

DESCRIPTION

TITLE OF THE INVENTION:

AIR CONDITIONING SYSTEM AND LEARNING DEVICE

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Field

[0001] The present disclosure relates to an air conditioning system that performs air conditioning by an air flow and to a learning device.

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Background

[0002] The air conditioning system disclosed in Patent Literature 1 trains a learning model on the basis of operation history information of an indoor unit to achieve automatic operation control that meets user's operation preference.

Citation List

Patent Literature

20 [0003] Patent Literature 1: Japanese Patent Application Laid-open No. 2021-63611

Summary of Invention

Problem to be solved by the Invention

25 [0004] When the air conditioning system disclosed in Patent Literature 1 has two or more setting options available in air conditioning operation, a setting made by automatic operation control may fail to meet the user's operation preference. For example, some people want to be exposed to an air flow from the air conditioner, and others do not want to be exposed to an air flow from the air conditioner. Thus, when a wind is blown to a user who does not want to be exposed to the air flow or when the wind is

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blown so as to avoid a user who wants to be exposed to the air flow, this will result in an air conditioning operation that does not meet the user's operation preference even if the setting of the air volume or the like meets the user's operation preference. The air conditioning system disclosed in Patent Literature 1 requires the user to manually change the setting made in the automatic operation control when the automatic operation control that does not meet the user's operation preference is performed even if the setting meets the user's operation preference at that time. This may take time and effort to perform air conditioning control that meets the user's operation preference.

[0005] The present disclosure has been made in view of the above, and an object of the present disclosure is to provide an air conditioning system that allows a user to determine whether to cause the air conditioning system to perform automatic operation control in accordance with a user's operation preference.

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Means to Solve the Problem

[0006] In order to solve the above-described problems and achieve the object, an air conditioning system according to the present disclosure includes an air conditioning device including an air conditioning unit that performs air conditioning operation and a control unit that controls the air conditioning unit; an inferring data acquisition unit that acquires inferring data including air conditioning environment data, which is information of an environment in which the air conditioning device is installed; an inference device that infers, from the air conditioning environment data, a proposed setting including at least two settings meeting a user's operation preference

with respect to the air conditioning device; and a communication terminal that remotely controls the air conditioning device. The communication terminal includes a display portion that displays a plurality of icons each
5 representing a function of the air conditioning device. The control unit causes a proposed setting icon for making the proposed setting inferred by the inference device to be displayed in the display portion, and when a user taps the proposed setting icon, the control unit controls the air
10 conditioning device according to the proposed setting corresponding to the proposed setting icon.

Effects of the Invention

[0007] The air conditioning system according to the
15 present disclosure has an effect that the user can determine whether to cause the air conditioning system to perform automatic operation control in accordance with a user's operation preference.

20 Brief Description of Drawings

[0008] FIG. 1 is a diagram illustrating a configuration of an air conditioning system according to a first embodiment.

FIG. 2 is a functional block diagram of the air
25 conditioning system according to the first embodiment.

FIG. 3 is a diagram illustrating a configuration of a learning device of the air conditioning system according to the first embodiment.

FIG. 4 is a diagram illustrating an example of
30 learning data of the air conditioning system according to the first embodiment.

FIG. 5 is a diagram illustrating a configuration of an inference device of the air conditioning system according

to the first embodiment.

FIG. 6 is a diagram illustrating an example of proposed setting of the air conditioning system according to the first embodiment.

5 FIG. 7 is a diagram illustrating an example of a neural network used in the learning device of the air conditioning system according to the first embodiment.

FIG. 8 is a flowchart illustrating a procedure of learning processing of the air conditioning system
10 according to the first embodiment.

FIG. 9 is a flowchart illustrating a procedure of inference processing of the air conditioning system according to the first embodiment.

FIG. 10 is a diagram illustrating an example of icon
15 display area for functions, displayed in a display portion of a communication terminal of the air conditioning system according to the first embodiment.

FIG. 11 is an enlarged view illustrating the example of the icon display area displayed in the display portion
20 of the communication terminal of the air conditioning system according to the first embodiment.

FIG. 12 is a diagram illustrating an example of air conditioning setting screen of the air conditioning system according to the first embodiment.

25 FIG. 13 is a diagram illustrating a hardware configuration of the learning device of the air conditioning system according to the first embodiment.

Description of Embodiment

30 [0009] Hereinafter, an air conditioning system and a learning device according to an embodiment will be described in detail with reference to the drawings.

[0010] First Embodiment.

FIG. 1 is a diagram illustrating a configuration of an air conditioning system according to a first embodiment.

An air conditioning system 1 includes an air conditioning device 10, a communication terminal 20, and a server 30.

5 The air conditioning device 10, the communication terminal 20, and the server 30 are connected to a network 40, and can mutually transmit and receive information through the network 40. The air conditioning system 1 allows an operation of the air conditioning device 10 to be remotely
10 controlled by the communication terminal 20. The communication terminal 20 is, for example, a smartphone terminal, a tablet terminal, or a notebook computer terminal. The network 40 is, for example, the Internet, but may be a local network.

15 [0011] FIG. 2 is a functional block diagram of the air conditioning system according to the first embodiment. The air conditioning device 10 includes an air conditioning unit 13, which performs air conditioning operation; a control unit 11, which controls the air conditioning unit
20 13; and a remote controller 12, which is an interface that receives a user operation. The air conditioning unit 13 is capable of setting a plurality of items for air conditioning control. Examples of setting items in the air conditioning control of the air conditioning unit 13
25 include a setting mode, a wind direction, an air volume, air blow exposure, and a function to be used. Note that "air blow exposure" is control to blow air toward a person in an indoor space. When the "air blow exposure" feature is active, air is blown toward the person in the indoor
30 space. When the "air blow exposure" feature is inactive, the air is blown to avoid the person in the indoor space. The control unit 11 controls the air conditioning unit 13 to perform air conditioning operation, thereby air-

conditioning the indoor space.

[0012] The user operates the remote controller 12 or the communication terminal 20 to input a command from the control unit 11 to the air conditioning unit 13. The
5 command is, for example, switching between an in-operation state and a stop state of air conditioning operation, setting of an operation mode, setting of a temperature, setting of humidity, setting of an air volume, setting of a wind direction, setting of a timer, and the like. The air
10 conditioning unit 13 performs air conditioning operation according to a command that has been input. Examples of the operation mode include a cooling operation, a heating operation, and a dehumidifying operation.

[0013] The server 30 includes a learning device 34,
15 which learns the relationship between at least two settings that meet the user's operation preference with respect to the air conditioning control of the air conditioning unit 13 and an ambient environment of the air conditioning device 10; a learned model storage unit 36, which stores a
20 learned model generated by the learning device 34; and an inference device 35, which infers a proposed setting 39 including at least two settings of the air conditioning device 10 from data for use in inference (hereinafter referred to as inferring data) 38, using the learned model.

25 [0014] FIG. 3 is a diagram illustrating a configuration of the learning device of the air conditioning system according to the first embodiment. The learning device 34 includes a learning data acquisition unit 341, which acquires learning data 37; and a model generation unit 342,
30 which generates a learned model on the basis of the learning data 37 acquired by the learning data acquisition unit 341. The learning data 37 includes history information 33 and air conditioning environment data 31 at

a past time, where the history information 33 is information on past settings of the setting items of the air conditioning control performed by the air conditioning unit 13. Note that at least two past settings made by the user regarding the air conditioning control of the air conditioning unit 13 indicated by the history information 33 may include not only a user operation of simultaneously setting a plurality of items, but also a user operation of changing a setting of a single setting item with a time interval. One example of simultaneously setting a plurality of items can be simultaneously setting the temperature and the air volume. One example of changing a setting of a single setting item with a time interval can be changing the air volume that has been set, after a lapse of a certain period of time.

[0015] FIG. 4 is a diagram illustrating an example of the learning data of the air conditioning system according to the first embodiment. The history information 33 includes specifics of a series of user operations for setting an operation mode, a set temperature, a wind direction, an air volume, and the like that have been set by a user operation performed on the remote controller 12 or the communication terminal 20. The history information 33 may be stored in the air conditioning device 10 or may be stored in a database provided separately from the air conditioning device 10. The air conditioning environment data 31 includes information such as an indoor temperature detected by a temperature sensor, humidity detected by a humidity sensor, a floor temperature detected by an infrared sensor, an outdoor temperature detected by an outside air temperature sensor, weather, and precipitation. The temperature sensor, the humidity sensor, the infrared sensor, and/or the outside air temperature sensor may be

provided in the air conditioning device 10, or may be provided separately from the air conditioning device 10.

[0016] The learning data acquisition unit 341 acquires the air conditioning environment data 31 and the history information 33 as the learning data 37. The learning data acquisition unit 341 is capable of acquiring the air conditioning environment data 31 and the history information 33 as the learning data 37 periodically, for example, once a day.

10 [0017] The model generation unit 342 uses the learning data 37 to learn a setting that is usually made by the user with respect to the air conditioning device 10, and generates a learned model for inferring the proposed setting 39 including settings of at least two of the air conditioning device 10. The learned model generated by the learning device 34 is stored in the learned model storage unit 36. The learned model stored in the learned model storage unit 36 is a model for inferring the proposed setting 39 from the air conditioning environment data 31.

20 [0018] FIG. 5 is a diagram illustrating a configuration of the inference device of the air conditioning system according to the first embodiment. The inference device 35 includes an inferring data acquisition unit 351, which acquires the inferring data 38; and an inference unit 352, which infers the proposed setting 39 from the inferring data 38. The inferring data 38 is the air conditioning environment data 31. Therefore, the inferring data acquisition unit 351 acquires the air conditioning environment data 31. The inference unit 352 uses the learned model stored in the learned model storage unit 36 to infer the proposed setting 39 from the air conditioning environment data 31 acquired by the inferring data acquisition unit 351. That is, the inference unit 352

finds a setting that is usually made by the user on the basis of the air conditioning environment data 31 acquired by the inferring data acquisition unit 351 and the learned model acquired from the learned model storage unit 36.

5 That is, inputting the air conditioning environment data 31 included in the inferring data 38 acquired by the inferring data acquisition unit 351 to the learned model enables the proposed setting 39 inferred from the air conditioning environment data 31 to be output.

10 [0019] FIG. 6 is a diagram illustrating an example of the proposed setting of the air conditioning system according to the first embodiment. The proposed setting 39, which is output data, represents specifics of a user operation for an air conditioning operation to be performed
15 using settings that have been corrected on the basis of the air conditioning environment data 31 such as information of the indoor temperature, the floor temperature, and the outdoor air temperature. The proposed setting 39 includes two or more settings. For example, the proposed setting 39
20 represents a user operation specifying an operation for 60 minutes in a cooling mode at 20°C with an upward wind direction, a relatively high air volume, and the air blow exposure made active, and a subsequent operation for 120 minutes in a cooling mode at 25°C with an automatic wind
25 direction, a relatively low air volume, and the air blow exposure made inactive. As described above, the settings indicated in the proposed setting 39 may include a user operation of changing the setting of one or more items with a time interval.

30 [0020] Note that the description has herein been given assuming that the proposed setting 39 is output using the learned model generated by the model generation unit 342 of the air conditioning system 1, but this may be performed in

such a manner that a learned model is acquired from the outside, such as from another air conditioning system, and the proposed setting 39 is output on the basis of the learned model.

5 [0021] The learning device 34 and the inference device 35 are used to learn the proposed setting 39 of the air conditioning unit 13, but may be, for example, devices separate from the air conditioning system 1 that are connected to the air conditioning unit 13 via the network
10 40. Furthermore, the learning device 34 and the inference device 35 may exist on a cloud server.

[0022] The learning algorithm used by the model generation unit 342 can be a known algorithm such as supervised learning, unsupervised learning, or
15 reinforcement learning. As an example, use of supervised learning to which a neural network is applied will next be described.

[0023] For example, the model generation unit 342 learns the proposed setting 39 by so-called supervised learning according to a neural network model. In this respect, the
20 term supervised learning refers to a method in which a feature in the learning data 37 is learned by providing a data set of inputs and labels, which are results, to the learning device 34, and then a result is inferred from the
25 input.

[0024] FIG. 7 is a diagram illustrating an example of the neural network used in the learning device of the air conditioning system according to the first embodiment. The neural network 70 includes an input layer 71 including a
30 plurality of neurons X1, X2, and X3, an intermediate layer 72 including a plurality of neurons Y1 and Y2, and an output layer 73 including a plurality of neurons Z1, Z2, and Z3. The intermediate layer may be one layer or two or

more layers. Note that the intermediate layer 72 is also referred to as a hidden layer.

[0025] For example, in a case of a three-layer neural network 70 as illustrated in FIG. 7, inputting a plurality
5 of inputs to the input layer 71 causes values thereof to be multiplied by weights w_{11} , w_{12} , w_{13} , w_{14} , w_{15} , and w_{16} and products thereof to be input to the intermediate layer 72, and the products to be further multiplied by weights w_{21} , w_{22} , w_{23} , w_{24} , w_{25} , and w_{26} , and products thereof to be
10 output from the output layer 73. These output results vary depending on the values of the weights w_{11} , w_{12} , w_{13} , w_{14} , w_{15} , and w_{16} and the values of the weights w_{21} , w_{22} , w_{23} , w_{24} , w_{25} , and w_{26} .

[0026] The neural network 70 learns the proposed setting
15 39 using so-called supervised learning according to the learning data 37, which is a combination of the air conditioning environment data 31 and the history information 33, acquired by the learning data acquisition unit 341.

[0027] That is, the neural network 70 performs learning
20 by adjusting the weights w_{11} , w_{12} , w_{13} , w_{14} , w_{15} , and w_{16} and the weights w_{21} , w_{22} , w_{23} , w_{24} , w_{25} , and w_{26} to cause the results resulting from inputting the air conditioning environment data 31 to the input layer 71 and output from
25 the output layer 73 to approach the proposed setting 39.

[0028] The model generation unit 342 generates a learned model by performing learning as described above, and outputs the learned model.

[0029] The learned model storage unit 36 stores the
30 learned model output from the model generation unit 342.

[0030] FIG. 8 is a flowchart illustrating a procedure of learning processing of the air conditioning system according to the first embodiment.

[0031] At step S11, the learning data acquisition unit 341 acquires the air conditioning environment data 31 and the history information 33 as the learning data 37.

Although the learning data acquisition unit 341 has been
5 described as simultaneously acquiring the air conditioning environment data 31 and the history information 33, it is sufficient that the learning data acquisition unit 341 is capable of acquiring the air conditioning environment data 31 and the history information 33 in association with each
10 other, and the learning data acquisition unit 341 may acquire the air conditioning environment data 31 and the data of the history information 33 at different timings.

[0032] At step S12, the model generation unit 342 learns the proposed setting 39 using so-called supervised learning
15 according to the learning data 37, which is a combination of the air conditioning environment data 31 and the history information 33, acquired by the learning data acquisition unit 341. The model generation unit 342 thus generates the learned model.

20 [0033] At step S13, the learned model storage unit 36 stores the learned model generated by the model generation unit 342.

[0034] Note that the learning device 34 can also use multiple regression analysis as the learning algorithm.
25 When multiple regression analysis is used as the learning algorithm, the learning device 34 calculates, for example, a regression equation representing the air conditioning device 10, which is the objective variable, using the air conditioning environment data 31 and the history
30 information 33 of the air conditioning device 10 as the explanatory variables. In addition, the learning device 34 can also use deep learning as the learning algorithm, where deep learning learns extraction of the feature amount

itself. Furthermore, the learning device 34 may perform machine learning using other known methods such as genetic programming, functional logic programming, and a support vector machine.

5 [0035] Note that the learning device 34 may generate the learned model on a per-user basis on the basis of the air conditioning environment data 31 and the history information 33 specific to each user. Use of the learned model specific to each user enables the inference device 35
10 to infer the proposed setting 39 according to the settings usually made by the user in question.

[0036] FIG. 9 is a flowchart illustrating a procedure of inference processing of the air conditioning system according to the first embodiment.

15 [0037] At step S21, the inferring data acquisition unit 351 acquires the air conditioning environment data 31, which is the inferring data 38.

[0038] At step S22, the inference unit 352 inputs the air conditioning environment data 31 to the learned model
20 stored in the learned model storage unit 36 to obtain the proposed setting 39.

[0039] At step S23, the inference unit 352 outputs the proposed setting 39 obtained using the learned model, to the air conditioning device 10.

25 [0040] At step S24, the control unit 11 causes an operation icon 190 to be displayed in a display portion 15 of the communication terminal 20 in addition to the icon or icons of the existing function, where the operation icon 190 is a proposed setting icon corresponding to the
30 proposed setting 39. The user can perform an operation indicated in the proposed setting 39 obtained at step S13, through the operation icon 190 newly displayed in the display portion 15.

[0041] FIG. 10 is a diagram illustrating an example of an icon display area displayed in the display portion of the communication terminal of the air conditioning system according to the first embodiment. The communication
5 terminal 20 includes an icon display area 16 in a part of the display portion 15.

[0042] FIG. 11 is an enlarged view illustrating the example of the icon display area displayed in the display portion of the communication terminal of the air
10 conditioning system according to the first embodiment. In the icon display area 16, the order of display positions for displaying operation icons is predetermined. Operation icons 180, 170, and 160 for performing function 1, function 2, and function 3 are what have originally been displayed,
15 and are not shortcut buttons. The icon display area 16 automatically displays in position the newly displayed operation icon 190 corresponding to the proposed setting 39. When the inference unit 352 outputs the proposed setting 39, an icon is newly displayed in the icon display
20 area 16.

[0043] The operation icon 180 of function 1 in FIG. 11 is positioned at a first display position. The operation icon 170 of function 2 is positioned at a second display position. The operation icon 160 of function 3 is
25 positioned at a third display position. The operation icon 190 for the proposed setting is positioned at a fourth display position. The operation icons 180, 170, and 160 of function 1, function 2, and function 3 are existing icons, whereas the operation icon 190 for the proposed setting is
30 newly displayed through periodic data acquisition and learning with a period such as once a day. By tapping the operation icon 190, the control unit 11 performs air conditioning control according to the proposed setting 39.

Note that, in a case where some of the settings included in the proposed setting 39 have already been set by the user, the operation icon 190 serves to make an additional setting for an item for which no setting has yet been made by the user.

[0044] Note that tapping of the operation icon 190 may cause specifics of the operation corresponding to the proposed setting 39 to be displayed in the display portion 15. FIG. 12 is a diagram illustrating an example of air conditioning setting screen of the air conditioning system according to the first embodiment. In the example illustrated in FIG. 12, the display portion 15 displays specifics of a user operation specifying an operation for 30 minutes in a cooling mode at 18°C with an upward wind direction and an air volume of level 4, and a subsequent operation for three hours in a cooling mode at 25°C with an automatic wind direction and an air volume of level 2. When a user operation is performed of tapping an execute button 191 displayed in the display portion 15 together with the specifics of user operation, the control unit 11 performs air conditioning control according to the proposed setting 39. In this way, the user can cause the control unit 11 to perform air conditioning control according to the proposed setting 39 after confirming details of the air conditioning settings that will result from the proposed setting 39.

[0045] The air conditioning system 1 according to the first embodiment includes the inference device 35, which infers, from the air conditioning environment data 31, the proposed setting 39 including at least two settings meeting the user's operation preference with respect to the air conditioning device 10, and performs air conditioning control according to the proposed setting 39 by a user

operation of tapping the operation icon 190, which is a proposed setting icon corresponding to the proposed setting 39. This enables the user to determine whether to cause the air conditioning system 1 to perform automatic operation control in accordance with the user's operation preference.

[0046] A hardware configuration of the learning device 34 and the inference device 35 according to the first embodiment will next be described. FIG. 13 is a diagram illustrating a hardware configuration of the learning device of the air conditioning system according to the first embodiment. The learning device 34 is implemented by a computer system including a processor 91, which executes various processes, a memory 92, which is a main memory, and a storage device 93, which stores information.

[0047] The processor 91 may be computing means such as an arithmetic unit, a microprocessor, a microcomputer, a central processing unit (CPU), or a digital signal processor (DSP). As the memory 92, a nonvolatile or volatile semiconductor memory such as a random access memory (RAM), a read-only memory (ROM), a flash memory, an erasable programmable read-only memory (EPROM), or an electrically erasable programmable read-only memory (EEPROM) (registered trademark) can be used. The storage device 93 stores a program for performing processing of learning the proposed setting 39.

[0048] In the computer system, the processor 91 loads a program corresponding to the processing of each component, stored in the storage device 93, into the memory 92 and executes the program, thereby implementing the function of the model generation unit 342. The memory 92 is used also as a temporary memory in each process performed by the processor 91. The program executed by the processor 91 may

be provided in a state of being stored in a storage medium or may be provided via the network 40.

[0049] Similarly to the learning device 34, the inference device 35 is also implemented by a computer system including the processor 91, which executes various processes, the memory 92, which is a main memory, and the storage device 93, which stores information. The processor 91 loads a program corresponding to the processing of each component, stored in the storage device 93, into the memory 92 and executes the program, thereby implementing the function of the inference unit 352. The memory 92 is used also as a temporary memory in each process performed by the processor 91. The program executed by the processor 91 may be provided in a state of being stored in a storage medium or may be provided via the network 40.

[0050] The configurations described in the above embodiment illustrate an example of the aspects, and can be combined with another known technique, and a part of the configuration can be omitted or changed without departing from the gist.

Reference Signs List

[0051] 1 air conditioning system; 10 air conditioning device; 11 control unit; 12 remote controller; 13 air conditioning unit; 15 display portion; 16 icon display area; 20 communication terminal; 30 server; 31 air conditioning environment data; 33 history information; 34 learning device; 35 inference device; 36 learned model storage unit; 37 learning data; 38 inferring data; 39 proposed setting; 40 network; 70 neural network; 71 input layer; 72 intermediate layer; 73 output layer; 91 processor; 92 memory; 93 storage device; 160, 170, 180, 190 operation icon; 191 execute button; 341 learning

data acquisition unit; 342 model generation unit; 351
inferring data acquisition unit; 352 inference unit.

CLAIMS

[Claim 1] An air conditioning system comprising:

an air conditioning device comprising an air conditioning unit to perform air conditioning operation and
5 a control unit to control the air conditioning unit;

an inferring data acquisition unit to acquire inferring data, the inferring data including air conditioning environment data, the air conditioning environment data being information of an environment in
10 which the air conditioning device is installed;

an inference device to infer, from the air conditioning environment data, a proposed setting including at least two settings meeting a user's operation preference with respect to the air conditioning device; and

15 a communication terminal to remotely control the air conditioning device, wherein

the communication terminal includes a display portion to display a plurality of icons, the icons each representing a function of the air conditioning device,

20 the control unit causes a proposed setting icon to be displayed in the display portion, the proposed setting icon being an icon for making the proposed setting that has been inferred by the inference device, and

when a user taps the proposed setting icon, the
25 control unit controls the air conditioning device according to the proposed setting corresponding to the proposed setting icon.

[Claim 2] The air conditioning system according to claim 1,
30 wherein the inference device infers the proposed setting on a basis of the air conditioning environment data input from the inferring data acquisition unit, using a learned model for inferring the proposed setting from the air

conditioning environment data.

[Claim 3] The air conditioning system according to claim 1 or 2, wherein the air conditioning environment data is
5 information about at least one of an outdoor temperature or a floor temperature.

[Claim 4] The air conditioning system according to any one of claims 1 to 3, wherein the proposed setting consists of
10 at least two of an indoor temperature, a wind direction, an air volume, and air blow exposure.

[Claim 5] The air conditioning system according to claim 4, wherein the proposed setting includes two or more settings
15 to be made at time intervals of execution.

[Claim 6] The air conditioning system according to any one of claims 1 to 5, comprising
a server comprising the inferring data acquisition
20 unit and the inference device, wherein
the air conditioning device and the server are connected to each other via a network.

[Claim 7] The air conditioning system according to any one
25 of claims 1 to 6, comprising a learning device, the learning device comprising a learning data acquisition unit and a model generation unit, the learning data acquisition unit acquiring learning data, the learning data including the air conditioning environment data and history
30 information including at least two settings made by a user with respect to the air conditioning device, the model generation unit generating, by using the learning data, a learned model for inferring, from the air conditioning

environment data, a proposed setting including at least two settings to be made by the user with respect to the air conditioning device.

- 5 [Claim 8] The air conditioning system according to claim 7, wherein the history information is information representing settings of at least two of an operation mode, a set temperature, a wind direction, an air volume, and air blow exposure.

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[Claim 9] A learning device comprising:

- a learning data acquisition unit to acquire learning data, the learning data including air conditioning environment data and history information, the air
15 conditioning environment data being information of an environment in which an air conditioning device is installed, the history information including at least two settings made by a user with respect to the air conditioning device; and
20 a model generation unit to generate, by using the learning data, a learned model for inferring, from the air conditioning environment data, a proposed setting including at least two settings to be made by the user with respect to the air conditioning device.

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- [Claim 10] The learning device according to claim 9, wherein the history information is information representing settings of at least two of an operation mode, a set temperature, a wind direction, an air volume, and air blow
30 exposure.