Title: METHOD AND APPARATUS FOR GENERATING A USER INTERFACE

Abstract: A method of generating a user interface, including the steps of: receiving at least one device attribute of a device; and generating a user interface corresponding to said device attribute for monitoring or controlling the device through the user interface. An apparatus for generating a user interface, comprising: receiving means, for receiving at least one device attribute of a device; and generating means, for generating a user interface corresponding to said device attribute for monitoring or controlling the device through the user interface. According to the present invention, an appropriate user interface can be easily generated whether the home device joins or leaves a network with a specific plan or rearrangement, or at random.
Declaration under Rule 4.17:
— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

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METHOD AND APPARATUS FOR GENERATING A USER INTERFACE

FIELD OF THE INVENTION

The present invention relates to a method and apparatus for generating a user interface, and more particularly, to a method and apparatus for generating a user interface in a wireless network.

BACKGROUND OF THE INVENTION

With the development of science & technology and the enhancement of the living standards of people, there will be more and more home devices, such as air-conditioners, TV sets and refrigerators and the like, in a houseroom. In order to facilitate the control and management, a user can connect these home devices via a wired (e.g. the Internet) or wireless network (e.g. a sensor network), and monitor or control them through a monitoring device. For instance, Ipronto, a handheld universal remote controller, developed by KONINKLIJKE PHILIPS ELECTRONICS N.V. of the Netherlands, can control various home devices, such as home cinemas, refrigerators, washing machines, cameras and air-conditioners and the like, which are connected via an infrared/radio/Ethernet network and the like.

Generally, a sensor network are composed of a large number of sensor nodes, each of sensor nodes is operable to take a certain action, such as measuring, performing wireless communication. Sensor nodes are usually equipped with, for example, sensing unit (one or more), local memory, processor (e.g. central processing unit (CPU)), wireless communication infrastructure and the like.

Every home device can have an internal wireless sensor network, namely a device sensor network. For instance, a plurality of sensors can be deployed inside an air-conditioner device and form a device sensor network to respectively detect attribute values of the air-conditioner, including temperature, wind force at the wind outlet, air quality and so on. In addition, a user can build a home sensor network (within the range of home) out of home devices to serve as a backbone for connecting different device sensor networks in the home devices.

Every device sensor network can provide attributes and attribute states of every home device, so that a monitoring device can monitor and control this home
device. For instance, a device sensor network of an air-conditioner can publish its working temperature and receive input instructions to and from a monitoring device through the home sensor network. Thus, the working temperature of the air-conditioner can be monitored and controlled.

Sensor nodes can be arranged in a wireless sensor network in different modes. In a wireless sensor network where each sensor nodes are arranged in an ad-hoc mode, a device (namely a sensor node) that has a device sensor network can join or leave the wireless sensor network without a specific plan or prearrangement.

In the case of ad-hoc mode is employed, when a user enters a home, the home sensor network will provide service information of each home device for his carried portable monitoring device, such as a mobile phone and other portable device. Moreover, the user can access the service information through a user interface displayed on the monitoring device.

However, since home devices each having a device sensor network join or leave the home sensor network without a specific plan or prearrangement, the monitoring device cannot know beforehand what services the home devices within the home sensor network will provide, nor can the monitoring device obtain in advance the user interfaces for acquiring these services.

Therefore, there is a need for a method and apparatus for generating a user interface, so that an appropriate user interface can be generated easily whether home devices join or leave the network with a specific plan or prearrangement, or at random.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a method and apparatus for generating a user interface, which is capable of generating a user interface for a home device in the case that this home device randomly joins or leaves a home sensor network.

To achieve the above-mentioned object, the present invention proposes a method of generating a user interface, including the steps of: (a) receiving at least one device attribute of a device; and (b) generating a user interface corresponding to said device attribute for monitoring or controlling the device through the user interface.

The present invention further proposes an apparatus for generating a user interface, comprising: receiving means, for receiving at least one device attribute of a
device; and generating means, for generating a user interface corresponding to said device attribute for monitoring or controlling the device through the user interface.

Using the method and apparatus for generating a user interface as provided by the present invention, a user interface of a home device can be generated to facilitate the monitoring of the home device by a user who carries a monitoring device, whether the home device joins or leaves a home sensor network with a specific plan or prearrangement, or at random. In the meantime, using the method and apparatus for generating a user interface as provided by the present invention, a user can select a more personalized user interface, and, he or she does not have to download from a corresponding device manufacturer website a corresponding user interface with respect to each home device, respectively.

Other features and advantages of the present invention will become more apparent from the following description taken in conjunction with the accompanying drawings.

**BRIEF DESCRIPTION OF THE DRAWINGS**

Hereinafter, the preferred embodiments of the present invention will be described with reference to the accompanying drawings, in which:

Fig. 1 is a structural block diagram of a wireless sensor network according to an embodiment of the present invention;

Fig. 2 is an overall flowchart of generating a user interface of a home device according to an embodiment of the present invention;

Fig. 3 is a detailed flowchart of generating a user interface of a home device under interaction with the monitoring device according to an embodiment of the present invention;

Fig. 4 is a schematic view of a database of user interface element corresponding to attributes of home devices according to an embodiment of the present invention;

Fig. 5 is a schematic view of a user interface according to an embodiment of the present invention;

Fig. 6 is a flowchart of generating a user interface of a home device by the home sensor network according to an embodiment of the present invention; and

Fig. 7 is a block diagram of an apparatus for generating a user interface according to an embodiment of the present invention.
In all of the above accompanying drawings, the same reference numeral denotes having an identical, like or corresponding feature and function.

DESCRIPTION OF THE INVENTION

The following description is directed to the case where home devices are connected together by a sensor network. Of course, those skilled in the art should appreciate that the present invention is also applicable to the case where home devices are connected together by other networks.

Fig. 1 is a structural block diagram of a wireless sensor network according to an embodiment of the present invention. More specifically, the home sensor network 100 comprises three sensor nodes 101, 102 and 103, among them P2P (point to point) wireless communication can be performed. Here, suppose that the sensor nodes 101, 102 and 103 are connected with device sensor networks 1011 and 1012, 1021 and 1022, 1031 and 1032, respectively, and here each of the device sensor networks represents a home device.

Fig. 2 is a flowchart of generating on a monitoring device, for example, a mobile device and the like, a user interface of a home device, which is within a home sensor network, according to an embodiment of the present invention.

First, in step S210, it is decided whether a new device sensor network is accessed. Of course, those skilled in the art should appreciate that the description here is taken from the point of view of the home sensor network. Here suppose that a new device sensor network 1013 is accessed to the sensor node 101, a new device sensor network 1023 is accessed to the sensor node 102, and a new device sensor network 1033 is accessed to the sensor node 103.

By detecting whether there is a message of request for accessing sent out from a device sensor network, the home sensor network can decide whether a new device sensor network is accessed. Also, the home sensor network can find a home device by detecting the device sensor network of this home device. For other types of wireless or wired networks, for example Bluetooth piconet, it can detect through the Bluetooth piconet protocol whether a new home device is accessed.

If a new home device is accessed, then the flow proceeds to step S220. If not, the flow proceeds to step S250.

In step S220, one or more attributes sent from the accessed new device
sensor network are received. For instance, temperature of an air-conditioner, volume of a TV set, playback, pause and stop of a media player are all attributes of devices.

Attribute published by the new home device includes an attribute name, an attribute value and whether an attribute is read-only or read-and-write, also it can further include the name of the device. When one attribute is read-only, the attribute can only be displayed on a monitoring device. Thus a user cannot modify the attribute through the monitoring device. When one attribute is read-and-write, not only the attribute can be displayed on a monitoring device, but also its attribute value can be modified by a user through the monitoring device.

After step S220, the flow proceeds to step S230, in which the received attributes of the new home device are stored. Then, the flow proceeds to step S240.

In step S240, the access of a new monitoring device is being monitored. Afterwards, the flow proceeds to step S250.

Also, whether a new monitoring device is accessed can be decided by detecting whether there is a message of request for accessing sent from the monitoring device.

In step S250, it is decided whether there is a newly accessed monitoring device. If there is a monitoring device accessed to the home sensor network, the flow proceeds to step S300; otherwise, the flow returns to step S240.

In step S300, the monitoring device is interacted so that a user interface of the home device can be generated in the monitoring device.

Of course, those skilled in the art should understand that the user interface can either be generated on the monitoring device upon a request of the monitoring device, or be formed immediately after step S230, i.e. generated by the home sensor network, and then be stored in a corresponding memory. Upon receipt of a request from the monitoring device, the home sensor network sends the user interface of a corresponding home device to the monitoring device.

The case where a user interface is directly generated on a monitoring device will be described below with reference to Fig. 3, and this flow is a detailed depiction of step S300 in Fig. 2.

In step S310, attributes of each home device sent from the home sensor network are received.

The attributes of each home device can be directly sent to a newly accessed
monitoring device by the home sensor network, or upon a request of the newly accessed monitoring device by the home sensor network, the attributes of corresponding home device will be sent to the monitoring device by the home sensor network.

Then, in step S320, the received attributes of each home device are displayed.

Upon receipt of the attributes of each home device sent by the home sensor network, the monitoring device can display the received attributes in a list or other modes on its display unit so as to facilitate the selection by a user.

In general, home devices may be produced by different manufacturers, and each manufacturer has their own way to name attributes of the devices, thus, one identical attribute of different home devices may have various attribute names. For instance, one manufacturer names the volume attribute of a TV set as “volume”, while another manufacturer may name the same attribute as “loudness”.

Therefore, in order to make the monitoring device be clearly aware of the meaning of an attributes sent from a home device, according to an embodiment of the present invention, it includes further processing on attributes using Ontology, that is, to find a definition word representing the meaning of a device attribute by searching a database of the correspondence relationships between attributes of devices and definition words.

For a detailed introduction to Ontology, please with reference to the relevant documents, such as S. Decker, S. Melnik, F. van Harmelen, D. Fensel, M. Klein, J. Broekstra, M. Erdmann, I. Horrocks, The Semantic Web: The Roles of XML and RDF, IEEE Internet Computing Sep.-Oct. (2000) 63-74. Thus, no excessive explanation will be provided here for the purpose of conciseness.

Through the Ontology processing, the aforesaid volume of a TV set has only one definition word, namely “volume”.

Moreover, through the name of a device as included in attributes, a user can differentiate attributes of different devices, such as the volume of a personal computer (PC) and the volume of a TV set, without any ambiguity.

Referring back to Fig. 3, in step S330, device attributes selected by a user are accepted.

After seeing the attributes shown on the display unit of the monitoring device, a user can select device attributes of interest.

In step S340, definition words that represent the meaning of the
accepted device attributes selected by a user are searched for.

Upon completion of the selection made by a user, the monitoring device searches for the definition words representing the meaning of the device attributes selected by a user using Ontology or other related art.

The monitoring device can search the local Ontology database, i.e. its own Ontology database, or the Ontology database on a network for the definition words representing the meaning of the device attributes selected by a user.

Of course, those skilled in the art should understand that if all device manufacturers within the industry define one identical device attribute in accordance with uniform standards, then step S340 can be omitted, and the flow skips directly to step S350 to search for the corresponding user interface elements based on the device attributes.

In step S350, the corresponding user interface elements are searched for.

If the definition words representing the meaning of the selected device attributes are retrieved, the monitoring device can search from the local database of user interface element, i.e. its own database of user interface element, or from the database of user interface element on a network for user interface elements corresponding to the definition words that represent the meaning of the selected device attributes.

Normally, the above-mentioned correspondence relationship between definition words and user interface elements can be designed in accordance with prior arts mastered by human. Each definition word has the corresponding user interface element.

For instance, Fig. 4 shows a schematic view of a database of user interface element corresponding to attributes of home devices according to an embodiment of the present invention.

Where, the volume attribute of a TV set can correspond to a slider 61 or a pointer 62 among user interface elements.

The working temperature attribute of an air-conditioner can correspond to a thermometer 63 or a slider 64 among user interface elements.

The playback button of a media player can correspond to a button 65 among user interface elements, a user can cause the media player to playback by clicking the button 65; the pause button can correspond to a button 66 among user interface elements, a user can cause the media player to pause by clicking the button 66; the stop button can correspond to a button 67 among user interface elements, a user can cause the media player
to stop by clicking the button 67. When the media player plays a program, a user can change the playback volume through a slider 68 among user interface elements, and change the playback position by moving a time bar 69 among user interface elements.

A user interface is generally formed by some user interface elements. Thus, to generate a user interface of a home device, a user can directly use these user interface elements in the database of user interface element.

Referring back to Fig. 3, in step S360, a user interface of the corresponding device is generated.

Having obtained all the user interface elements, the monitoring device can combine them to generate the user interface of the corresponding device.

Thus, if the selected attributes are read-and-write, a user can set new values of these attributes through the user interface. Moreover, after the monitoring device sending these updated attribute values back to the home sensor network, home devices of the network adjust their respectively associated attribute values.

If the selected attributes are read-only, a user can acquire knowledge about operation states of the related home device through the monitoring device.

According to the embodiment of the present invention, only intrinsic attributes of home devices are used to generate a user interface on a monitoring device, such as a mobile device and the like, and Ontology is used to prevent confusion of the meaning of attributes. Besides, a user can select a more personalized user interface regardless of a concrete home device.

Fig. 5 shows a schematic view of a user interface according to an embodiment of the present invention. The user interface shown in Fig. 5 is generated by searching and combining user interface elements in a database of user interface element, and the searching and combining process are based on a plurality of attributes of a media player. The user interface comprises a button 65 for play backing, a button 66 for pausing, a button 67 for stopping, a slider 68 for changing the playback volume, and a time bar 69 for changing the playback position. A user can perform the corresponding control on the media player through the user interface. Other elements of the user interface as shown in this figure are generated using the method shown in Fig. 3, and thus, it is unnecessary to go into details.

The case where a user interface of a home device is directly generated by a
home sensor network, i.e. the case where a user interface of a home device is directly generated after step S230 shown in Fig. 2, will be described below with reference to Fig. 6.

In step S410, stored attributes of each home device are displayed.

The stored attributes may be displayed in a list or other modes so as to facilitate the selection of a user.

In step S420, the device attributes selected by a user are accepted.

After seeing the displayed attributes, a user can select the device attributes of interest.

In step S430, user interface elements corresponding to the selected device attributes are searched for in a database of user interface element.

According to an embodiment of the present invention, first, a device attribute is processed using Ontology technology so as to find a definition word corresponding to the meaning of the device attribute, and a user interface element corresponding to the definition word corresponding to the meaning of the device attribute is searched for in a database of user interface element.

Next, in step S440, a user interface of the corresponding device is generated. Having been obtained all the user interface elements, these user interface elements can be combined to generate the user interface of the corresponding device.

Then, in step S450, the generated user interface is stored in a corresponding memory, and upon receipt of a request from the monitoring device, the user interface of the corresponding device can be sent to the monitoring device.

Fig. 7 is a block diagram of an apparatus for generating a user interface according to an embodiment of the present invention.

As shown in Fig. 7, the apparatus 50 comprises: receiving means (RM) 51, for receiving at least one device attribute of a home device; and generating means (GM) 52, for generating a user interface corresponding to the device attributes, so that a user can monitor or control the home device through the user interface. The generating means 52 comprises search means (SM) 521, for retrieving from a memory of user interface element (not shown) user interface elements corresponding to at least one device attribute. The generating means 52 further comprises combining means (CM) 522, for combining the user interface elements retrieved by the search means 521 to generate the user interface of the home device.
The apparatus 50 may further comprise processing means (PM) 53, for processing the device attributes received by the receiving means 51 to obtain definition words corresponding to the meaning of the device attributes. The processing means 53 comprises Ontology processing means (OPM) 531, for processing the device attributes using Ontology technology to find the definition words corresponding to the meaning of the device attributes. The Ontology processing means 531 processes the device attributes by searching a memory (not shown) of the correspondence relationships between device attributes and definition words so as to find the definition words corresponding to the meaning of the device attributes.

The apparatus 50 may even further comprise transmitting means (TM) 54, for transmitting re-set values of device attributes. According to another embodiment of the present invention, the transmitting means 54 can be used to transmit user interface information to the monitoring device, so that a user can monitor or control the home device through the monitoring device.

Of course, those skilled in the art should understand that the apparatus for generating a user interface can be included either in a monitoring device or in a home sensor network. That is, the user interface can be generated on a monitoring device based on a request of the monitoring device, or be generated on a home sensor network and stored in the corresponding memory. Upon receipt of a request from a monitoring device, the user interface of the corresponding home device is sent to the monitoring device by the home sensor network.

Of course, those skilled in the art should also understand that, the present invention is also applicable to office equipments, i.e., a user interface of office equipment can be generated.

Various changes and alternations can be made without departing from the concept and scope of the present invention. It shall be understood that the present invention is not limited to the specific embodiments, and the scope thereof is defined by the claims as appended.
CLAIMS:

1. A method of generating a user interface, comprising the steps of:
   (a) receiving at least one device attribute of a device; and
   (b) generating a user interface corresponding to said device attribute for monitoring
   or controlling the device through the user interface.

2. The method as claimed in claim 1, further comprising the step of:
   (c) processing said device attribute to obtain definition words corresponding to said
   device attribute, wherein step (b) includes generating a user interface corresponding to said
   definition words for monitoring or controlling the device through the user interface.

3. The method as claimed in claim 2, wherein step (b) includes the steps of:
   retrieving user interface elements corresponding to said definition words in a
   database of user interface element; and
   combining the retrieved user interface elements to generate the user interface of the
   device.

4. The method as claimed in claim 2, wherein step (c) includes the step of:
   processing said device attribute using Ontology technology to obtain definition words
   corresponding to said device attribute.

5. The method as claimed in claim 1, wherein step (b) includes the steps of:
   retrieving user interface elements corresponding to said device attribute in a
   database of user interface element; and
   combining the retrieved user interface elements to generate the user interface of the
   device.

6. The method as claimed in claim 1, further including the step of:
   (d) transmitting said user interface information to a monitoring device for
   monitoring or controlling the device through the monitoring device.
7. The method as claimed in any one of claims 1-6, wherein said device is connected in a wireless sensor network.

8. An apparatus for generating a user interface, comprising:
   receiving means, for receiving at least one device attribute of a device; and
   generating means, for generating a user interface corresponding to said device attribute for monitoring or controlling the device through the user interface.

9. The apparatus as claimed in claim 8, further comprising:
   processing means, for processing said device attribute to obtain definition words corresponding to said device attributes, wherein said generating means is used to generate a user interface corresponding to said definition words for monitoring or controlling the device through the user interface.

10. The apparatus as claimed in claim 9, wherein said generating means comprises:
    search means, for retrieving user interface elements corresponding to said definition words in a database of user interface element; and
    combining means, for combining the user interface elements retrieved by the search means to generate a user interface of the device.

11. The apparatus as claimed in claim 9, wherein said processing means comprise Ontology processing means, for processing said device attribute using Ontology technology to obtain definition words corresponding to said device attributes.

12. The apparatus as claimed in claim 8, wherein said generating means comprises:
    search means, for retrieving user interface elements corresponding to said device attribute in a database of user interface element; and
    combining means, for combining the user interface elements retrieved by the search means to generate the user interface of the device.

13. The apparatus as claimed in claim 8, further comprising:
    transmitting means, for transmitting said user interface information to a
monitoring device for monitoring or controlling the device through the monitoring device.

14. The apparatus as claimed in any one of claims 8-13, wherein said device is connected in a wireless sensor network.
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Start

S210
New home devices accessed?

Yes

S220
Receiving attributes reported by new home devices

S230
Storing the received attributes of the new home devices

S240
Monitoring the access of the new monitoring devices

S250
A monitoring device accessed?

No

Yes

S300
Interacting with the monitoring device to generate a user interface of a home device on the monitoring device

End

FIG. 2
Start

Receiving attributes of home devices

Displaying the received attributes of each home device

Accepting device attributes selected by a user

Retrieving definition words representing the meaning of the device attributes selected by the user

Searching for user interface elements

Generating a user interface of the corresponding device

End

FIG. 3
Start

Displaying stored attributes of home devices

Accepting device attributes selected by a user

Retrieving user interface elements corresponding to the selected device attributes

Generating a user interface of the corresponding device

Storing the generated user interface

End

FIG. 6
FIG. 7
**INTERNATIONAL SEARCH REPORT**

International application No  
PCT/IB2006/051637

### A. CLASSIFICATION OF SUBJECT MATTER

INV. 606F9/44

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)
606F

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)

EPO-Internal

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X Further documents are listed in the continuation of Box C.  

*X* Spacial categories of cited documents:

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

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*O* document referring to an oral discussion, use, exhibition or other means

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

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

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

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

*"* Document member of the same patent family

Date of the actual completion of the International search  
24 August 2006

Date of mailing of the international search report  
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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk
Tel: (+31-70) 340-2040, Tx: 31 651 epos nl, Fax: (+31-70) 340-3010

Authorized officer  
Tomàs Blanch, F
# INTERNATIONAL SEARCH REPORT

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