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(54) SMART INFRARED CONTROL DEVICE AND SMART INFRARED CONTROL SYSTEM

(57) Provided are a smart infrared control device (10) and a smart infrared control system, said smart infrared control device (10) comprising: an infrared-code receiving module (11), which receives a first infrared code; a parsing-script acquisition module (12), which acquires a first parsing script corresponding to the first infrared code; an infrared parsing module (13), which uses the first parsing script to parse the first infrared code to obtain a corresponding control signal. Using only one smart infrared control device (10), it is possible to obtain the control information of different types of remote controllers, making it easy to obtain the usage habits of a user and facilitating data analysis.
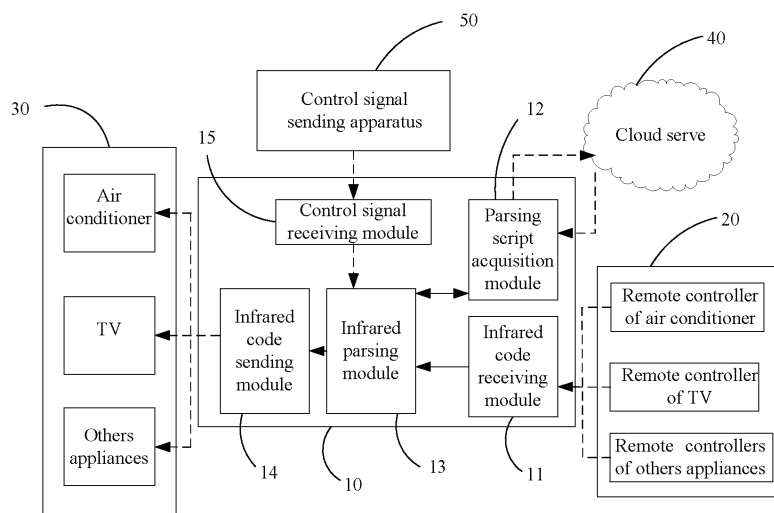
FIG. 1

EP 3 399 511 A1

Description

TECHNICAL FIELD

[0001] The invention relates to infrared remote control technology, in particular to an intelligent infrared control device and an intelligent infrared control system.

BACKGROUND

[0002] At present, there are more and more universal remote controllers, Wi-Fi-to-infrared (IR) control apparatus, and mobile phone integrated infrared control products. These products can integrate infrared controllers for various home appliances into one unit. All apparatuses which are controlled by infrared control apparatuses can be controlled by only one apparatus, thus bringing great convenience to users. These products are implemented by embedding infrared codes of all appliances. However, the storage space of such an infrared remote controller needs to be large, the more apparatuses that can be controlled, the higher the cost of the infrared controller, and the infrared controller is not easy to be expanded.

SUMMARY

[0003] The problem solved by the present invention is to provide an intelligent infrared control device and an intelligent infrared control system. Only one intelligent infrared control device can be used to acquire control information of different kinds of remote controllers to control different external apparatuses.

[0004] To solve the foregoing problem, embodiments of the present invention provide an intelligent infrared control device. The device includes an infrared code receiving module, a parsing script acquisition module and an infrared parsing module.

[0005] The infrared code receiving module is configured to receive a first infrared code.

[0006] The parsing script acquisition module is configured to acquire a first parsing script corresponding to the first infrared code.

[0007] The infrared parsing module is configured to parse the first infrared code using the first parsing script, to acquire the control signal corresponding to the first infrared code.

[0008] According to an embodiment, the device may further include: an infrared code sending module configured to send a second infrared code.

[0009] The parsing script acquisition module may be further configured to acquire a second parsing script corresponding to the second infrared code.

[0010] The infrared parsing module may be further configured to modulate the acquired control signal into a second infrared code using the second parsing script.

[0011] According to an embodiment, the first parsing script is the same as or different from the second parsing script.

[0012] According to an embodiment, the first parsing script and the second parsing script may be lua infrared code parsing scripts.

[0013] According to an embodiment, the intelligent infrared control device may further include: a control signal receiving module configured to receive the control signal and send the control signal to the infrared parsing module. The infrared parsing module may be further configured to modulate the acquired control signal into a second infrared code using a second parsing script.

[0014] According to an embodiment, the intelligent infrared control device may also include a control signal storage module configured to store control information of the control signal.

[0015] Embodiments of the present invention further provide an intelligent infrared control system including: an intelligent infrared control device and an external control apparatus.

[0016] The intelligent infrared control device includes an infrared code receiving module, a parsing script acquisition module and an infrared parsing module.

[0017] The infrared code receiving module is configured to receive a first infrared code sent by the external control apparatus.

[0018] The parsing script acquisition module is configured to acquire a first parsing script corresponding to the first infrared code.

[0019] The infrared parsing module is configured to parse the first infrared code using the first parsing script, to acquire a control signal sent from the external control apparatus.

[0020] According to an embodiment, the intelligent infrared control system may also include an external apparatus.

[0021] The intelligent infrared control device may further include: an infrared code sending module configured to send a second infrared code to the external apparatus to control the external apparatus.

[0022] The parsing script acquisition module of the intelligent infrared control device may be further configured to: acquire a second parsing script corresponding to the second infrared code.

[0023] The infrared parsing module of the intelligent infrared control device may be further configured to: modulate the acquired control signal into the second infrared code using the second parsing script.

[0024] According to an embodiment, the intelligent infrared control system may also include a control signal storage module configured to store control information of the control signal, and control the external apparatus using the stored control information..

[0025] According to an embodiment, the intelligent infrared control system may further include a control signal sending apparatus, the intelligent infrared control device may further include a control signal receiving module.

[0026] The control signal receiving module may be configured to receive the control signal sent from the con-

trol signal sending apparatus and send the control signal to the infrared parsing module, the infrared parsing module may be further configured to modulate the acquired control signal into a second infrared code using a second parsing script.

[0027] According to an embodiment, the intelligent infrared control system may further include a cloud server, the parsing script acquisition module may be further configured to acquire the first parsing script and the second parsing script from the cloud server.

[0028] According to an embodiment, the intelligent infrared control system may also include a control signal storage module configured to store control information of the control signal.

[0029] Compared with the prior art, the present technical solution has the following advantages.

[0030] Since the intelligent infrared control device of the present invention has a parsing script acquisition module, through acquiring the first parsing script by the parsing script acquisition module, parsing the first infrared code using the first parsing script to acquire the control signal corresponding to the first infrared, control information of different kinds of remote controllers can be acquired using only one intelligent infrared control device, which is convenient for obtaining the usage habits of the user and is convenient for performing data analysis.

[0031] Further, the parsing script acquisition module may also acquire a second parsing script corresponding to the second infrared code, modulate the acquired control signal into a second infrared code using the second parsing script and send the second infrared code to the external apparatus to control the external apparatus, it can be achieved that one remote controller can control a plurality of external apparatuses, even different external apparatus, ,which is very convenient and greatly improves the user experience.

BRIEF DESCRIPTION OF DRAWINGS

[0032] FIG. 1 is a schematic structural diagram of an intelligent infrared control system according to embodiments of the present invention.

DETAILED DESCRIPTION

[0033] The following clearly describes the technical solutions of the present invention through specific embodiments in conjunction with the accompanying drawings.

[0034] Embodiments of the present invention provide an intelligent infrared control system. Referring to FIG. 1, the intelligent infrared control system includes: an intelligent infrared control device 10, an external control apparatus 20, an external apparatus 30, a cloud server 40, and a control signal sending apparatus 50. The infrared control device 10 includes an infrared code receiving module 11, a parsing script acquisition module 12, an infrared parsing module 13, an infrared code sending module 14, a control signal receiving module 15, and a control signal storage module (not shown).

[0035] The infrared code receiving module 11 is configured to receive the infrared signal from the external control apparatus 20, acquire a first infrared code, and send the first infrared code to the infrared parsing module 13 for parsing. In the prior art, there are many solutions for receiving the infrared signal from the external control apparatus 20 and acquiring the first infrared code, which will not be described here.

[0036] The parsing script acquisition module 12 is configured to acquire a first parsing script corresponding to the first infrared code. The first parsing script may be stored in the intelligent infrared control device 10 in advance, that is, the intelligent infrared control device 10 stores a first parsing script of the first infrared code corresponding to the external control apparatus 20 in advance. The first parsing script may also be stored in the cloud server 40. The parsing script acquisition module 12 can be a wired communication module or a wireless communication module. Specifically, the wireless communication module can be a module using a technology such as Wi-Fi, RF, 3G, 4G, etc., and the wired communication can be the 485 interface communication, the power carrier communication, etc. The first parsing script corresponding to the first infrared code may be acquired from the cloud server 40 using the parsing script acquisition module 12. Alternatively, a part of the first parsing script may be stored in the intelligent infrared control device 10 in advance, and others may be stored in the cloud server 40. The first parsing script corresponding to the first infrared code can be acquired from the cloud server 40 using the parsing script acquisition module 12..

[0037] In the smart home field or other fields, there are a lot of external apparatuses that need to be controlled by a remote controller. For example, air conditioners can be controlled by remote controls dedicated to air conditioners, TVs can be controlled by remote controllers dedicated to TVs, and some curtains, humidifiers, etc. also can be controlled by remote controller dedicated to them. Most of the remote controllers are infrared remote controllers. However, if too many remote controllers are used, they are easily be lost or forgotten, and it is inconvenient and unclear which remote controller controls which external apparatus. In the prior art, there are some universal remote controllers that can control a variety of external apparatuses, such as simultaneously control air conditioners with different brands, however, so-called universal remote controllers are also pre-programmed to control external apparatuses with specified types, it cannot control the infrared codes of all air conditioners or TVs on the market. In the present invention, the first parsing script corresponding to the first infrared code may be stored in the cloud server 40, and the first parsing script corresponding to the first infrared code may be acquired from the cloud server 40 using the parsing script acquisition module 12. The first parsing scripts corresponding to different external apparatuses may be acquired as need at any time. The first parsing scripts corresponding

to different external apparatuses may be supplemented at any time. Control information of different kinds of remote controllers can be acquired using only one intelligent infrared control device to control different external apparatuses. It can save the development cost of the intelligent infrared control device in the early stage, and it is also beneficial for the intelligent infrared control device to expand the external apparatuses that can be controlled latter.

[0038]   In one embodiment, the APP of the mobile phone is connected to the parsing script acquisition module 12. The APP of the mobile phone searches for the external apparatus to be controlled or the models of the corresponding external control apparatuses, and finds the specified Uniform Resource Locator (URL) of the corresponding first parsing script in the cloud server and sends it to the parsing script acquisition module. The parsing script acquisition module downloads the corresponding first parsing script to the cloud server according to the URL.

[0039]   The control units of different external apparatuses may be developed based on multiple platforms. Because of the strong compatibility, the lua language as a cross-platform embedded scripting language can be at least applicable to multiple platforms including the Android platform, the los platform, and the Windows platform. A complete lua script parser has a small size of about 200K and a fast parsing speed. Therefore, in this embodiment, the first parsing script is a lua infrared code parsing script. In other embodiments, the parsing script may also employ other scripting engines.

[0040]   In this embodiment, the parsing script acquisition module 12 may also acquire a second parsing script corresponding to the second infrared code, and the second infrared code can be used to control the external apparatus 30. In other embodiments, the parse script acquisition module may not acquire the second parsing script corresponding to the second infrared code.

[0041]   The second parsing script may be stored in the intelligent infrared control device 10 in advance, that is, the intelligent infrared control device 10 stores the second parsing script of the second infrared code corresponding to the external apparatus 30 to be controlled in advance. The second parsing script may also be stored in the cloud server 40. The parsing script acquisition module 12 can be a wired communication module or a wireless communication module. Specifically, the wireless communication module can be a module using a technology such as Wi-Fi, RF, 3G, 4G, etc., and the wired communication can be the 485 interface communication, the power carrier communication, etc. The second parsing script corresponding to the second infrared code can be acquired from the cloud server 40 using the parsing script acquisition module 12. Alternatively, a part of the second parsing script may be stored in the intelligent infrared control device 10 in advance, and others may be stored in the cloud server 40. The second parsing script corresponding to the second infrared code can be ac-

quired from the cloud server 40 using the parsing script acquisition module 12. The method for obtaining the second parsing script may reference to the method for acquiring the first parsing script, which will not be described again here.

[0042]   The second parsing script may be as same as the first parsing script, that is, the external control apparatus corresponds to an external apparatus, for example, the external control apparatus is a remote controller of an air conditioner. The external apparatus is an air conditioner with a respective model. The intelligent infrared control device 10 parses the first infrared code generated by the remote controller of the air conditioner to obtain a control signal, converts the control signal to a second infrared code corresponding to the control signal and sends the second infrared code to the air conditioner to control the air conditioner. In this case, the first infrared code and the second infrared code may also be same. Both of the first parsing script and the second parsing script are lua infrared code parsing scripts. In this situation, since the external control apparatus can directly control the external apparatus, the step of converting the control signal into the second infrared code corresponding to the control signal and sending the second infrared code to the external apparatus can be omitted.

[0043]   The second parsing script may also be different from the first parsing script, that is, the external control apparatus does not correspond to the external apparatus. For example, the external apparatus is an air conditioner, the external control apparatus is not a remote controller of the air conditioner with a respective model. Or the external control apparatus is a universal remote controller, but cannot control the air conditioner. The intelligent infrared control device 10 parses the first infrared code generated by the external control apparatus to obtain a control signal, converts the control signal into a second infrared code corresponding to the control signal, and sends the second infrared code to the air conditioner to control the air conditioner. In this case, the first infrared code and the second infrared code are different, but both of the first parsing script and the second parsing script may be lua infrared code parsing scripts.

[0044]   In this embodiment, the infrared parsing module 13 has a lua script parser capable of parsing the lua infrared code. The lua script parser parses the first infrared code using the first parsing script, and acquires the control signal sent by the external control apparatus 13, and can also modulate the acquired control signal into a second infrared cod.. The control signal may be either a control signal parsed from the first infrared code or a control signal acquired directly.

[0045]   In other embodiments, the infrared parsing module may only have the function of parsing the first infrared code using the first parsing script, and does not have the function of modulating the acquired control signal into the second infrared code.

[0046]   The infrared code sending module 14 acquires the second infrared code generated by the infrared pars-

ing module 13, and sends the second infrared code to the external apparatus to control the external apparatus.

[0047] The control signal receiving module 15 can directly acquire the control signal for the external apparatus, so that the infrared parsing module 13 can directly modulate the acquired control signal into a second infrared code for control. In other embodiments, the control signal receiving module may not be needed.

[0048] The control signal receiving module 15 may be a wired communication module or a wireless communication module. Specifically, the wireless communication module can be a module using a technology such as Wi-Fi, RF, 3G, 4G, etc., and the wired communication can be the 485 interface communication, the power carrier communication, etc. The control signal can be acquired from the control signal sending apparatus 50 using the control signal receiving module 15.

[0049] In this embodiment, the control signal receiving module 15 and the parsing script acquisition module 12 share one Wi-Fi module in the intelligent infrared control device 10 to communicate, and acquire the control signal from the control signal sending apparatus 50 by the Wi-Fi module. In other embodiments, the control signal receiving module and the parsing script acquisition module may also use other communication modules which are same or different for communication.

[0050] The control signal storage module is configured to store the acquired control signal, learn the stored control signal and use the stored control information to control the external apparatus.

[0051] Since the control signal includes control time, control action of the user, etc., it can reflect the habit of a user using an external apparatus. By acquiring the usage habits of the user, it can make powerful data analysis for market sales etc.

[0052] In other embodiments, the external apparatus can formulate an intelligent control scheme according to the favorite usage habit of the user, and can automatically and intelligently control the external apparatus to operate without the operation of the user. For example, the user is accustomed to turn on the air conditioner at 10:00 pm and set the temperature at 18 degrees, the control signal storage module 16 stores the control signal and learns the favorite usage habits of the user. The user may not remotely control the air conditioner every night. The intelligent infrared control device can convert the control signal stored in the control signal storage module into the second infrared code corresponding to the control signal, to turn on the air conditioner and adjust the temperature to 18 degrees automatically at 10:00 pm, thus improving the intelligence level of the smart home and improving the user experience.

[0053] In this embodiment, the control signal storage module is located in the intelligent infrared control device as a built-in storage module. In other embodiments, the control signal storage module may also be located at the cloud server, and the acquired control signal is uploaded to the control signal storage module of the cloud server

in real time or regularly. The cloud server may be used to analyze and feedback the usage habits of the user. When it is necessary to automatically control the external apparatus, the intelligent infrared control device acquires the control information stored in the cloud server and controls the external apparatus.

[0054] In this embodiment, the external apparatus 30 may be some appliances such as a television, an air conditioner, an electric curtain, etc. Correspondingly, the external control apparatus 20 is a remote controller corresponding to the models of the appliances. When the remote controller controls the electrical device remotely, the intelligent infrared control device 10 acquires and stores each control signal, that is, the intelligent infrared control device 10 collects and analyzes the usage habits of the user.

[0055] In other embodiments, even if the external apparatus do not correspond to the external control apparatus, for example, a Konka TV and a remote controller of a Samsung TV, the infrared codes of the Konka TV and the Samsung TV are different. As long as the intelligent infrared control device 10 acquires the corresponding first decoding script and the second decoding script, when the button for amplifying volume is pressed on the remote controller of the Samsung TV, the intelligent infrared control device 10 parses the first infrared code to obtain a control signal for amplifying the volume, and modulates the control signal for amplifying the volume to form a second infrared code which can also control the Konka TV, so that all TV with different brands and models can be controlled by only one TV remote controller through the conversion of the intelligent infrared control device 10.

[0056] In other embodiments, the external apparatus may also be any other apparatus employing an infrared remote control.

[0057] The cloud server 40 is configured to store various first decoding scripts and second decoding scripts. The cloud server may also be located at a server or computer in the user's home, or may be located at the Internet. The first decoding script and the second decoding script stored on the cloud server 40 can be updated and added at any time.

[0058] In other embodiments, the cloud server is also used to store the control information used to control the external apparatus by the user.

[0059] In this embodiment, the intelligent infrared control system has a control signal sending apparatus 50. The control signal sending apparatus 50 directly sends a control signal to the intelligent infrared control device 10, so that the intelligent infrared control device 10 can control the external apparatus using the second infrared code modulated from the control signal. In other embodiments, there may be no control signal sending apparatus.

[0060] The control signal sending apparatus may be an intelligent terminal, which can select the control signal and send the control signal to the control signal receiving

module 15 through a communication method such as Wi-Fi, etc.

[0061] In an embodiment, the control signal sending apparatus may be a mobile phone. It is not necessary for each control button to learn to generate the function panel of the remote controller. The mobile phone may search the remote controller or the model of an external apparatus directly to generate an analog function panel of the remote controller. Because the lua parsing script already contains the infrared code parsing and the infrared code modulating for the model, the mobile phone may send the corresponding control signal to the intelligent infrared control device 10 through performing selection on the function panel of the remote controller directly generated on the mobile phone.

[0062] Since the intelligent infrared control device of the present invention has at least a parsing script acquisition module, through acquiring the first parsing script by the parsing script acquisition module, parsing the first infrared code using the first parsing script to acquire the control signal corresponding to the first infrared, control information of different kinds of remote controllers can be acquired using only one intelligent infrared control device, it is convenient for obtaining the usage habits of the user and is convenient for performing data analysis.

[0063] Further, the parsing script acquisition module may also acquire a second parsing script corresponding to the second infrared code, modulate the acquired control signal into a second infrared code using the second parsing script and send the second infrared code to the external apparatus to control the external apparatus, it can be achieved that one remote controller can control a plurality of external apparatuses, even different external apparatus, it is very convenient and greatly improves the user experience.

[0064] A person skilled in the art can further appreciate that the exemplary units and algorithm steps described in conjunction with the embodiments disclosed in the present application can be implemented by electronic hardware, computer software, or a combination of the electronic hardware and the computer software. In order to clearly illustrate the interchangeability of the hardware and the software, the composition and steps of the various examples have been generally described in terms of functionality in the above description. Whether these functions are implemented by the hardware or the software depends on the specific application of the technical solution and design constraint conditions. A person skilled in the art may use different methods to implement the described functions for each specific application, but such implementation should not be considered to be beyond the scope of the present application.

[0065] The steps of the method or the algorithm described in connection with the embodiments disclosed in this application may be implemented by hardware, a software module executed by a processor, or a combination of the hardware and the software module executed by the processor. A software module may be located in random access memory RAM, memory, read only memory ROM, electrically programmable ROM, electrically erasable programmable ROM, registers, hard disk, removable disk, CD-ROM, or storage media in any other form known in the art.

[0066] Although the present invention has been disclosed as the preferred embodiment as above, it is not intended to limit the present invention. Any person skilled in the art can utilize the above-disclosed method and technical content to make possible changes and modifications to the technical solutions of the present invention without departing from the spirit and scope of the present invention. Therefore, any content that does not depart from the technical solution of the present invention, any simple modifications, equivalent changes and modifications made to the above examples according to the technical essence of the present invention belong to the protection range of technical solutions of the present invention.

Claims

1. An intelligent infrared control device, comprising:

   an infrared code receiving module, configured to receive a first infrared code;
   a parsing script acquisition module, configured to acquire a first parsing script corresponding to the first infrared code; and
   an infrared parsing module, configured to parse the first infrared code using the first parsing script, to acquire a control signal corresponding to the first infrared code.

2. The intelligent infrared control device according to claim 1, further comprising:

   an infrared code sending module, configured to send out a second infrared code;
   wherein the parsing script acquisition module is further configured to acquire a second parsing script corresponding to the second infrared code; and
   wherein the infrared parsing module is further configured to modulate the acquired control signal into the second infrared code using the second parsing script.

3. The intelligent infrared control device according to claim 2, wherein the first parsing script is the same as or different from the second parsing script.

4. The intelligent infrared control device according to claim 1 or 2, wherein the first parsing script and the second parsing script are lua infrared code parsing scripts.

5. The intelligent infrared control device according to claim 1, further comprising:

a control signal receiving module, configured to receive the control signal and send the control signal to the infrared parsing module, wherein the infrared parsing module is further configured to modulate the control signal into a second infrared code using a second parsing script.

6. The intelligent infrared control device according to claim 1, further comprising:

a control signal storage module, configured to store control information of the control signal.

7. An intelligent infrared control system comprising:

an intelligent infrared control device; and an external control apparatus, wherein the intelligent infrared control device comprises:

an infrared code receiving module, configured to receive a first infrared code sent from the external control apparatus; a parsing script acquisition module, configured to acquire a first parsing script corresponding to the first infrared code; an infrared parsing module, configured to parse the first infrared code using the first parsing script, to acquire a control signal sent from the external control apparatus.

8. The intelligent infrared control system according to claim 7, further comprising an external apparatus, wherein the intelligent infrared control device further comprises: an infrared code sending module, configured to send a second infrared code to the external apparatus to control the external apparatus; wherein the parsing script acquisition module of the intelligent infrared control device is further configured to: acquire a second parsing script corresponding to the second infrared code; and wherein the infrared parsing module of the intelligent infrared control device is further configured to: modulate the control signal into the second infrared code using the second parsing script.

9. The intelligent infrared control system according to claim 8, further comprising:
a control signal storage module, configured to store control information of the control signal, and control the external apparatus using the stored control information.

10. The intelligent infrared control system according to

claim 7, further comprising a control signal sending apparatus,
wherein the intelligent infrared control device further comprises: a control signal receiving module, configured to receive the control signal sent from the control signal sending apparatus and send the control signal to the infrared parsing module, and wherein the infrared parsing module is further configured to modulate the control signal into a second infrared code using a second parsing script.

11. The intelligent infrared control system according to claim 7 or 8, further comprising a cloud server, wherein the parsing script acquisition module is further configured to acquire the first parsing script and the second parsing script from the cloud server.

12. The intelligent infrared control system according to claim 7, further comprising: a control signal storage module, configured to store control information of the control signal.
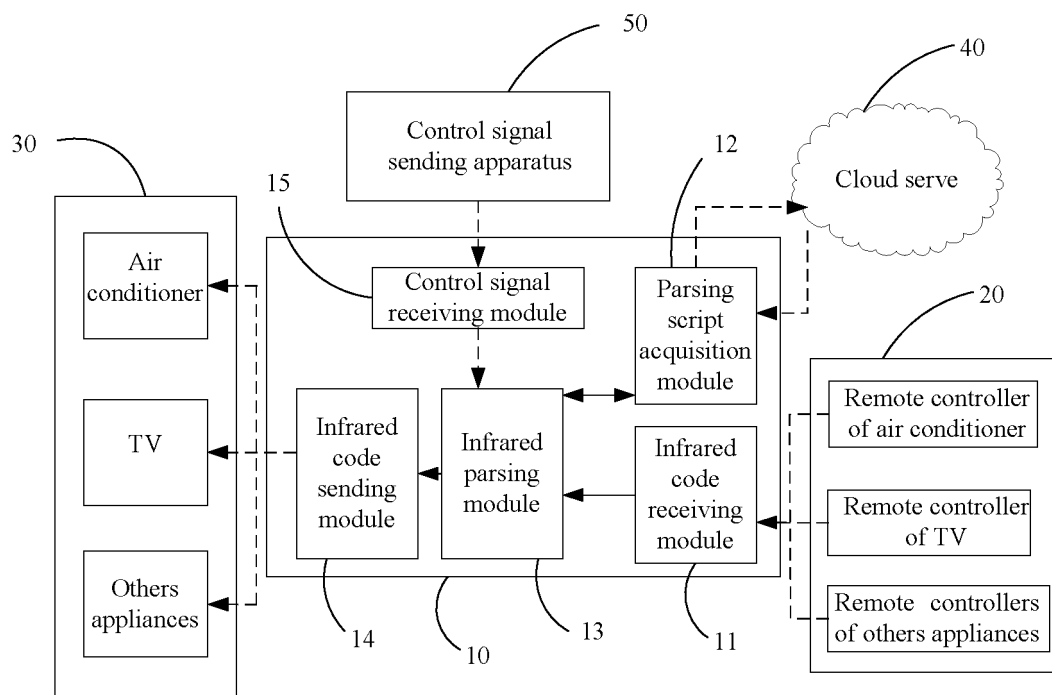
FIG. 1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2016/074489

A. CLASSIFICATION OF SUBJECT MATTER

G08C 23/04 (2006.01) i

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)

G08C 23, G08C 17, H04L 29, H04N 5

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)

CNABS; CNTXT; CNKI; VEN: remote control, infrared code, infrared, remot+, code?, download, script?, universal, updat+, server

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 1912948 A (SUNPLUS TECHNOLOGY CO., LTD. et al.), 14 February 2007 (14.02.2007), description, pages 7-17, and figures 1-9	1-4, 6-9, 12
Y	CN 1912948 A (SUNPLUS TECHNOLOGY CO., LTD. et al.), 14 February 2007 (14.02.2007), description, pages 7-17, and figures 1-9	5, 10-11
Y	CN 103839401 A (YU, Zhiwei et al.), 04 June 2014 (04.06.2014), description, paragraphs [0020]-[0021], and figures 1-2	5, 10-11
A	CN 102693624 A (CHENG, Sheng et al.), 26 September 2012 (26.09.2012), the whole document	1-12
A	CN 204596141 U (ZHEJIANG YUEJU INTELLIGENT TECHNOLOGY CO., LTD.), 26 August 2015 (26.08.2015), the whole document	1-12
A	US 2014341585 A1 (SEOBY ELECTRONICS CO., LTD. et al.), 20 November 2014 (20.11.2014), the whole document	1-12

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

* Special categories of cited documents:	"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
"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	"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
"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)	"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
"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	"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 September 2016 (22.09.2016)	**30 September 2016 (30.09.2016)**

| Name and mailing address of the ISA/CN: State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No.: (86-10) 62019451 | Authorized officer **YANG, Xi** Telephone No.: (86-10) **62085797** |

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

	International application No.
	PCT/CN2016/074489

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 1912948 A	14 February 2007	CN 100395999 C	18 June 2008
CN 103839401 A	04 June 2014	None	
CN 102693624 A	26 September 2012	CN 102693624 B	15 July 2015
CN 204596141 U	26 August 2015	None	
US 2014341585 A1	20 November 2014	KR 101623162 B1	20 May 2016
		KR 20140135433 A	26 November 2014

Form PCT/ISA/210 (patent family annex) (July 2009)