

TITLE:

MANAGEMENT DEVICE AND MANAGEMENT METHOD

BACKGROUND

5 Technical Field

[0001] The disclosure relates to a management device and a management method for managing an air conditioning system.

Description of Related Art

[0002] The thermal comfort of residential environment, which is the target of air
10 conditioning in buildings, is evaluated by, for example, the feeling of temperature indicated by the felt air temperature, the thermal sensation of a resident such as hot/cold, and the degree of dissatisfaction/satisfaction with the indoor environment. In addition to environment measurement values such as the air temperature and the humidity, standard thermal comfort indexes for evaluating these include the discomfort index (DI) calculated
15 from the air temperature and the humidity; the standard new effective temperature (SET*) calculated from the six factors of the air temperature, the humidity, the radiation temperature, the wind speed, the metabolic rate and the activity intensity, and adopted by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) as the standard felt air temperature; the predicted mean vote (PMV) calculated
20 from the same six factors and internationally standardized by ISO-7730; and the predicted percentage of dissatisfied (PPD) calculated from the PMV. These thermal comfort indexes are useful for grasping the air conditioning state, which is the result of air conditioning control. A facility manager evaluates the air conditioning environment of the building by using the thermal comfort index, and performs operation management of
25 the air conditioning while considering the comfort of residents.

[0003] However, such comfort evaluation indexes are average indexes based on the premise of a large number of people, and often differ from the feeling of residents actually staying in the residential area. Therefore, comfort evaluation methods that reflect the real state of the feelings of the residents have been proposed (see Non-Patent Document 1,
5 Non-Patent Document 2, and Patent Document 1).

[0004] As described above, when the conventional comfort evaluation methods are roughly classified into two types, they include comfort evaluation methods that consider all residents to have an average feeling of comfort based on the premise of a large number of people like the international standards (hereinafter referred to as “uniform evaluation”) and comfort evaluation methods that match the real state of the feelings of the residents,
10 such as the methods disclosed in Non-Patent Document 1, Non-Patent Document 2, and Patent Document 1 (hereinafter referred to as “real state evaluation”). However, since uniform evaluation is calculated uniformly from physical measurement values, in a broad sense, simple physical measurement values such as the temperature and the humidity can
15 be also regarded as uniform evaluation indexes. Since there are advantages and disadvantages to uniform evaluation and real state evaluation, there is still room for improvement in effectively utilizing uniform evaluation indexes and real state evaluation indexes for the operation management of air conditioning.

Related Art

20 Patent Document

[0005] [Patent Document 1] Japanese Laid-open No. 2019-100657

Non-Patent Document

[0006] [Non-Patent Document 1] Joyce Kim, Yuxun Zhou, Stefano Schiavon et al., “Personal comfort models: predicting individuals’ thermal preference using occupant
25 heating and cooling behavior and machine learning,” *Building and Environment*, Vol. 129,

pp. 96-106, 2018.

[Non-Patent Document 2] Kazuki Wada et al., “Advanced Approaches for net Zero Energy Building (ZEB), Part.10, Advanced Approaches by Takenaka Corporation – Higashi Kanto Branch Office,” *2017 KOCHI Technical Papers of Annual Meeting The Society of Heating, Air-Conditioning and Sanitary Engineers of Japan 2017*, Vol. 10, pp. 37-40, 2017.

SUMMARY

Technical Problem

10 **[0007]** The disclosure has been made to solve the above problems, and provides a management device and a management method capable of effectively utilizing a uniform evaluation index and a real state evaluation index for the operation management of air conditioning.

Solution to the Problem

15 **[0008]** A management device of the disclosure includes an evaluation value determination part configured to determine, based on an environment measurement value of an evaluation target space, a first evaluation value which is a standard thermal comfort index of the evaluation target space; an evaluation value calculation part configured to calculate, based on the first evaluation value, a second evaluation value which reflects a
20 real thermal sensation of a resident of the evaluation target space; and a display part configured to display the first evaluation value and the second evaluation value simultaneously.

Further, in a configuration example of the management device of the disclosure, the evaluation value calculation part calculates, in addition to the second evaluation value,
25 a difference between the second evaluation value and the first evaluation value, and the

display part displays the difference between the second evaluation value and the first evaluation value simultaneously with displaying the first evaluation value and the second evaluation value.

Further, in a configuration example of the management device of the disclosure,
5 the display part, in a case where the difference between the second evaluation value and the first evaluation value exceeds a preset threshold value, displays to notify an operator that the threshold value has been exceeded.

[0009] Further, a configuration example of the management device of the disclosure further includes an evaluation part configured to evaluate the first evaluation value, and
10 the display part displays an evaluation result of the first evaluation value simultaneously with displaying the first evaluation value and the second evaluation value.

Further, in a configuration example of the management device of the disclosure, the display part, in a case where the first evaluation value is determined to be out of a preset range as a result of evaluation by the evaluation part, displays to notify an operator
15 that the first evaluation value is out of the range.

Further, in a configuration example of the management device of the disclosure, the evaluation value calculation part calculates the second evaluation value from the first evaluation value by using a real thermal sensation model in which a relationship between the first evaluation value and the second evaluation value has been pre-learned.

[0010] Further, a management method of the disclosure includes a first step of determining, based on an environment measurement value of an evaluation target space, a first evaluation value which is a standard thermal comfort index of the evaluation target space; a second step of calculating, based on the first evaluation value, a second evaluation value which reflects a real thermal sensation of a resident of the evaluation
20 target space; and a third step of displaying the first evaluation value and the second
25 target space; and a third step of displaying the first evaluation value and the second

evaluation value simultaneously.

Further, in a configuration example of the management method of the disclosure, the second step includes a step of calculating, in addition to the second evaluation value, a difference between the second evaluation value and the first evaluation value, and the third
5 step includes a step of displaying the difference between the second evaluation value and the first evaluation value simultaneously with displaying the first evaluation value and the second evaluation value.

Further, in a configuration example of the management method of the disclosure, the third step, in a case where the difference between the second evaluation value and the
10 first evaluation value exceeds a preset threshold value, includes a step of displaying to notify an operator that the threshold value has been exceeded.

[0011] Further, a configuration example of the management method of the disclosure further includes a fourth step of evaluating the first evaluation value between the second step and the third step, and the third step includes a step of displaying an evaluation result
15 of the first evaluation value simultaneously with displaying the first evaluation value and the second evaluation value.

Further, in a configuration example of the management method of the disclosure, the third step, in a case where the first evaluation value is determined to be out of a preset range as a result of evaluation in the fourth step, includes a step of displaying to notify an
20 operator that the first evaluation value is out of the range.

Further, in a configuration example of the management method of the disclosure, the second step includes a step of calculating the second evaluation value from the first evaluation value by using a real thermal sensation model in which a relationship between the first evaluation value and the second evaluation value has been pre-learned.

Effects

[0012] According to the disclosure, on a screen displayed by the display part, the first evaluation value is simultaneously displayed in addition to the second evaluation value to allow comparison. In this way, it is possible to easily recognize whether there is an abnormality in the air conditioning state, which is the air conditioning control result, while the comfort evaluation result that matches the real state of the feelings of the residents is being presented. As a result, in the disclosure, the first evaluation value and the second evaluation value may be effectively utilized for the operation management of air conditioning.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

FIG. 1 is a diagram showing an example of an air conditioning system according to the first embodiment of the disclosure.

FIG. 2 is a plan diagram showing a layout of air conditioning zones according to the first embodiment of the disclosure.

FIG. 3 is a block diagram showing a configuration of the building management device according to the first embodiment of the disclosure.

FIG. 4 is a diagram showing an example of the correlation between the uniform evaluation values and the real state evaluation values.

FIG. 5 is a flowchart illustrating a learning operation of the model generation part according to the first embodiment of the disclosure.

FIG. 6 is a diagram showing the correspondence between the standard PMV and the PPD, which are uniform evaluation values, and the thermal sensation (verbal expression).

FIG. 7 is a diagram showing an example of the real state evaluation values

calculated by the real thermal sensation model.

FIG. 8 is a diagram showing another example of the real state evaluation value calculated by the real thermal sensation model.

FIG. 9 is a flowchart illustrating the operation of the uniform evaluation value
5 determination part according to the first embodiment of the disclosure.

FIG. 10 is a flowchart illustrating the operation of the real state evaluation value calculation part according to the first embodiment of the disclosure.

FIG. 11 is a flowchart illustrating the operation of the display part according to the first embodiment of the disclosure.

10 FIG. 12 is a diagram showing a display example according to the first embodiment of the disclosure.

FIG. 13 is a diagram showing another display example according to the first embodiment of the disclosure.

15 FIG. 14 is a diagram showing another display example according to the first embodiment of the disclosure.

FIG. 15 is a diagram showing another display example according to the first embodiment of the disclosure.

FIG. 16 is a diagram showing another display example according to the first embodiment of the disclosure.

20 FIG. 17 is a block diagram showing the configuration of the building management device according to the second embodiment of the disclosure.

FIG. 18 is a flowchart illustrating the operation of the real state evaluation value calculation part according to the second embodiment of the disclosure.

25 FIG. 19 is a flowchart illustrating the operation of the display part according to the second embodiment of the disclosure.

FIG. 20 is a diagram showing a display example according to the second embodiment of the disclosure.

FIG. 21 is a diagram showing another display example according to the second embodiment of the disclosure.

5 FIG. 22 is a block diagram showing the configuration of the building management device according to the third embodiment of the disclosure.

FIG. 23 is a flowchart illustrating the operation of the real state evaluation value calculation part according to the third embodiment of the disclosure.

10 FIG. 24 is a flowchart illustrating the operation of the display part according to the third embodiment of the disclosure.

FIG. 25 is a diagram showing a display example according to the third embodiment of the disclosure.

FIG. 26 is a diagram showing another display example according to the third embodiment of the disclosure.

15 FIG. 27 is a block diagram showing a configuration example of a computer that realizes the building management device according to the first to third embodiments of the disclosure.

DESCRIPTION OF THE EMBODIMENTS

20 **[0014]** [Principle of Disclosure]

Since the real state evaluation is evaluation that reflects feelings of residents that are not uniform, even if the environment is the same, various evaluation results will be shown depending on the feelings of the residents. For example, even in two air conditioning zones in the same environment, the real state evaluation results for each zone
25 indicate that residents in one zone feel very cold and residents in another zone feel very

hot. First, it is necessary to take this point into consideration for the real state evaluation.

[0015] Here, for example, when the evaluation results of the uniform evaluation differ between zones in the same environment, the causes are often environmental deterioration due to a malfunction of the air conditioning system such as a failure of equipment such as a temperature sensor, a heat source or a valve, or an abnormality in the communication between equipment. On the other hand, when the evaluation results of the real state evaluation differ between zones in the same environment, as described above, the causes may be the difference (real state) in the feelings of the residents in each air conditioning zone. In other words, in the real state evaluation, the causes to be estimated corresponding to the evaluation results are more complicated than in the uniform evaluation. The inventor paid attention to this point.

[0016] When only the above-mentioned real state evaluation results are displayed on the indoor environment management screen or the like monitored by the facility manager, it is difficult for the facility manager or the operator to recognize whether the cause of the difference of the comfort evaluation between zones is a difference that reflects the real state of the feelings of the residents or whether it includes the possibility of a malfunction of the air conditioning system or the like. As a result, the inventor found that there is room for improvement in that problems such as delay in discovering a malfunction in the air conditioning system may occur.

[0017] Then, the inventor has come up with the idea of simultaneously displaying the evaluation results of the uniform evaluation which indicate the air conditioning control state (air conditioning state) based on a uniform standard, in addition to the evaluation results of the real state evaluation, on the indoor environment management screen when the real state evaluation is applied to allow comparison. As a result, it is possible to reduce the possibility of problems such as delay in discovering a malfunction of the air

conditioning system while presenting the comfort evaluation result that matches the real state of the feelings of the residents.

[0018] [First Embodiment]

In a first embodiment of the disclosure, the results of the real state evaluation and the results of the uniform evaluation (uniform evaluation values) indicating the state of the air conditioning control (air conditioning state) are displayed simultaneously. In this embodiment, an example will be described in which the air temperature T, the relative humidity H, and the PMV, which is a thermal comfort index of uniform evaluation, are displayed as uniform evaluation values. Further, the embodiment is an example in which thermal sensation information of an actual resident corresponding to the uniform evaluation value PMV is used as learning data, and a real thermal sensation model in which the relationship between the PMV and the thermal sensation information has been machine-learned is pre-generated, and the real state evaluation is performed by using the real thermal sensation model.

[0019] FIG. 1 is a diagram showing an example of an air conditioning system according to the embodiment. In the embodiment, the unit of an evaluation target space is an air conditioning zone, and an example of performing the residential environment evaluation for each air conditioning zone will be described. In FIG. 1, 100 is a resident; 101 is a building management device; 102-1 to 102-6 are air conditioning control devices (controllers) provided for each air conditioning zone Z-1 to Z-6 in the building; 103-1 to 103-6 are temperature and humidity sensors that measure the temperature and the humidity of the air conditioning zones Z-1 to Z-6; 104-1 to 104-6 are indoor units provided in each air conditioning zone Z-1 to Z-6; and 105-1 to 105-6 are outdoor units provided for each air conditioning zone Z-1 to Z-6.

[0020] The air conditioning control devices 102-1 to 102-6 control the air conditioning

equipment (the indoor units 104-1 to 104-6 and the outdoor units 105-1 to 105-6) for each air conditioning zone Z-1 to Z-6 so that the temperature measured by the temperature and humidity sensors 103-1 to 103-6 matches the room temperature setting value, and the humidity measured by the temperature and humidity sensors 103-1 to 103-6 matches the humidity setting value. FIG. 2 shows the layout of the air conditioning zones Z-1 to Z-6 when viewed from above.

[0021] Further, in the embodiment, an example of applying the disclosure to a building operation management system such as the building automation system (BAS) or the building energy management system (BEMS) will be described, but the disclosure may be applied to a controller for integrated management of multiple air conditioners and a monitoring screen for the air conditioning state. Further, since the disclosure relates to the display of the residential environment evaluation results, the disclosure is not limited to the air conditioning equipment, the air conditioning system, or the like.

[0022] The building management device 101 of the embodiment acquires and holds operation information and environment measurement values (the temperature, the humidity, etc.) of the air conditioning equipment in each air conditioning zone Z-1 to Z-6, and thermal sensation report information from a resident; displays the operation information, the environment measurement values, and operation control information (a start/stop instruction and room temperature setting value control), and transmits an operation control instruction to the air conditioning equipment.

[0023] FIG. 3 is a block diagram showing a configuration of the building management device 101. The building management device 101 includes an environmental quantity acquisition part 10 that acquires the environment measurement values of the evaluation target space as the environmental quantity; a thermal sensation report information acquisition part 11 that acquires and holds thermal sensation report information from the

resident of the evaluation target space; a control part 12 that gives commands to the air conditioning equipment in the evaluation target space; a uniform evaluation value determination part 14 that determines a uniform evaluation value (first evaluation value), which is a standard thermal comfort index of the evaluation target space, based on the environment measurement values of the evaluation target space; a model generation part 15 that pre-generates, for each air conditioning zone Z-1 to Z-6, a real thermal sensation model that models the relationship between multiple uniform evaluation values and real state evaluation data generated from the thermal sensation report information felt by the actual resident corresponding to each uniform evaluation value; a real state evaluation value calculation part 16 that calculates a real state evaluation value (second evaluation value) based on the uniform evaluation value; an evaluation information management part 17 that integrates and holds the uniform evaluation value and the real state evaluation value; and a display part 18 that simultaneously displays the uniform evaluation value and the real state evaluation value.

[0024] The environmental quantity acquisition part 10 acquires the indoor environment measurement values (the temperature, the humidity, etc.) from the environment measurement devices (the temperature and humidity sensors 103-1 to 103-6) disposed in the air conditioning zones Z-1 to Z-6 together with the measurement date and time, and holds the specific information of the air conditioning zones Z-1 to Z-6 in which the indoor environment measurement values are measured, the measurement date and time, and the indoor environment measurement values in association with each other as the environmental quantity. The environmental quantity acquisition part 10 transmits the environmental quantity in response to a request from the uniform evaluation value determination part 14. The types of the environment measurement values to be acquired, the target evaluation unit (air conditioning zone), the cycle and time for acquiring the

environment measurement values, and the information of the acquisition sources are preset by the provider or the manager.

[0025] The thermal sensation report information acquisition part 11 acquires thermal sensation report information from the residents of the air conditioning zones Z-1 to Z-6.

5 Each resident may report the thermal sensation that he/she feels from an electronic device such as a smartphone or a personal computer (PC) at any time. The thermal sensation report information acquisition part 11 holds the thermal sensation report information from the residents, the generation time of the thermal sensation report information, and the specific information of the air conditioning zones Z-1 to Z-6 from which the thermal
10 sensation report information is acquired in association with each other.

[0026] In the normal mode, the control part 12 transmits, for example, a setting value (the room temperature setting value, the humidity setting value, etc.) determined by the provider or the manager to the air conditioning control devices 102-1 to 102-6 of the air conditioning zones Z-1 to Z-6. In addition, the control part 12 is installed with a thermal
15 sensation report control mode that automatically changes the room temperature setting value by utilizing the thermal sensation report information (lowering the setting value when many residents feel hot for air conditioning in the summer, etc.).

[0027] Regarding the air conditioning system that changes the room temperature setting value by using the thermal sensation report information, since it is disclosed in, for
20 example, the document of Yasuhito Omagari et al., “Feasibility Study on Environmental Control using Thermal Sensation Vote,” *2016 KAGOSHIMA Technical Papers of Annual Meeting The Society of Heating, Air-Conditioning and Sanitary Engineers of Japan 2016*, Vol. 3, pp. 41-44, 2016/9, detailed explanation is omitted.

[0028] The uniform evaluation value determination part 14 acquires the environmental
25 quantity from the environmental quantity acquisition part 10, determines the uniform

evaluation value based on the environmental quantity for each air conditioning zone Z-1 to Z-6, and transmits the determined uniform evaluation value in response to the request of the real state evaluation value calculation part 16 and the evaluation information management part 17. The uniform evaluation value includes the indoor environment measurement values included in the environmental quantity acquired from the environmental quantity acquisition part 10 and a value calculated based on the indoor environment measurement values. The type of information held as the uniform evaluation value and the calculation method of the uniform evaluation value that requires calculation are preset by the control provider or the facility manager.

[0029] The uniform evaluation value that requires calculation includes a standard index of the felt air temperature such as the operating temperature and SET*, a standard index of the thermal sensation represented by the PMV, and a standard index of a degree of dissatisfaction (satisfaction) represented by the PPD. The calculation method of the uniform evaluation value is more generally available based on international standards, guidelines, etc. Further, the PMV is defined as a numerical value between -3 and +3, and the correspondence relationship between the PMV and the PPD and the feeling of the thermal sensation of the residents (verbal expression) corresponds to the international standard as shown in FIG. 6.

[0030] Further, when the parameter value required for calculating the uniform evaluation value cannot be acquired from the environmental quantity, a conventional method, that is, a general representative value may be used for the parameter value, and the parameter value may be preset in the uniform evaluation value determination part 14 together with the information on the calculation method. For example, the calculation of the SET* and the PMV requires the values of the six factors including the air temperature, the humidity, the radiation temperature, the wind speed, the clothing amount, and the

metabolic rate. The air temperature and the humidity can be acquired from the environmental quantity. Further, in a quiet summer office where desk work is the main work, generally, the radiation temperature may be set equal to the air temperature, the wind speed set to 0.1 [m/s], the clothing amount set to 0.6 [clo], and the metabolic rate set to 1.0 [met].

[0031] Next, the model generation part 15 pre-generates, for each air conditioning zone Z-1 to Z-6, a real thermal sensation model that models the relationship between the uniform evaluation value and the real state evaluation data generated by applying primary processing to the thermal sensation report information felt by the actual residents corresponding to the uniform evaluation value. A learning method of the real thermal sensation model includes machine learning. For a machine learning method, deep learning and the like are known. The learning method of the real thermal sensation model will be described below.

[0032] In the embodiment, the uniform evaluation value may be acquired by the uniform evaluation value determination part 14. If a model that corrects the uniform evaluation value according to the real state of the feelings of the residents is generated by machine learning, a trained model that realizes the real state evaluation may be acquired. In other words, it is possible to calculate the real state evaluation value by giving a uniform evaluation value as an input to the trained real thermal sensation model.

FIG. 4 shows an example of a model showing the correlation between the uniform evaluation values and the real state evaluation values. The straight line L1 in FIG. 4 shows the characteristics of the model when the real state evaluation value and the uniform evaluation value are equal. The real state evaluation value includes the real-state felt air temperature, the real-state dissatisfaction degree, and the real-state thermal sensation corresponding to the thermal comfort evaluation indexes.

[0033] FIG. 5 is a flowchart illustrating a learning operation of the model generation part 15. In the embodiment, first, in order to collect learning data, the air conditioning system is operated for a certain period of time in the above-mentioned thermal sensation report control mode. In this way, the uniform evaluation value for each air conditioning zone Z-1 to Z-6 is held in the uniform evaluation value determination part 14, and the thermal sensation report information felt by the actual resident for each air conditioning zone Z-1 to Z-6 is held in the thermal sensation report information acquisition part 11. In addition, here, although the thermal sensation report information reported by the actual resident is information that reflects the thermal sensation actually felt by the resident, the report information is not always available even in an environment where the resident is dissatisfied because he/she may be “busy” or “preoccupied with other tasks,” and the same thermal sensation report information is not always acquired in the same environment due to the influence of the physical condition and psychological state of the resident, and the information has a lot of variation. Furthermore, it is necessary to reduce the effect of such variation by generating a model that takes the following cases into consideration: if the amount of learning data is small, it will lead to deterioration of the accuracy of the real thermal sensation model, and model identification itself becomes difficult; further, given that the data range (range of the environment) of the uniform evaluation value included in the learning data is related to the range of the environment to which the model can be applied, the real state evaluation value used by the facility manager to perform the operation management of the air conditioning while evaluating the air conditioning environment of the building and considering the comfort of the residents should not become overfitting by using multiple pieces of learning data for a certain period of time such as one month.

[0034] The model generation part 15 generates learning data by using the uniform

evaluation value of the uniform evaluation value determination part 14 acquired and held during a period for a learning data generation period pre-designated by the control provider or the facility manager of, for example, one month, and by using the thermal sensation report information of the thermal sensation report information acquisition part

11. Specifically, for example, the learning data generation period is divided into fixed data processing sections (30 minutes, 1 hour, etc.) in which the air conditioning environment does not change significantly, and for each processing section, the uniform evaluation values are averaged for each air conditioning zone Z-1 to Z-6, and the thermal sensation report information in the same data processing section is averaged for each air conditioning zone Z-1 to Z-6, and used as the real state evaluation data. Then, the model generation part 15 acquires data in which the average value of the uniform evaluation values in the data processing section and the corresponding real state evaluation data in the same data processing section (average value of the thermal sensation report information) are associated with each air conditioning zone Z-1 to Z-6 as the learning data (step S1-1 in FIG. 5). In this way, the learning data may be acquired for each of the multiple data processing sections within the learning data generation period.

[0035] Further, for the generation method of the real state evaluation data (primary processing method of the thermal sensation report information), it is assumed that the processing method corresponding to the real state evaluation value (the real-state felt air temperature, the real-state dissatisfaction degree, the real-state thermal sensation, etc.) to be used is pre-determined. For example, when the felt air temperature is used as the thermal sensation report information, the average statistic is used as the real state evaluation data of the felt air temperature for each of the multiple data processing sections and the air conditioning zones Z-1 to Z-6 corresponding to the learning data generation period. In addition, when the dissatisfaction degree is used as thermal sensation report

information, the number of residents dissatisfied with the indoor thermal environment is calculated for each of the multiple data processing sections and the air conditioning zones Z-1 to Z-6 corresponding to the learning data generation period, and the percentage of dissatisfied calculated from the number of residents and the number of dissatisfied residents in the target zone is calculated and used as the real state evaluation data of the dissatisfaction degree. Furthermore, when the thermal sensation report in verbal expression (very hot, hot, slightly hot, neither hot nor cold, slightly cold, cold, very cold, etc.) is used as the thermal sensation report information, the thermal sensation information is processed by being quantified and then averaged and the like based on the correspondence shown in FIG. 6 to be used as the real state evaluation data of the thermal sensation.

Further, the embodiment shows a simple method of calculating the average value as the generation method of the real state evaluation data, but a report processing method for reducing the variation in the thermal sensation report information as disclosed in Patent Document 1, needless to say, may be added to the generation method of real state evaluation data.

[0036] The model generation part 15 may perform machine learning of the real thermal sensation model for each air conditioning zone Z-1 to Z-6 by a general method such as deep learning by using the learning data for each air conditioning zone Z-1 to Z-6 (step S1-2 in FIG. 5). By using the generated real thermal sensation model, it is possible to estimate the real state evaluation value for any uniform evaluation value that is not included in the learning data. For example, a real thermal sensation model with one month in October as the learning data generation period may be used to estimate the real state evaluation value in November.

[0037] Then, the model generation part 15 stores the real thermal sensation model of the

learning result (step S1-3 in FIG. 5). FIG. 7 shows an example of the real state evaluation values RPMV_zn calculated by the trained real thermal sensation model for each air conditioning zone Z-1 to Z-6. Here, the uniform evaluation value to be input is the PMV. RPMV_zn (n = 1 to 6) are real thermal sensation models (real-state thermal sensation) of the air conditioning zones Z-1 to Z-6, respectively. As a reference, L2 in FIG. 7 shows the characteristics of the real thermal sensation model when the real state evaluation value and the uniform evaluation value are equal.

[0038] FIG. 8 shows another example of the real state evaluation value calculated by the trained real thermal sensation model. In the example of FIG. 8, the uniform evaluation value of the input is the PMV, and the real state evaluation value of the output is the percentage of dissatisfied.

The trained model disclosed in Patent Document 1 expresses the relationship between the PMV and dissatisfaction degree (percentage of dissatisfied) by correcting the standard PPD function, but the PMV and the PPD are related by equation (1) given in ISO-7730. In this way, it is possible to calculate the PPD from the PMV.

$$PPD = 100 - 95 \times \exp (-0.03353 \times PMV^4 - 0.2179 \times PMV^2) \dots (1)$$

[0039] Therefore, if the PMV on the horizontal axis shown in FIG. 8 is converted to the PPD, a result equivalent to the relationship between the PPD and the real-state dissatisfaction degree shown in FIG. 4 may be obtained. Further, by back-calculating the PMV corresponding to the real state evaluation value from the percentage of dissatisfied (vertical axis) which is the real state evaluation value, a result equivalent to the relationship between the PMV and the real-state thermal sensation in FIG. 4 may be obtained. Furthermore, since the parameters required for calculating the PMV and the SET* are the same, they may be converted to each other, resulting in a model that may be expressed in the space shown in FIG. 4.

[0040] As shown above, the real thermal sensation model generated by machine learning may be appropriately converted by using a mathematical relationship with respect to the comfort evaluation index, and the disclosure is not limited to the method of using the learning result as it is.

5 **[0041]** Next, the real state evaluation value calculation part 16 acquires the uniform evaluation value from the uniform evaluation value determination part 14, and calculates the real state evaluation value for each air conditioning zone Z-1 to Z-6 by using the trained real thermal sensation model for each air conditioning zone Z-1 to Z-6 pre-generated by the model generation part 15. The parameter values required for
10 calculating the real state evaluation value are pre-registered by the provider or the facility manager. The real state evaluation value calculation part 16 transmits the real state evaluation value calculated for each air conditioning zone Z-1 to Z-6 in response to the request of the evaluation information management part 17.

[0042] In the embodiment, the real-state thermal sensation RPMV, which is the real state
15 evaluation value, is calculated from the PMV included in the uniform evaluation value acquired from the uniform evaluation value determination part 14 and the pre-registered trained real thermal sensation model for each air conditioning zone Z-1 to Z-6.

When a parameter value of the same type as the parameter value used for calculating the uniform evaluation value by the uniform evaluation value determination
20 part 14 is also used in the calculation by the real state evaluation value calculation part 16, the same value as the value set in the uniform evaluation value determination part 14 may be used.

[0043] The evaluation information management part 17 holds the uniform evaluation value acquired from the uniform evaluation value determination part 14 and the real state
25 evaluation value acquired from the real state evaluation value calculation part 16 in

association with each other.

The display part 18 displays the uniform evaluation value and the real state evaluation value in a form that allows simultaneous comparison in response to a request from an operator such as a facility manager.

5 **[0044]** Hereinafter, the operation of the building management device 101 of the embodiment will be described in more detail. The indoor environment measurement values (the temperature and the humidity) cyclically collected for air conditioning control are sequentially transmitted to the building management device 101 from the air conditioning control devices 102-1 to 102-6.

10 The display part 18 of the building management device 101 displays the latest evaluation information or the evaluation information at any past evaluation date and time instructed by the operator.

[0045] The environmental quantity acquisition part 10 acquires the indoor environment measurement values together with the measurement date and time, and holds the indoor
15 environment measurement values for each air conditioning zone Z-1 to Z-6 and the specific information of the air conditioning zones Z-1 to Z-6 in which the indoor environment measurement values are measured in association with the measurement date and time as the environmental quantity. In the embodiment, the latest environmental quantity is sequentially accumulated in the environmental quantity acquisition part 10
20 according to the cycle in which the indoor environment measurement values are updated.

[0046] FIG. 9 is a flowchart illustrating the operation of the uniform evaluation value determination part 14. The uniform evaluation value determination part 14 acquires the environmental quantity from the environmental quantity acquisition part 10 (step S1-11 in FIG. 9). Then, the uniform evaluation value determination part 14 increases the
25 evaluation unit count n for distinguishing the evaluation unit (air conditioning zone) by 1

(step S1-12 in FIG. 9), and determines whether the evaluation unit count n is less than or equal to the upper limit value N_v (step S1-13 in FIG. 9). The initial value of the evaluation unit count n is 0, and the upper limit value N_v (the number of air conditioning zones) is 6. Here, since the uniform evaluation value PMV of the air conditioning zone has not been calculated, the process proceeds to step S1-14.

[0047] The uniform evaluation value determination part 14 acquires the environment measurement values (the temperature and the humidity) required for calculating the uniform evaluation value PMV of the evaluation unit count n (air conditioning zone Z- n) from the environmental quantity of the evaluation unit count n (step S1-14 in FIG. 9), and calculates the uniform evaluation value PMV of the evaluation unit count n (step S1-15 in FIG. 9). In this way, by repeating the processes of steps S1-12 to S1-15 for each evaluation unit count n , the uniform evaluation value PMV is calculated for each evaluation unit count n . When the calculation of the uniform evaluation value PMV of the evaluation unit count $n = N_v$ (air conditioning zone Z-6) is completed, the evaluation unit count n exceeds the upper limit value N_v in the next step S1-13, so the operation of the uniform evaluation value determination part 14 ends.

[0048] Regarding the parameter values required for calculating the PMV other than the temperature and the humidity that may be acquired from the environmental quantity, as described above, the radiation temperature may be preset equal to the air temperature, the wind speed preset to 0.1 [m/s], the clothing amount preset to 0.6 [clo], and the metabolic rate preset to 1.0 [met].

[0049] In the embodiment, the uniform evaluation value to be calculated is the PMV, but as described above, the uniform evaluation value includes the operating temperature, the SET*, the PMV, the PPD, etc., and a uniform evaluation value other than the PMV may be calculated. Further, multiple uniform evaluation values such as the SET* and the PMV

may be calculated. When calculating multiple uniform evaluation values, in FIG. 9, the processes of steps S1-12 to S1-15 may be repeated until all the calculation of the uniform evaluation values is completed.

[0050] Further, when the uniform evaluation values are only the temperature and the humidity, and the uniform evaluation values such as the operating temperature, the SET*, the PMV, and the PPD are not calculated, the processes of steps S1-12 to S1-15 are omitted.

The temperature and the humidity included in the environmental quantity may be used as they are as uniform evaluation values.

[0051] FIG. 10 is a flowchart illustrating the operation of the real state evaluation value calculation part 16. The real state evaluation value calculation part 16 acquires the uniform evaluation value from the uniform evaluation value determination part 14 (step S1-21 in FIG. 10). Then, the real state evaluation value calculation part 16 increases the evaluation unit count n for distinguishing the evaluation unit (air conditioning zone) by 1 (step S1-22 in FIG. 10), and determines whether the evaluation unit count n is less than or equal to the upper limit value N_v (step S1-23 in FIG. 10). As described above, the initial value of the evaluation unit count n is 0, and the upper limit value N_v (the number of air conditioning zones) is 6. Here, since the real state evaluation value RPMV of the air conditioning zone has not been calculated, the process proceeds to step S1-24.

[0052] The real state evaluation value calculation part 16 extracts the uniform evaluation value PMV of the evaluation unit count n (air conditioning zone Z- n) from the information acquired from the uniform evaluation value determination part 14 (step S1-24 in FIG. 10), and calculates the real state evaluation value RPMV of the evaluation unit count n by using the real thermal sensation model of the evaluation unit count n (step S1-25 in FIG. 10).

[0053] In this way, the real state evaluation value calculation part 16 calculates the real state evaluation value RPMV for each evaluation unit count n by repeating the processes of steps S1-22 to S1-25 for each evaluation unit count n. When the calculation of the real state evaluation value RPMV of the evaluation unit count n = Nv (air conditioning zone Z-6) is completed, the evaluation unit count n exceeds the upper limit value Nv in the next step S1-23, so the operation of the real state evaluation value calculation part 16 ends.

[0054] In the embodiment, the calculated real state evaluation value is the RPMV indicating the real-state thermal sensation, and the real state evaluation values of the air conditioning zones Z-1 to Z-6 are RPMV_zn (n = 1 to 6). The function M_zn (PMV) (n = 1 to 6) of the real thermal sensation model for each air conditioning zone Z-1 to Z-6 for calculating the real state evaluation values RPMV_zn (n = 1 to 6) is given by equations (2) to (7). In addition, in equations (2) to (7), a simple function expression is used for simplification of explanation, but the expression of the real thermal sensation model may be expressed by more complicated functions or the like.

[0055]

$$\text{RPMV_z1} = \text{M_z1}(\text{PMV}) = 1.655 \times \text{PMV}^2 + 0.1576 \times \text{PMV} + 0.26 \dots (2)$$

$$\text{RPMV_z2} = \text{M_z2}(\text{PMV}) = 1.75 \times \text{PMV} - 0.2 \dots (3)$$

$$\text{RPMV_z3} = \text{M_z3}(\text{PMV}) = \text{PMV} + 0.1 \dots (4)$$

$$\text{RPMV_z4} = \text{M_z4}(\text{PMV}) = 1.655 \times \text{PMV}^2 + 0.1576 \times \text{PMV} + 0.26 \dots (5)$$

$$\text{RPMV_z5} = \text{M_z5}(\text{PMV}) = 0.85 \times \text{PMV}^2 \dots (6)$$

$$\text{RPMV_z6} = \text{M_z6}(\text{PMV}) = \text{PMV} - 0.13 \dots (7)$$

[0056] The evaluation information management part 17 associates and integrates the uniform evaluation value acquired from the uniform evaluation value determination part 14 and the information of the real state evaluation value acquired from the real state evaluation value calculation part 16 and holds them as evaluation information.

[0057] FIG. 11 is a flowchart illustrating the operation of the display part 18. When there is an instruction from an operator such as a facility manager (step S1-26 in FIG. 11), the display part 18 displays the uniform evaluation value and the real state evaluation value simultaneously in a form that allows comparison in response to the instruction of the operator (step S1-27 in FIG. 11).

[0058] The display instruction of the operator includes information that specifies the display information, such as the measurement date and time and the target evaluation unit. For example, the operator may instruct to display the information of the latest date and time, may directly specify the measurement date and time, or may instruct to specify the year-month-day and to display the information of the evaluation results of the same day in chronological order.

[0059] FIGs. 12 to 14 show display examples when the operator has instructed to display the information of the latest date and time or designated the date and time of the information. In the example of FIG. 12, on a screen 80 displayed by the display part 18, for the latest date and time or the designated date and time (9:00:00, March 1, 2020), the temperature, the humidity, and the PMV are displayed as the uniform evaluation values of the air conditioning zones Z-1 to Z-6, and the real-state thermal sensation (RPMV) is displayed as the corresponding real state evaluation value.

[0060] Similarly, in the example of FIG. 13, on the screen 80, the layout of the air conditioning zone of the floor is shown, and the temperature, the humidity and the PMV are displayed as the uniform evaluation values of the air conditioning zones Z-1 to Z-6, and the real-state thermal sensation is displayed as the corresponding real state evaluation value, and display areas 800-1 to 800-6 corresponding to each air conditioning zone Z-1 to Z-6 are color-coded according to the level of the real-state thermal sensation.

[0061] Similarly, in the example of FIG. 14, on the screen 80, the temperature, the

humidity, and the PMV are displayed as the uniform evaluation values of the air conditioning zones Z-1 to Z-6, and the real-state thermal sensation is displayed as the corresponding real state evaluation value, and the display areas 800-1 to 800-6 corresponding to each air conditioning zone Z-1 to Z-6 are color-coded according to the level of the real-state thermal sensation, and a part of the display areas 800-1 to 800-6 corresponding to each air conditioning zone Z-1 to Z-6 is color-coded according to the level of the uniform evaluation value PMV.

[0062] In addition, FIGs. 15 and 16 show display examples of showing uniform evaluation values and real state evaluation values in chronological order when the date (March 1, 2020) and the display time zone (9:00 to 17:00) are designated. When the time zone is designated, needless to say, it is possible to designate the time interval to be displayed, such as every hour or every 30 minutes.

[0063] As described above, in the embodiment, in addition to the evaluation result of the real state evaluation, the result of the uniform evaluation is simultaneously displayed to allow comparison on the indoor environment management screen when the real state evaluation is applied. In this way, it is possible to easily recognize whether there is an abnormality in the air conditioning state, which is the air conditioning control result, while the comfort evaluation result that matches the real state of the feelings of the residents is being presented.

[0064] [Second Embodiment]

Next, a second embodiment of the disclosure will be described. In the second embodiment of the disclosure, when the real state evaluation value and the uniform evaluation value are displayed simultaneously, the difference between the real state evaluation value and the uniform evaluation value is displayed simultaneously. In this way, even if the real state evaluation value is an extreme value, it is possible to easily

recognize whether the cause is due to the difference (real state) of the feelings of the target resident.

[0065] FIG. 17 is a block diagram showing the configuration of the building management device 101 according to the embodiment, and the same configurations as those in FIG. 3 are denoted by the same reference numerals. The building management device 101 of the embodiment includes the environmental quantity acquisition part 10, the thermal sensation report information acquisition part 11, the control part 12, a uniform evaluation value determination part 14a, the model generation part 15, a real state evaluation value calculation part 16a, an evaluation information management part 17a, and a display part 18a.

[0066] Hereinafter, only the parts different from those of the first embodiment will be described. The basic operation of the uniform evaluation value determination part 14a is the same as that of the uniform evaluation value determination part 14 of the first embodiment. The difference from the first embodiment is that when the uniform evaluation value determination part 14a calculates the uniform evaluation value (step S1-15 in FIG. 9), the uniform evaluation value determination part 14a appends information for specifying the target to be compared with the real state evaluation value to the uniform evaluation value. The uniform evaluation value (comparison index) for evaluating the difference from the real state evaluation value is predetermined and preset by the control provider or the facility manager.

[0067] When the real state evaluation value is the real-state felt air temperature, the felt air temperature index such as the air temperature, the operating temperature, or the SET*, etc. may be used as the comparison index. When the real state evaluation value is the real-state thermal sensation, the thermal sensation index represented by the PMV may be used as the comparison index. When the real state evaluation value is the real-state

dissatisfaction degree, the dissatisfaction degree index represented by the PPD may be used as the comparison index.

[0068] For example, comparison flag information is appended to all the uniform evaluation values, and the comparison flag “1” is appended to the uniform evaluation value as the comparison index, and the comparison flag “0” is appended to the other uniform evaluation values. In the embodiment, the real state evaluation value is set to the real-state thermal sensation, and the uniform evaluation value as the comparison index is set to the PMV.

[0069] FIG. 18 is a flowchart illustrating the operation of the real state evaluation value calculation part 16a. The processes of steps S1-21 to S1-25 in FIG. 18 are as described in the first embodiment.

The real state evaluation value calculation part 16a calculates the real state evaluation value RPMV of the evaluation unit count n from the uniform evaluation value of the evaluation unit count n (step S1-25 in FIG. 18), and then calculates the difference RPMV-PMV between the calculated real state evaluation value RPMV and the uniform evaluation value PMV in which the comparison flag is “1” among the uniform evaluation values of the evaluation unit count n (step S2-11 in FIG. 18).

[0070] In this way, the real state evaluation value calculation part 16a calculates the real state evaluation value RPMV and the evaluation value difference for each evaluation unit count n by repeating the processes of steps S1-22 to S1-25 and S2-11 for each evaluation unit count n . When the calculation of the real state evaluation value RPMV and the evaluation value difference of the evaluation unit count $n = N_v$ (air conditioning zone Z-6) is completed, the evaluation unit count n exceeds the upper limit value N_v in the next step S1-23, so the operation of the real state evaluation value calculation part 16a ends.

[0071] The evaluation information management part 17a associates and integrates the

uniform evaluation value acquired from the uniform evaluation value determination part 14a and the information of the real state evaluation value and the evaluation value difference acquired from the real state evaluation value calculation part 16a and holds them as evaluation information.

5 **[0072]** FIG. 19 is a flowchart illustrating the operation of the display part 18a. When there is an instruction from an operator such as a facility manager (step S2-12 in FIG. 19), the display part 18a displays the evaluation value difference between the real state evaluation value and the uniform evaluation value simultaneously with displaying the uniform evaluation value and the real state evaluation value in a form that allows
10 comparison in response to the instruction of the operator (step S2-13 in FIG. 19).

[0073] When the evaluation value difference is greater than a preset threshold value, it is preferable to use a highlight display by color or design so that the operator may easily recognize it. Display examples of the embodiment are shown in FIGs. 20 and 21. In the example of FIG. 20, on the screen 80 displayed by the display part 18a, the air
15 conditioning zone Z-4 in which the real-state thermal sensation difference (RPMV-PMV) – which is the evaluation value difference between the real-state thermal sensation (RPMV), which is the real state evaluation value, and the PMV – is greater than or equal to a predetermined threshold value (+0.3 in the embodiment) is displayed in a different color from other air conditioning zones.

20 **[0074]** In the example of FIG. 21, for the air conditioning zone Z-4 in which the real-state thermal sensation difference (RPMV-PMV) – which is the evaluation value difference between the real-state thermal sensation (RPMV), which is the real state evaluation value, and the PMV – is greater than or equal to a predetermined threshold value (+0.3 in the embodiment), the boundary line of the air conditioning zone Z-4 on the
25 layout is emphasized, and the guidance of “hot zone” is displayed. This guidance display

shows the operator the difference (real state) of the feelings of the target resident.

[0075] As described above, in the embodiment, even if the real state evaluation value is an extreme value, it is possible to easily recognize whether the cause is due to the difference (real state) of the feelings of the target resident.

5 **[0076]** [Third Embodiment]

Next, a third embodiment of the disclosure will be described. In the third embodiment of the disclosure, when the real state evaluation value and the uniform evaluation value are displayed simultaneously, it is evaluated whether the uniform evaluation value (air conditioning state quantity) is normal, and this evaluation result is
10 also displayed simultaneously. By simultaneously grasping whether there is an abnormality in the air conditioning state, even if the real state evaluation value is an extreme value, it is possible to easily recognize whether the cause is due to the difference (real state) of the feelings of the target resident.

[0077] FIG. 22 is a block diagram showing the configuration of the building
15 management device 101 according to the embodiment, and the same configurations as those in FIG. 3 are denoted by the same reference numerals. The building management device 101 of the embodiment includes the environmental quantity acquisition part 10, the thermal sensation report information acquisition part 11, the control part 12, the uniform evaluation value determination part 14, the model generation part 15, the real state
20 evaluation value calculation part 16, an evaluation information management part 17b, a display part 18b, and an air conditioning state evaluation part 19.

[0078] Hereinafter, only the parts different from those of the first embodiment will be described. In the embodiment, the temperature of the air conditioning zone Z-n ($n = 1$ to 6) will be described as T_{zn} , the humidity described as H_{zn} , and the PMV described as
25 PMV_{zn} . The air conditioning state evaluation part 19 acquires the uniform evaluation

value from the uniform evaluation value determination part 14, and evaluates the air conditioning state for each evaluation unit (air conditioning zone).

The air conditioning state evaluation part 19 transmits the air conditioning state evaluation result for each evaluation unit in response to the request of the evaluation information management part 17b. The types of parameters and the evaluation method used for air conditioning state evaluation are preset by the control provider or the facility manager.

[0079] In the embodiment, an example of determining whether the uniform evaluation value (the temperature, the humidity, and the PMV) acquired from the uniform evaluation value determination part 14 is within a preset range will be described. For the temperature and humidity ranges, the standards stipulated by the Building Administration Law (Act on Maintenance of Sanitation in Buildings) are applied, and for the PMV range, the comfort range stipulated by ISO7730 is applied.

[0080] FIG. 23 is a flowchart illustrating the operation of the air conditioning state evaluation part 19. The air conditioning state evaluation part 19 acquires the uniform evaluation value from the uniform evaluation value determination part 14 (step S3-11 in FIG. 23). Then, the air conditioning state evaluation part 19 increases the evaluation unit count n for distinguishing the evaluation unit (air conditioning zone) by 1 (step S3-12 in FIG. 23), and determines whether the evaluation unit count n is less than or equal to the upper limit value N_v (step S3-13 in FIG. 23). As described above, the initial value of the evaluation unit count n is 0, and the upper limit value N_v (the number of air conditioning zones) is 6. Here, since the evaluation of the air conditioning state in the air conditioning zone has not been completed, the process proceeds to step S3-14.

[0081] The air conditioning state evaluation part 19 determines whether the temperature T_{zn} ($n = 1$ to 6) included in the acquired uniform evaluation value is within a preset range

(greater than or equal to 17 °C and less than or equal to 28 °C), and if the temperature Tzn is out of the range, the abnormality flag of the temperature Tzn is set to “1” (step S3-14 in FIG. 23). The initial value of the abnormality flag of the temperature Tzn is “0.”

[0082] The air conditioning state evaluation part 19 determines whether the humidity Hzn (n = 1 to 6) included in the acquired uniform evaluation value is within a preset range (greater than or equal to 40% and less than or equal to 70%), and if the humidity Hzn is out of the range, the abnormality flag of the humidity Hzn is set to “1” (step S3-15 in FIG. 23). The initial value of the abnormality flag of the humidity Hzn is “0.”

[0083] Further, the air conditioning state evaluation part 19 determines whether the PMVzn (n = 1 to 6) included in the acquired uniform evaluation value is within a preset range (greater than or equal to -0.5 and less than or equal to 0.5), and if the PMVzn is out of the range, the abnormality flag of the PMVzn is set to “1” (step S3-16 in FIG. 23). The initial value of the abnormality flag of the PMVzn is “0.”

[0084] In this way, the air conditioning state evaluation part 19 evaluates the uniform evaluation value for each evaluation unit count n by repeating the processes of steps S3-12 to S3-16 for each evaluation unit count n. When the evaluation of the uniform evaluation value of the evaluation unit count n = Nv (air conditioning zone Z-6) is completed, the evaluation unit count n exceeds the upper limit value Nv in the next step S3-13, so the operation of the air conditioning state evaluation part 19 ends.

[0085] The evaluation information management part 17b associates and integrates the uniform evaluation value acquired from the uniform evaluation value determination part 14, the real state evaluation value acquired from the real state evaluation value calculation part 16, and the evaluation result acquired from the air conditioning state evaluation part 19, and holds them as evaluation information.

[0086] FIG. 24 is a flowchart illustrating the operation of the display part 18b. When

there is an instruction from an operator such as a facility manager (step S3-17 in FIG. 24), the display part 18b displays the evaluation result of the uniform evaluation value (air conditioning state quantity) simultaneously with displaying the uniform evaluation value and the real state evaluation value in a form that allows comparison in response to the instruction of the operator (step S3-18 in FIG. 24).

[0087] When it is determined there is an abnormality in the air conditioning state evaluation, it is preferable to use a highlight display or a guidance display by color or design so that the operator may easily recognize it. Display examples of the embodiment are shown in FIGs. 25 and 26. In the example of FIG. 25, on the screen 80 displayed by the display part 18b, for the air conditioning zone Z-4 in which the PMV is out of the range, the PMV and the real-state thermal sensation (RPMV), which is the real state evaluation value, are displayed in a different color from other air conditioning zones.

In the example of FIG. 26, for the air conditioning zone Z-4 in which the PMV is out of the range, the boundary line of the air conditioning zone Z-4 on the layout is emphasized, and the guidance that “PMV is greater than or equal to the threshold value of 0.5” is displayed.

[0088] As described above, in the embodiment, even if the real state evaluation value is an extreme value, it is possible to easily recognize whether the cause is due to the difference (real state) of the feelings of the target resident.

[0089] The building management device described in the first to third embodiments may be realized by a computer including a central processing unit (CPU), a storage device and an interface, and a program that controls these hardware resources. A configuration example of this computer is shown in FIG. 27.

[0090] The computer includes a CPU 300, a storage device 301, and an interface device (I/F) 302. The air conditioning control devices 102-1 to 102-6 and the like are connected

to the I/F 302. In such a computer, a program for realizing the management method of the disclosure is stored in the storage device 301. The CPU 300 executes the processes described in the first to third embodiments according to the program stored in the storage device 301.

5 **[0091]** [Industrial Applicability]

[0092]

10 10: Environmental quantity acquisition part; 11: Thermal sensation report information acquisition part; 12: Control part; 14, 14a: Uniform evaluation value determination part; 15: Model generation part; 16, 16a: Real state evaluation value calculation part; 17, 17a, 17b: Evaluation information management part; 18, 18a, 18b: Display part; 19: Air conditioning state evaluation part; 101: Building management device; 102-1 to 102-6: Air conditioning control device; 103-1 to 103-6: Temperature and humidity sensor; 104-1 to 104-6: Indoor unit; 105-1 to 105-6: Outdoor unit; Z-1 to Z-6: Air conditioning zone

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CLAIMS

WHAT IS CLAIMED IS:

[Claim 1]

A management device comprising:

5 an evaluation value determination part configured to determine, based on an environment measurement value of an evaluation target space, a first evaluation value which is a standard thermal comfort index of the evaluation target space;

 an evaluation value calculation part configured to calculate, based on the first evaluation value, a second evaluation value which reflects a real thermal sensation of a
10 resident of the evaluation target space, and which is calculated by inputting a thermal comfort index value into a trained real thermal sensation model; and

 a display part configured to display the first evaluation value and the second evaluation value simultaneously.

15 [Claim 2]

 The management device according to claim 1, wherein the evaluation value calculation part calculates, in addition to the second evaluation value, a difference between the second evaluation value and the first evaluation value, and

 the display part displays the difference between the second evaluation value and
20 the first evaluation value simultaneously with displaying the first evaluation value and the second evaluation value.

[Claim 3]

 The management device according to claim 2, wherein the display part, in a case
25 where the difference between the second evaluation value and the first evaluation value

exceeds a preset threshold value, displays to notify an operator that the threshold value has been exceeded.

[Claim 4]

5 The management device according to claim 1, further comprising:
an evaluation part configured to evaluate the first evaluation value,
wherein the display part displays an evaluation result of the first evaluation value
simultaneously with displaying the first evaluation value and the second evaluation value.

10 [Claim 5]

The management device according to claim 4, wherein the display part, in a case
where the first evaluation value is determined to be out of a preset range as a result of
evaluation by the evaluation part, displays to notify an operator that the first evaluation
value is out of the range.

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[Claim 6]

The management device according to any one of claims 1 to 5, wherein in the
trained real thermal sensation model, a relationship between the first evaluation value and
the second evaluation value has been pre-learned.

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[Claim 7]

A management method comprising:
a first step of determining, based on an environment measurement value of an
evaluation target space, a first evaluation value which is a standard thermal comfort index
25 of the evaluation target space;

a second step of calculating, based on the first evaluation value, a second evaluation value which reflects a real thermal sensation of a resident of the evaluation target space, and which is calculated by inputting a thermal comfort index value into a trained real thermal sensation model; and

5 a third step of displaying the first evaluation value and the second evaluation value simultaneously.

[Claim 8]

The management method according to claim 7, wherein the second step includes
10 a step of calculating, in addition to the second evaluation value, a difference between the second evaluation value and the first evaluation value, and

the third step includes a step of displaying the difference between the second evaluation value and the first evaluation value simultaneously with displaying the first evaluation value and the second evaluation value.

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[Claim 9]

The management method according to claim 8, wherein the third step, in a case where the difference between the second evaluation value and the first evaluation value exceeds a preset threshold value, includes a step of displaying to notify an operator that
20 the threshold value has been exceeded.

[Claim 10]

The management method according to claim 7, further comprising:

a fourth step of evaluating the first evaluation value between the second step and
25 the third step,

wherein the third step includes a step of displaying an evaluation result of the first evaluation value simultaneously with displaying the first evaluation value and the second evaluation value.

5 [Claim 11]

The management method according to claim 10, wherein the third step, in a case where the first evaluation value is determined to be out of a preset range as a result of evaluation in the fourth step, includes a step of displaying to notify an operator that the first evaluation value is out of the range.

10

[Claim 12]

The management method according to any one of claims 7 to 11, wherein in the trained real thermal sensation model, a relationship between the first evaluation value and the second evaluation value has been pre-learned.