controlling device **100**, the data could be analyzed to, for example:

(18) discern ways to improve access to features/functionalities that are used frequently;

(19) discern which appliances are being used, how often they are being used, when they are being used, how they are being used in a home theater environment, etc. to provide solutions for command functional operations of such appliances;

(20) discern ways to improve the ergonomics of the universal controlling device **100**; and/or

(21) discern interests of the user of the universal controlling device **100** (to thereby target the user with advertising, promotions, etc.);

(22) It is to be understood that these exemplary usages are not intended to be limiting.

(23) It is also contemplated that the user interaction data can be further stamped with/correlated with data that is indicative of a specific user of the universal controlling device **100**. To this end, the universal controlling device **100** can have a biometric sensor, an image recognition system, a log-in system or the like for use in identifying a current operator of the universal controlling device **100** (as well as others in the area of the universal controlling device **100** as desired). This optionally collected user identifying data can also be retrieved from memory as described above and then used (with the other collected data) to, for example, discern usage patterns of the universal controlling device **100** and/or target appliances by persons in various age groups, gender groups, or the like for the various purposes noted above.

(24) While various concepts have been described in detail, it will be appreciated by those skilled in the art that various modifications and alternatives to those concepts could be developed in light of the overall teachings of the disclosure. For example, while described in the context of functional modules and illustrated using block diagram format, it is to be understood that, unless otherwise stated to the contrary, one or more of the described functions and/or features may be integrated in a single physical device and/or a software module, or one or more functions and/or features may be implemented in separate physical devices or software modules. It will also be appreciated that a detailed discussion of the actual implementation of each module is not necessary for an enabling

understanding of the invention. Rather, the actual implementation of such modules would be well within the routine skill of an engineer, given the disclosure herein of the attributes, functionality, and inter-relationship of the various functional modules in the system. Therefore, a person skilled in the art, applying ordinary skill, will be able to practice the invention set forth in the claims without undue experimentation. It will be additionally appreciated that the particular concepts disclosed are meant to be illustrative only and not limiting as to the scope of the invention which is to be given the full breadth of the appended claims and any equivalents thereof.

(25) All patents cited within this document are hereby incorporated by reference in their entirety.

## Claims

1. A universal controlling device, comprising: a processing device; a user interface coupled to the processing device; and at least one memory device coupled to the processing device, wherein the at least one memory device has stored thereon instructions which instructions, when executed by the processing device, cause the universal controlling device to respond to the universal controlling device being caused to exit a quiescent mode of operation by providing a time stamp to a first data previously stored in the at least one memory device that indicates a one of a plurality of controllable appliance operating modes in which the universal controlling device is currently operating and by subsequently sensing a first user interaction with the user interface indictive of a first command being transmitted to a media rendering appliance to cause the media rendering appliance to access a one of the plurality of media content, sensing a second user interaction with the user interface indicative of a second command being transmitted to the media rendering appliance to cause the media rendering appliance to stop accessing the one of the plurality of media content, and storing within the at least one memory device a second data indicative of a time between the sensed first user interaction and the sensed second user interaction.

2. The universal controlling device as recited in claim 1, wherein the instructions cause the universal controlling device to further determine a user of the universal controlling device when at least the first user interaction with the user interface is sensed and store a third data indicative of the determined user in the at least one memory device.

3. The universal controlling device as recited in claim 2, wherein a log-in feature is used to determine the user of the universal controlling device.

4. The universal controlling device as recited in claim 2, wherein a biometric sensor coupled to the processing device is used to determine the user of the universal controlling device.

5. The universal controlling device as recited in claim 2, wherein an imaging device coupled to the processing device is used to determine the user of the universal controlling device.

6. The universal controlling device as recited in claim 1, wherein the media content comprises a channel capable of being tuned to by the media rendering appliance.

7. The universal controlling device as recited in claim 6, wherein the media rendering appliance comprises a television.

8. The universal controlling device as recited in claim 6, wherein the media rendering appliance comprises a settop box.

9. The universal controlling device as recited in claim 1, wherein the media rendering appliance comprises a television.

10. The universal controlling device as recited in claim 1, wherein the media rendering appliance comprises a settop box.

11. The universal controlling device as recited in claim 1, wherein at least one of the first command and the second command comprises an appliance power control command.

12. The universal controlling device as recited in claim 1, wherein at least one of the first command and the second command comprises an appliance channel tuning command.

13. The universal controlling device as recited in claim 1, wherein the instructions cause the

universal remote controlling device to store storing within the at least one memory device a third data indicative of an amount of time between the sensed first user interaction and the sensed second user interaction during which the universal controlling device is idle.

14. The universal controlling device as recited in claim 1, wherein the time stamp comprises a real time timestamp.

15. The universal controlling device as recited in claim 1, wherein the time stamp comprises a relative time timestamp.