

[DESCRIPTION]

INDOOR ENVIRONMENT CONTROL SYSTEM AND INDOOR
ENVIRONMENT CONTROL METHOD

[Technical Field]

[0001]

The present invention relates to an indoor environment control system and an indoor environment control method.

[Background Art]

[0002]

Conventionally, techniques for improving comfort of indoor spaces have been proposed. For example, Patent Literature (PTL) 1 discloses an air-conditioning control technique that accurately calculates the number of people who enter a building from the outside for maintaining comfort and health of people inside the building.

[Citation List]

[Patent Literature]

[0003]

[PTL 1] Japanese Unexamined Patent Application Publication No. 2014-005993

[Summary of Invention]

[Technical Problem]

[0004]

Embodiments of the present invention provide an indoor environment control system that can provide information for and a means of controlling an environment in an indoor space.

[Solution to Problem]

[0005]

According to a first aspect of the present invention, there is provided an indoor environment control system, including: a storage that stores indoor environment profiles each for controlling one or more devices to be used for controlling an indoor environment in a building; an obtainer that obtains indoor environment information indicating at least one of the indoor environment in the building which has been sensed and the indoor environment in the building which is desired by a user, and one or more items of device information relating to the one or more devices; and an information processor that selectively provides one or more of the indoor environment profiles each as a target profile, based on the indoor environment information obtained, wherein the information processor determines whether the target profile can be reproduced by the one or more devices indicated in the one or more items of device information obtained, and provides the target profile when it is determined that the target profile can be reproduced by the one or more devices.

[0005a]

According to a second aspect of the present invention, there is provided an indoor environment control system, including: a storage that stores indoor environment profiles each for controlling one or more devices to be used for controlling an indoor environment in a building; an obtainer that obtains indoor environment information indicating at least one of the indoor environment in the building which has been sensed and the indoor environment in the building which is desired by a user; and an information processor that selectively provides one or more of the indoor environment profiles each as a target profile, based on the indoor environment information obtained, wherein the obtainer further obtains one or more items of device information relating to the one or more devices, and when the indoor environment profiles selected based on the indoor environment information obtained cannot be reproduced by the one or more devices indicated in the one or more items of device

information, the information processor provides one or more control algorithms for the one or more devices for approximating the indoor environment in the building to an indoor environment defined by the target profile.

[0005b]

According to a third aspect of the present invention, there is provided an indoor environment control system, including: a storage that stores indoor environment profiles each for controlling one or more devices to be used for controlling an indoor environment in a building; an obtainer that obtains indoor environment information indicating at least one of the indoor environment in the building which has been sensed and the indoor environment in the building which is desired by a user; and an information processor that selectively provides one or more of the indoor environment profiles each as a target profile, based on the indoor environment information obtained, wherein the obtainer further obtains one or more items of device information relating to the one or more devices, and when the indoor environment profiles selected based on the indoor environment information obtained cannot be reproduced by the one or more devices indicated in the one or more items of device information, the information processor presents a device required for reproducing the target profile.

[0006]

According to a fourth aspect of the present invention, there is provided an indoor environment control method executed by a computer, the indoor environment control method including: storing indoor environment profiles each for controlling one or more devices to be used for controlling an indoor environment in a building; obtaining indoor environment information indicating at least one of the indoor environment in the building which has been sensed and the indoor environment in the building which is desired by a user, and one or more items of device information relating to the one or more devices; selectively providing one or more of the indoor environment profiles as one or more target profiles, based on the indoor environment information obtained; and determining whether the one

or more target profiles can be reproduced by the one or more devices indicated in the one or more items of device information obtained, wherein in the selectively providing of the one or more target profiles, the one or more target profiles are provided when it is determined that the one or more target profiles can be reproduced by the one or more devices.

[0006a]

According to a fifth aspect of the present invention, there is provided an indoor environment control method executed by a computer, the indoor environment control method including: storing indoor environment profiles each for controlling one or more devices to be used for controlling an indoor environment in a building; obtaining indoor environment information indicating at least one of the indoor environment in the building which has been sensed and the indoor environment in the building which is desired by a user, and one or more items of device information relating to the one or more devices; selectively providing one or more of the indoor environment profiles as one or more target profiles, based on the indoor environment information obtained; and providing one or more control algorithms for the one or more devices for approximating the indoor environment in the building to an indoor environment defined by the one or more target profiles, when the indoor environment profiles selected based on the indoor environment information obtained cannot be reproduced by the one or more devices indicated in the one or more items of device information.

[0006b]

According to a sixth aspect of the present invention, there is provided an indoor environment control method executed by a computer, the indoor environment control method including: storing indoor environment profiles each for controlling one or more devices to be used for controlling an indoor environment in a building; obtaining indoor environment information indicating at least one of the indoor environment in the building which has been sensed and the indoor environment in the building which is desired by a user, and one or more items of device information relating to the one or more devices; selectively providing one or more of the indoor environment

profiles as one or more target profiles, based on the indoor environment information obtained; and presenting a device required for reproducing the one or more target profiles when the indoor environment profiles selected based on the indoor environment information obtained cannot be reproduced by the one or more devices indicated in the one or more items of device information.

[0007]

According to a seventh aspect of the present invention, there is provided a program for causing a computer to execute the above aspects of the indoor environment control method.

[Advantageous Effects of Invention]

[0008]

An indoor environment control system according to embodiments of the present invention can provide information for and a means of controlling an environment in an indoor space.

[Brief Description of Drawings]

[0009]

[FIG. 1]

FIG. 1 is a block diagram illustrating a functional configuration of an indoor environment control system according to an embodiment.

[FIG. 2]

FIG. 2 is a diagram illustrating an example of an indoor environment profile.

[FIG. 3]

FIG. 3 is a flowchart illustrating Operation example 1 of

operation performed by the indoor environment control system according to the embodiment.

[FIG. 4]

FIG. 4 is a diagram illustrating an example of a selection screen displayed on a display of an operation terminal.

[FIG. 5]

FIG. 5 is a flowchart illustrating Operation example 2 of operation performed by the indoor environment control system according to the embodiment.

10 [FIG. 6]

FIG. 6 is a flowchart illustrating Operation example 3 of operation performed by the indoor environment control system according to the embodiment.

[FIG. 7]

15 FIG. 7 is a flowchart illustrating Operation example 4 of operation performed by the indoor environment control system according to the embodiment.

[FIG. 8]

FIG. 8 is a flowchart illustrating Operation example 5 of operation performed by the indoor environment control system according to the embodiment.

20 [FIG. 9]

FIG. 9 is a flowchart illustrating Operation example 6 of operation performed by the indoor environment control system according to the embodiment.

25 [FIG. 10]

FIG. 10 is a diagram illustrating an example of an image showing devices required for reproducing a target profile.

[FIG. 11]

30 FIG. 11 is a flowchart illustrating Operation example 7 of operation performed by the indoor environment control system according to the embodiment.

[FIG. 12]

FIG. 12 is a flowchart illustrating Operation example 8 of operation performed by the indoor environment control system

35

according to the embodiment.

[FIG. 13]

FIG. 13 is a diagram illustrating an example of an image showing that maintenance is necessary.

5 [FIG. 14]

FIG. 14 is a flowchart illustrating Operation example 9 of operation performed by the indoor environment control system according to the embodiment.

[FIG. 15]

10 FIG. 15 is a flowchart illustrating Operation example 10 of operation performed by the indoor environment control system according to the embodiment.

[FIG. 16]

15 FIG. 16 is a flowchart illustrating Operation example 11 of operation performed by the indoor environment control system according to the embodiment.

[FIG. 17]

20 FIG. 17 is a diagram illustrating an example of an image including evaluation values each of which is obtained before and after an indoor environment is controlled using a target profile.

[FIG. 18]

FIG. 18 is a flowchart illustrating Operation example 12 of operation performed by the indoor environment control system according to the embodiment.

25 [FIG. 19]

FIG. 19 is a diagram illustrating an image including an evaluation value indicating an outdoor environment and an evaluation value indicating an indoor environment.

[Description of Embodiments]

30 [0010]

Hereinafter, embodiments will be described with reference to the drawings. The embodiments described below each show a general or a specific example. The numerical values, shapes, materials, elements, the arrangement and connection of the elements, steps, the processing order of the steps etc., in the

following embodiments are mere examples, and therefore do not intend to limit the present invention. Moreover, among elements in the following embodiments, those not recited in any of the independent claims are described as optional elements.

5 [0011]

It should be noted that the drawings are schematic diagrams, and do not necessarily provide strictly accurate illustrations. Throughout the drawings, the same numeral is given to substantially the same element, and redundant description may be omitted or
10 simplified.

[0012]

[Embodiment]

[Overview]

First, an overview of an indoor environment control system according to an embodiment will be described. FIG. 1 is a block diagram illustrating a functional configuration of the indoor environment control system according to the embodiment. Indoor environment control system 10 can control an indoor environment in a building, such as home 11. As illustrated in FIG. 1, indoor
15 environment control system 10 includes profile management server 20, control device 30, one or more devices 40, indoor sensor 51, operation terminal 60, external device 71, external device 72, external device 73, server device 81, and server device 82.

[0013]

25 Profile management server 20 is a device that manages indoor environment profiles. Specifically, each of the indoor environment profiles is information indicating target values of parameters that indicate an indoor environment. Moreover, each of the target values is, to be more specific, a target range indicating at least one of an upper target value and a lower target value of a parameter indicating
30 an indoor environment. Each target value need not indicate a target range. Each target value may be, for example, a set value to be set in device 40.

[0014]

35 The parameters indicating an indoor environment include, for

example, thermal comfort (e.g., a temperature, humidity, airflow strength, or an airflow direction), air quality (AQ), light (an illuminance level, an illuminance distribution, glare, a color, and/or an atmosphere of a room), sound (a background noise, acoustic privacy, and/or articulation), and smell. AQ is, for example, gas concentrations. Gas concentrations include a CO₂ concentration, a total volatile organic compounds (TVOC) concentration, a particulate matter (PM) concentration, a nitrogen oxides (NO_x) concentration, a sulfur oxides (SO_x) concentration, an ozone (O₃) concentration, etc. AQ also includes the amount of airborne mold and the like. In an indoor environment profile, these parameters are determined for each of places (i.e., areas) in a space, for example. FIG. 2 is a diagram illustrating an example of an indoor environment profile.

[0015]

Although an example of an indoor environment profile shown in FIG. 2 includes a plurality of parameters, an indoor environment profile is to include at least one parameter. Moreover, it is not essential that a parameter indicating an indoor environment is determined for each place in a space. For example, an indoor environment profile may include a single parameter indicating an indoor environment which is determined for the entire space.

[0016]

Profile management server 20 includes storage 23 that stores a plurality of types of indoor environment profiles in advance. Profile management server 20 obtains, from external device 71 that holds an indoor environment profile having a track record of being used in a school, the indoor environment profile, and stores the indoor environment profile in storage 23, for example. Likewise, profile management server 20 obtains, from external device 72 that holds an indoor environment profile having a track record of being used in an office, the indoor environment profile, and stores the indoor environment profile in storage 23, for example. Profile management server 20 also obtains, from external device 73 that holds an indoor environment profile having a track record of being used in a hospital, the indoor environment profile, and stores the

indoor environment profile in storage 23, for example. In addition, a general user may upload an indoor environment profile created by the user to profile management server 20, and such indoor environment profile may be stored in storage 23. As described
5 above, a wide variety of indoor environment profiles are stored in profile management server 20 in advance. Indoor environment profiles to be stored in profile management server 20 may include indoor environment profiles whose efficacy has been proved, such as an indoor environment profile that has been proved to improve
10 concentration of students of a particular school.
[0017]

A user who resides in home 11 can operate operation terminal 60 to download an indoor environment profile from profile management server 20. Control device 30 controls one or more
15 devices 40 based on the downloaded indoor environment profile to control an indoor environment in home 11. For example, if an indoor environment profile having a track record of being used in a school is downloaded, control device 30 can reproduce an indoor environment same as an indoor environment in the school in home
20 11.
[0018]

[Configuration: profile management server]

The following will be describing a particular configuration of each of devices included in the above-described indoor environment control system 10. First, profile management server 20 will be
25 described.
[0019]

As described above, profile management server 20 is a device that manages indoor environment profiles. Specifically, profile
30 management server 20 includes communicator 21, information processor 22, and storage 23.
[0020]

Communicator 21 is a communication module (communication circuit) for profile management server 20 to communicate with
35 control device 30, operation terminal 60, external device 71,

external device 72, external device 73, server device 81, and server device 82, via wide area network 90 such as the Internet. Communication performed by communicator 21 may be wireless communication or wired communication. A communication standard used for communication is also not particularly limited. Communicator 21 includes obtainer 24.

[0021]

Information processor 22 performs information processing relating to management of indoor environment profiles. Specifically, information processor 22 is implemented by a processor, a microcomputer, or a dedicated circuit. Information processor 22 may be implemented by a combination of two or more elements among a processor, a microcomputer, or a dedicated circuit.

[0022]

Storage 23 is a storage device that stores a plurality of indoor environment profiles. Storage 23 also stores, for example, a computer program that is executed for information processor 22 to perform the above-described information processing. Specifically, storage 23 is implemented by a semiconductor memory, a hard disk drive (HDD), etc.

[0023]

[Configuration: control device]

Control device 30 obtains (downloads) an indoor environment profile from profile management server 20, and controls one or more devices 40 based on the downloaded indoor environment profile to control an indoor environment in home 11. Control device 30 is provided in home 11. Control device 30 is, for example, an energy management system (EMS) controller having energy management functions, but may be a gateway device or a home controller not having energy management functions. Specifically, control device 30 includes first communicator 31, controller 32, storage 33, and second communicator 34.

[0024]

First communicator 31 is a communication module (communication circuit) for control device 30 to communicate with

profile management server 20, etc. via wide area network 90 such as the Internet. Communication performed by first communicator 31 may be wireless communication or wired communication. A communication standard used for communication is also not particularly limited.

[0025]

Controller 32 controls, based on an indoor environment profile, one or more devices 40 for controlling an indoor environment. For example, controller 32 transmits control signals using second communicator 34 to control one or more devices 40. Specifically, controller 32 is implemented by a processor, a microcomputer, or a dedicated circuit. Controller 32 may be implemented by a combination of two or more elements among a processor, a microcomputer, or a dedicated circuit.

[0026]

Storage 33 is a storage device that stores, for example, a computer program that is executed for controller 32 to control one or more devices 40 based on an indoor environment profile. Specifically, storage 33 is implemented by a semiconductor memory, etc.

[0027]

Second communicator 34 is a communication module (communication circuit) for control device 30 to communicate with one or more devices 40 via a local communication network. Communication performed by second communicator 34 may be wireless communication or wired communication. A communication standard used for the communication is also not particularly limited.

[0028]

[Configuration: device]

Devices 40 receive control signals transmitted from control device 30, and control an indoor environment in home 11 based on the received control signals. Devices 40 are provided in home 11. Devices 40 include ventilation device 41, air conditioner 42, lighting device 43, air purifier 44, scent generator 45, speaker 46, etc.

[0029]

Ventilation device 41 ventilates an inside of home 11 based on a control signal received from control device 30. Ventilation device 41 may have both a function of supplying air from the outside of home 11 to the inside of home 11 and a function of releasing air from the inside of home 11 to the outside of home 11. Ventilation device 41 may have only one of the air supplying function and the air releasing function. Ventilation device 41 may be implemented by, for example, an air blower (fan).

[0030]

10 Air conditioner 42 controls a temperature and humidity of the inside of home 11 based on a control signal received from control device 30.

[0031]

15 lighting device 43 controls an illuminance (brightness) of the inside of home 11 based on a control signal received from control device 30. Lighting device 43 is, for example, a ceiling light having a function of dimming light. Lighting device 43 may have a function of toning light.

[0032]

20 Air purifier 44 have a function of decreasing a concentration of at least one of PM, NO_x, SO_x, O₃, and volatile organic compounds (VOC) in an indoor space, based on a control signal received from control device 30, or a function of decreasing the amount of airborne mold in the indoor space, based on a control signal received from control device 30. Air purifier 44 is, for example, a fan-type air purifier including an air filter. Air purifier 44 takes in air of an indoor space, filters the air through the air filter, and release the air in the indoor space. A high efficiency particulate air (HEPA) filter exemplifies the air filter. Alternatively, air purifier 44 may be an air purifier that uses hypochlorous acid for odor elimination or for disinfection.

[0033]

35 Scent generator 45 releases a scent based on a control signal received from control device 30. Scent generator 45 is, for example, an aroma diffuser, but may be a scent generator other than an aroma

diffuser.

[0034]

Speaker 46 outputs a canceling sound for canceling a noise or music, based on a control signal received from control device 30.

5 [0035]

[Configuration: indoor sensor and outdoor sensor]

Indoor sensor 51 senses an indoor environment in home 11, and outputs, as a sensed result, information (may be referred to as sensed information) indicating the indoor environment in home 11.

10 Indoor sensor 51 is communicable with control device 30, and can transmit information indicating a state of the indoor environment to control device 30. Indoor sensor 51 may be a semiconductor gas sensor capable of sensing the above-described gas concentrations, a temperature sensor, a humidity sensor, an airflow sensor, an
15 illuminance sensor, a human detection sensor, a microphone, and a camera. Moreover, indoor sensor 51 may be a sensor (including a camera) that senses an action taken by a person inside home 11, and a sensor (a window sensor or an electric lock) that senses a state of home 11.

20 [0036]

Indoor sensor 51 may also be a vital sensor that senses vital information of a person in home 11. The vital sensor is, for example, a blood pressure gauge that senses blood pressure of a person, or a heart rate meter that senses a heart rate of a person. The vital
25 sensor may be a wearable sensor that comes into contact with a human body, or may be a contactless sensor. Indoor environment control using the vital information is, for example, control that approximates an indoor environment in home 11 to a relaxing space using scent generator 45, when a person is assessed as having stress
30 as a result of a stress assessment carried out based on a heart rate sensed by a wearable sensor.

[0037]

Outdoor sensor 52 senses an outdoor environment around home 11, and outputs, as a sensed result, outdoor environment
35 information (may be referred to as sensed information) indicating

the outdoor environment around home 11. Outdoor sensor 52 is communicable with control device 30, and can transmit the information indicating a state of the outdoor environment to control device 30. Outdoor sensor 52 may be a semiconductor gas sensor capable of sensing the above-described gas concentrations, a temperature sensor, a humidity sensor, etc. Outdoor sensor 52 may be provided for each of homes 11, or provided at a particular location in a town. In addition, the outdoor environment information may be obtained from a server device that manages weather forecast information, etc., via wide area network 90.

[0038]

[Configuration: operation terminal]

Operation terminal 60 is an information terminal possessed by a user who resides in home 11, and is specifically a mobile terminal, such as a smartphone or a tablet terminal. Operation terminal 60 may be an information terminal provided on a wall, or may be an information terminal integrated with a gateway. Operation terminal 60 includes display 61 implemented by a liquid crystal panel, an organic electroluminescent (EL) panel, or the like, and operation receiver 62 implemented by a touch panel, hardware keys, or the like.

[0039]

[Configuration: external device and server device]

External device 71, external device 72, and external device 73 each hold indoor environment profiles. Each of external device 71, external device 72, and external device 73 is a cloud server, but may be an information terminal such as a personal computer. Note that although FIG. 1 illustrates three external devices, the number of external devices is not particularly limited.

[0040]

Server device 81 provides an e-commerce website. Server device 82 is used by maintenance providers who provide maintenance of devices 40.

[0041]

[Operation example 1]

Next, Operation example 1 of operation performed by indoor environment control system 10 will be described. FIG. 3 is a flowchart illustrating Operation example 1 of operation performed by indoor environment control system 10.

5 [0042]

First, obtainer 24 of profile management server 20 obtains indoor environment profiles (S11). As described above, obtainer 24 obtains an indoor environment profile from, for example, each of external device 71, external device 72, and external device 73 via
10 wide area network 90. As described above, indoor environment profiles each are information for controlling one or more devices 40 to be used for controlling an indoor environment in home 11. The indoor environment profiles obtained by obtainer 24 are stored in storage 23 (S12). Note that indoor environment profiles may be
15 regularly obtained, and the indoor environment profiles stored in storage 23 may be regularly updated each time indoor environment profiles are obtained.

[0043]

Next, obtainer 24 obtains indoor environment information
20 indicating an environment in home 11 which is desired by a user (S13). The indoor environment information is transmitted from operation terminal 60 by the user operating operation receiver 62 of operation terminal 60. In other words, obtainer 24 obtains the indoor environment information from operation terminal 60.

25 [0044]

The user can select an environment in home 11 which is desired by the user from a selection screen displayed on display 61 of operation terminal 60. FIG. 4 is a diagram illustrating an example of a selection screen displayed on display 61 of operation terminal 60.

30 [0045]

As illustrated in FIG. 4, the user can select one indoor environment from among an indoor environment in a school (e.g., an indoor environment suitable to concentrate on learning), an indoor environment in a hospital (e.g., an indoor environment in which
35 viruses etc. are unlikely to generate), and an indoor environment in

an office (e.g., an indoor environment suitable for working using a personal computer). Note that indoor environment information may directly or indirectly indicate an environment in home 11 which is desired by a user. The selection screen may display options which indirectly indicate an environment, such as a concentration mode (a mode selected when a user wants to concentrate on work), a relax mode (a mode selected when a user wants to relax), and a bedtime mode (a mode selected when a user wants to go to bed), etc.

[0046]

Next, information processor 22 selectively provides control device 30 with one or more of the indoor environment profiles stored in storage 23 as one or more target profiles, based on the obtained indoor environment information (S14). For example, when the indoor environment information indicates an indoor environment in an office, an indoor environment profile of an office among the indoor environment profiles stored in storage 23 is selected as a target profile. In step S14, a couple of indoor environment profiles may be selected. In other words, at least one of the indoor environment profiles is to be selected as a target profile. The one or more target profiles are transmitted by communicator 21 to control device 30.

[0047]

Next, controller 32 of control device 30 controls one or more devices 40 based on the one or more target profiles (i.e., target values of parameters indicating an environment) received (i.e., downloaded) by first communicator 31 to approximate the indoor environment in home 11 to an indoor environment defined by the one or more target profiles (S15). Consequently, the indoor environment in an office is reproduced in home 11.

[0048]

As has been described above, indoor environment control system 10 in Operation example 1 can provide control device 30 with an indoor environment profile based on an operation performed on operation terminal 60 by a user. The above-described indoor environment control system 10 can approximate the indoor environment in home 11 to an indoor environment desired by a user.

[0049]

[Operation example 2]

Next, Operation example 2 of operation performed by indoor environment control system 10 will be described. FIG. 5 is a flowchart illustrating Operation example 2 of operation performed by indoor environment control system 10. Note that storage 23 of profile management server 20 in Operation example 2 stores a plurality of indoor environment profiles in advance. The same applies to all other operation examples from Operation example 3 onward.

[0050]

First, obtainer 24 of profile management server 20 obtains indoor environment information indicating an environment in home 11 which is obtained by sensing the environment in home 11 (S21). In other words, the indoor environment information in Operation example 2 indicates a sensed result outputted from indoor sensor 51. In this case, obtainer 24 obtains the indoor environment information outputted by indoor sensor 51 via control device 30, but if indoor sensor 51 can be directly connected with wide area network 90, obtainer 24 may obtain the indoor environment information not via control device 30.

[0051]

Next, information processor 22 selectively provides control device 30 with one or more of the indoor environment profiles stored in storage 23 as one or more target profiles, based on the obtained indoor environment information (S22). For example, when indoor sensor 51 is a camera, and the indoor environment information (in this case, image information) indicates that a user takes a seat at a desk in home 11, an indoor environment profile suitable for learning is selected as a target profile from among the indoor environment profiles stored in storage 23. In step S22, a couple of indoor environment profiles may be selected. In other words, at least one of the indoor environment profiles is to be selected as a target profile. The one or more target profiles are transmitted by communicator 21 to control device 30.

[0052]

Next, controller 32 of control device 30 controls one or more devices 40 based on the one or more target profiles received by first communicator 31 to approximate the indoor environment in home 11 to an indoor environment defined by the one or more target profile (S23). Consequently, when the user takes a seat at a desk in home 11, the indoor environment in home 11 is automatically controlled to an indoor environment suitable for learning.

[0053]

As has been described above, indoor environment control system 10 in Operation example 2 can provide control device 30 with an indoor environment profile based on a sensed result obtained by indoor sensor 51.

[0054]

Note that Operation example 1 and Operation example 2 may be combined. For example, indoor environment information indicating both an environment in home 11 which has been sensed and an environment in home 11 which is desired by a user may be obtained. In this case, control device 30 is provided with an indoor environment profile suitable for an environment desired by a user and for the present environment in home 11.

[0055]

[Operation example 3]

Next, Operation example 3 of operation performed by indoor environment control system 10 will be described. FIG. 6 is a flowchart illustrating Operation example 3 of operation performed by indoor environment control system 10.

[0056]

First, obtainer 24 of profile management server 20 obtains indoor environment information indicating an indoor environment in home 11 which is desired by a user (S31). Obtainer 24 obtains the indoor environment information from operation terminal 60.

[0057]

Next, obtainer 24 obtains one or more items of device information relating to one or more devices 40 (S32). An item of

device information is information specific to a device. In other words, an item of device information is attribute information on a device. An item of device information includes a model of device 40, a type of device 40 (whether device 40 is a ventilation device, an air
5 conditioner, etc.), capacity (a settable temperature range, the maximum air volume) of device 40, and the like. Control device 30 obtains, from each of devices 40, an item of device information on device 40, and transmits items of device information to profile management server 20. In other words, obtainer 24 obtains the
10 items of device information from control device 30.

[0058]

Next, information processor 22 selectively provides control device 30 with one or more of the indoor environment profiles stored in storage 23 as one or more target profiles, based on the obtained
15 indoor environment information and the obtained items of device information (S33).

[0059]

For example, when the indoor environment information indicates an indoor environment in an office, one or more indoor environment profiles of offices are temporarily selected from among
20 the indoor environment profiles stored in storage 23. Next, only an indoor environment profile that can be reproduced by one or more devices 40 indicated in the selected one or more indoor environment profiles of offices is selected as a target profile. For example, when
25 air conditioner 42 and lighting device 43 are provided in home 11, but air purifier 44 is not provided in home 11, only an indoor environment profile which need not operate air purifier 44 is selected as the target profile. In other words, only an indoor environment profile that can be reproduced in home 11 is selected as the target
30 profile. The target profile is transmitted by communicator 21 to control device 30.

[0060]

Next, controller 32 of control device 30 controls one or more devices 40 based on the target profile received by first communicator
35 31 to approximate the indoor environment in home 11 to an indoor

environment defined by the target profile (S34). Consequently, an indoor environment in an office is reproduced in home 11.

[0061]

5 As has been described above, indoor environment control system 10 in Operation example 3 can selectively provide control device 30 with an indoor environment profile which is desired by a user and can be reproduced by one or more devices 40 provided in home 11.

[0062]

10 Note that indoor environment information in Operation example 3 need not indicate an environment in home 11 which is desired by a user, but may indicate an environment in home 11 which has been sensed. In other words, Operation example 3 may use the indoor environment information used in Operation example 2,
15 instead of the indoor environment information used in Operation example 1. The same applies to all other operation examples from Operation example 4 onward.

[0063]

Moreover, in order to select a target profile, target profiles are
20 narrowed down by indoor environment information and then by one or more items of device information in Operation example 3, but the target profiles may be narrowed down by the one or more items of device information and then by the indoor environment information.

[0064]

25 [Operation Example 4]

Next, Operation example 4 of operation performed by indoor environment control system 10 will be described. FIG. 7 is a flowchart illustrating Operation example 4 of operation performed by indoor environment control system 10.

30 [0065]

First, obtainer 24 of profile management server 20 obtains indoor environment information indicating an indoor environment in home 11 which is desired by a user (S41). Obtainer 24 obtains the indoor environment information from operation terminal 60.

35 [0066]

Next, obtainer 24 obtains outdoor environment information indicating an environment outside home 11 which is obtained by sensing the environment outside home 11 (S42). Specifically, the outdoor environment information is information indicating a temperature, humidity, air quality, etc. outside home 11. Obtainer 24 obtains the outdoor environment information outputted by outdoor sensor 52 via control device 30, but if outdoor sensor 52 can be directly connected with wide area network 90, obtainer 24 may obtain the outdoor environment information not via control device 30.
[0067]

Moreover, obtainer 24 may obtain the outdoor environment information from a server device (e.g., a server device that manages weather information, which is not illustrated in FIG. 1) that manages a temperature, humidity, air quality, etc. outside home 11 via wide area network 90. It may be considered that the outdoor environment information provided from the server device includes, other than the above, traffic congestion information (i.e., information indirectly indicating air quality outside home 11), and area information indicating an area in which a pathogen, such as an influenza virus, is prevalent. Besides the above, it may be considered that the outdoor environment information includes medical information (e.g., a health insurance claim form), information indicating time of sunset, etc. The medical information can be used, particularly based on personal preference according to a symptom or a disorder. The information indicating time of sunset can be used for controlling an illuminance of the inside of home 11.
[0068]

Next, information processor 22 selectively provides control device 30 with one or more of the indoor environment profiles stored in storage 23 as one or more target profiles, based on the obtained indoor environment information and the obtained outdoor environment information (S43).
[0069]

For example, it may be considered that the indoor

environment information indicates an indoor environment in an office,
and that the outdoor environment information indicates air quality
outside home 11 which is relatively poor (e.g., high PM
concentration). When the air quality outside home 11 is relatively
5 poor, taking in air outside home 11 into home 11 by operating
ventilation device 41 leads to a reduction in air quality in home 11.
[0070]

In such a case, information processor 22 temporarily selects
one or more indoor environment profiles of offices from among the
10 indoor environment profiles stored in storage 23, and then selects,
from among the one or more indoor environment profiles of offices,
only an indoor environment profile that can be reproduced without
the operation of ventilation device 41 as a target profile. In other
words, only an indoor environment profile estimated not to
15 deteriorate the indoor environment in home 11 is selected as the
target profile. The target profile is transmitted by communicator 21
to control device 30.
[0071]

Next, controller 32 of control device 30 controls one or more
20 devices 40 based on the target profile received by first communicator
31 to approximate the indoor environment in home 11 to an indoor
environment defined by the target profile (S44). Consequently, an
indoor environment in an office is reproduced in home 11.
[0072]

As has been described above, indoor environment control
25 system 10 in Operation example 4 can selectively provide control
device 30 with an indoor environment profile which is desired by a
user and is estimated not to deteriorate the indoor environment in
home 11.
30 [0073]

Moreover, in order to select a target profile, target profiles are
narrowed down by indoor environment information and then by
outdoor environment information in Operation example 4, but the
target profiles may be narrowed down by the outdoor environment
35 information and then by the indoor environment information.

[0074]

[Operation Example 5]

Next, Operation example 5 of operation performed by indoor environment control system 10 will be described. FIG. 8 is a flowchart illustrating Operation example 5 of operation performed by indoor environment control system 10. Note that the description of control to be performed on one or more devices 40 by control device 30 after the provision of a target profile is the same as the description provided in Operation examples 1 through 4, and thus the description is omitted in Operation example 5. The same applies to all other operation examples from Operation example 6 onward.

[0075]

First, obtainer 24 of profile management server 20 obtains indoor environment information indicating an indoor environment in home 11 which is desired by a user (S51). Obtainer 24 obtains the indoor environment information from operation terminal 60, for example.

[0076]

Next, obtainer 24 obtains one or more items of device information relating to one or more devices 40 (S52). Obtainer 24 obtains the one or more items of device information from control device 30, for example.

[0077]

Next, information processor 22 selects one indoor environment profile from among the indoor environment profiles stored in storage 23 as a target profile, based on the obtained indoor environment information (S53). Then, information processor 22 determines whether the selected target profile can be reproduced by one or more devices 40 indicated in the one or more items of device information (S54). In Operation example 5, each of the indoor environment profiles is associated with one or more devices required for reproducing each indoor environment profile, and is stored in storage 23. Accordingly, information processor 22 can determine whether the selected target profile can be reproduced by one or more devices 40 indicated in the one or more items of device information

by referring to storage 23.

[0078]

When it is determined that the selected target profile can be reproduced by one or more devices 40 indicated in the one or more items of device information (Yes in S54), information processor 22 provides control device 30 with the target profile (S55). Alternatively, when it is determined that the selected target profile cannot be reproduced by one or more devices 40 indicated in the one or more items of device information (No in S54), information processor 22 provides control device 30 with one or more control algorithms for approximating the indoor environment in home 11 to an indoor environment defined by the target profile (S56). In other words, when the target profile cannot be reproduced under the control of one or more devices 40, information processor 22 provides control device 30 with one or more particular control algorithms (e.g., values to be set in devices 40) for reproducing an indoor environment profile similar to the target profile. The one or more control algorithms to be provided may be appropriately generated, or may be stored in storage 23 as a database prepared in advance.

[0079]

As has been described above, indoor environment control system 10 in Operation example 5 can provide control device 30 with a particular control algorithm for approximating an indoor environment in a home to an indoor environment defined by an indoor environment profile desired by a user, when one or more devices 40 provided in home 11 cannot reproduce the indoor environment profile desired by the user.

[0080]

[Operation Example 6]

Next, Operation example 6 of operation performed by indoor environment control system 10 will be described. FIG. 9 is a flowchart illustrating Operation example 6 of operation performed by indoor environment control system 10.

[0081]

First, obtainer 24 of profile management server 20 obtains

indoor environment information indicating an environment in home 11 which is desired by a user (S61). Obtainer 24 obtains the indoor environment information from, for example, operation terminal 60. [0082]

5 Next, obtainer 24 obtains one or more items of device information relating to one or more devices 40 (S62). Obtainer 24 obtains the one or more items of device information from control device 30, for example. [0083]

10 Next, information processor 22 selects one indoor environment profile from among the indoor environment profiles stored in storage 23 as a target profile, based on the obtained indoor environment information (S63). Then, information processor 22 determines whether the selected target profile can be reproduced by
15 one or more devices 40 indicated in the one or more items of device information (S64). In Operation example 6, each of the indoor environment profiles is associated with one or more devices required for reproducing each indoor environment profile, and is stored in storage 23. Accordingly, information processor 22 can determine
20 whether the selected target profile can be reproduced by one or more devices 40 indicated in the one or more items of device information by referring to storage 23. [0084]

 When it is determined that the selected target profile can be
25 reproduced by one or more devices 40 indicated in the one or more items of device information (Yes in S64), information processor 22 provides control device 30 with the target profile (S65). Alternatively, when it is determined that the selected target profile cannot be reproduced by one or more devices 40 indicated in the one
30 or more items of device information (No in S64), information processor 22 presents control device 30 with a device required for reproducing an environment defined by the target profile (S66). For example, information processor 22 causes communicator 21 to transmit information (e.g., image information) for presenting a
35 device required for reproducing the target profile. When operation

terminal 60 receives the image information, display 61 displays an image showing a device required for reproducing the target profile. FIG. 10 is a diagram illustrating an example of such an image. The target profile can be reproduced from the next time by a user
5 purchasing the displayed device to be provided in home 11, for example.

[0085]

As has been described above, indoor environment control system 10 in Operation example 6 can present a user with a device
10 required for reproducing an indoor environment profile desired by a user, when one or more devices 40 provided in home 11 cannot reproduce an environment defined by the indoor environment profile.

[0086]

[Operation Example 7]

15 Next, Operation example 7 of operation performed by indoor environment control system 10 will be described. FIG. 11 is a flowchart illustrating Operation example 7 of operation performed by indoor environment control system 10.

[0087]

20 First, obtainer 24 of profile management server 20 obtains indoor environment information indicating an environment in home 11 which is desired by a user (S71). Obtainer 24 obtains the indoor environment information from operation terminal 60, for example.

[0088]

25 Next, obtainer 24 obtains one or more items of operation history information on one or more devices 40 (S72). The one or more items of operation history information are stored in storage 33 of control device 30 in advance. In other words, obtainer 24 obtains the one or more items of operation history information from control
30 device 30. According to the one or more items of operation history information, it is possible to grasp setting preference, frequency of use of devices 40 by a user, etc.

[0089]

Next, information processor 22 selects one indoor
35 environment profile from among the indoor environment profiles

stored in storage 23, based on the obtained indoor environment information (S73). Then, information processor 22 customizes the selected indoor environment profile based on the one or more items of operation history information (S74).

5 [0090]

For example, when an item of operation history information indicates a set temperature set in an air conditioner for cooling a space which is lower than an average set temperature for cooling a space, it may be estimated that a user prefers a thermal environment
10 in which a temperature is slightly set lower than normal. Accordingly, information processor 22 customizes a target temperature value defined by the selected indoor environment profile such that the target temperature value is decreased by a predetermined value. The specific method of customizing an indoor
15 environment profile is not particularly limited; a machine learning model may be used for customizing an indoor environment profile, for example. Information processor 22 then provides control device 30 with the customized indoor environment profile as a target profile (S75).

20 [0091]

As has been described above, indoor environment control system 10 in Operation example 7 can provide an indoor environment profile which is desired by a user and is further customized based on user preference (to be more specific, a
25 tendency for a user to use a device).

[0092]

[Operation Example 8]

Next, Operation example 8 of operation performed by indoor environment control system 10 will be described. FIG. 12 is a
30 flowchart illustrating Operation example 8 of operation performed by indoor environment control system 10.

[0093]

Controller 32 of control device 30 controls one or more devices
40 using a target profile to control an indoor environment in home 11
35 (S81).

[0094]

Obtainer 24 of profile management server 20 obtains sensed information indicating an environment in home 11 which is sensed while or after the indoor environment is controlled using the target
5 profile (S82). The sensed information indicates at least one of a temperature, humidity, an illuminance, airflow strength, an airflow direction, smell, air quality, etc. in home 11, and is outputted by indoor sensor 51.

[0095]

10 Information processor 22 determines whether one or more devices 40 need maintenance based on the obtained sensed information. For example, information processor 22 determines whether the target profile is reproduced after a fixed period has elapsed since control of an indoor environment has started (S83).
15 When it is determined that the target profile is reproduced after the fixed period has elapsed (Yes in S83), information processor 22 determines that one or more devices 40 do not need maintenance (S84).

[0096]

20 Alternatively, when it is determined that the target profile is not reproduced after the fixed period has elapsed (No in S83), information processor 22 determines that one or more devices 40 need maintenance (S85). For example, when a PM concentration specified in the target profile is not reproduced (the PM concentration
25 is more than or equal to a predetermined concentration even after the fixed period has elapsed), it is estimated that one or more devices 40 (e.g., ventilation device 41 and air purifier 44) each having a function capable of decreasing PM are not properly operating. In other words, it can be determined that one or more
30 devices 40 need maintenance.

[0097]

When it is determined that one or more devices 40 need maintenance, information processor 22 notifies a user that maintenance is necessary (S86). For example, information
35 processor 22 causes communicator 21 to transmit notification

information for notifying the user that maintenance is necessary. When operation terminal 60 receives the notification information, display 61 displays an image showing that maintenance is necessary. FIG. 13 is a diagram illustrating an example of such an image. Such an image makes it possible for the user to become aware that maintenance is necessary. Note that storage 23 of profile management server 20 stores a database in which environmental parameters that cannot be reproduced are associated with devices 40 each of which is estimated to be the cause of a failure to reproduce a particular environmental parameter. One or more devices which need maintenance are identified based on the database.

[0098]

As has been described above, indoor environment control system 10 in Operation example 8 can estimate that one or more devices 40 need maintenance when a target profile desired by a user cannot be reproduced, and can notify the user that maintenance is necessary.

[0099]

[Operation Example 9]

Next, Operation example 9 of operation performed by indoor environment control system 10 will be described. FIG. 14 is a flowchart illustrating Operation example 9 of operation performed by indoor environment control system 10.

[0100]

Steps S81 through S85 are the same as steps S81 through S85 in Operation example 8. When it is determined that one or more devices 40 need maintenance (S85), information processor 22 places an order for a component to be used for maintenance (S87). For example, information processor 22 causes communicator 21 to transmit order placement information for placing an order for a component (e.g., an air filter) to be used for maintenance. When server device 81 that provides an e-commerce website receives the order placement information, the component to be used for maintenance is delivered to home 11. Note that storage 23 of

profile management server 20 stores a maintenance component database in which each of devices is associated with a component to be used for maintenance of the device. A component to be used for maintenance is identified based on the database.

5 [0101]

As has been described above, indoor environment control system 10 in Operation example 9 can place an order for a component to be used for maintenance, when it is determined one or more devices 40 need maintenance.

10 [0102]

[Operation Example 10]

Next, Operation example 10 of operation performed by indoor environment control system 10 will be described. FIG. 15 is a flowchart illustrating Operation example 10 of operation performed by indoor environment control system 10.

15 [0103]

Steps S81 through S85 are the same as steps S81 through S85 in Operation example 8. When it is determined that one or more devices 40 need maintenance (S85), information processor 22 notifies a maintenance provider that maintenance is necessary (S88). For example, information processor 22 causes communicator 21 to transmit notification information for notifying the maintenance provider that maintenance is necessary. When the notification information is received by server device 82 which is used by the maintenance provider, arrangements for maintenance (e.g., arrangements for staff members and components), etc. are made. Note that storage 23 of profile management server 20 stores a maintenance provider database in which each of devices is associated with a maintenance provider for maintenance of the device.

20
25
30

[0104]

As has been described above, indoor environment control system 10 in Operation example 10 can notify a maintenance provider that maintenance is necessary, when it is determined that one or more devices 40 need maintenance.

35

[0105]

[Operation Example 11]

Next, Operation example 11 of operation performed by indoor environment control system 10 will be described. FIG. 16 is a flowchart illustrating Operation example 11 of operation performed by indoor environment control system 10.

[0106]

First, obtainer 24 of profile management server 20 obtains sensed information indicating an environment in home 11 which is sensed before the indoor environment is controlled using a target profile (S91). The sensed information indicates at least one of a temperature, humidity, an illuminance, airflow strength, an airflow direction, smell, air quality, etc. in home 11, and is outputted by indoor sensor 51.

[0107]

Next, information processor 22 calculates, based on the sensed information obtained in step S91, an evaluation value indicating the indoor environment before the indoor environment is controlled using the target profile (S92). Although the evaluation value is not particularly limited, an evaluation value according to a purpose of the target profile may be used, for example. For example, when the target profile is an indoor environment profile of a school, a purpose of the target profile is to concentrate on learning. Accordingly, as the evaluation value, an evaluation value indicating a concentration level that indicates ease of concentration on learning is used. An evaluation value indicating the concentration level may be calculated using, for example, a CO₂ concentration (concentration on learning is greater for a lower CO₂ concentration) and a light color temperature (concentration on learning is greater for a higher color temperature).

[0108]

Next, obtainer 24 obtains sensed information indicating an environment in home 11 which is sensed after the indoor environment is controlled using the target profile (S93). Information processor 22 calculates, based on the sensed

information obtained in step S93, an evaluation value (e.g., an evaluation value indicating the concentration level) indicating the indoor environment after the indoor environment is controlled using the target profile (S94).

5 [0109]

Thereafter, information processor 22 presents a user with (i) the evaluation value indicating the indoor environment before the indoor environment is controlled using the target profile and (ii) the evaluation value indicating the indoor environment after the indoor environment is controlled using the target profile (S95). For example, information processor 22 causes communicator 21 to transmit information (e.g., image information) in which these two evaluation values are made possible to be presented (e.g., simultaneously presented) for comparison. When operation terminal 60 receives the image information, display 61 displays an image including the evaluation values each of which is indicating the indoor environment before and after the indoor environment is controlled using the target profile. FIG. 17 is a diagram illustrating an example of such an image.

20 [0110]

As has been described above, indoor environment control system 10 in Operation example 11 can present a user with an effect that can be achieved by reproducing a target profile in home 11.

[0111]

25 [Operation Example 12]

Next, Operation example 12 of operation performed by indoor environment control system 10 will be described. FIG. 18 is a flowchart illustrating Operation example 12 of operation performed by indoor environment control system 10.

30 [0112]

First, obtainer 24 of profile management server 20 obtains sensed information indicating an environment outside home 11 which has been sensed (S101). The sensed information indicates at least one of a temperature, humidity, air quality, etc. outside home 11, and is outputted by outdoor sensor 52. Instead of the sensed

information, obtainer 24 may obtain outdoor information from a server device (e.g., a server device that manages weather forecast information) that manages weather forecast information or PM2.5 concentration forecast information via wide area network 90.

5 [0113]

Next, information processor 22 calculates an evaluation value indicating the outdoor environment, based on the sensed information obtained in step S101 (S102).

[0114]

10 Next, obtainer 24 obtains sensed information indicating an indoor environment in home 11 which is sensed after the indoor environment is controlled using a target profile (S103). Information processor 22 calculates an evaluation value indicating the indoor environment after the indoor environment is controlled using the
15 target profile, based on the sensed information obtained in step S103 (S104).

[0115]

Thereafter, information processor 22 presents a user with the evaluation value indicating the outdoor environment and the
20 evaluation value indicating the indoor environment after the indoor environment is controlled using the target profile (S105). For example, information processor 22 causes communicator 21 to transmit information (e.g., image information) in which these two evaluation values are made possible to be presented (e.g.,
25 simultaneously presented) for comparison. When operation terminal 60 receives the image information, display 61 displays an image including (i) the evaluation value indicating the outdoor environment and (ii) the evaluation value indicating the indoor environment after the indoor environment is controlled using the
30 target profile. FIG. 19 is a diagram illustrating an example of such an image.

[0116]

As has been described above, indoor environment control system 10 in Operation example 12 can present a user with an effect
35 that can be achieved by reproducing a target profile in home 11.

[0117]

[Variation]

Although operation terminal 60 is used as a user interface in the above-described embodiment, control device 30 may be used as
5 a user interface instead of operation terminal 60.

[0118]

For example, indoor environment information indicating an environment in home 11 which is desired by a user may be transferred from control device 30 to profile management server 20
10 by a user operating an operation receiver (not illustrated) of control device 30, instead of the user operating operation receiver 62 of operation terminal 60. Likewise, an image shown in each of FIG. 4, FIG. 10, FIG. 13, FIG. 17, and FIG. 19 may be displayed on a display (not illustrated) of control device 30, instead of display 61 of
15 operation terminal 60.

[0119]

In addition, control device 30 may include part of or all of elements included in profile management server 20 in the above-described embodiment. For example, control device 30 may
20 include information processor 22 and obtainer 24. In other words, instead of profile management server 20, control device 30 may perform processing performed by information processor 22 and processing performed by obtainer 24.

[0120]

Moreover, although indoor environment control system 10
25 described in the above embodiment controls an indoor environment in home 11, indoor environment control system 10 may control an indoor environment in a building, such as an office, a hospital, or a school, other than home 11. Furthermore, an indoor environment
30 may be controlled for each of spaces (a living room, a dining room, etc.) included in a building, such as home 11. In this case, a single control device 30 may control an indoor environment in each of the spaces, or a plurality of control devices 30 corresponding to the spaces may be provided to control an indoor environment in a space
35 corresponding to each control device 30. When a single control

device 30 controls an indoor environment in each space, attribute information of device 40 includes information indicating a place (a living room, a children's room, etc.) in which device 40 is provided. The information is recorded by a user or a provider of device 40.

5 [0121]

[Advantageous Effects, etc.]

As has been described above, indoor environment control system 10 includes: storage 23 that stores indoor environment profiles each for controlling one or more devices 40 to be used for
10 controlling an indoor environment in a building; obtainer 24 that obtains indoor environment information indicating at least one of the indoor environment in the building which has been sensed and the indoor environment in the building which is desired by a user; and
information processor 22 that selectively provides one or more of the
15 indoor environment profiles each as a target profile, based on the indoor environment information obtained.

[0122]

The above-described indoor environment control system 10 can provide target profiles as information for and a means of
20 controlling an environment in an indoor space.

[0123]

In addition, obtainer 24 further obtains one or more items of device information relating to one or more devices 40, for example. Information processor 22 selectively provides one or more of the
25 indoor environment profiles each as a target profile, based on the indoor environment information obtained and the one or more items of device information obtained.

[0124]

The above-described indoor environment control system 10 can provide target profiles with consideration given to a type or capacity of one or more devices 40.

[0125]

In addition, obtainer 24 further obtains outdoor environment information on an outside of the building, for example. Information
35 processor 22 selectively provides one or more of the indoor

environment profiles each as a target profile, based on the indoor environment information obtained and the outdoor environment information obtained.

[0126]

5 The above-described indoor environment control system 10 can provide target profiles with consideration given to outdoor environment information such that an indoor environment would not be deteriorated.

[0127]

10 In addition, obtainer 24 further obtains one or more items of device information relating to one or more devices 40, for example. When the indoor environment profiles selected based on the indoor environment information obtained cannot be reproduced by one or more devices 40 indicated in the one or more items of device
15 information, information processor 22 provides one or more control algorithms for one or more devices 40 for approximating the indoor environment in the building to an indoor environment defined by the target profile.

[0128]

20 The above-described indoor environment control system 10 can approximate an indoor environment in a building to an indoor environment defined by a target profile, when it is estimated that the target profile cannot be reproduced.

[0129]

25 In addition, obtainer 24 further obtains one or more items of device information relating to one or more devices 40, for example. When the indoor environment profiles selected based on the indoor environment information obtained cannot be reproduced by one or more devices 40 indicated in the one or more items of device
30 information, information processor 22 presents a device required for reproducing the target profile.

[0130]

 The above-described indoor environment control system 10 can present a user with a method for reproducing a target profile,
35 when it is estimated that the target profile cannot be reproduced.

[0131]

In addition, obtainer 24 further obtains one or more items of device information relating to one or more devices 40, for example. Information processor 22 customizes, based on one or more items of use history information on one or more devices 40 included in the one or more items of device information, the one or more of the indoor environment profiles selected based on the indoor environment information, and provides the one or more indoor environment profiles customized each as the target profile.

10 [0132]

The above-described indoor environment control system 10 can provide a target profile that reflects user preference.

[0133]

In addition, information processor 22 presents the user with (i) information indicating an indoor environment before the indoor environment is controlled using the target profile provided and (ii) information indicating an indoor environment after the indoor environment is controlled using the target profile provided, for example.

20 [0134]

The above-described indoor environment control system 10 can present a user with a difference between an indoor environment before the indoor environment is controlled and an indoor environment after the indoor environment is controlled.

25 [0135]

In addition, obtainer 24 further obtains outdoor environment information on an outside of the building, for example. Information processor 22 presents a user with (i) information indicating an indoor environment after the indoor environment is controlled using the target profile provided and (ii) information indicating an outdoor environment indicated in the outdoor environment information.

[0136]

The above-described indoor environment control system 10 can present a user with a difference between an outdoor environment and an indoor environment after the indoor environment is

controlled.

[0137]

5 In addition, obtainer 24 further obtains sensed information indicating an indoor environment in the building which is sensed while or after the indoor environment is controlled using the target profile provided, for example. Information processor 22 determines whether the one or more devices 40 need maintenance, based on the sensed information.

[0138]

10 The above-described indoor environment control system 10 can determine that maintenance is necessary based on whether a target profile is reproduced or not.

[0139]

15 In addition, when it is determined that one or more devices 40 need maintenance, information processor 22 notifies the user that maintenance is necessary, for example.

[0140]

The above-described indoor environment control system 10 can notify a user that maintenance is necessary.

20 [0141]

In addition, when it is determined that one or more devices 40 need maintenance, information processor 22 places an order for a component to be used for maintenance, for example.

[0142]

25 The above-described indoor environment control system 10 can place an order for a component to be used for maintenance.

[0143]

30 In addition, when it is determined that one or more devices 40 need maintenance, information processor 22 notifies a maintenance provider that maintenance is necessary.

[0144]

The above-described indoor environment control system 10 can notify a maintenance provider that maintenance is necessary.

[0145]

35 In addition, the building is home 11, for example.

[0146]

The above-described indoor environment control system 10 can provide a target profile as information for controlling an environment in an indoor space of home 11.

5 [0147]

In addition, home 11 is provided with control device 30 that controls one or more devices 40, for example. Control device 30 includes obtainer 24 and information processor 22.

[0148]

10 The above-described indoor environment control system 10 can perform processing of providing a target profile using control device 30 provided in home 11.

[0149]

15 In addition, home 11 includes spaces, and the indoor environment is controlled for each of the spaces, for example.

[0150]

The above-described indoor environment control system 10 can provide a target profile as information for controlling an environment in an indoor space of home 11 for each of spaces
20 included in home 11.

[0151]

In addition, each of the indoor environment profiles stored in storage 23 is (i) an indoor environment profile to be used in a building other than home 11, (ii) an indoor environment profile
25 obtained by obtainer 24 from external device 71, etc., and (iii) regularly updated, for example.

[0152]

The above-described indoor environment control system 10 can store indoor environment profiles obtained from external device
30 71, etc., and can provide a target profile selected from among the indoor environment profiles.

[0153]

In addition, an indoor environment control method executed by a computer, such as indoor environment control system 10,
35 includes: storing indoor environment profiles each for controlling one

or more devices 40 to be used for controlling an indoor environment in a building; obtaining indoor environment information indicating at least one of the indoor environment in the building which has been sensed and the indoor environment in the building which is desired
5 by a user; and selectively providing one or more of the indoor environment profiles as one or more target profiles, based on the indoor environment information obtained.

[0154]

Such an indoor environment control method can provide target
10 profiles as information for controlling an environment in an indoor space.

[0155]

[Other Embodiments]

Hereinbefore, an indoor environment control system according
15 to the embodiments has been described, but the present invention is not limited to the embodiments.

[0156]

For example, although the indoor environment control system described in the above embodiments provides an indoor environment
20 profile, the indoor environment control system may place importance on air quality, and may provide an air quality profile. In other words, an indoor environment profile described in the above embodiments may be replaced by an air quality profile.

[0157]

Moreover, the indoor environment control system described in the above embodiments is implemented by a plurality of devices, but may be implemented as a single device. When the indoor environment control system is implemented by a plurality of devices, elements included in the indoor environment control system may be
30 assigned to the plurality of devices in any manner.

[0158]

In addition, in the above embodiments, each element may be configured as a dedicated hardware product or may be implemented by executing a software program suitable for the element. Each
35 element may be implemented as a result of a program execution unit,

such as a central processing unit (CPU), processor or the like, loading and executing a software program stored in a storage medium such as a hard disk or a semiconductor memory.

[0159]

5 Moreover, each element may be a circuit (or an integrated circuit). These circuits may constitute a single circuit as a whole or may be individual circuits. Furthermore, each circuit may be a general-purpose circuit or may be a dedicated circuit.

[0160]

10 These general and specific aspects of the present invention may be implemented using a system, a device, a method, an integrated circuit, a computer program, or a computer-readable recording medium such as a CD-ROM. Alternatively, these general and specific aspects of the present invention may be implemented by
15 an optional combination of a system, a device, a method, an integrated circuit, a computer program, or a recording medium. For example, the present invention may be implemented as a profile management server (or a system corresponding to the profile management server) described in the above embodiments.
20 Furthermore, the present invention may be implemented as an indoor environment control method implemented by a computer, such as the indoor environment control system according to the above-described embodiments. The present invention may be implemented as a program for causing a computer to implement such
25 an indoor environment control method, or may be implemented as a non-transitory computer-readable recording medium in which such a program is stored.

[0161]

 In addition, the orders of a plurality of processes shown in the
30 flowcharts described in the above embodiments are mere examples. The orders of the plurality of processes may be changed, and the plurality of processes may be performed in parallel. Moreover, a process performed by a particular processor may be performed by another processor.

35 [0162]

The present invention also encompasses: embodiments achieved by applying various modifications conceivable to those skilled in the art to each embodiment; and embodiments achieved by optionally combining the elements and the functions of each embodiment without departing from the essence of the present invention.

[Reference Signs List]

[0163]

	10	indoor environment control system
10	11	home
	22	information processor
	23	storage
	24	obtainer
	30	control device
15	40	device

CLAIMS

1. An indoor environment control system, comprising:
 - a storage that stores indoor environment profiles each for controlling one or more devices to be used for controlling an indoor environment in a building;
 - an obtainer that obtains indoor environment information indicating at least one of the indoor environment in the building which has been sensed and the indoor environment in the building which is desired by a user, and one or more items of device information relating to the one or more devices; and
 - an information processor that selectively provides one or more of the indoor environment profiles each as a target profile, based on the indoor environment information obtained, wherein
 - the information processor determines whether the target profile can be reproduced by the one or more devices indicated in the one or more items of device information obtained, and provides the target profile when it is determined that the target profile can be reproduced by the one or more devices.
2. The indoor environment control system according to claim 1, wherein
 - the obtainer further obtains outdoor environment information on an outside of the building, and
 - the information processor selectively provides the one or more of the indoor environment profiles each as the target profile, based on the indoor environment information obtained and the outdoor environment information obtained.
3. An indoor environment control system, comprising:
 - a storage that stores indoor environment profiles each for controlling one or more devices to be used for controlling an indoor environment in a building;
 - an obtainer that obtains indoor environment information indicating at least one of the indoor environment in the building which has been sensed and the indoor environment in the building which is desired by a user; and

an information processor that selectively provides one or more of the indoor environment profiles each as a target profile, based on the indoor environment information obtained, wherein

the obtainer further obtains one or more items of device information relating to the one or more devices, and

when the indoor environment profiles selected based on the indoor environment information obtained cannot be reproduced by the one or more devices indicated in the one or more items of device information, the information processor provides one or more control algorithms for the one or more devices for approximating the indoor environment in the building to an indoor environment defined by the target profile.

4. An indoor environment control system, comprising:

a storage that stores indoor environment profiles each for controlling one or more devices to be used for controlling an indoor environment in a building;

an obtainer that obtains indoor environment information indicating at least one of the indoor environment in the building which has been sensed and the indoor environment in the building which is desired by a user; and

an information processor that selectively provides one or more of the indoor environment profiles each as a target profile, based on the indoor environment information obtained, wherein

the obtainer further obtains one or more items of device information relating to the one or more devices, and

when the indoor environment profiles selected based on the indoor environment information obtained cannot be reproduced by the one or more devices indicated in the one or more items of device information, the information processor presents a device required for reproducing the target profile.

5. An indoor environment control system according to claim 1, wherein

the information processor customizes, based on one or more items of use history information on the one or more devices included in the one or more items of device information, the indoor

environment profiles selected based on the indoor environment information, and provides the indoor environment profiles customized each as the target profile.

6. The indoor environment control system according to any one of claims 1 to 5, wherein

the information processor presents the user with (i) information indicating an indoor environment before the indoor environment is controlled using the target profile provided and (ii) information indicating an indoor environment after the indoor environment is controlled using the target profile provided.

7. The indoor environment control system according to any one of claims 1 to 6, wherein

the obtainer further obtains outdoor environment information on an outside of the building, and

the information processor presents the user with (i) information indicating an indoor environment after the indoor environment is controlled using the target profile provided and (ii) information indicating an outdoor environment indicated in the outdoor environment information.

8. The indoor environment control system according to any one of claims 1 to 7, wherein

the obtainer further obtains sensed information indicating an indoor environment in the building which is sensed while or after the indoor environment is controlled using the target profile provided, and

the information processor determines whether the one or more devices need maintenance, based on the sensed information.

9. The indoor environment control system according to claim 8, wherein

when it is determined that the one or more devices need maintenance, the information processor notifies the user that maintenance is necessary.

10. The indoor environment control system according to claim 8, wherein

when it is determined that the one or more devices need maintenance, the information processor places an order for a component to be used for maintenance.

11. The indoor environment control system according to claim 8, wherein

when it is determined that the one or more devices need maintenance, the information processor notifies a maintenance provider that maintenance is necessary.

12. The indoor environment control system according to any one of claims 1 to 11, wherein

the building is a home.

13. The indoor environment control system according to claim 12, wherein

the home is provided with a control device that controls the one or more devices, and

the control device includes the obtainer and the information processor.

14. The indoor environment control system according to claim 12 or 13, wherein

the home includes spaces, and

the indoor environment is controlled for each of the spaces.

15. The indoor environment control system according to any one of claims 12 to 14, wherein

each of the indoor environment profiles stored in the storage is (i) an indoor environment profile to be used in a building other than a home, (ii) an indoor environment profile obtained by the obtainer from an external device, and (iii) regularly updated.

16. An indoor environment control method executed by a computer, the indoor environment control method comprising:

storing indoor environment profiles each for controlling one or more devices to be used for controlling an indoor environment in a building;

obtaining indoor environment information indicating at least one of the indoor environment in the building which has been sensed and the indoor environment in the building which is desired by a user, and one or more items of device information relating to the one or more devices;

selectively providing one or more of the indoor environment profiles as one or more target profiles, based on the indoor environment information obtained; and

determining whether the one or more target profiles can be reproduced by the one or more devices indicated in the one or more items of device information obtained, wherein

in the selectively providing of the one or more target profiles, the one or more target profiles are provided when it is determined that the one or more target profiles can be reproduced by the one or more devices.

17. An indoor environment control method executed by a computer, the indoor environment control method comprising:

storing indoor environment profiles each for controlling one or more devices to be used for controlling an indoor environment in a building;

obtaining indoor environment information indicating at least one of the indoor environment in the building which has been sensed and the indoor environment in the building which is desired by a user, and one or more items of device information relating to the one or more devices;

selectively providing one or more of the indoor environment profiles as one or more target profiles, based on the indoor environment information obtained; and

providing one or more control algorithms for the one or more devices for approximating the indoor environment in the building to an indoor environment defined by the one or more target profiles, when the indoor environment profiles selected based on the indoor environment information obtained cannot be reproduced by the one or more devices indicated in the one or more items of device information.

18. An indoor environment control method executed by a computer, the indoor environment control method comprising:

storing indoor environment profiles each for controlling one or more

devices to be used for controlling an indoor environment in a building;

obtaining indoor environment information indicating at least one of the indoor environment in the building which has been sensed and the indoor environment in the building which is desired by a user, and one or more items of device information relating to the one or more devices;

selectively providing one or more of the indoor environment profiles as one or more target profiles, based on the indoor environment information obtained; and

presenting a device required for reproducing the one or more target profiles when the indoor environment profiles selected based on the indoor environment information obtained cannot be reproduced by the one or more devices indicated in the one or more items of device information.

19. A program for causing a computer to execute the indoor environment control method according to any one of claims 16 to 18.