METHOD AND SYSTEM FOR CONTROLLING INDOOR DEVICE FROM OUTDOOR

Abstract: A method for controlling indoor devices from outdoor comprises, during a setting procedure, a step of sending registering information of the controlled device from an indoor control unit to an outdoor control unit; and comprises during a controlling procedure, sending a control command from a control device which is outside of an indoor environment to the outdoor control unit via internet; sending a control request from the outdoor control unit to a signal generation interface which is outside of the indoor environment; sending a trigger signal from the signal generation interface to a signal reception interface in the indoor environment to inform the indoor control unit; and acquiring the control command by the indoor control unit from the outdoor control unit via the internet so as to make the control device control the controlled device.
DESCRIPTION

METHOD AND SYSTEM FOR CONTROLLING INDOOR DEVICE FROM OUTDOOR

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Technical Field

The present invention relates to a method of controlling an indoor device, and a system for controlling an indoor device, more particularly, to a method for controlling an indoor device from outdoor, and a system of the same.

Background Art

Conventionally, the remote control to a device is executed on a dedicated network. Since the price of communication medium is expensive, the usage of such traditional remote control is only limited to some industrial applications. However, with the popular of Internet, controlling various devices through Internet appears and gets widespread. Because of the convenience and low price of remote control through internet, those electrical appliance such as refrigerator, washing machine, air conditioner, television can be remotely controlled, which results in the appearance of Home Internet Appliances (HIA) and makes the user able to remotely manipulate those home internet appliances.

US patent application publication No. US2003/0009537 discloses a home network architecture over World Wide Web (WWW). In this application, a user can remotely control a device in home from outdoor by sending a request to a home portal therefrom. Next,
the home portal forwards the request of the user to a home network gateway. The home network gateway uses a home network IP address registered in the home portal, i.e. a static IP address of the home network gateway. Then, the home network gateway can communicate with the requested device and control it by using an internal home network searching method.

However, the conventional technique as described above has the drawbacks as follows. Firstly, due to the usage of a registered IP address, the home network gateway thus has a public IP address in the public network domain. This public IP address may raise a security problem since a hacker can try to attack any known IP address. Secondly, the number of IP addresses is limited and its capacity is not enough. Because most of Internet Service Providers (ISPs) only provide a few IP addresses to a customer, it is obvious that the IP addresses are not enough if each device in home of the customer corresponds to a different IP address. In order to solve the above two problems, a router or firewall with a function of Network Address Translation (NAT) can be used in home so as to protect the devices and share the valuable IP address resource. However, such a method will bring the following problems about NAT.

Presently, a lot of families have already begun to use a broadband Internet access service. Therefore, a mechanism to connect the home network to the internet by using the router with NAT function in home gets more and more wide spreading. Further, a lot of home electrical appliances solve the problem of the lack of enough public IP addresses by using the NAT mechanism. This means that a plurality of private IP addresses need to be mapped to
one public IP address combined with a plurality of different port numbers. After it is subjected to this processing, each home electrical appliance can easily be connected to the Internet. Thus, there are two ways to perform the control from outdoor through the NAT. However, following problems exist in the two ways.

Firstly, although the static public IP address can be set through the NAT mechanism to be mapped to the private IP address of one home electrical appliance, such a setting procedure is not very easy to a user without professional knowledge in this term.

Secondly, referring to Fig. 1, in order to transfer a control packet to an indoor device 11, it is necessary to know the public IP address of an indoor environment 1. Supposed that the mapping relations between the static public IP address and the private IP addresses do not exist, then the control packet can not arrive at the indoor environment 1. Thus, an ISP 2 should provide the indoor environment 1 with a public IP address. Supposed that the ISP 2 dynamically specifies the public IP address, then a target IP address will correspondingly change when a mobile device 3 attempt to connect to the indoor environment 1.

Referring to Fig. 2, the above NAT problems can be solved by Simple Traversal Of UDP Through NAT (STUN) protocol, wherein UDP denotes User Datagram Protocol. A STUN client uses UDP packets to establish a connection interface in order to maintain the available state of the NAT table. Next, the mobile device requests the public IP address and port number of the indoor device through a STUN server from outdoor so as to access the indoor device.
The above processing way, however, will bring the following problems. Firstly, with the increase of the number of the registered users/indoor devices, a periodical transmission for establishing the connection port would correspondingly increase. This is a heavy burden to the STUN server. Secondly, by means of the periodic UDP packets, the connection interface or the NAT interface number map is open during the whole processing. This is harmful to the security of the STUN client.

Disclosure of Invention

It is an object of the present invention to provide a method for controlling an indoor device from outdoor, which is capable of improving the security of the system, mitigating internet loads, reducing the cost of signal transmission, and remotely controlling an indoor device from outdoor in an economic and secure manner.

In order to achieve the object of the present invention, there is provide a method for controlling an indoor device from outdoor which is used to make a controlling device outside an indoor environment to send a control command to remotely control a controlled device in the indoor environment, the method comprising the steps of: (a) sending a registering information of the controlled device from an indoor control unit to an outdoor control unit during a setting procedure; (b) sending the control command from the controlling device to the outdoor control unit via internet during a controlling procedure; (c) sending a control request from the outdoor control unit to a signal generation interface adjacent to the outdoor control unit during the controlling procedure; (d) sending a trigger signal
from the signal generation interface to a signal reception interface in the indoor environment to inform the indoor control unit of the control request during the controlling procedure; and (e) the indoor control unit being connected to the outdoor control unit via internet, and acquiring the control command from the outdoor control unit so as to make the controlling device able to remotely control the controlled device during the controlling procedure.

Further, it is another object of the present invention to provide a system for controlling an indoor device from outdoor, which is capable of improving the security of the system, mitigating internet loads, reducing the cost of signal transmission, and remotely controlling an indoor device from outdoor in an economic and secure manner.

In order to achieve the another object of the present invention, there is provide a system for controlling an indoor device from outdoor which is used to send a control command from outside of an indoor environment via internet to remotely control a controlled device in the indoor environment, the system comprising a controlling device, an outdoor control unit, a signal generation interface, a signal reception interface and an indoor control unit. The controlling device is in an outdoor environment, and sends the control command via the internet during a controlling procedure. The outdoor control unit sends a control request after receiving the control command sent from the controlling device during the controlling procedure, and the outdoor control unit receives registering information of the controlled device during a setting procedure. The signal generation interface is adjacent to the outdoor
control unit, and sends a trigger signal after receiving the control request sent from the outdoor control unit during the controlling procedure. The signal reception interface is in the indoor environment, and sends a notification after receiving the trigger signal sent from the signal generation interface during the controlling procedure. The indoor control unit acquires the control command from the outdoor control unit via the internet after receiving the notification send from the signal reception interface during the controlling procedure so that the controlling device is able to remotely control the controlled device, and the indoor control unit sends the registering information of the controlled device to the outdoor control unit during the setting procedure.

Brief Description of Drawings

15 Fig.1 is a diagram showing an architecture for controlling an indoor device from outdoor in the prior art;

Fig.2 is a flowchart illustrating the STUN protocol in the prior art;

Fig.3 is a block diagram showing the system for controlling an indoor device from outdoor according to a first preferred embodiment of the present invention;

Fig.4 is a diagram showing the system for controlling an indoor device from outdoor according to the first preferred embodiment;

Fig. 5 is a flowchart illustrating a setting procedure according to the first preferred embodiment;
Fig. 6 is a flowchart illustrating a controlling procedure according to the first preferred embodiment;

Fig. 7 is a block diagram showing the system for controlling an indoor device from outdoor according to a second preferred embodiment of the present invention;

Fig. 8 is a diagram showing the system for controlling an indoor device from outdoor according to the second preferred embodiment;

Fig. 9 is a flowchart illustrating a setting procedure according to the second preferred embodiment;

Fig. 10 is a flowchart illustrating a controlling procedure according to the second preferred embodiment;

Fig. 11 is a block diagram showing the system for controlling an indoor device from outdoor according to a third preferred embodiment of the present invention;

Fig. 12 is a diagram showing the system for controlling an indoor device from outdoor according to the third preferred embodiment;

Fig. 13 is a flowchart illustrating a setting procedure according to the third preferred embodiment; and

Fig. 14 is a flowchart illustrating a controlling procedure according to the third preferred embodiment.

Best Mode for Carrying Out the Invention

The aforementioned and other technical contents, features and effects of the present invention will be apparent from the following
detailed descriptions about three preferred embodiments with reference to appended drawings.

Before detailing the present invention, it is noted that similar components are denoted by same reference signs in the following description.

Referring to Figs. 3 and 4, in order to avoid security problem, in the first preferred embodiment of the present invention, a telephone line 71 of a public switching telephone network (PSTN) 7 is used to transfer a trigger signal to an indoor environment 5. The system of the present invention sends a control command from outside of the indoor environment 5 via internet 4 so as to remotely control a controlled device 51 in the indoor environment 5. The system comprises a controlling device 61, an outdoor control unit 62, a signal generation interface 63, a signal reception interface 64 and an indoor control unit 65.

The controlling device 61 is outside of the indoor environment 5. In a controlling procedure of the present invention (referring to the description about Fig. 6), the controlling device 61 sends the control command via the internet 4. The controlling device 61 may be a hardware device with a browser control interface, such as mobile phone, personal digital assistant (PDA), personal computer (PC) or portable computer. For example, if the controlling device 61 is a portable computer, then the control command can be sent to the outdoor control unit 62 via the internet 4 by using the operation of the controlling device 61 on network. Alternatively, if the controlling device 61 is a mobile phone, then the control command can be sent to the outdoor control unit 62 successively passing through a mobile
telecommunication network 8, a gateway 81 and the internet 4 by using the operation of the controlling device 61 on network.

The outdoor control unit 62 located in the public network domain has several functions as follows. Firstly, the outdoor control unit 62 can be used to record a map table between users and the users' information. Secondly, the outdoor control unit 62 can be used to receive the control command from the controlling device 61. Thirdly, the outdoor control unit 62 can be used to send a control request to the signal generation interface 63, which is able to dial telephone to the signal reception interface 64. In addition, the outdoor control unit 62 can be used to forward a response from the controlled device 51 for the control command to the controlling device 61.

In a setting procedure of the present invention (referring to the description about Fig. 5), when receiving the registering information of the controlled device 51 from the indoor control unit 65, the outdoor control unit 62 records this registering information in its look-up table. In the controlling procedure, the indoor control unit will store the control command and send a signal to the signal generation interface 63 when the controlling device 61 sends the control command to the indoor control unit 65 so as to dial to the signal reception interface 64 through the telephone line 71. Moreover, if the outdoor control unit 62 receives a response information from the controlled device 51 for the control command, then the outdoor control unit 62 may transfer this response information to the controlling device 61.
The signal generation interface 63 is adjacent to the outdoor control unit 62, and sends a trigger signal to the signal reception interface 64 through the telephone line 71 of the PSTN 7 after receiving the control request from the outdoor control unit 62 during the controlling procedure. After the signal generation interface 63 receives the control request from the outdoor control unit 62, the signal generation interface 63 will dial to the signal reception interface 64 through the telephone line 71.

The signal reception interface 64 is in the indoor environment, and has several functions as follows. Firstly, the signal reception interface 64 may automatically dial to a switch (not shown) of the PSTN 7 to request a telephone number of the indoor environment 5 to be sent back during the setting procedure. Secondly, the signal reception interface 64 may automatically respond a telephone call from the signal generation interface 63. Thirdly, the signal reception interface 64 may transfer the trigger signal to inform the indoor control unit 65. After receiving the telephone call from the signal generation interface 63, the signal reception interface 64 will send the trigger signal to the indoor control unit 65.

The indoor control unit 65 has several functions as follows. Firstly, the indoor control unit 65 may notify the signal reception interface 64 to dial to the switch of the PSTN 7 to request the telephone number of the indoor environment 5 to be sent back during the setting procedure. Secondly, the indoor control unit 65 may send the registering information of the controlled device 51 to the outdoor control unit 62 located in the public network domain during the setting procedure. Thirdly, the indoor control unit 65 may
receive the trigger signal from the signal reception interface 64 during the control procedure. Moreover, the indoor control unit 65 may acquire the control command from the outdoor control unit 62 during the controlling procedure. In addition, the indoor control unit 65 may control the controlled device 51 in the indoor environment 5. Further, performing the control command to the controlled device 51, the indoor control unit 65 may transfer a response of the controlled device 51 to the outdoor control unit 62.

During the setting procedure of the present invention, the indoor control unit 65 firstly dials to the switch of the PSTN 7 through the signal reception interface 64 to obtain the telephone number of the indoor environment 5. Then, the indoor control unit 65 transfers the registering information such as the telephone number of the indoor environment 5 and the information related to the controlled device 51 to the outdoor control unit 62. Therefore, during the controlling procedure, upon receiving the trigger signal from the signal reception interface 64, the indoor control unit 65 establishes connection with the outdoor control unit 62 through the internet 4, and then obtains the control command. Next, the indoor control unit 65 sends the control command to the controlled device 51 in the indoor environment 5. Subsequently, the controlled device 51 reports its state to the indoor control unit 65, and the indoor control unit 65 further transfers this responding information to the outdoor control unit 62.

Referring to Figs. 4 and 5, the automatic setting procedure according to the first preferred embodiment includes the following steps. Firstly, as shown in Step 911, the indoor control unit 65
requests to the signal reception interface 64 to obtain the telephone number of the indoor environment 5. Next, as shown in Step 912, the signal reception interface 64 may dial to the switch of the PSTN 7 since the telephone number of the switch of the PSTN 7 is already built-in the indoor control unit 65. Then, as shown in Step 913, the switch of the PSTN 7 transfers a response which is the telephone number of the indoor environment 5 to the signal reception interface 64. After that, as shown in Step 914, the indoor control unit 65 obtains the telephone number of the indoor environment 5 from the signal reception interface 64. Then, as shown in Step 915, the signal reception interface 64 may connect to the outdoor control unit 62 through a broadband router 66 and the internet 4 in that order so that the telephone number of the indoor environment 5 and the information related to the controlled device 51 are registered in the outdoor control unit 62. Hence, in the first preferred embodiment, upon connecting the controlled device 51 the indoor control unit 65 can automatically make a telephone call to the switch to obtain the telephone number of the environment 5 by using the built-in telephone number of the switch of the PSTN 7. Then, the telephone number of the indoor environment 5 and the information related to the controlled device 51 are registered in the outdoor control unit 62 without manual intervention.

Referring to Figs. 4 and 6, the controlling procedure according to the first preferred embodiment includes the following steps. Firstly, as shown in Step 920, the controlling device 61 sends the control command to the outdoor control unit 62 via the internet 4. Next, as shown in Step 921, the outdoor control unit 62 requests the signal
generation interface 63 to make an outgoing telephone call. Then, as shown in Step 922, the signal generation interface 63 may dial to the signal reception interface 64 to send the trigger signal. Next, as shown in Step 923, after receiving the telephone call made by the signal generation interface 63, the signal reception interface 64 sends the notification to the indoor control unit 65. Then, as shown in Step 924, the indoor control unit 65 actively establishes connection with the outdoor control unit 62 via the internet 4. After that, as shown in Step 925, the indoor control unit 65 may obtain the control command from the outdoor control unit 62. Then, as shown in Step 926, the indoor control unit 65 transfers the control command to the controlled device 51 and makes the controlled device 51 to execute the control command so that the controlling device 61 is able to control the controlled device 51 remotely. Subsequently, as shown in Step 927 to Step 929, in response, the controlled device 51 transfers its state after the execution of the control command to the controlling device 61 via the indoor control unit 65 and the outdoor control unit 62.

As described above, in the first preferred embodiment according to the present invention, the security problem can be avoided by using the telephone line 71 to directly transfer the trigger signal to the indoor environment 5, but not the usage of the conventional technique of registering IP addresses (which results in a problem of the hackers' attacking known IP addresses). In the invention, the indoor control unit 65 will be notified to establish an internet connection only when it is necessary. Thus, the method and system according to the first preferred embodiment can solve the
NAT problem as described above. In addition, instead of periodically transmitting UDP packets, according to the first preferred embodiment, the signal is triggered by using the telephone line 71 so that the secure and load problems due to STUN protocol can be prevented.

Referring to Figs. 7 to 10, in the second preferred embodiment according to the present invention, the communication between the signal generation interface 63 and the signal reception interface 64 is achieved by Short Message Service (SMS) or Multimedia Message Serve (MMS) 82 of the mobile telecommunication network 8. Therefore, the architecture of the system, the setting procedure and the controlling procedure are slightly different from those of the aforementioned first preferred embodiment.

The setting procedure according to the second preferred embodiment includes the following steps. Firstly, as shown in Step 931, the indoor control unit 65 writes the registering information such as short message service number and the information related to the controlled device 51 into SMS or MMS, and then requests the signal reception interface 64 to send this registration SMS or MMS. Next, as shown in Step 932, the signal reception interface 64 may forward this registration SMS or MMS to the signal generation interface 63 since the material such as short message service number of the outdoor control unit 62 has been built-in the indoor control unit 65. After that, as shown in Step 933, the signal generation interface 63 forwards this registration SMS or MMS to the outdoor control unit 62, and then the outdoor control unit 62 analyzes the registration SMS or MMS and records the information
related to the controlled device 51 in the indoor environment 5. After then, as shown in Steps 934 to 936, the outdoor control unit 62 sends a response SMS or MMS to the indoor control unit 65 via the signal generation interface 63 and the signal reception interface 64 in that order. Hence, in the second preferred embodiment, upon connecting with the controlled device 51, the indoor control unit 65 can automatically register its short message service number and relevant registering information of the controlled means 51 to the outdoor control unit 62 by using the built-in short message service number of the outdoor control unit 62 without manual intervention.

The controlling procedure according to the second preferred embodiment includes the following steps. Firstly, as shown in Step 940, the controlling device 61 sends the control command to the outdoor control unit 62 via the internet 4. Next, as shown in Step 941, the outdoor control unit 62 requests the signal generation interface 63 to send the SMS or MMS. Then, as shown in Step 942, the signal generation interface 63 sends the SMS or MMS to the signal reception interface 64 so as to send the trigger signal. Following that, as shown in Step 943, after receiving the SMS or MMS sent from the signal generation interface 63, the signal reception interface 64 sends the notification to the indoor control unit 65. Then, as shown in Step 944, the indoor control unit 65 actively establishes connection with the outdoor control unit 62 via the internet 4. Thus, as shown in Step 945, the indoor control unit 65 may obtain the control command from the outdoor control unit 62. After that, as shown in Step 946, the indoor control unit 65 transfers the control command to the controlled device 51 and makes the
controlled device 51 execute the control command so that the controlling device 61 may control the controlled device 51 remotely. Subsequently, as shown in Step 947 to Step 949, in response, the controlled device 51 transfers its state after the execution of the control command to the controlling device 61 via the indoor control unit 65 and the outdoor control unit 62.

Referring to Figs. 11 to 14, in the third preferred embodiment according to the present invention, the communication between the signal generation interface 63 and the signal reception interface 64 is achieved by e-mails 41. Therefore, the architecture of the system, the setting procedure and the controlling procedure are slightly different from those of the aforementioned first and second preferred embodiments.

The setting procedure according to the third preferred embodiment includes the following steps. Firstly, as shown in Step 951, the indoor control unit 65 writes the registering information such as its e-mail address and the information related to the controlled device 51 into an e-mail, and requests the signal reception interface 64 to send this registration e-mail. Next, as shown in Step 952, the signal reception interface 64 may forward this registration e-mail to the signal generation interface 63 since the material such as e-mail address of the outdoor control unit 62 and the like has already been built-in the indoor control unit 65. Then, as shown in Step 953, the signal generation interface 63 forwards this registration e-mail to the outdoor control unit 62, and then the outdoor control unit 62 analyzes the registration e-mail and records the information related to the controlled device 51 in the
indoor environment 5. After then, as shown in Steps 954 to 956, the outdoor control unit 62 sends a response e-mail to the indoor control unit 65 via the signal generation interface 63 and the signal reception interface 64 in that order. Hence, in the third preferred embodiment, upon connecting with the controlled device 51, the indoor control unit 65 can automatically register its e-mail address and relevant registering information of the controlled means 51 to the outdoor control unit 62 by using the built-in e-mail address of the outdoor control unit 62 without manual intervention.

The controlling procedure according to the third preferred embodiment includes the following steps. Firstly, as shown in Step 960, the controlling device 61 sends the control command to the outdoor control unit 62 via the internet 4. Next, as shown in Step 961, the outdoor control unit 62 requests the signal generation interface 63 to send the e-mail. Then, as shown in Step 962, the signal generation interface 63 sends the e-mail to the signal reception interface 64 so as to send out the trigger signal. Next, as shown in Step 963, after receiving the e-mail sent from the signal generation interface 63, the signal reception interface 64 sends the notification to the indoor control unit 65. After that, as shown in Step 964, the indoor control unit 65 actively establishes connection with the outdoor control unit 62 via the internet 4. Thus, as shown in Step 965, the indoor control unit 65 may obtain the control command from the outdoor control unit 62. Next, as shown in Step 966, the indoor control unit 65 transfers the control command to the controlled device 51 and make the controlled device 51 execute the control command so that the controlling device 61 can control the controlled
device 51 remotely. Subsequently, as shown in Step 967 to Step 969, in response, the controlled device 51 transfers its state after the execution of the control command to the controlling device 61 via the indoor control unit 65 and the outdoor control unit 62.

Therefore, according to the above three preferred embodiments, the present invention has the following advantages. Firstly, the present invention is capable of improving system security. Secondly, the present invention is capable of mitigating the internet load of the outdoor control unit 62. Thirdly, the present invention is capable of reducing the cost of the signal transmission. In addition, the present invention can remotely control the controlled device 51 in the indoor environment 5 from outdoor in an economic and secure manner.

In summary, the method and system for controlling an indoor device from outdoor according to the present invention are characterized in that the trigger signal is directly sent to the indoor environment 5 by using the telephone number 71, the SMS or MMS 82, or the e-mail 41. The indoor control unit 65 will be notified to establish the internet connection only when it is necessary. Hence, the present invention has advantages such as improvement of the system security, mitigation of the internet load of the outdoor control unit 62, reduction of the cost of the signal transmission, and controlling the controlled device 51 in the indoor environment 5 from outdoor in an economic and secure manner.

Although the preferred embodiments of the present invention are described above, the present invention is not intended to be limited thereto. Those skilled in the art can make various changes
and modifications to the embodiments without departing from the protection scope of the present invention defined by the following claims.
CLAIMS

1. A method for controlling an indoor device from outdoor using an outdoor controlling device and an indoor controlled device, the method comprising the steps of:

   (a) sending registering information of the controlled device from an indoor control unit to an outdoor control unit during a setting procedure;

   (b) sending the control command from the controlling device to the outdoor control unit via internet during a controlling procedure;

   (c) sending a control request from the outdoor control unit to a signal generation interface which is adjacent to the outdoor control unit during the controlling procedure;

   (d) sending a trigger signal from the signal generation interface to a signal reception interface in the indoor environment to inform the indoor control unit of the control request during the controlling procedure; and

   (e) the indoor control unit being connected to the outdoor control unit via internet, and acquiring the control command from the outdoor control unit to make the controlling device remotely control the controlled device during the controlling procedure.

2. The method for controlling an indoor device from outdoor according to Claim 1, wherein the signal generation interface communicates with the signal reception interface through a telephone line of a public switching telephone network, and the
registering information includes a telephone number of the indoor environment, and the step (a) comprising the sub-steps of:

(a1) dialing, by the indoor control unit, a telephone call to a switch of the public switching telephone network through the signal reception interface and the public switching telephone network successively to request the telephone number to be sent back;

(a2) sending, by the switch of the public switching telephone network, back the telephone number to the indoor control unit through the public switching telephone network and the signal reception interface successively; and

(a3) establishing a connection between the indoor control unit and the outdoor control unit through the internet to transfer the registering information to the outdoor control unit.

3. The method for controlling an indoor device from outdoor according to Claim 1, wherein the signal generation interface communicates with the signal reception interface through short message service of a mobile telecommunication network, and the registering information includes a short message service number of the indoor control unit, and the step (a) comprising that the indoor control unit sends a short message containing the registering information to the outdoor control unit through the signal reception interface, the mobile telecommunication network and the signal generation interface in that order.

4. The method for controlling an indoor device from outdoor according to Claim 1, wherein the signal generation interface communicates with the signal reception interface through multimedia
message service of a mobile telecommunication network, and the registering information includes a multimedia message service number of the indoor control unit, and the step (a) comprising that the indoor control unit sends a multimedia message containing the registering information to the outdoor control unit through the signal reception interface, the mobile telecommunication network and the signal generation interface in that order.

5. The method for controlling an indoor device from outdoor according to Claim 1, wherein the signal generation interface communicates with the signal reception interface through e-mails, and the registering information includes an e-mail address of the indoor control unit, and the step (a) comprising that the indoor control unit sends an e-mail containing the registering information to the outdoor control unit through the signal reception interface, the internet and the signal generation interface in that order.

6. A system for controlling an indoor device from outdoor which is used to send a control command from outside of an indoor environment via internet to remotely control a controlled device in the indoor environment, the system comprising:

   a controlling device located in an outdoor environment for, during a controlling procedure, sending the control command via the internet;

   an outdoor control unit for, during the controlling procedure, sending a control request after receiving the control command from the controlling device, and receiving registering information of the controlled device during a setting procedure;
a signal generation interface which is adjacent to the outdoor control unit for, during the controlling procedure, sending a trigger signal after receiving the control request from the outdoor control unit;

a signal reception interface which is in the indoor environment for, during the controlling procedure, sending a notification after receiving the trigger signal from the signal generation interface; and

an indoor control unit for, during the controlling procedure, acquiring the control command from the outdoor control unit via the internet after receiving the notification send from the signal reception interface so as to make the controlling device able to remotely control the controlled device, and during the setting procedure, for sending the registering information of the controlled device to the outdoor control unit.

7. The system for controlling an indoor device from outdoor according to Claim 6, wherein the controlling device is a mobile phone.

8. The system for controlling an indoor device from outdoor according to Claim 6, wherein the controlling device is a personal digital assistant.

9. The system for controlling an indoor device from outdoor according to Claim 6, wherein the controlling device is a personal computer.

10. The system for controlling an indoor device from outdoor according to Claim 6, wherein the controlling device is a portable computer.
11. The system for controlling an indoor device from outdoor according to Claim 6, wherein the signal generation interface communicates with the signal reception interface through a telephone line of a public switching telephone network, and the registering information includes a telephone number of the indoor environment.

12. The system for controlling an indoor device from outdoor according to Claim 6, wherein the signal generation interface communicates with the signal reception interface through short message service of a mobile telecommunication network, and the registering information includes a short message service number of the indoor control unit.

13. The system for controlling an indoor device from outdoor according to Claim 6, wherein the signal generation interface communicates with the signal reception interface through multimedia message service of a mobile telecommunication network, and the registering information includes a multimedia message service number of the indoor control unit.

14. The system for controlling an indoor device from outdoor according to Claim 6, wherein the signal generation interface communicates with the signal reception interface through e-mails, and the registering information includes an e-mail address of the indoor control unit.

15. A mobile phone incorporated with the controlling device as claimed in Claim 6.
16. A personal digital assistant incorporated with the controlling device as claimed in Claim 6.

17. A personal computer incorporated with the controlling device as claimed in Claim 6.

18. A portable computer incorporated with the controlling device as claimed in Claim 6.
Fig. 2

STUN SERVER

MOBILE DEVICE

STUN CLIENT INDOOR DEVICE

ROUTER/GATEWAY (NAT)

UDP PACKETS (NAT TABLE IS AVAILABLE)

PERIODICITY

REQUESTING FOR IP/INTERFACE OF THE INDOOR DEVICE

RESPONDING IP/INTERFACE OF THE INDOOR DEVICE

CONTROL COMMAND FOR THE INDOOR DEVICE
Fig. 10

CONTROLLING DEVICE
OUTDOOR CONTROL UNIT
SIGNAL GENERATION INTERFACE

SENDING CONTROL COMMAND

940

REQUESTING TO SEND OUT SMS OR MMS

941

SENDING OUT SMS OR MMS TO DELIVER TRIGGER SIGNAL

942

STARTING INTERNET CONNECTION

OBTAINING CONTROL COMMAND

RESPONSE

948

OUTDOOR

INDOOR

BROADBAND ROUTER (NAT)
SIGNAL RECEPTION INTERFACE
INDOOR CONTROL UNIT
CONTROLLED DEVICE

PUBLIC IP
PRIVATE IP

THROUGH INTERNET
THROUGH SMS OR MMS

NOTIFYING

943

EXECUTION OF CONTROL COMMAND

RESPONSE

947

944

945
Fig. 14

CONTROLLING DEVICE ➔ OUTDOOR
OUTDOOR CONTROL UNIT ➔ SIGNAL GENERATION INTERFACE
SENDING CONTROL COMMAND ➔ 960
REQUESTING TO SEND OUT E-MAIL ➔ 961
SENDING OUT E-MAIL TO DELIVER TRIGGER SIGNAL ➔ 962
STARTING INTERNET CONNECTION ➔ 964
NOTIFYING ➔ 963
EXECUTION OF CONTROL COMMAND ➔ 966
RESPONSE ➔ 967

INDOOR
BROADBAND ROUTER (NAT) ➔ SIGNAL RECEPTION INTERFACE
INDOOR CONTROL UNIT ➔ CONTROLLED DEVICE

THROUGH INTERNET ➔ PUBLIC IP ➔ PRIVATE IP
THROUGH E-MAIL ➔ RESPONSE ➔ 968 ➔ 969 ➔ 965 ➔ 962 ➔ 961 ➔ 960