A proximity detector is used in a mobile device to detect available remotely controllable devices and their functions. A remote control display is then provided on the mobile device that allows a user to control the remotely controllable devices found in a particular location. As a user changes locations, new devices are sensed and the user is provided with remote control functions for the devices in that particular location. Remote control functions can be obtained directly from the sensed devices and/or from a lookup table and/or network and/or user input.
PROximity based self learning remote

BACKGROUND

[0001] Many devices in the home today, especially home entertainment systems, are operated by remote control. In fact, collections of the devices often require multiple remotes to operate the different devices in the same room. One method of solving this is to have a universal remote which can control a plethora of devices. In fact, today's smart phones and other communication devices can also serve as universal remotes, with the added benefit of always being available in the home since they are typically carried for quick access to phone service, texting, e-mail, etc. However, this presents a problem. If the device is truly used as a universal remote, some devices it advertises as being available can be in a different room, and the consumer must sort out which set of control functions are used for the available devices in that location.

SUMMARY

[0002] Proximity detection is leveraged by a universal remote device that allows the device to sense when it is within proximity of a controllable device. It then tailors its display to provide a control panel that emulates the device's remotely controllable functions. This allows a user to carry, for example, a mobile device from room to room and easily remotely control devices found in that particular room, without requiring additional user input. A priori knowledge can also be used to facilitate in knowing what devices are at particular locations. When the mobile device determines its location (e.g., via GPS, cell phone, Wi-Fi, etc.), it uses a lookup table to determine what emulated functions can be provided for that location.

[0003] The above presents a simplified summary of the subject matter in order to provide a basic understanding of some aspects of subject matter embodiments. This summary is not an extensive overview of the subject matter. It is not intended to identify key/critical elements of the embodiments or to delineate the scope of the subject matter. Its sole purpose is to present some concepts of the subject matter in a simplified form as a prelude to the more detailed description that is presented later.
To the accomplishment of the foregoing and related ends, certain illustrative aspects of embodiments are described herein in connection with the following description and the annexed drawings. These aspects are indicative, however, of but a few of the various ways in which the principles of the subject matter can be employed, and the subject matter is intended to include all such aspects and their equivalents. Other advantages and novel features of the subject matter can become apparent from the following detailed description when considered in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an example of a mobile device with a proximity sensor that can be employed in an embodiment.

FIG. 2 illustrates a touch screen device that can be utilized in an embodiment.

FIG. 3 is a first example of an operation of a mobile device in a home environment operating multiple devices' remote functions in multiple rooms.

FIG. 4 is a second example of an operation of a mobile device in a home environment operating multiple devices' remote functions in multiple rooms.

FIG. 5 is an example of a standard receiver device, such as a settop box that can be employed with an embodiment.

FIG. 6 is a block diagram of a method of using a proximity sensor to learn remote functions from an electronic device.

DETAILED DESCRIPTION

The subject matter is now described with reference to the drawings, wherein like reference numerals are used to refer to like elements throughout. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the subject matter. It can be evident, however, that subject matter embodiments can be practiced without these specific details. In other instances, well-known structures and devices are shown in block diagram form in order to facilitate describing the embodiments.

As used in this application, the term "component" is intended to refer to hardware, software, or a combination of hardware and software in execution. For
example, a component can be, but is not limited to being, a process running on a
processor, a processor, an object, an executable, and/or a microchip and the like. By
way of illustration, both an application running on a processor and the processor can
be a component. One or more components can reside within a process and a
cOMPONENT can be localized on one system and/or distributed between two or more
systems. Functions of the various components shown in the figures can be provided
through the use of dedicated hardware as well as hardware capable of executing
software in association with appropriate software.

When provided by a processor, the functions can be provided by a
single dedicated processor, by a single shared processor, or by a plurality of
individual processors, some of which can be shared. Moreover, explicit use of the
term "processor" or "controller" should not be construed to refer exclusively to
hardware capable of executing software, and can implicitly include, without
limitation, digital signal processor ("DSP") hardware, read-only memory ("ROM")
for storing software, random access memory ("RAM"), and non-volatile storage.

Moreover, all statements herein reciting instances and embodiments of the invention
are intended to encompass both structural and functional equivalents. Additionally, it
is intended that such equivalents include both currently known equivalents as well as
equivalents developed in the future (i.e., any elements developed that perform the
same function, regardless of structure).

Universal remotes have been available for some time. In typical use,
however, they are tied precisely to the room and multiple devices for which they are
to be used, even if they are learning remotes. Since smart phones and similar mobile
devices are carried - unlike a standard remote - some notion of location needs to be
added to clarify which devices are available to be controlled. The solution to this is to
have the device sense its proximity to the devices to be controlled, and only activate
the remote control function for those devices for which it can control.

FIG. 1 is a proximity sensing system 100 comprised of a mobile device
102 that interfaces with an electronic device 104 and a user 106. The electronic
device 104 can be a standalone electronic device and/or a device with embedded
electronics and the like. For example, some coffee makers and refrigerators can be
remote controlled by built in electronics. Settop boxes, televisions, and other displays
can be controlled as well. The mobile device 102 is typically comprised of a proximity sensor 108 that is used to sense or detect electronic devices that can be controlled by a remote control. The proximity sensor can accomplish this by sensing radio frequencies, infrared, Bluetooth and other remote control communications technologies. Once a device is sensed, the proximity sensor 108 can poll the device and/or use other interrogation methods and/or use bidirectional communications to establish the functions available for control. In an alternative embodiment, the proximity sensor 108 can sense, for example, the make and model of the electronic device. Item 108 can then use, for example, an optional lookup table 112 to determine the available remote control functions. Likewise, the proximity sensor 108 can also interact with an optional network 116 to obtain specifics about a given make and model of an electronic device. The optional lookup table 112 can also be populated with *apriori* knowledge of devices at particular locations from user inputs and/or from the network 116. The network 116 can be a local wireless and/or wired network and/or a wide area network (e.g., the Internet) and the like. Thus, in another embodiment, an optional locator 114 determines the location of the mobile device and looks up which electronic devices are available in that location in the lookup table 112. The optional locator 114 can use global positioning, cell phone coverage, Wi-Fi coverage and/or Wi-Fi communications and the like to determine its location. The proximity sensor 108 can then determine what functions are available for devices in that location without actively sensing devices.

[0011] Once a determination is made as to what devices are available and which functions can be remotely controlled, a user interface 110 is used to provide those devices and functionality to a user 106. The user interface 110 can be a hardware interface with dedicated buttons and the like and/or a software interface such as a touch screen and the like. Item 110 can also be a combination of both buttons and software touch screens. In a representative embodiment, the user 106 is initially presented with a top level menu of the available electronic devices in a particular environment that the mobile device currently resides in. The order can be predetermined by likelihood of use and/or by a user. The user 106 can then select a device and is then presented with sub menus that allow remote control of that device.
In another embodiment, the user interface 110 can provide remote control functions at the top level if only one device is detected.

The functions described above can be remotely controlled by a proximity sensing device such as that illustrated in FIG. 2 - a touch screen device as an example of a remote control device. This touch screen device can be used as the remote control device for one or more of the electronic devices (e.g. settop boxes, televisions, etc.) as described herein. The touch screen device can display an emulation of the device's remote control, allowing the user to operate the device as if from the device's original remote control. Other mobile devices can include, but are not limited to, mobile cell phones, personal digital assistants (PDAs), portable laptops, universal type remote controls, etc.

The user interface processing employs an input device that can be used to express the operational functions of a remote control, such as fast forward, rewind, channel change etc. To allow for this, a mobile device or touch panel device 200 can be interfaced via a user interface 516 and/or touch panel interface 522 of the receiving device 500, as shown in FIG. 5. The touch panel 200 serves as a remote control function emulator. It is important to note that the touch panel 200 can be a standalone device, or can be included in a mobile device (phone or PDA, etc.), a pad or tablet computer, or other similar portable device. The touch panel 200 can also include a remote control and/or communications interface that is similar to the interface found in the receiving electronic device. This communications interface is preferably bi-directional.

By sensing the proximity of the remote control interface in the touch panel (i.e., mobile device) to the interfaces of settop boxes, televisions, and other equipment, the remote control interface can adjust its menu of available options for only those devices available for control at that location. This can be done by direct sensing of the strength of the radio frequency signal; discrimination for various devices can be obtained by noting clusters of equipment which are *apriori* known to be co-located, as well as direct interrogation by infrared (IR) (assuming an IR interface), which, by using the two-way communication channel, can indicate being within line-of-sight of the device. RF means can also be utilized for direct interrogation.
Ideally, the interface between the mobile (i.e., external remote) device (e.g., the second screen or tablet shown in FIG.2) and the electronic devices (settop box, television, etc.) is bi-directional in some form. For example, the interface can be a radio frequency (RF) means and/or an infrared (IR) means. For instance, an RF means, such as a Bluetooth interface, can be used, instead of and/or with an IR means. The proximity detection can be performed, and then remote control data (codes, mappings, key diagrams) can be sent from the electronic device to the mobile device. Alternatively, the proximity detection can be done, the consumer device type detected (e.g., Brand, model, etc.) and the remote functions can be downloaded to the mobile device over an Internet connection and website.

Another feature is that certain programmed remote emulations (the emulation of a remote control function set for a particular device) in the mobile device can be "locked in." In this way, that remote functionality can be used to operate a particular consumer device that is located anywhere in the house. An example can be a remotely located satellite box feeding video to multiple rooms over a cabled or wireless interface, such as MoCA.

FIGs. 3 and 4 show examples of the operation of a mobile device in a home environment operating multiple devices' remote functions in multiple rooms. In FIG. 3, a proximity sensing remote control device is at Location 1 302 which is in a living/family room 304. A television (TV1) 310, a digital video disc player (DVD) 312, and a satellite receiver and/or cable settop box (SAT/Cable) 314 are available at Location 1 302. The proximity sensing remote control device senses what remotely controllable devices are in Location 1 302 and displays a top level menu 306 on its display 308. The top level menu 306 allows a user to select which device they wish to control and/or to display more detailed controls for that device. This is accomplished automatically without the user needing to enter what devices are available at that location. Some devices such as mobile phones have GPS and/or other built-in location functions that can be utilized to determine location and then use a lookup table to determine what devices are available in that location (a priori knowledge of the devices scenario). Alternatively, the proximity sensing device can sense the available devices in the room and populate its display and/or functions accordingly.
In FIG. 4, the proximity sensing remote control device is carried to Location 2 402 which is in a kitchen 404. A refrigerator 410 and a television (TV2) 412 are available to be remotely controlled at Location 2 402. The proximity sensing remote control device senses that it is in Location 2 402 and displays a top level menu 406 on its display 408. The detection of the remotely controllable devices (e.g., refrigerator and television) is accomplished automatically without the user needing to enter what devices are available. As noted above, this can be done based on location information and/or based on actively sensing devices in the location and the like.

FIG. 5 illustrates the internal workings of an electronic device that is typically controlled via remote control. This illustration is provided to complete how an embodiment of the proximity sensing remote control device can interact with components of the electronic device. In this example, electronic device is a settop box that can be employed with a proximity sensing remote control device. It should be noted that a proximity sensing remote control device can also be used with any type of electronic devices, including, for example, televisions, digital video disc (DVD) players, stereos, kitchen appliances, clocks, garage door openers or other devices and the like. Many of the components illustrated in FIG. 5 are utilized also for these types of devices. They can also include some form of a remote control interface that can ideally use two-way communications.

Looking again to FIG. 5, a block diagram of an embodiment of a electronic device 500 is shown. The electronic device 500 can be included as part of a gateway device, modem, settop box, or other similar electronics device. The device 500 shown can also be incorporated into other systems including an audio device or a display device, etc. In either case, several components for operation of the system are not shown in the interest of conciseness, as they are well known to those skilled in the art.

In the device 500 shown in FIG. 5, content is received by an input signal receiver 502. The input signal receiver 502 can be one of several known receiver circuits used for receiving, demodulation, and decoding signals provided over one of the several possible networks including over the air, cable, satellite, Ethernet, fiber and phone line networks. The desired input signal can be selected and retrieved by the input signal receiver 502 based on user input provided through a control
interface or touch panel interface 522. Touch panel interface 522 can include an
interface for a touch screen device. Touch panel interface 522 can also be adapted to
interface to a cellular phone, a tablet, a mouse, a high end remote or the like. In some
cases, the touch panel interface 522 can also be the remote control interface. In other
cases, the remote control interface can be included in the user interface 516 and
separate from the touch panel interface.

[0021] The decoded output signal is provided to an input stream processor
504. The input stream processor 504 performs the final signal selection and
processing, and includes separation of video content from audio content for the
content stream. The audio content is provided to an audio processor 506 for
conversion from the received format, such as compressed digital signal, to an analog
waveform signal. The analog waveform signal is provided to an audio interface 508
and further to the display device or audio amplifier. Both of which can be remotely
controllable functions. Alternatively, the audio interface 508 can provide a digital
signal to an audio output device or display device using a High-Definition Multimedia
Interconnect Format (HDMI) cable or alternate audio interface such as via a Sony/Philips Digital
Interconnect Format (SPDIF). Output audio sources can also be remotely controlled.
The audio interface can also include amplifiers for driving one more sets of speakers.
The audio processor 506 also performs any necessary conversion for the storage of
the audio signals.

[0022] The video output from the input stream processor 504 is provided to a
video processor 510. The video signal can be one of several formats. The video
processor 510 provides, as necessary a conversion of the video content, based on the
input signal format. The video processor 510 also performs any necessary conversion
for the storage of the video signals. They type of processing and/or the input source
can also be a remotely controlled function.

[0023] A storage device 512 stores audio and video content received at the
input. The storage device 512 allows later retrieval and playback of the content under
the control of a controller 514 and also based on commands, e.g., navigation
instructions such as fast-forward (FF) and rewind (Rew), received from a user
interface 516 and/or touch panel interface 522. These functions can also be remotely
controlled. The storage device 512 can be a hard disk drive, one or more large
capacity integrated electronic memories, such as static RAM (SRAM), or dynamic RAM (DRAM), or can be an interchangeable optical disk storage system such as a compact disk (CD) drive or digital video disk (DVD) drive.

[0024] The converted video signal, from the video processor 510, either originating from the input or from the storage device 512, is provided to the display interface 518. The display interface 518 further provides the display signal to a display device of the type described above. The display interface 518 can be an analog signal interface such as red-green-blue (RGB) or can be a digital interface such as HDMI. Which display interface and/or what is displayed can also be a remotely controlled function.

[0025] The controller 514 is interconnected via a bus to several of the components of the device 500, including the input stream processor 502, audio processor 506, video processor 510, storage device 512, and a user interface 516. The controller 514 manages the conversion process for converting the input stream signal into a signal for storage on the storage device or for display. The controller 514 also manages the retrieval and playback of stored content which can also be remotely controllable functions. The controller 514 is further coupled to control memory 520 (e.g., volatile or non-volatile memory, including RAM, SRAM, DRAM, ROM, programmable ROM (PROM), flash memory, electronically programmable ROM (EPROM), electronically erasable programmable ROM (EEPROM), etc.) for storing information and instruction code for controller 514. Control memory 520 can store instructions for controller 514. Control memory can also store a database of elements, such as graphic elements containing content.

[0026] In view of the exemplary systems shown and described above, methodologies that can be implemented in accordance with the embodiments will be better appreciated with reference to the flow charts of FIG. 6. While, for purposes of simplicity of explanation, the methodologies are shown and described as a series of blocks, it is to be understood and appreciated that the embodiments are not limited by the order of the blocks, as some blocks can, in accordance with an embodiment, occur in different orders and/or concurrently with other blocks from that shown and described herein. Moreover, not all illustrated blocks may be required to implement the methodologies in accordance with the embodiments.
FIG. 6 is a flow diagram of a method 600 of remotely controlling devices by a mobile device. The method starts 602 by sensing whether devices in an environment have a remote control interface 604. Remote control functions are then emulated on the mobile device for at least one sensed device 606, ending the flow 608. In one embodiment, the functions of a sensed device are emulated by using a lookup table to determine what functions are available for the device. In yet another embodiment, the emulated functions for a sensed device can be "locked in" and its emulated functions remain available on the mobile device regardless of the mobile device's location and/or whether the mobile device has sensed that particular device. This allows, for example, a home music system to be controlled in any room rather than just in the room where the audio equipment resides, etc. In still yet another embodiment, a network connection can be exploited to obtain remote control functions for a sensed device. For example, if a make and model are all that is known, the remote functionality can be requested via communication with the network and the remote functions downloaded to the mobile device.

The emulated remote control functions can be interactively displayed on the mobile device. This allows a user to select which device to control and/or what specific functions to control. The user can also utilize the interactions to input data such as what devices are located where in their home, etc. This a priori knowledge can be stored in a lookup table in the mobile device and/or stored online in a home network (LAN) and/or a wide area network (WAN, e.g., the Internet). This permits the user to download remote functions for obscure equipment that can utilize "out of the norm" communication protocols for their remote control. The user can also edit the list of remote functions for each device. For example, a device might have 25 remote functions that can be controlled. However, a user may only want to control three of them and does not want to drill through unnecessary functions. Thus, the list can be edited to only display those that the user uses most and/or expresses a desire to use.

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

1. A mobile device that controls other devices, comprising:
   a proximity sensor that senses whether devices in an environment have a remote control interface; and
   a user interface that emulates remote control functions for at least one sensed device.

2. The mobile device of claim 1, wherein the proximity sensor senses which model of a device is in the environment and the user interface uses a lookup table to emulate remote control functions associated with the model of the device.

3. The mobile device of claim 1, wherein the proximity sensor senses devices by sensing at least one of the strength of a radio frequency, what other devices are in close proximity of a device, and by direct interrogation by infrared.

4. The mobile device of claim 1, wherein the user interface locks in emulated remote control functions for a device that can be controlled from more than one environment.

5. The mobile device of claim 1, wherein the proximity sensor learns at least one function that is remotely controllable for a sensed device.

6. The mobile device of claim 1, wherein the user interface provides user interactive remote control functions.

7. The mobile device of claim 1, wherein the mobile device uses bi-directional communications to remotely control a device.

8. The mobile device of claim 7, wherein the bi-directional communications comprising one of radio frequency (RF) communications and infrared (IR) communications.
9. The mobile device of claim 1, wherein the mobile device interacts with a network to obtain information associated with emulating remote control functions.

10. A mobile device that controls other devices, comprising:
    a locator that determines a location of the mobile device;
    a device data table that stores remote controllable devices based on their location; and
    a user interface that emulates remote control functions for at least one device found in the data table based on location of the mobile device.

11. The mobile device of claim 10, wherein the mobile device interacts with a network to obtain device data information associated with emulating remote control functions.

12. A method for remotely controlling devices by a mobile device, comprising the steps of:
    sensing whether devices in an environment have a remote control interface;
    and
    emulating remote control functions for at least one sensed device on the mobile device.

13. The method of claim 12 further comprising the step of:
    determining functions of a sensed device to emulate by using a lookup table to determine available remote control functions of the device.

14. The method of claim 12 further comprising the step of:
    locking in emulated functions of a sensed device to allow remote control of the device in another environment.
15. The method of claim 12 further comprising the step of:
communicating with a network to obtain remote control functions of a sensed
device.

16. The method of claim 15 further comprising the step of:
displaying the emulated remote control functions interactively on the mobile
device.

17. A system that remotely controls devices, comprising:
a means for sensing whether devices in an environment have a remote control
interface; and
a means for emulating remote control functions for at least one sensed device
on the mobile device.

18. The system of claim 17, wherein the sensing means includes at least
one of the strength of a radio frequency, what other devices are in close proximity of a
device, and by direct interrogation by infrared.
Proximity-based Self-leaning Remote

FIG. 4
FIG. 6

600

Start 602

SENSING WHETHER DEVICES IN AN ENVIRONMENT HAVE A REMOTE CONTROL INTERFACE 604

EMULATING REMOTE CONTROL FUNCTIONS FOR AT LEAST ONE SENSED DEVICE ON THE MOBILE DEVICE 606

End 608
A. CLASSIFICATION OF SUBJECT MATTER
INV. H04N5/44 H04N21/41 H04N21/47 H04N21/422 H04M1/725
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

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 practical, search terms used)

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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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 but published on or after the international filing date
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* 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
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Date of the actual completion of the international search: 29 January 2013

Date of mailing of the international search report: 14/02/2013

Authorized officer: Dockhorn, Hans
## DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. □ Claims Nos.:
   because they relate to subject matter not required to be searched by this Authority, namely:

2. □ Claims Nos.:
   because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. □ Claims Nos.:
   because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

This International Searching Authority found multiple inventions in this international application, as follows:

   see additional sheet

1. ☑ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. □ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. □ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. □ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

□ The additional search fees were accompanied by the applicant’s protest and, where applicable, the payment of a protest fee.

□ The additional search fees were accompanied by the applicant’s protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☒ No protest accompanied the payment of additional search fees.
This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-9, 12-18

   Sensing RF signal strength, other devices in close proximity of a [sensed] device or direct interrogation by infra-red

2. claims: 10, 11

   A mobile device locating itself
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