

[DESCRIPTION]

[Title of Invention] ENVIRONMENTAL CONTROL SYSTEM,
ENVIRONMENTAL CONTROL METHOD, AND PROGRAM

[Technical Field]

5 [0001]

The present disclosure relates to an environmental control system, an environmental control method, and a program.

[Background Art]

[0002]

10 Patent Literature (PTL) 1 discloses a lighting control device. The lighting control device decides whether each of division areas into which a lighting area is divided in advance is a stay area where a person stays or a non-stay area where a person does not stay, based on a movement speed detected by a detection section. Then
15 a lighting control section performs lighting control on a lighting apparatus of each division area, based on the decision result.

[Citation List]

[Patent Literature]

[0003]

20 [PTL 1] Japanese Unexamined Patent Application Publication No. 2013-109876

[Summary of Invention]

[Technical Problem]

[0004]

25 The present invention provides an environmental control system, an environmental control method, and a program that easily prevent a user from staying at one place.

[Solution to Problem]

[0005]

30 An environmental control system according to an aspect of the present invention includes an instruction unit, an obtainer, and a calculator. The instruction unit gives an instruction to a lighting controller that performs lighting control of lighting devices each of which is assigned to a corresponding one of a plurality of specific
35 spaces. The obtainer obtains user-related information of each of the

plurality of specific spaces. The calculator calculates a user-stay index of each of the plurality of specific spaces, based on the user-related information obtained by the obtainer. When the user-stay index of one of the plurality of specific spaces calculated by the calculator exceeds a threshold value, the instruction unit gives an instruction to the lighting controller to change the lighting control of at least a lighting device that is assigned to the one of the plurality of specific spaces, among the lighting devices.

[0006]

An environmental control method according to an aspect of the present invention includes giving an instruction, obtaining, and calculating. In the giving an instruction, an instruction is given to a lighting controller that performs lighting control of lighting devices each of which is assigned to a corresponding one of a plurality of specific spaces. In the obtaining, user-related information of each of the plurality of specific spaces is obtained. In the calculating, a user-stay index of each of the plurality of specific spaces is calculated based on the user-related information obtained in the obtaining. The giving an instruction includes, when the user-stay index of one of the plurality of specific spaces calculated in the calculating exceeds a threshold value, giving an instruction to the lighting controller to change the lighting control of at least a lighting device that is assigned to the one of the plurality of specific spaces, among the lighting devices.

[0007]

A program according to an aspect of the present invention causes one or more processors to execute the above-described environmental control method.

[Advantageous Effects of Invention]

[0008]

An environmental control system, an environmental control method, and a program according to the present invention have the advantageous effect of easily preventing a user from staying at one place.

[Brief Description of Drawings]

[0009]

[FIG. 1A]

FIG. 1A is a plan view illustrating a schema of an office for which an environmental control system according to an embodiment is used, and that is in a state before lighting control is changed.

[FIG. 1B]

FIG. 1B is a plan view illustrating a schema of the office for which the environmental control system according to the embodiment is used, and that is in a state after the lighting control is changed.

[FIG. 2]

FIG. 2 is a block diagram illustrating a functional configuration of the environmental control system according to the embodiment.

[FIG. 3]

FIG. 3 is a flowchart illustrating an operation example of the environmental control system according to the embodiment.

[FIG. 4]

FIG. 4 is a block diagram illustrating a functional configuration of an environmental control system according to Variation 1 of the embodiment.

[FIG. 5]

FIG. 5 is a block diagram illustrating a functional configuration of an environmental control system according to Variation 2 of the embodiment.

[Description of Embodiments]

[0010]

Hereinafter, embodiments will be described in detail with reference to the Drawings. It should be noted that each embodiment described below shows a general or specific example of the present disclosure. The numerical values, shapes, materials, constituent elements, the arrangement and connection of the constituent elements, steps, the processing order of the steps etc. shown in each embodiment below are mere examples, and therefore do not limit the scope of the present invention. Moreover, among the constituent elements in each embodiment below, constituent elements not recited in any one of the independent claims are described as arbitrary

constituent elements.

[0011]

It should be noted that the Drawings are schematic drawings, and are not necessarily exact depictions. Moreover, elements that are essentially the same share the same reference signs in the respective Drawings, and overlapping explanations thereof may be omitted or simplified.

[0012]

[Embodiment]

10 [Configuration]

First, a configuration of an environmental control system according to an embodiment will be described. FIG. 1A is a plan view illustrating a schema of an office for which the environmental control system according to the present embodiment is used, and that is in a state before lighting control is changed. FIG. 1B is a plan view illustrating a schema of the office for which the environmental control system according to the present embodiment is used, and that is in a state after the lighting control is changed. FIG. 2 is a block diagram illustrating a functional configuration of the environmental control system according to the present embodiment.

[0013]

Environmental control system 100 according to the present embodiment is a system that is used in an environment, such as an office, in which people may freely choose a work place according to their own work, for example, and is used for controlling such an environment. In the present embodiment, environmental control system 100 is assumed to be used for an Activity Based Working (ABW) style office. Here, "ABW" means a kind of working style that allows users (e.g., employees) to choose a work place, a desk, or the like, according to their own work. In such an ABW style office, when a user takes on a task requiring concentration, the user can choose a relatively quiet place; moreover, when a user holds a meeting, the user can choose a relaxing place such as a sofa.

[0014]

35 It should be noted that the use of environmental control system

100 is not limited to an ABW style office. Environmental control system 100 may be used for a non-territorial office (free-address office) or other environments as long as users can freely choose a work place according to their own work. For example, environmental control system 100 may be used for an educational facility such as an elementary school, a junior high school, a high school, or a university; a public facility such as a public hall or a library; or a store or a commercial facility.

[0015]

As illustrated in FIG. 2, environmental control system 100 includes lighting controller 11, instruction unit 12, obtainer 13, calculator 14, setting unit 15, and storage 16. It should be noted that it is sufficient for environmental control system 100 to include at least instruction unit 12, obtainer 13, and calculator 14, and environmental control system 100 does not necessarily include lighting controller 11, setting unit 15, and storage 16. For example, when a lighting control system that is separate from environmental control system 100 exists, the lighting control system may function as lighting controller 11.

[0016]

Moreover, as illustrated in FIG. 1A and FIG. 1B, lighting devices 1 are provided in an environment (here, ABW style office 3) for which environmental control system 100 is used. Environmental control system 100 may be provided in office 3 or in a remote location away from office 3.

[0017]

Each lighting device 1 is located on a ceiling in office 3. Needless to say, each lighting device 1 may be located on a wall, a floor, or a desk in office 3, other than the ceiling. In the present embodiment, as an example, each lighting device 1 is a light for general lighting as ambient lighting that uniformly illuminates a target space, and includes a light source including a solid light-emitting element such as a light-emitting diode (LED). Moreover, the light source of each lighting device 1 is configured to be controlled by lighting controller 11 to enable either one or both of dimming and

color-change of light.

[0018]

Lighting devices 1 are grouped into groups G1. In the example illustrated in FIG. 2, lighting devices 1 are grouped into three groups G1. Of course, the number of groups G1 is not limited to three, and may be two, four, or more. Here, one or more lighting devices 1 in the same group G1 are located close to one another. Then, one or more lighting devices 1 in the same group G1 illuminate a space corresponding to the same group G1 in office 3.

[0019]

For example, three groups G1 are assumed to be group A, group B, and group C. In this case, one or more lighting devices 1 in group A illuminate space α corresponding to group A in office 3, one or more lighting devices 1 in group B illuminate space β corresponding to group B in office 3, and one or more lighting devices 1 in group C illuminate space γ corresponding to group C in office 3

[0020]

Thus, one or more lighting devices 1 in the same group G1 illuminate a space corresponding to the same group G1. In other words, in the present embodiment, lighting controller 11 performs lighting control of lighting devices 1 each of which is assigned to a corresponding one of a plurality (here, three) of spaces. Here, the plurality of spaces include at least one specific space SP1 (see FIG. 1A and FIG. 1B). Specific space SP1 is a space in which lighting of one or more lighting devices 1 is controlled based on a user-stay index, which is to be described later. In the present embodiment, each of the plurality of spaces is specific space SP1. In other words, it can be said that lighting controller 11 performs lighting control of lighting devices 1 each of which is assigned to a corresponding one of specific spaces SP1.

[0021]

For example, a manager of environmental control system 100 carries out grouping of lighting devices 1 into groups G1 beforehand. The manager carries out the grouping by using an information terminal with which parameters of environmental control system 100

can be set, for example. Examples of the information terminal may include a smartphone, a tablet device, and a personal computer.

[0022]

It should be noted that, in office 3, adjacent spaces may be, but is not necessarily, partitioned. In the present embodiment, office 3 is assumed to be composed of one large room in which no other room is created by partitioning with a wall or equipment. Such office 3 is preferred since an enhanced view and improved design is provided.

[0023]

Moreover, in the present embodiment, light emitted from one or more lighting devices 1 provided in one of adjacent two spaces needs not precisely illuminate only the one of the adjacent two spaces and is allowed to partially reach the other of the adjacent two spaces. In other words, it is sufficient that light emitted from one or more lighting devices 1 corresponding to an arbitrary space mainly illuminate the arbitrary space. Even if light from an other space partially reaches the arbitrary space, such light is allowable as long as the light from the other space has almost no influence on the arbitrary space. This is because the light from the other space that is different from the arbitrary space has only a small influence on the view of a user using the arbitrary space or a work environment of the user.

[0024]

Lighting controller 11 can communicate with each lighting device 1 and controls either one or both of dimming and color-change of light of each lighting device 1 by transmitting a lighting control signal to each lighting device 1. In the present embodiment, lighting controller 11 transmits identical lighting control signals to one or more lighting devices 1 in the same group G1. In other words, lighting controller 11 controls one or more lighting devices 1 by each group G1. The communication between lighting controller 11 and each lighting device 1 may be wired or wireless communication, and communication standards are not particularly limited. Moreover, the identical lighting control signals need not be transmitted at the

exactly same time. A transmission time difference among the identical lighting control signals is preferably 60 minutes or less, more preferably 30 minutes or less, and further more preferably one minute or less. The transmission time difference is preferably 60 minutes or less because it is more laborsaving compared to when an environment of a space is changed by moving equipment or furniture with manpower.

[0025]

Furthermore, the identical lighting control signals transmitted from lighting controller 11 to one or more lighting devices 1 in the same group G1 need not be exactly identical. A slight difference in the content of control among the identical lighting control signals is allowable as long as the slight difference has only a small influence on the corresponding space. For example, the tolerance of a color temperature is $\pm 500\text{K}$ and the tolerance of a dimming rate is $\pm 20\%$.

[0026]

Instruction unit 12 gives an instruction to lighting controller 11 by transmitting a control signal to lighting controller 11. When receiving the control signal from instruction unit 12, lighting controller 11 controls one or more lighting devices 1 of each group G1, that is, lighting devices 1 each of which is assigned to a corresponding one of spaces, according to the content of the control signal received.

[0027]

Obtainer 13 obtains user-related information of each of specific spaces SP1. Obtainer 13 obtains user presence information or user identification information. When calculator 14 calculates a user-stay index according to [Calculation Example 1] in [Calculation of User-stay Index], which is to be described later, it is sufficient that obtainer 13 can obtain user presence information. On the other hand, when calculator 14 calculates a user-stay index according to [Calculation Example 2] in [Calculation of User-stay Index], which is to be described later, it is sufficient that obtainer 13 can obtain user identification information.

[0028]

Obtainer 13 can obtain user presence information by obtaining a detection result transmitted from a motion detector, such as an infrared sensor, provided in specific space SP1 in office 3, for example. In other words, obtainer 13 can obtain information regarding the presence or absence of a user in specific space SP1, that is, user presence information, by obtaining a detection result from the motion detector.

[0029]

Moreover, obtainer 13 can obtain user presence information or user identification information by obtaining a detection result from an indoor positional information detection system using Bluetooth (registered trademark) Low Energy (BLE) or the like that is employed in office 3, for example.

[0030]

Furthermore, obtainer 13 can obtain user presence information or user identification information by obtaining an image of office 3 captured by a camera provided in office 3 and then appropriately performing image analysis processing on the image captured, for example.

[0031]

As another example, obtainer 13 can obtain user presence information or user identification information by obtaining, from a tag reader provided in specific space SP1, a reading result of a wireless IC tag carried around by a user.

[0032]

Calculator 14 calculates a user-stay index of each of specific spaces SP1, based on the user-related information obtained by obtainer 13. Here, a "user-stay index" is an index for evaluating specific space SP1 and has a correlation with a temporal change in the number of or a temporal change in the composition of users present in specific space SP1. For example, a user-stay index becomes lower as a frequency of change in the number of users present in specific space SP1 per unit time (several tens of minutes or several hours, etc.) becomes higher, and vice versa. For another example, a user-stay index becomes lower as a frequency of change

in the composition of users present in specific space SP1 per unit time becomes higher, and vice versa. A user-stay index is calculated based on time information and at least one of user presence information or user identification information. A calculation method
5 of a user-stay index will be described in detail in [Calculation of User-stay Index], which is to be described later.

[0033]

In specific space SP1 having a high user-stay index, the number or composition of users present in specific space SP1 is unlikely to
10 change much over time. On the contrary, in specific space SP1 having a low user-stay index, the number or composition of users present in specific space SP1 is likely to change over time. Therefore, in specific space SP1 having a low user-stay index, spontaneous communication, which is desirable for an office such as an ABW style
15 office or a non-territorial office, can be expected to be more frequent. Such communication is favorable for a manager who manages an office because a wide variety of communication makes innovation more likely to happen.

[0034]

When a user-stay index calculated by calculator 14 exceeds a
20 threshold value, instruction unit 12 instructs lighting controller 11 to change lighting control of one or more lighting devices 1 in the corresponding specific space SP1. In the present embodiment, a user-stay index is a positive real number of which maximum value is
25 "1". The threshold value is 0.5 or more for example, and may be set beforehand by a manager or a provider of environmental control system 100. Moreover, the threshold value may be appropriately set by setting unit 15, which is to be described later.

[0035]

As described above, in the present embodiment, there are a
30 plurality of specific spaces SP1. Accordingly, in the present embodiment, when a user-stay index of one of specific spaces SP1 calculated by calculator 14 exceeds the threshold value, instruction unit 12 instructs lighting controller 11 to change lighting control of at
35 least one or more lighting devices 1 in the one of specific spaces SP1.

In other words, when a user-stay index of an arbitrary specific space SP1 exceeds the threshold value, instruction unit 12 instructs lighting controller 11 to change lighting control of one or more lighting devices 1 of the arbitrary specific space SP1. Of course, instruction unit 12 may further instruct lighting controller 11 to change lighting control of one or more lighting devices 1 of another specific space SP1.

[0036]

In order to make a user, who is present in specific space SP1 having a user-stay index exceeding the threshold value, aware that the user tends to stay at one place, instruction unit 12 instructs lighting controller 11 to change lighting control of one or more lighting devices 1 in specific space SP1 in which the user is present. For example, instruction unit 12 may instruct lighting controller 11 to change a set value of brightness or a set value of a color temperature of illumination light from one or more lighting devices 1 of specific space SP1 having a user-stay index exceeding the threshold value, or may instruct lighting controller 11 to switch the light of the one or more lighting devices 1 from light for general lighting to spotlight.

[0037]

Moreover, for example, instruction unit 12 may instruct lighting controller 11 to change the number of lighting devices 1 assigned to specific space SP1 having a user-stay index exceeding the threshold value (i.e., to increase or decrease the size of specific space SP1 having a user-stay index exceeding the threshold value). In this case, when the number of lighting devices 1 assigned to specific space SP1 having a user-stay index exceeding the threshold value is changed, instruction unit 12 also instructs lighting controller 11 to change the number of lighting devices 1 assigned to another specific space SP1. In short, lighting control of each of lighting devices 1 may include control of changing a set value of brightness or a set value of a color temperature, control of changing the number of lighting devices 1 assigned to specific space SP1 having a user-stay index exceeding the threshold value, or control of emitting spotlight. It should be noted that the control of emitting spotlight is only available when lighting device 1 includes a spotlight in addition to a light for general lighting.

[0038]

Particularly in the present embodiment, in order to prompt a user in specific space SP1 having a user-stay index exceeding the threshold value to move to another space, instruction unit 12 instructs lighting controller 11 to change lighting control of one or more lighting devices 1 in specific space SP1 in which the user is present. In other words, lighting control of each of lighting devices 1 may include control of prompting a user to move to a space other than specific space SP1 having a user-stay index exceeding the threshold value.

10 [0039]

For example, illumination light in specific space SP1 is assumed to have a relatively low color temperature and a warm color before a user-stay index of specific space SP1 exceeds the threshold value. In this case, instruction unit 12 instructs lighting controller 11 to increase the color temperature of the illumination light in specific space SP1. Thus, the color temperature of the illumination light in specific space SP1 is made relatively high to achieve a cool color. Accordingly, it can be expected that a user in specific space SP1, who has stayed in specific space SP1 because of warm color illumination light, will be more likely to move to another space in search of warm color illumination light.

20 [0040]

Moreover, for example, specific space SP1 is assumed to be illuminated by light for general lighting before a user-stay index of specific space SP1 exceeds the threshold value. In this case, instruction unit 12 instructs lighting controller 11 to switch the light of one or more lighting devices 1 of specific space SP1 from light for general lighting to spotlight. Thus, specific space SP1 is made to be illuminated by the spotlight. Accordingly, it can be expected that a user in specific space SP1, who has stayed in specific space SP1 because of uniform illumination light, will be more likely to move to another space in search of uniform illumination light.

30 [0041]

Here, when the environment in specific space SP1 having a user-stay index exceeding the threshold value is changed as described

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above, it can also be expected that a user in another space will move to specific space SP1 having the user-stay index exceeding the threshold value because of the changed environment. In other words, it can be said that lighting control of each of lighting devices 1 may include control of prompting a user to move to specific space SP1 having a user-stay index exceeding the threshold value from another space.

[0042]

For example, when the number of lighting devices 1 assigned to specific space SP1 having a user-stay index exceeding the threshold value is increased, the size of specific space SP1 is accordingly increased, and thus a vacant space is created therein. In this case, it can be expected that a user in another space will be more likely to move to specific space SP1 to use the vacant space.

[0043]

Hereinafter, a specific example of an instruction by instruction unit 12 to change lighting control of one or more lighting devices 1 in specific space SP1 will be described with reference to FIG. 1A and FIG. 1B. Hereinafter, the description will be carried out under the assumption that, in FIG. 1A and FIG. 1B, specific space SP1 at the lower left of office 3 is "first space SP11", specific space SP1 at the upper right of office 3 is "second space SP12", and specific space SP1 at the lower right of office 3 is "third space SP13".

[0044]

In the example illustrated in FIG. 1A, each lighting device 1 is caused to provide warm color illumination light having a color temperature (here, 3000K) that is lower than a reference color temperature (here, 5000K) in first space SP11. Moreover, in the example illustrated in FIG. 1A, each lighting device 1 is caused to provide cool color illumination light having a color temperature (here, 6000K) that is greater than the reference color temperature in second space SP12. Furthermore, in the example illustrated in FIG. 1A, each lighting device 1 is caused to provide illumination light having the reference color temperature in third space SP13.

[0045]

Here, a user-stay index of first space SP11 is assumed to exceed the threshold value. Then, instruction unit 12 instructs lighting controller 11 to provide illumination light having a color temperature (here, 6000K) that is greater than the reference color temperature in first space SP11 as illustrated in FIG. 1B. At the same time, instruction unit 12 also instructs lighting controller 11 to change lighting control of one or more lighting devices 1 in each of second space SP12 and third space SP13 each of which has a user-stay index not exceeding the threshold value. Specifically, as illustrated in FIG. 1B, instruction unit 12 instructs lighting controller 11 to provide illumination light having the reference color temperature in second space SP12 and to provide illumination light having a color temperature (here, 3000K) that is lower than the reference color temperature in third space SP13.

[0046]

Accordingly, it can be expected that a user in first space SP11 will be more likely to move out of first space SP11 in which the illumination environment has become the opposite of the illumination environment before the change of lighting control. Moreover, since the illumination environment in second space SP12 and the illumination environment in third space SP13 after the change of lighting control are similar to the illumination environment in first space SP11 before the change of lighting control, it can be expected that a user in first space SP11 will be more likely to move to either one of second space SP12 and third space SP13.

[0047]

Setting unit 15 sets a threshold value to be used by calculator 14, according to an input by a user. For example, a user can perform an input for setting a threshold value using an information terminal. The threshold value inputted through the information terminal is transmitted to environmental control system 100 from the information terminal. Then, setting unit 15 updates a threshold value to be used by calculator 14 with the threshold value received from the information terminal. Thus, a user's subjective opinion can be taken into account for determination of whether a user tends to stay in

specific space SP1.

[0048]

It should be noted that it is preferred that setting of a threshold value in setting unit 15 be carried out only by a user who has an authority. In such a case, for example, it is preferred that a manager of environmental control system 100 have the authority. Moreover, as described above, a threshold value may be set beforehand by a manager or a provider of environmental control system 100. In such a case, setting unit 15 is not necessary.

[0049]

Storage 16 is a storage device in which necessary information (computer program and so on) for lighting controller 11, instruction unit 12, calculator 14, and the like to operate is stored. For example, storage 16 is implemented by a hard disk drive (HDD); however, storage 16 is not limited to this example and may be implemented by a semiconductor memory or other well-known electronic information storage means.

[0050]

Lighting controller 11, instruction unit 12, obtainer 13, calculator 14, setting unit 15, and storage 16 may be mounted on a single substrate or housed in a single case. The above-described substrate or case may be provided to equipment or furniture, such as a ceiling, a wall, a floor, or a desk, in office 3. In such a case, environmental control system 100 is made small and is therefore preferred.

[0051]

[Calculation of User-stay Index]

Hereinafter, calculation examples of a user-stay index by calculator 14 will be described.

[0052]

[Calculation Example 1]

In Calculation Example 1, a user-stay index is calculated based on the number of users present in specific space SP1 at an arbitrary time. The number of users can be calculated based on user presence information obtained by obtainer 13.

[0053]

Obtainer 13 periodically obtains user presence information. Specifically, obtainer 13 periodically obtains data in which a time and the number of users present in specific space SP1 at the time are associated with each other. In other words, obtainer 13 obtains, as user-related information, user presence information of each of specific spaces SP1 at an arbitrary time. Then, calculator 14 calculates a user-stay index, based on the data obtained by obtainer 13. In other words, calculator 14 calculates a user-stay index of each of specific spaces SP1, based on the user presence information obtained by obtainer 13.

[0054]

An example of calculation of a user-stay index of each of two arbitrary specific spaces SP1 will be described with reference to Table 1 below. Hereinafter, one of two arbitrary specific spaces SP1 is referred to as a "first specific space" and the other of two arbitrary specific spaces SP1 is referred to as a "second specific space". In Table 1, "first calculated value" represents an amount of a temporal change in the number of users in specific space SP1. Here, a "first calculated value" is an absolute value of difference between the number of users in specific space SP1 at an arbitrary time obtained by obtainer 13 and the number of users in specific space SP1 at a previous arbitrary time just before the arbitrary time obtained by obtainer 13.

[0055]

For example, the first calculated value of the first specific space at 10:00 is "1" since an absolute value of difference between "9", which is the number of users in the first specific space at 10:00, and "10", which is the number of users in the first specific space at 9:00, is "1". Moreover, for example, the first calculated value of the second specific space at 12:00 is "4" since an absolute value of difference between "6", which is the number of users in the second specific space at 12:00, and "2", which is the number of users in the second specific space at 11:00, is "4".

[0056]

[Table 1]

Time	Total number of users in first specific space	First calculated value of first specific space	Total number of users in second specific space	First calculated value of second specific space
9:00	10	-	4	-
10:00	9	1	10	6
11:00	10	1	2	8
12:00	11	1	6	4

[0057]

Calculator 14 calculates a user-stay index for every predetermined time period. Here, the predetermined time period is three hours, specifically, from 9:00 to 12:00 for the example shown in Table 1. First, calculator 14 determines a second calculated value for the predetermined time period by calculating the sum of the first calculated values of respective times during the predetermined time period. In the example shown in Table 1, the second calculated value of the first specific space for the time period from 9:00 to 12:00 is "3" since the sum of the first calculated values of the first specific space is " $1 + 1 + 1 = 3$ ". Moreover, in the example shown in Table 1, the second calculated value of the second specific space for the time period from 9:00 to 12:00 is "18" since the sum of the first calculated values of the second specific space is " $6 + 8 + 4 = 18$ ".

[0058]

Then, calculator 14 determines a user-stay index for the predetermined time period by calculating the reciprocal of the second calculated value for the predetermined time period. In the example shown in Table 1, the user-stay index of the first specific space for the time period from 9:00 to 12:00 is " $1/3 \approx 0.33$ " since the second calculated value of the first specific space for the time period from 9:00 to 12:00 is "3". Moreover, in the example shown in Table 1, the user-stay index of the second specific space for the time period from 9:00 to 12:00 is " $1/18 \approx 0.06$ " since the second calculated value of the second specific space for the time period from 9:00 to 12:00 is "18".

[0059]

It should be noted that, when the second calculated value is "0", a user-stay index is calculated by dividing "1" by "0", and the

resulting user-stay index calculated in such a way is referred to as “infinity” in the present embodiment.

[0060]

Here, a higher user-stay index indicates that more users tend to stay in specific space SP1, and a lower user-stay index indicates that less users tend to stay in specific space SP1. Accordingly, in the example shown in Table 1, users tend to stay in the first specific space but not in the second specific space, during the time period from 9:00 to 12:00. Therefore, in the example shown in Table 1, it can be said that the second specific space is a space in which spontaneous communication, which is desirable for an office such as an ABW style office or a non-territorial office, can be expected to be more frequent, during the time period from 9:00 to 12:00.

[0061]

[Calculation Example 2]

In Calculation Example 2, a user-stay index is calculated based on user identification information of specific space SP1 at an arbitrary time. User identification information can be obtained by obtainer 13.

[0062]

Obtainer 13 periodically obtains user identification information. Specifically, obtainer 13 periodically obtains data in which a time and user identification information of specific space SP1 at the time are associated with each other. In other words, obtainer 13 obtains, as user-related information, user identification information at an arbitrary time. Then, calculator 14 calculates a user-stay index, based on the data obtained by obtainer 13. In other words, calculator 14 calculates a user-stay index of each of specific spaces SP1, based on the user identification information obtained by obtainer 13.

[0063]

An example of calculation of a user-stay index of each of two arbitrary specific spaces SP1 (here, a first specific space and a second specific space) will be described with reference to Table 2 below. In Table 2, “user ID” represents user identification information. In the example shown in Table 2, a “user ID” is denoted by a three-digit

number. Needless to say, the "user ID" may be denoted by characters such as alphabets, or may be denoted by a combination of numbers and characters.

[0064]

5 Moreover, in Table 2, "third calculated value" represents an amount of a temporal change in the user identification information of specific space SP1. Here, a "third calculated value" is an absolute value of the number of differences between the user identification information of specific space SP1 at an arbitrary time obtained by
10 obtainer 13 and the user identification information of specific space SP1 at a previous arbitrary time just before the arbitrary time obtained by obtainer 13.

[0065]

 For example, user IDs in the first specific space at 10:00 are
15 "001", "002", and "003", and user IDs in the first specific space at 9:00 are "001", "002", and "003". Since there is no difference between the user identification information at 9:00 and the user identification information at 10:00, the third calculated value of the first specific space at 10:00 is "0". Moreover, for example, user IDs
20 in the second specific space at 10:00 are "004", "007", and "010", and user IDs in the second specific space at 9:00 are "004", "005", and "006". Even though there is no difference between the number of users in the second specific space at 9:00 and the number of users in the second specific space at 10:00, the third calculated value of the
25 second specific space at 10:00 is "2" since two users have been replaced with different users.

[0066]

[Table 2]

Time	User ID in first specific space	Third calculated value of first specific space	User ID in second specific space	Third calculated value of second specific space
9:00	001,002,003	-	004,005,006	-
10:00	001,002,003	0	004,007,010	2
11:00	001,002,003	0	007,011,023	2
12:00	001,002	1	023	2

30 [0067]

 Calculator 14 calculates a user-stay index for every

predetermined time period. Here, the predetermined time period is three hours, specifically, from 9:00 to 12:00 for the example shown in Table 2. First, calculator 14 determines a fourth calculated value for the predetermined time period by calculating the sum of the third
5 calculated values of respective times during the predetermined time period. In the example shown in Table 2, the fourth calculated value of the first specific space for the time period from 9:00 to 12:00 is "1" since the sum of the third calculated values of the first specific space is " $0 + 0 + 1 = 1$ ". Moreover, in the example shown in Table
10 2, the fourth calculated value of the second specific space for the time period from 9:00 to 12:00 is "6" since the sum of the third calculated values of the second specific space is " $2 + 2 + 2 = 6$ ".

[0068]

Then, calculator 14 determines a user-stay index for the
15 predetermined time period by calculating the reciprocal of the fourth calculated value for the predetermined time period. In the example shown in Table 2, the user-stay index of the first specific space for the time period from 9:00 to 12:00 is " $1/1 = 1$ " since the fourth calculated value of the first specific space for the time period from
20 9:00 to 12:00 is "1". Moreover, in the example shown in Table 2, the user-stay index of the second specific space for the time period from 9:00 to 12:00 is " $1/6 \approx 0.17$ " since the fourth calculated value of the second specific space for the time period from 9:00 to 12:00 is "6".

[0069]

25 It should be noted that, when the fourth calculated value is "0", a user-stay index is calculated by dividing "1" by "0", and the resulting user-stay index calculated in such a way is referred to as "infinity" in the present embodiment.

[0070]

30 Here, a higher user-stay index indicates that more users tend to stay in specific space SP1, and a lower user-stay index indicates that less users tend to stay in specific space SP1. Accordingly, in the example shown in Table 2, users tend to stay in the first specific space but not in the second specific space, during the time period from 9:00
35 to 12:00. Therefore, in the example shown in Table 2, it can be said

that the second specific space is a space in which spontaneous communication, which is desirable for an office such as an ABW style office or a non-territorial office, can be expected to be more frequent, during the time period from 9:00 to 12:00.

5 [0071]

The above-described calculation method of a user-stay index is just an example, and a user-stay index may be calculated by other methods. For example, the above-described first calculated value may be the quotient obtained when the number of users in specific
10 space SP1 at an arbitrary time obtained by obtainer 13 is divided by the number of users in specific space SP1 at a previous arbitrary time just before the arbitrary time obtained by obtainer 13. Moreover, for example, the above-described second calculated value may be the integral value of the first calculated values during the predetermined
15 time period. Furthermore, a user-stay index may be calculated by a combination of the calculation method in Calculation Example 1 and the calculation method in Calculation Example 2.

[0072]

[Operation]

20 Hereinafter, an example of the operation of environmental control system 100 according to the present embodiment will be described. FIG. 3 is a flowchart illustrating an operation example of environmental control system 100 according to the present embodiment. Hereinafter, a threshold value to be used by calculator
25 14 is assumed to be set beforehand. Moreover, hereinafter, lighting controller 11 is assumed to perform lighting control of one or more lighting devices 1 by each group G1. Furthermore, hereinafter, a description will be given with a focus on a single specific space SP1 among specific spaces SP1.

30 [0073]

First, obtainer 13 periodically obtains user-related information of specific space SP1 (S1). Process S1 corresponds to obtaining ST2 of an environmental control method. When a predetermined time period (e.g., three hours) has elapsed after obtainer 13 starts to
35 obtain the information (S2: Yes), calculator 14 calculates a user-stay

index based on the information obtained by obtainer 13 (S3). Process S3 corresponds to calculating ST3 of the environmental control method.

[0074]

5 Then, when the user-stay index calculated by calculator 14 does not exceed the threshold value (S4: No), instruction unit 12 does nothing in particular. In other words, lighting control of each lighting device 1 is not changed by lighting controller 11. On the other hand, when the user-stay index calculated by calculator 14 exceeds the
10 threshold value (S4: Yes), instruction unit 12 instructs lighting controller 11 to change lighting control of each lighting device 1 in specific space SP1 (S5). Process S5 corresponds to giving an instruction ST1 of the environmental control method. Accordingly, the illumination environment in specific space SP1 is changed.
15 Thereafter, the above-described series of processes S1 to S5 is repeated.

[0075]

[Advantageous Effect]

 Hereinafter, advantageous effects of environmental control
20 system 100 according to the present embodiment will be described. When a user-stay index of one of specific spaces SP1 exceeds a threshold value, that is, when a user tends to stay in the one of specific spaces SP1, environmental control system 100 according to the present embodiment changes the illumination environment in the
25 one of specific spaces SP1. Accordingly, there is an advantageous effect that a user in the one of specific spaces SP1 can be given an opportunity to move to another space and is easily prevented from staying at one place. Consequently, by causing a user who tends to stay in the one of specific spaces SP1 to move to another space,
30 spontaneous communication, which is desirable for an office such as an ABW style office or a non-territorial office, can be expected to be more frequent. Then, it can also be expected that a wide variety of communication will make innovation more likely to happen.

[0076]

35 Moreover, since environmental control system 100 according to

the present embodiment can make illumination environments of specific spaces SP1 different from one another by at least changing the illumination environment in specific space SP1 having a user-stay index exceeding the threshold value, a so-called zoning effect can be expected.

[0077]

Here, for example, the zoning effect means perceivable division of a space into spaces and may include an effect of enabling a user to easily perceive that the spaces are different from one another in appearance. Moreover, the zoning effect may include an effect of easily prompting a user to change, as intended by zoning, the user's behavior or movement according to the user's perception. For example, it is assumed that zoning is performed with the intention of making an arbitrary space suitable for a user to take on a task requiring concentration. In such a case, it can be said that the zoning effect is exerted when a user who has seen the arbitrary space comes to use the arbitrary space mainly for the purpose of taking on a task requiring concentration.

[0078]

Moreover, the zoning effect may include an effect of causing a user to have a tendency to feel: a user's subjective effect or feeling according to the purpose of zoning; or a physiological, psychological, or physical effect according to the purpose of zoning, when the user actually uses a space resulting from zoning. For example, it is assumed that zoning is performed for the purpose of making an arbitrary space suitable for a user to take on a task requiring concentration, and the arbitrary space is used by a user. In such a case, it can be said that the zoning effect is exerted when the user feels that the user has successfully concentrated on the user's task by using the arbitrary space or when an index or data regarding a psychological or physical effect indicating that the user has concentrated on the user's task is obtained.

[0079]

By performing lighting control as described above, a space can be zoned into specific spaces SP1 without using equipment or

furniture. Therefore, the design of specific spaces SP1 can be easily improved; moreover, the layout of office 3 can be changed immediately by lighting control such as dimming or color-change of light, that is, so-called active zoning is made possible. In other words, when zoning is performed by the above-described lighting control, a change of control parameters for dimming or color-change of light in each of specific spaces SP1 will be completed in a few seconds, for example. In such a case, consequently, it is possible to change the layout of office 3 in a few seconds. Here, when the layout of office 3 is changed by moving equipment or furniture with manpower, it may take 60 minutes, a few hours, one day, or in some cases, several days. In view of the above, zoning by the above-described lighting control may exert a significant effect.

[0080]

By active zoning, the layout of office 3 can be changed in a short cycle, such as every hour, every day, or every month, compared to a conventional way in which the layout of office 3 is changed by rearranging equipment or furniture.

[0081]

[Variations]

Although the embodiment is described as above, the present invention is not limited to the above-described embodiment. Hereinafter, variations of the embodiment will be described. The variations described below can be appropriately combined.

[0082]

[Variation 1 of Embodiment]

Environmental control system 100 according to Variation 1 of the embodiment is different from environmental control system 100 according to the embodiment in that sound devices 2 are provided in office 3 and instruction unit 12 gives an instruction to sound controller 17. FIG. 4 is a block diagram illustrating a functional configuration of environmental control system 100 according to Variation 1 of the embodiment. It should be noted that environmental control system 100 does not necessarily include sound controller 17. For example, when a sound control system that is separate from environmental

control system 100 exists, the sound control system may function as sound controller 17.

[0083]

Each sound device 2 is located on a ceiling in office 3. Needless to say, each sound device 2 may be located on a wall, a floor, or a desk in office 3, other than the ceiling. In Variation 1, each sound device 2 is an omnidirectional loudspeaker as an example, and plays a content transmitted from sound controller 17. It should be noted that each sound device 2 may be a directional loudspeaker such as a parametric loudspeaker, a loudspeaker using ultrasonic waves, or a loudspeaker including an enclosure having a horn-like structure. A directional loudspeaker is preferred because a degree to which a portion of sound from the directional loudspeaker is audible in the outside of a space corresponding to the directional loudspeaker can be easily reduced when the directional loudspeaker is used.

[0084]

Sound devices 2 are grouped into groups G1, similar to lighting devices 1. In the example illustrated in FIG. 1A to FIG. 2, sound devices 2 are grouped into three groups G1. Here, one or more sound devices 2 in the same group G1 are located close to one another. Then, one or more sound devices 2 in the same group G1 output sound to a space corresponding to the same group G1 in office 3.

[0085]

For example, three groups G1 are assumed to be group A, group B, and group C. In this case, one or more sound devices 2 in group A output sound to space α corresponding to group A in office 3, one or more sound devices 2 in group B output sound to space β corresponding to group B in office 3, and one or more sound devices 2 in group C output sound to space γ corresponding to group C in office 3.

[0086]

Similar to lighting devices 1, a manager of environmental control system 100 carries out grouping of sound devices 2 into groups G1 beforehand using an information terminal.

[0087]

It should be noted that sound outputted from one or more sound devices 2 that is provided in one of adjacent two spaces needs not be outputted to only the one of the adjacent two spaces, and is allowed to be partially audible in the other of the adjacent two spaces.

5 In other words, it is sufficient that sound outputted from one or more sound devices 2 corresponding to an arbitrary space be mainly audible in the arbitrary space. Even if sound from another space is partially audible in the arbitrary space, such sound is allowable as long as the sound has almost no influence on the arbitrary space.

10 [0088]

Sound controller 17 can communicate with each sound device 2 and causes each sound device 2 to play a content by transmitting a sound control signal (including the content to be played) to each sound device 2. Here, sound controller 17 transmits identical sound
15 control signals to one or more sound devices 2 in the same group G1. In other words, sound controller 17 controls one or more sound devices 2 by each group G1. The communication between sound controller 17 and each sound device 2 may be wired or wireless communication, and communication standards are not particularly
20 limited.

[0089]

Moreover, the content may be stored in sound controller 17, each sound device 2, or storage 16. The content is stored in an electronic data medium in a WAV format or mp3 format, for example;
25 however, the present disclosure is not limited to this example. For example, the content may be stored in a compact disc (CD) by any well-known method.

[0090]

Instruction unit 12 gives an instruction to sound controller 17
30 by transmitting a control signal to sound controller 17. When receiving the control signal from instruction unit 12, sound controller 17 controls one or more sound devices 2 of each group G1, that is, sound devices 2 each of which is assigned to a corresponding one of spaces, according to the content of the control signal received. In
35 other words, instruction unit 12 is configured to give an instruction to

sound controller 17 that performs output control of sound devices 2 each of which is assigned to a corresponding one of specific spaces SP1.

[0091]

5 Accordingly, when a user-stay index of one of specific spaces SP1 calculated by calculator 14 exceeds a threshold value, instruction unit 12 instructs sound controller 17 to change output control of at least one or more sound devices 2 in the one of specific spaces SP1. For example, when music or the like is not played in the one of specific spaces SP1 before the user-stay index of the one of specific spaces SP1 exceeds the threshold value, instruction unit 12 instructs sound controller 17 to play some music or the like in the one of specific spaces SP1. On the contrary, when music or the like has been played in the one of specific spaces SP1 before the user-stay index of the one of specific spaces SP1 exceeds the threshold value, instruction unit 12 instructs sound controller 17 to play music or the like having an opposite effect in the one of specific spaces SP1.

[0092]

20 As above, because sound is outputted to specific space SP1, there is an advantageous effect that a user who tends to stay in specific space SP1 can be further easily given an opportunity to move to another specific space SP1 and is further easily prevented from staying at one place.

[0093]

25 [Variation 2 of Embodiment]

 Environmental control system 100 according to Variation 2 of the embodiment is different from environmental control system 100 according to the embodiment in that notifier 18 is provided as illustrated in FIG. 5. FIG. 5 is a block diagram illustrating a functional configuration of environmental control system 100 according to Variation 2 of the embodiment.

[0094]

35 Notifier 18 notifies a user of information regarding a user-stay index calculated by calculator 14. For example, notifier 18 generates a heat map, a graph, or the like (hereinafter, simply referred to as

"map or the like") that is a plan view of office 3 and visualizes a user-stay index of each of specific spaces SP1. Then, notifier 18 transmits the generated map or the like to an information terminal used by the user. Thus, the user can grasp a user staying degree in each of specific spaces SP1 by checking the map or the like received by the information terminal.

[0095]

Moreover, notifier 18 may transmit the generated map or the like to a projector provided in office 3. In such a case, the projector projects the received map or the like on a screen. Thus, the user can grasp a user staying degree in each of specific spaces SP1 by checking the map or the like projected on the screen. It should be noted that the projector may project the map or the like on a wall or a ceiling in office 3, instead of the screen.

[0096]

For another example, notifier 18 may notify a user by a message or an audio content that indicates a user staying degree in each of specific spaces SP1, instead of transmitting the map or the like. Of course, notifier 18 may notify a user by an appropriate combination of the map or the like, the message, and the audio content.

[0097]

[Other Variations]

Although a user-stay index is calculated for every three hours in the embodiment, a user-stay index may be calculated in a shorter cycle or a longer cycle.

[0098]

Although calculator 14 calculates a user-stay index without distinguishing users in the embodiment, the present disclosure is not limited to this example. For example, calculator 14 may calculate a user-stay index per user, based on user identification information obtained by obtainer 13. In such a case, with a focus on a specific user, the specific user in specific space SP1 can be given an opportunity to move to another space.

[0099]

Although office 3 is composed of one large room in which no other room is created in the embodiment, the present disclosure is not limited to this example. For example, office 3 may be composed of a large room including one or more rooms, or may be composed of a plurality of floors.

[0100]

Although environmental control system 100 is used for a single office 3 in the embodiment, the present disclosure is not limited to this example. For example, environmental control system 100 may be used for a plurality of offices 3 and may control each lighting device 1 by each office 3.

[0101]

Although lighting device 1 is not included in the constituent elements of environmental control system 100 in the embodiment, lighting device 1 may be included in the constituent elements of environmental control system 100. Similarly, although sound device 2 is not included in the constituent elements of environmental control system 100 in Variation 1 of the embodiment, sound device 2 may be included in the constituent elements of environmental control system 100.

[0102]

Moreover, for example, although environmental control system 100 is implemented by a plurality of devices in the above-described embodiment, environmental control system 100 may be implemented as a single device. For example, environmental control system 100 may be implemented as a single device equivalent to a server device. When environmental control system 100 is implemented by a plurality of devices, the constituent elements included in environmental control system 100 can be assigned to any of the plurality of devices. For example, the constituent elements included in the server device in the above-described embodiment may be included in an information terminal provided in a closed space. In other words, the present invention may be implemented by cloud computing or edge computing.

[0103]

For example, a method for communication between the devices

in the above-described embodiment is not particularly limited. Moreover, a relay device, which is not illustrated in the Drawings, may be used for the communication between the devices.

[0104]

5 Furthermore, in the above-described embodiment, each of the constituent elements may be implemented by executing a software program suitable for each of the constituent elements. Each of the constituent elements may be implemented by a program execution unit, such as a CPU or a processor, to retrieve and execute a software
10 program stored in a recording medium such as a hard disk drive or a semiconductor memory.

[0105]

 Moreover, each of the constituent elements may be implemented by hardware. For example, each of the constituent
15 elements may be a circuit (or an integrated circuit). These circuits may form a single circuit as a whole, or may each form an individual circuit. Moreover, these circuits may be general-purpose circuits or may be dedicated circuits.

[0106]

20 Moreover, general or specific aspects of the present invention may be realized as a system, a device, a method, an integrated circuit, a computer program, or a computer-readable recording medium such as a CD-ROM. Furthermore, general or specific aspects of the present invention may be realized as an arbitrary combination of a
25 system, a device, a method, an integrated circuit, a computer program, and a recording medium.

[0107]

 For example, the present invention may be realized as an environmental control method that is executed by a computer such as
30 environmental control system 100, as a program for causing a computer to execute the environmental control method, or as a non-transitory computer-readable recording medium in which the program is stored.

[0108]

35 For other examples, forms obtained by making various

modifications to the above-described embodiments that can be conceived by a person skilled in the art, as well as other forms realized by arbitrarily combining some constituent elements and functions in the above-described embodiments, without departing
5 from the essence of the present invention, are included in the scope of the present invention.

[0109]

[Conclusion]

As described above, environmental control system 100 includes
10 instruction unit 12, obtainer 13, and calculator 14. Instruction unit 12 gives an instruction to lighting controller 11 that performs lighting control of lighting devices 1 each of which is assigned to a corresponding one of a plurality of specific spaces SP1. Obtainer 13 obtains user-related information of each of the plurality of specific
15 spaces SP1. Calculator 14 calculates a user-stay index of each of the plurality of specific spaces SP1, based on the user-related information obtained by obtainer 13. When the user-stay index of one of the plurality of specific spaces SP1 calculated by calculator 14 exceeds a threshold value, instruction unit 12 instructs lighting controller 11 to
20 change the lighting control of at least lighting device 1 that is assigned to the one of the plurality of specific spaces SP1, among lighting devices 1.

[0110]

Accordingly, environmental control system 100 has the
25 advantageous effect that a user who tends to stay in specific space SP1 can be given an opportunity to move to another space, and is easily prevented from staying at one place.

[0111]

Moreover, for example, in environmental control system 100,
30 obtainer 13 obtains, as the user-related information, user presence information of each of the plurality of specific spaces SP1 at an arbitrary time. Calculator 14 calculates the user-stay index of each of the plurality of specific spaces SP1, based on the user presence information obtained by obtainer 13.

35 [0112]

Accordingly, environmental control system 100 has the advantageous effect that a user staying degree in specific space SP1 can be easily determined since a user-stay index is calculated based on a staying time of a user, which is relatively easy to obtain.

5 [0113]

Moreover, for example, in environmental control system 100, obtainer 13 obtains, as the user-related information, user identification information at an arbitrary time. Calculator 14 calculates the user-stay index of each of the plurality of specific spaces SP1, based on the user identification information obtained by obtainer 13.

[0114]

Accordingly, environmental control system 100 has the advantageous effect that a user staying degree in specific space SP1 can be easily determined since a user-stay index is calculated based on user identification information, which is relatively easy to obtain.

[0115]

Moreover, for example, in environmental control system 100, the lighting control of lighting devices 1 includes: control of changing a set value of brightness or a set value of a color temperature; control of changing the number of one or more lighting devices 1 assigned to specific space SP1 having the user-stay index exceeding the threshold value, among lighting devices 1; or control of emitting spotlight.

[0116]

Accordingly, environmental control system 100 has the advantageous effect that a user who tends to stay in specific space SP1 can easily and visually notice change in the illumination environment of specific space SP1.

[0117]

Moreover, for example, in environmental control system 100, the lighting control of lighting devices 1 includes control of prompting a user to move to a specific space other than specific space SP1 having the user-stay index exceeding the threshold value, among the plurality of specific spaces SP1.

35 [0118]

Accordingly, environmental control system 100 has the advantageous effect that a user who tends to stay in specific space SP1 is likely to move to another space. Moreover, environmental control system 100 may perform active control for prompting a user to move to another space from specific space SP1 having a user-stay index exceeding the threshold value by reducing the brightness or flickering the illumination light in specific space SP1 having the user-stay index exceeding the threshold value, in order to reduce a risk of infection therein. Environmental control system 100 has the advantageous effect that a risk of infection is likely to be reduced since such a control is likely to resolve the situation in which users stay close to one another or users are crowded.

[0119]

Moreover, for example, in environmental control system 100, the lighting control of lighting devices 1 includes control of prompting a user to move from a specific space other than specific space SP1 having the user-stay index exceeding the threshold value to specific space SP1 having the user-stay index exceeding the threshold value, among the plurality of specific spaces SP1.

[0120]

Accordingly, environmental control system 100 has the advantageous effect that the movement of a user can easily be promoted.

[0121]

Moreover, for example, in environmental control system 100, instruction unit 12 gives an instruction to sound controller 17 that performs output control of sound devices 2 each of which is assigned to a corresponding one of the plurality of specific spaces SP1. When the user-stay index of one of the plurality of specific spaces SP1 calculated by calculator 14 exceeds the threshold value, instruction unit 12 gives an instruction to sound controller 17 to change the output control of at least sound device 2 that is assigned to the one of the plurality of specific spaces SP1, among sound devices 2.

[0122]

Accordingly, environmental control system 100 has the

advantageous effect that, because sound is outputted to specific space SP1, a user who tends to stay in specific space SP1 can be further easily given an opportunity to move to another specific space SP1 and is further easily prevented from staying at one place.

5 [0123]

Moreover, for example, environmental control system 100 further includes notifier 18 that notifies a user of information regarding the user-stay index calculated by calculator 14.

[0124]

10 Accordingly, environmental control system 100 enables a user to grasp a user staying degree in specific space SP1.

[0125]

Moreover, for example, environmental control system 100 further includes setting unit 15 that sets the threshold value to be used by calculator 14, according to an input by a user.

15

[0126]

Accordingly, environmental control system 100 enables a user's subjective opinion to be taken into account for determination of whether a user tends to stay in specific space SP1.

20 [0127]

Moreover, for example, an environmental control method includes giving an instruction ST1, obtaining ST2, and calculating ST3. In giving an instruction ST1, an instruction is given to lighting controller 11 that performs lighting control of lighting devices 1 each of which is assigned to a corresponding one of a plurality of specific spaces SP1. In obtaining ST2, user-related information of each of the plurality of specific spaces SP1 is obtained. In calculating ST3, a user-stay index of each of the plurality of specific spaces SP1 is calculated based on the user-related information obtained in obtaining ST2. The giving an instruction ST1 includes, when the user-stay index of one of the plurality of specific spaces SP1 calculated in calculating ST3 exceeds a threshold value, giving an instruction to lighting controller 11 to change the lighting control of at least lighting device 1 that is assigned to the one of the plurality of specific spaces SP1, among lighting devices 1.

25

30

35

[0128]

Accordingly, the environmental control method has the advantageous effect that a user who tends to stay in specific space SP1 can be given an opportunity to move to another space and is easily prevented from staying at one place.

[0129]

Moreover, for example, a program causes one or more processors to execute the above-described environmental control method.

10 [0130]

Accordingly, the program has the advantageous effect that a user who tends to stay in specific space SP1 can be given an opportunity to move to another space and is easily prevented from staying at one place.

15 [Reference Signs List]

[0131]

- 100 environmental control system
- 11 lighting controller
- 12 instruction unit
- 20 13 obtainer
- 14 calculator
- 15 setting unit
- 17 sound controller
- 18 notifier
- 25 1 lighting device
- 2 sound device
- SP1 specific space
- ST1 giving an instruction
- ST2 obtaining
- 30 ST3 calculating

[CLAIMS]

[Claim 1]

An environmental control system comprising:

an instruction unit that gives an instruction to a lighting
5 controller that performs lighting control of lighting devices each of
which is assigned to a corresponding one of a plurality of specific
spaces;

an obtainer that obtains user-related information of each of the
plurality of specific spaces; and

10 a calculator that calculates a user-stay index of each of the
plurality of specific spaces, based on the user-related information
obtained by the obtainer,

wherein, when the user-stay index of one of the plurality of
specific spaces calculated by the calculator exceeds a threshold value,
15 the instruction unit gives an instruction to the lighting controller to
change the lighting control of at least a lighting device that is
assigned to the one of the plurality of specific spaces, among the
lighting devices.

20 [Claim 2]

The environmental control system according to claim 1,

wherein the obtainer obtains, as the user-related information,
user presence information of each of the plurality of specific spaces
at an arbitrary time, and

25 the calculator calculates the user-stay index of each of the
plurality of specific spaces, based on the user presence information
obtained by the obtainer.

[Claim 3]

30 The environmental control system according to claim 2,

wherein the obtainer obtains, as the user-related information,
user identification information at an arbitrary time, and

the calculator calculates the user-stay index of each of the
plurality of specific spaces, based on the user identification
35 information obtained by the obtainer.

[Claim 4]

The environmental control system according to any one of claims 1 to 3,

5 wherein the lighting control of the lighting devices includes:
control of changing a set value of brightness or a set value of a color
temperature; control of changing a total number of one or more
lighting devices assigned to a specific space having the user-stay
index exceeding the threshold value, among the lighting devices; or
10 control of emitting spotlight.

[Claim 5]

The environmental control system according to any one of claims 1 to 4,

15 wherein the lighting control of the lighting devices includes
control of prompting a user to move to a specific space other than a
specific space having the user-stay index exceeding the threshold
value, among the plurality of specific spaces.

20 [Claim 6]

The environmental control system according to any one of claims 1 to 4,

 wherein the lighting control of the lighting devices includes
control of prompting a user to move from a specific space other than
25 a specific space having the user-stay index exceeding the threshold
value to the specific space having the user-stay index exceeding the
threshold value, among the plurality of specific spaces.

[Claim 7]

30 The environmental control system according to any one of
claims 1 to 6,

 wherein the instruction unit gives an instruction to a sound
controller that performs output control of sound devices each of which
is assigned to a corresponding one of the plurality of specific spaces,
35 and

when the user-stay index of one of the plurality of specific spaces calculated by the calculator exceeds the threshold value, the instruction unit gives an instruction to the sound controller to change the output control of at least a sound device that is assigned to the one of the plurality of specific spaces, among the sound devices.

[Claim 8]

The environmental control system according to any one of claims 1 to 7, further comprising:
a notifier that notifies a user of information regarding the user-stay index calculated by the calculator.

[Claim 9]

The environmental control system according to any one of claims 1 to 8, further comprising:
a setting unit that sets the threshold value to be used by the calculator, according to an input by a user.

[Claim 10]

An environmental control method comprising:
giving an instruction to a lighting controller that performs lighting control of lighting devices each of which is assigned to a corresponding one of a plurality of specific spaces;
obtaining user-related information of each of the plurality of specific spaces; and
calculating a user-stay index of each of the plurality of specific spaces, based on the user-related information obtained in the obtaining,
wherein the giving including, when the user-stay index of one of the plurality of specific spaces calculated in the calculating exceeds a threshold value, giving an instruction to the lighting controller to change the lighting control of at least a lighting device that is assigned to the one of the plurality of specific spaces, among the lighting devices.

[Claim 11]

A program for causing one or more processors to execute the environmental control method according to claim 10.