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(54) **METHOD FOR CONTROLLING AIR CONDITIONER, AIR CONDITIONER AND COMPUTER-READABLE STORAGE MEDIUM**

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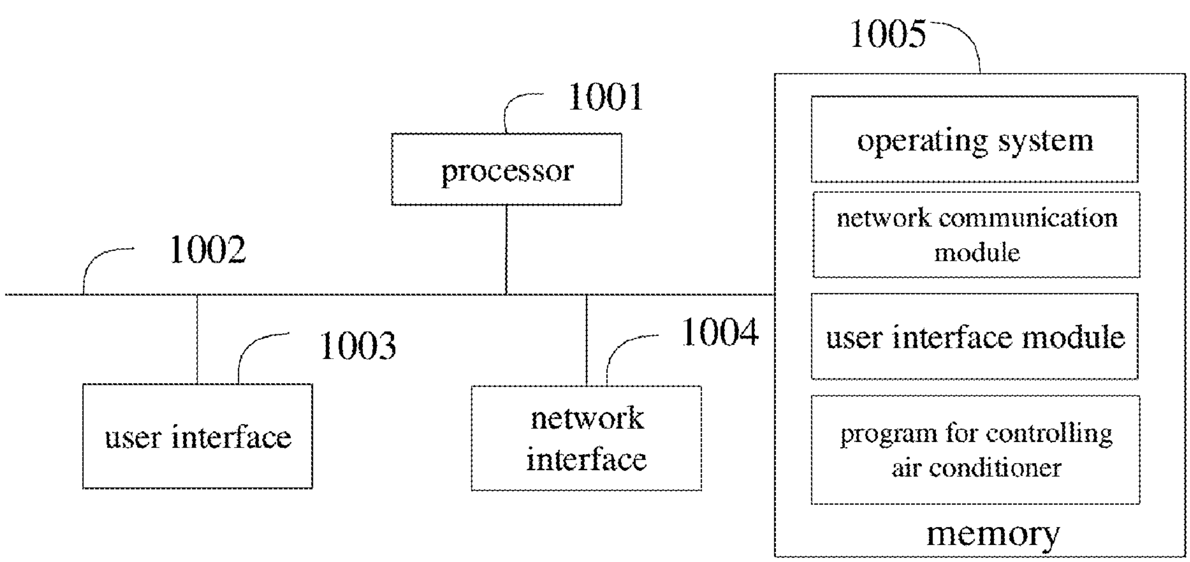
(57) **ABSTRACT**

A method for controlling an air conditioner, an air conditioner and a computer-readable storage medium are provided. The method includes: obtaining at least two predicted control parameter combinations for a current cycle prediction of the air conditioner and obtaining a historical control parameter combination of the air conditioner from a previous cycle operation; determining a target control parameter combination for the air conditioner according to parameter similarities between each of the predicted control parameter combinations and the historical control parameter combination; and controlling the air conditioner to operate according to the parameter values in the target control parameter combination.



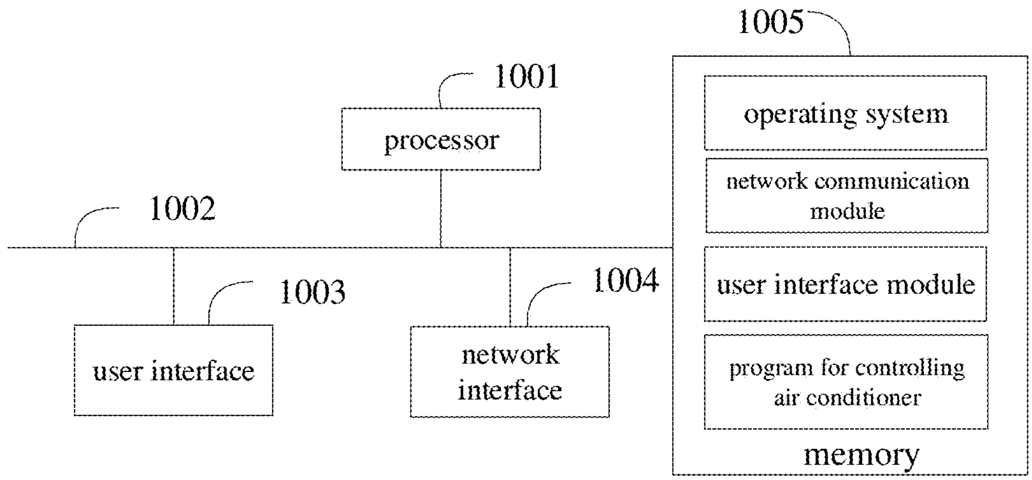



FIG. 1

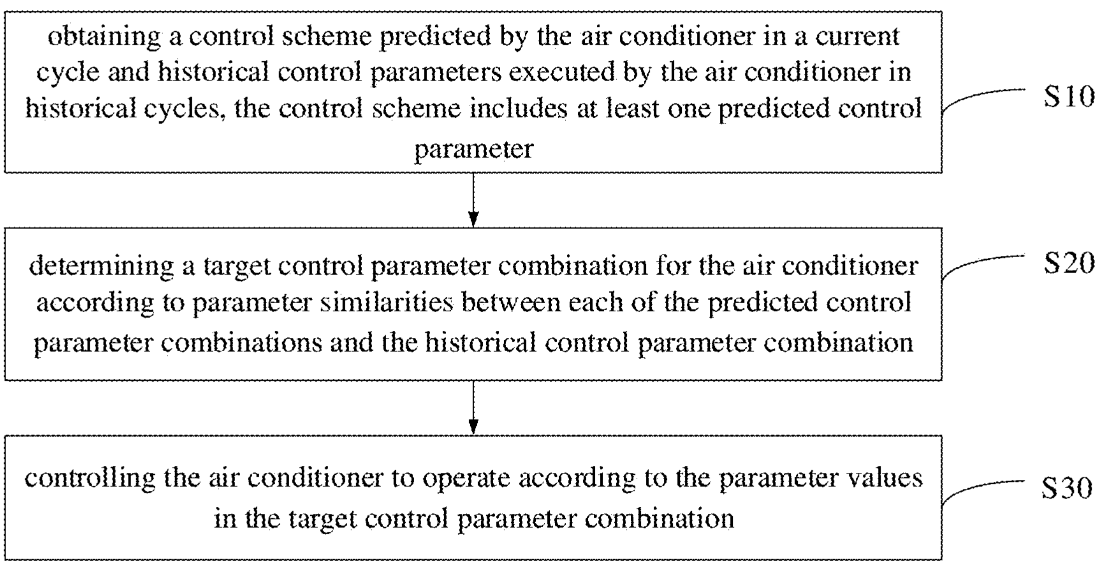



FIG. 2

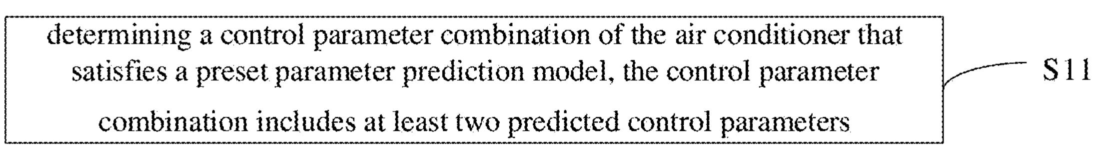



FIG. 3

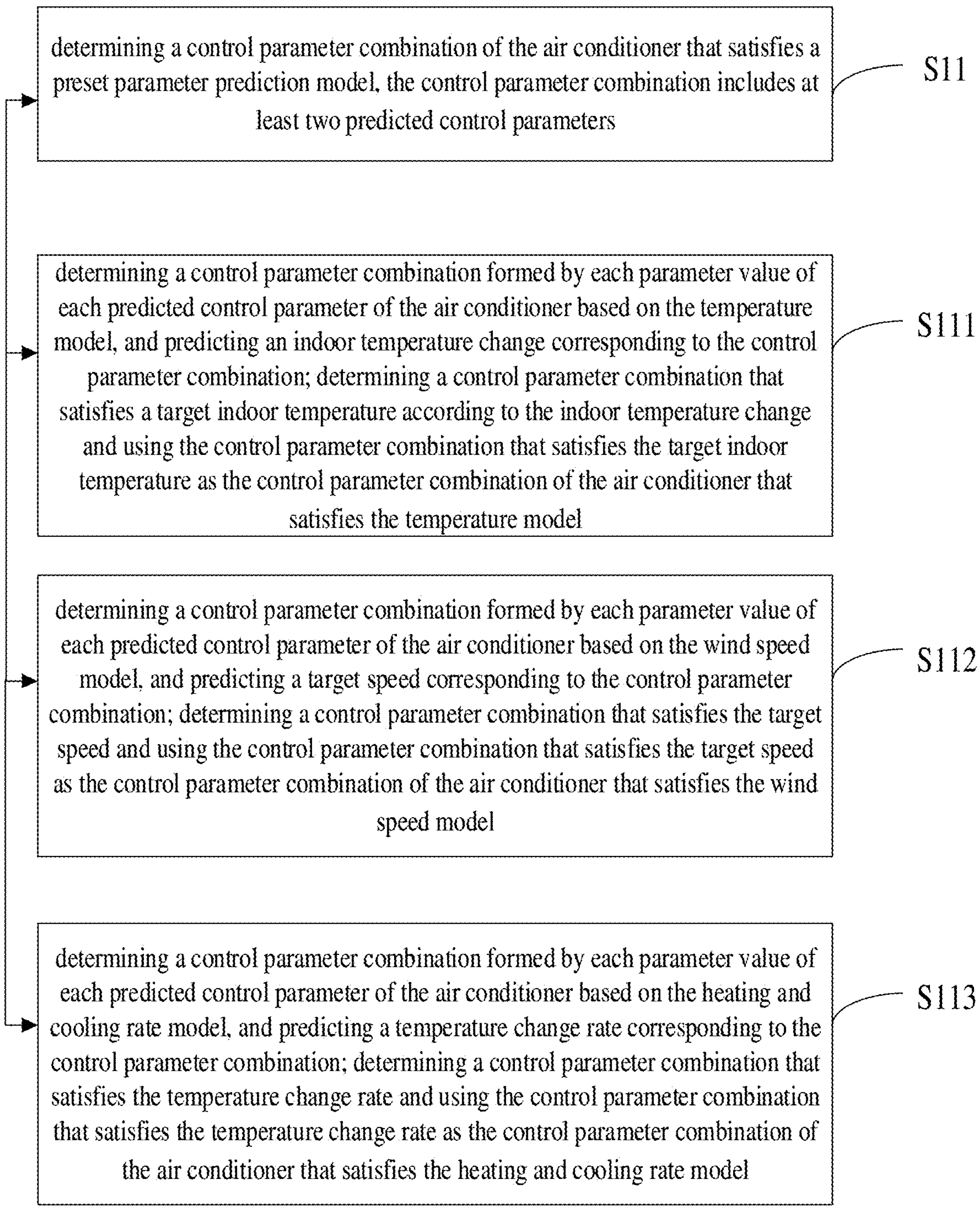

determining a control parameter combination of the air conditioner that satisfies a preset parameter prediction model, the control parameter combination includes at least two predicted control parameters
S11
determining a control parameter combination formed by each parameter value of each predicted control parameter of the air conditioner based on the temperature model, and predicting an indoor temperature change corresponding to the control parameter combination; determining a control parameter combination that satisfies a target indoor temperature according to the indoor temperature change and using the control parameter combination that satisfies the target indoor temperature as the control parameter combination of the air conditioner that satisfies the temperature model
S111
determining a control parameter combination formed by each parameter value of each predicted control parameter of the air conditioner based on the wind speed model, and predicting a target speed corresponding to the control parameter combination; determining a control parameter combination that satisfies the target speed and using the control parameter combination that satisfies the target speed as the control parameter combination of the air conditioner that satisfies the wind speed model
S112
determining a control parameter combination formed by each parameter value of each predicted control parameter of the air conditioner based on the heating and cooling rate model, and predicting a temperature change rate corresponding to the control parameter combination; determining a control parameter combination that satisfies the temperature change rate and using the control parameter combination that satisfies the temperature change rate as the control parameter combination of the air conditioner that satisfies the heating and cooling rate model
S113

FIG. 4

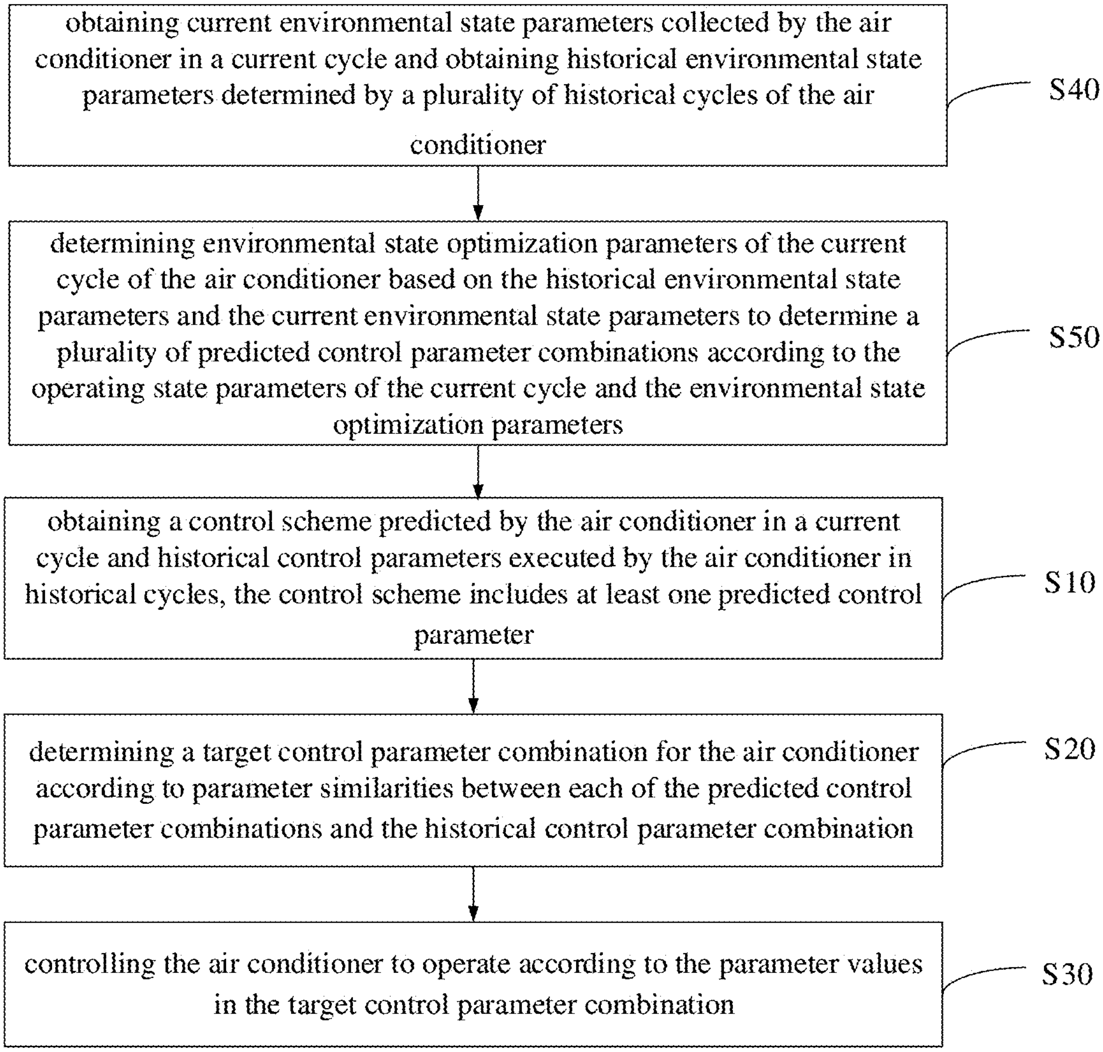

obtaining current environmental state parameters collected by the air conditioner in a current cycle and obtaining historical environmental state parameters determined by a plurality of historical cycles of the air conditioner
S40
determining environmental state optimization parameters of the current cycle of the air conditioner based on the historical environmental state parameters and the current environmental state parameters to determine a plurality of predicted control parameter combinations according to the operating state parameters of the current cycle and the environmental state optimization parameters
S50
obtaining a control scheme predicted by the air conditioner in a current cycle and historical control parameters executed by the air conditioner in historical cycles, the control scheme includes at least one predicted control parameter
S10
determining a target control parameter combination for the air conditioner according to parameter similarities between each of the predicted control parameter combinations and the historical control parameter combination
S20
controlling the air conditioner to operate according to the parameter values in the target control parameter combination
S30

FIG. 5

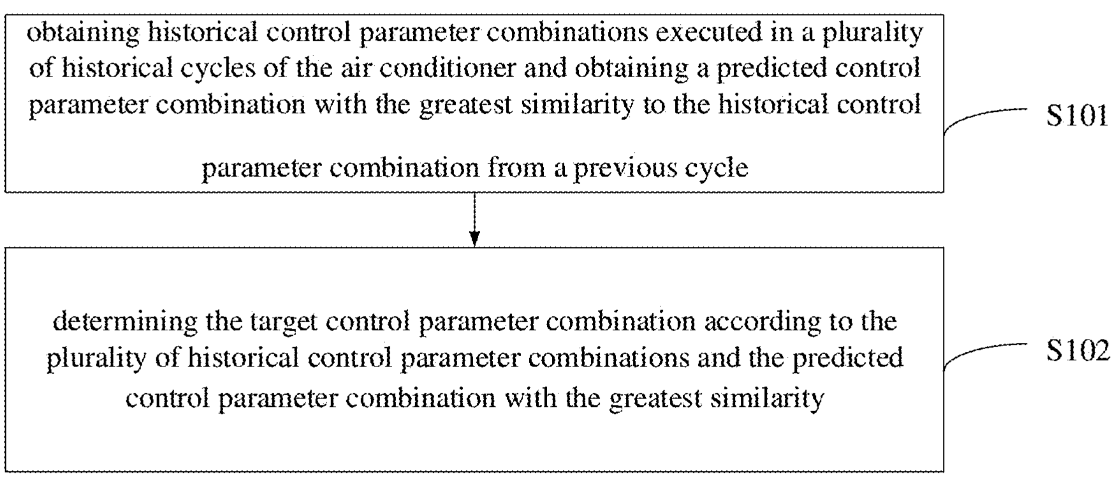

obtaining historical control parameter combinations executed in a plurality of historical cycles of the air conditioner and obtaining a predicted control parameter combination with the greatest similarity to the historical control parameter combination from a previous cycle
S101
determining the target control parameter combination according to the plurality of historical control parameter combinations and the predicted control parameter combination with the greatest similarity
S102

FIG. 6

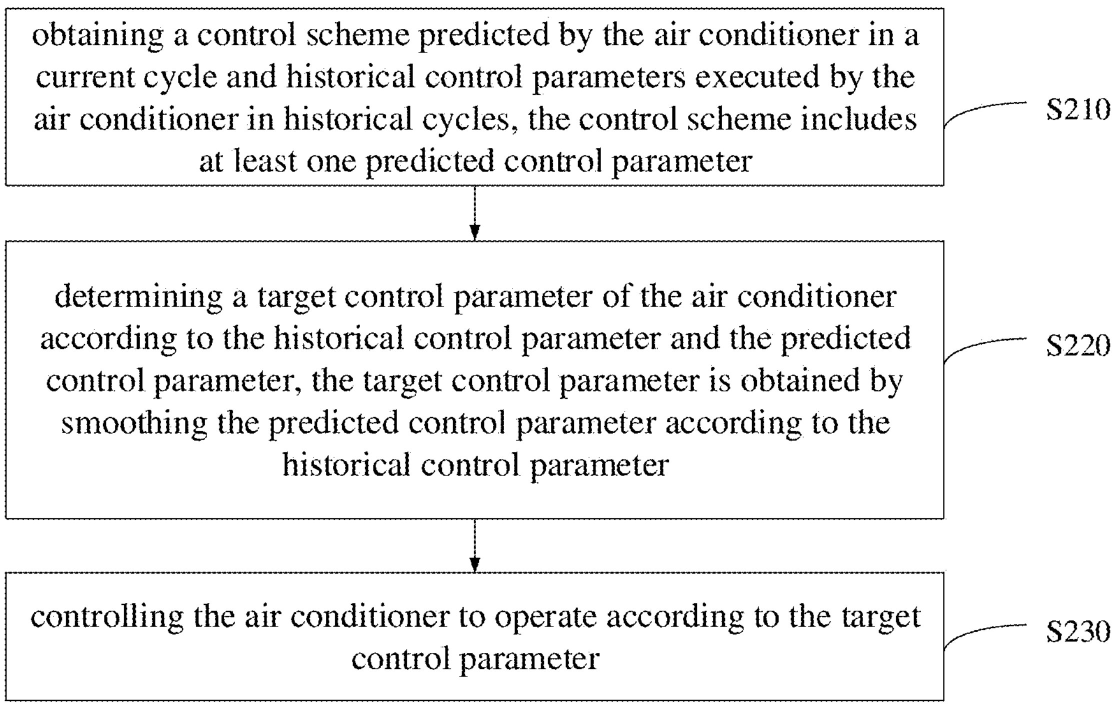

obtaining a control scheme predicted by the air conditioner in a current cycle and historical control parameters executed by the air conditioner in historical cycles, the control scheme includes at least one predicted control parameter
S210
determining a target control parameter of the air conditioner according to the historical control parameter and the predicted control parameter, the target control parameter is obtained by smoothing the predicted control parameter according to the historical control parameter
S220
controlling the air conditioner to operate according to the target control parameter
S230

FIG. 7

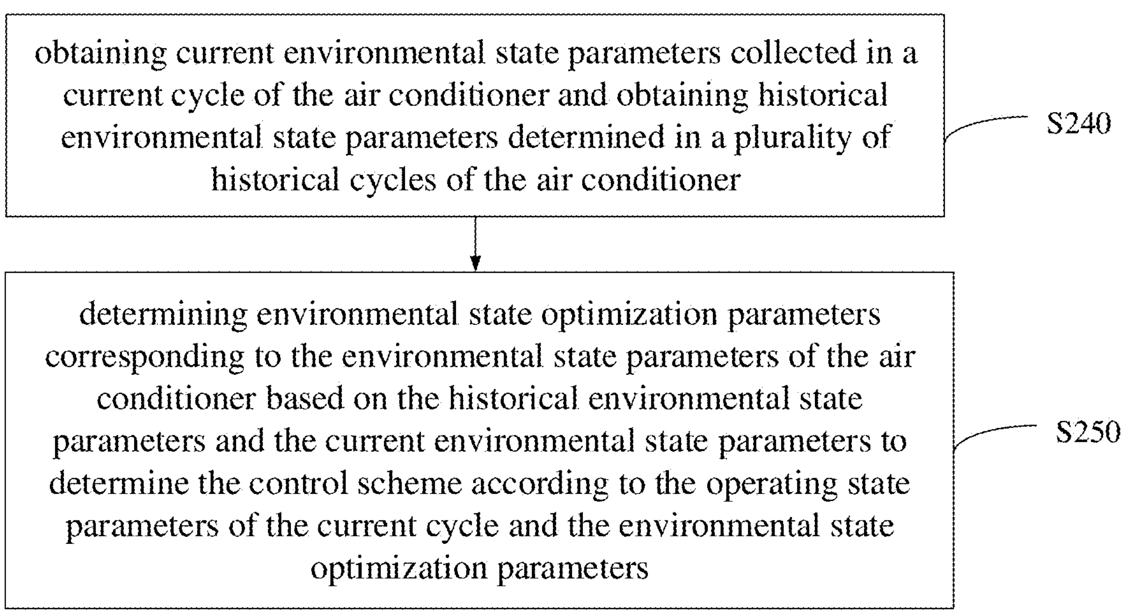

obtaining current environmental state parameters collected in a current cycle of the air conditioner and obtaining historical environmental state parameters determined in a plurality of historical cycles of the air conditioner
S240
determining environmental state optimization parameters corresponding to the environmental state parameters of the air conditioner based on the historical environmental state parameters and the current environmental state parameters to determine the control scheme according to the operating state parameters of the current cycle and the environmental state optimization parameters
S250

FIG. 8

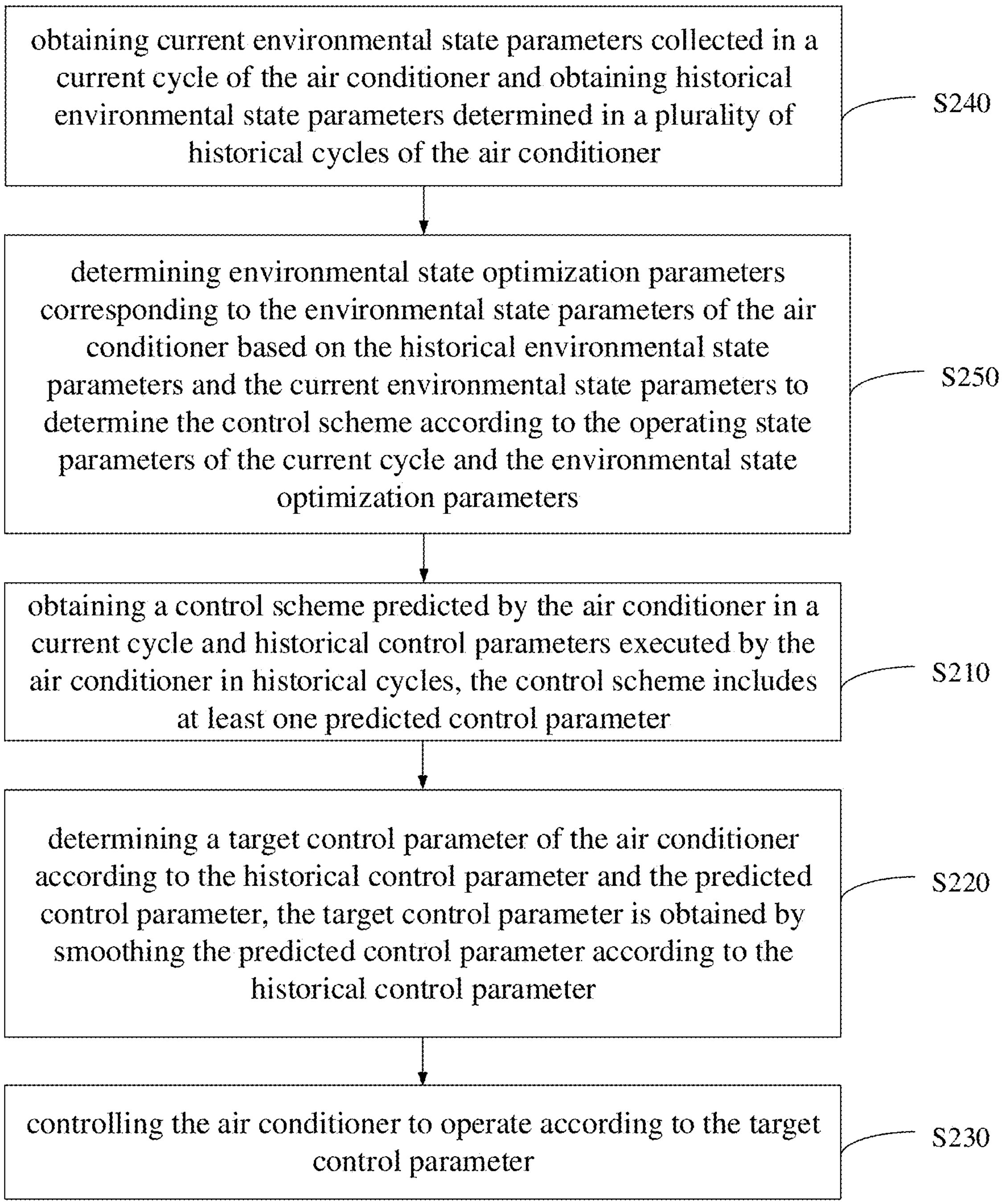

obtaining current environmental state parameters collected in a current cycle of the air conditioner and obtaining historical environmental state parameters determined in a plurality of historical cycles of the air conditioner
S240
determining environmental state optimization parameters corresponding to the environmental state parameters of the air conditioner based on the historical environmental state parameters and the current environmental state parameters to determine the control scheme according to the operating state parameters of the current cycle and the environmental state optimization parameters
S250
obtaining a control scheme predicted by the air conditioner in a current cycle and historical control parameters executed by the air conditioner in historical cycles, the control scheme includes at least one predicted control parameter
S210
determining a target control parameter of the air conditioner according to the historical control parameter and the predicted control parameter, the target control parameter is obtained by smoothing the predicted control parameter according to the historical control parameter
S220
controlling the air conditioner to operate according to the target control parameter
S230

FIG. 9

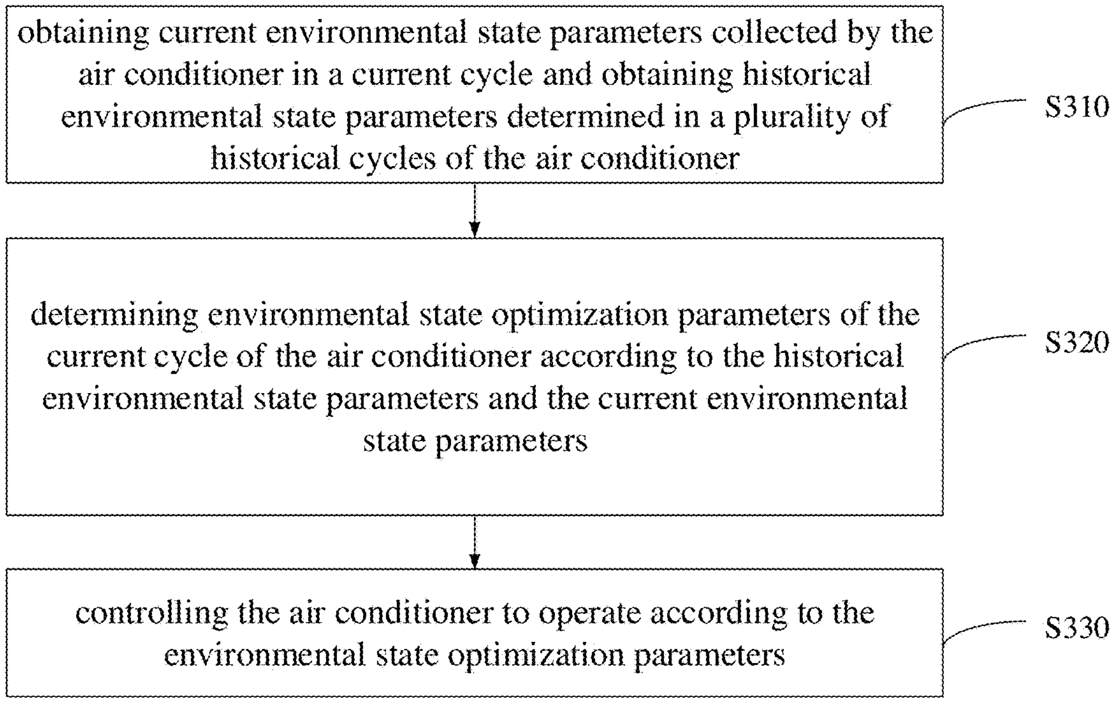

obtaining current environmental state parameters collected by the air conditioner in a current cycle and obtaining historical environmental state parameters determined in a plurality of historical cycles of the air conditioner
S310
determining environmental state optimization parameters of the current cycle of the air conditioner according to the historical environmental state parameters and the current environmental state parameters
S320
controlling the air conditioner to operate according to the environmental state optimization parameters
S330

FIG. 10

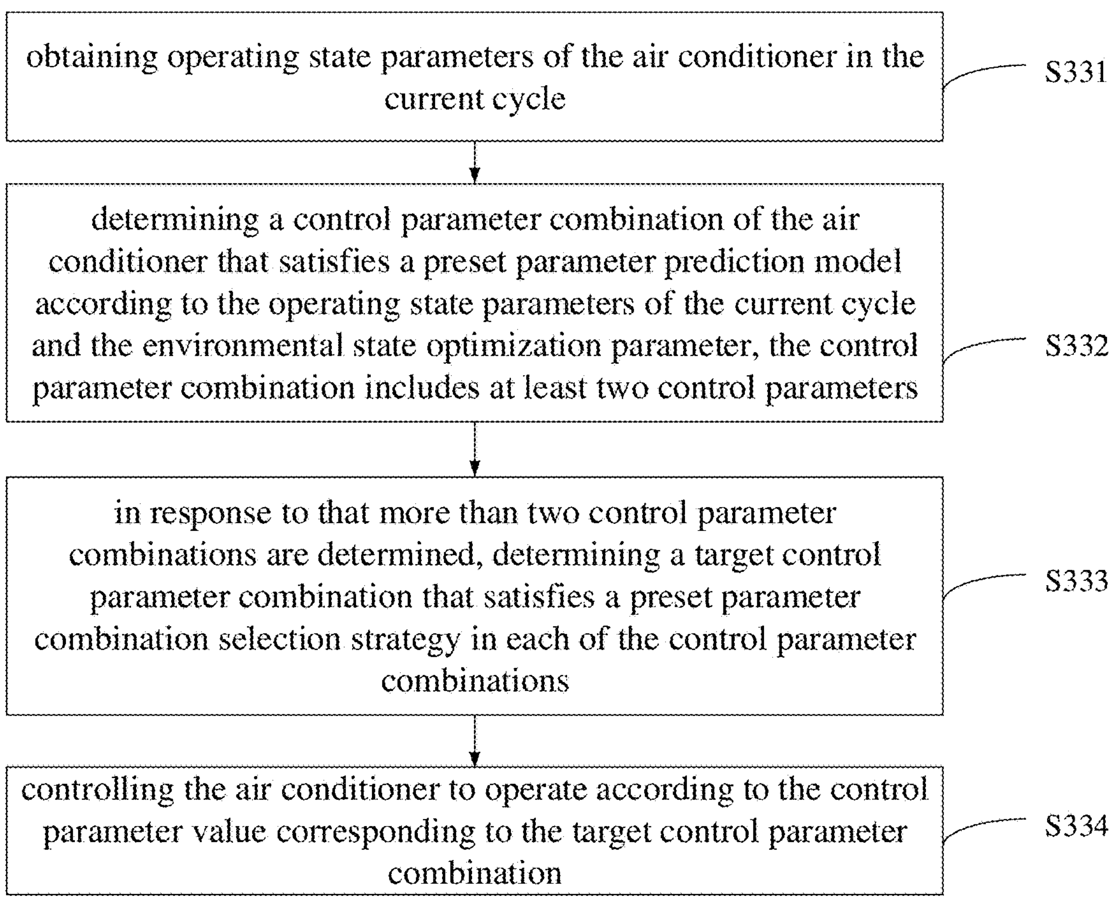

obtaining operating state parameters of the air conditioner in the current cycle
S331
determining a control parameter combination of the air conditioner that satisfies a preset parameter prediction model according to the operating state parameters of the current cycle and the environmental state optimization parameter, the control parameter combination includes at least two control parameters
S332
in response to that more than two control parameter combinations are determined, determining a target control parameter combination that satisfies a preset parameter combination selection strategy in each of the control parameter combinations
S333
controlling the air conditioner to operate according to the control parameter value corresponding to the target control parameter combination
S334

FIG. 11

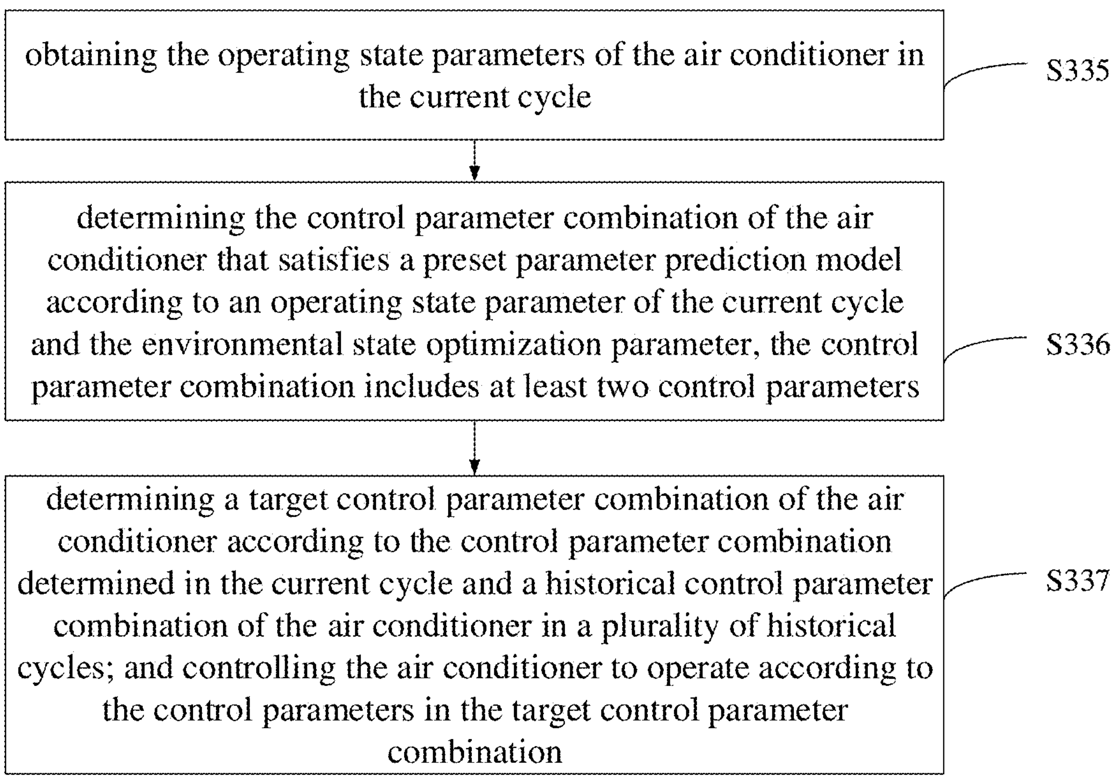

obtaining the operating state parameters of the air conditioner in the current cycle
S335
determining the control parameter combination of the air conditioner that satisfies a preset parameter prediction model according to an operating state parameter of the current cycle and the environmental state optimization parameter, the control parameter combination includes at least two control parameters
S336
determining a target control parameter combination of the air conditioner according to the control parameter combination determined in the current cycle and a historical control parameter combination of the air conditioner in a plurality of historical cycles; and controlling the air conditioner to operate according to the control parameters in the target control parameter combination
S337

FIG. 12

# METHOD FOR CONTROLLING AIR CONDITIONER, AIR CONDITIONER AND COMPUTER-READABLE STORAGE MEDIUM

## CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation application of PCT International Patent Application No. PCT/CN2023/111096 filed on Aug. 3, 2023, which claims priority to and benefits of Chinese Patent Application Nos. 202211351676.6, 202211351702.5, both filed on Oct. 31, 2022, and 202211394510.2, filed on Nov. 8, 2022, the entire contents of each of which are incorporated herein by reference for all purposes. No new matter has been introduced.

## FIELD

[0002] The present application relates to the field of air conditioner control, and in particular, to a method for controlling an air conditioner, an air conditioner, and a computer-readable storage medium.

## BACKGROUND

[0003] During the operation of an air conditioner, due to sensor errors, control parameter hopping (compressor operating frequency, internal fan speed), etc., warm air oscillation may occur, causing user discomfort.

[0004] In relevant technical solutions, Genetic Algorithm (GA) based on Proportional Integral Derivative (PID) control theory and combined with Artificial Intelligence (AI) machine learning or deep learning is commonly used as the main control logic of the air conditioner. This approach enables refined control of internal parameters of the air conditioner, offering significant advantages in terms of energy efficiency and user comfort.

[0005] However, when sensor data collection errors occur in the air conditioner, substantial differences may arise between the predicted control parameters and the current control parameters of the air conditioner, potentially leading to oscillations in the air outlet temperature and airflow speed of the air conditioner, thus degrading the user experience. Additionally, this control method may cause frequent oscillations in internal control parameters of the air conditioner (e.g., compressor frequency exhibiting a wavy trend), which can impact the lifespan of related components such as the compressor and internal fan. Furthermore, when the control parameters change greatly, this control method may also cause the temperature and wind speed to oscillate, and degrading the user experience. Therefore, the current air conditioner has the problem of warm air oscillation.

[0006] The above content is provided solely to assist in understanding the technical solution of the present application and does not constitute an admission that the above content is prior art.

## SUMMARY

[0007] The main objective of the present application is to provide a method for controlling an air conditioner, aiming to solve the problem of how to avoid warm air oscillation in the air conditioner.

[0008] In order to achieve the above objective, the present application provides a method for controlling an air conditioner, including:

[0009] obtaining at least two predicted control parameter combinations for a current cycle prediction of the air conditioner and obtaining a historical control parameter combination of the air conditioner from a previous cycle operation;

[0010] determining a target control parameter combination for the air conditioner according to parameter similarities between each of the predicted control parameter combinations and the historical control parameter combination; and

[0011] controlling the air conditioner to operate according to the parameter values in the target control parameter combination.

[0012] In addition, to achieve the above objective, the present application further provides a method for controlling an air conditioner, including:

[0013] obtaining a control scheme predicted by the air conditioner in a current cycle and historical control parameters executed by the air conditioner in historical cycles, the control scheme includes at least one predicted control parameter;

[0014] determining a target control parameter of the air conditioner according to the historical control parameter and the predicted control parameter, the target control parameter is obtained by smoothing the predicted control parameter according to the historical control parameter; and

[0015] controlling the air conditioner to operate according to the target control parameter.

[0016] In addition, to achieve the above objective, the present application further provides a method for controlling an air conditioner, including:

[0017] obtaining current environmental state parameters collected by the air conditioner in a current cycle and obtaining historical environmental state parameters determined in a plurality of historical cycles of the air conditioner;

[0018] determining environmental state optimization parameters of the current cycle of the air conditioner according to the historical environmental state parameters and the current environmental state parameters; and

[0019] controlling the air conditioner to operate according to the environmental state optimization parameters.

[0020] In addition, to achieve the above objective, the present application further provides an air conditioner, including a memory, at least one processor, and a program for controlling the air conditioner stored in the memory and executable on the processor, the program for controlling the air conditioner, when executed by the processor, implements the steps of the method for controlling air conditioner as described above.

[0021] In addition, to achieve the above objective, the present application further provides a computer-readable storage medium. The computer-readable storage medium stores a program for controlling an air conditioner, and when executed by a processor, the steps of the method for controlling air conditioner as described above are implemented.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0022] FIG. **1** is a schematic structural diagram of a hardware operating environment involved in an embodiment of the present application.

**[0023]** FIG. **2** is a flowchart of a method for controlling an air conditioner according to an embodiment of the present application.

**[0024]** FIG. **3** is a detailed flowchart of step S**10** of the method for controlling an air conditioner according to an embodiment of the present application.

**[0025]** FIG. **4** is a detailed flowchart of the method for controlling an air conditioner according to an embodiment of the present application.

**[0026]** FIG. **5** is a flowchart of the method for controlling an air conditioner according to an embodiment of the present application.

**[0027]** FIG. **6** is a flowchart of the method for controlling an air conditioner according to an embodiment of the present application.

**[0028]** FIG. **7** is a flowchart of the method for controlling an air conditioner according to an embodiment of the present application.

**[0029]** FIG. **8** is a flowchart of the method for controlling an air conditioner according to an embodiment of the present application.

**[0030]** FIG. **9** is a flowchart of the method for controlling an air conditioner according to an embodiment of the present application.

**[0031]** FIG. **10** is a flowchart of the method for controlling an air conditioner according to an embodiment of the present application.

**[0032]** FIG. **11** is a flowchart of the method for controlling an air conditioner according to an embodiment of the present application.

**[0033]** FIG. **12** is a flowchart of the method for controlling an air conditioner according to an embodiment of the present application.

**[0034]** The realization of the purposes, functional features, and advantages of the present application will be further explained in conjunction with embodiments and with reference to the accompanying drawings.

## DETAILED DESCRIPTION OF EMBODIMENTS

**[0035]** During the operation of an air conditioner, due to sensor errors, control parameter hopping (compressor operating frequency, internal fan speed), etc., warm air oscillation may occur, causing user discomfort.

**[0036]** At present, almost all air-conditioning manufacturers use the Genetic Algorithm (GA) (piecewise function) under Proportional Integral Derivative (PID) control theory as the main control logic of the air conditioner; this method is based on certain experience or rules, and the control parameters are relatively stable/continuous.

**[0037]** In addition, some air conditioner manufacturers have begun to try to use AI machine learning/deep learning as the main control logic of the air conditioner. The control is more refined and has great advantages in energy saving and comfort, but the control parameters will also be more oscillatory (for example: compressor frequency exhibiting a wavy trend).

**[0038]** The present application uses the predicted control parameter combination with the greatest similarity between the historical control parameter combination and the predicted control parameter combination executed by the air conditioner in the previous cycle as the target control parameter combination, so that the parameter changes between different cycles of the air conditioner are relatively small, thereby keeping the warm air relatively stable.

**[0039]** In order to better understand the above technical solution, exemplary embodiments of the present application will be described in more detail below with reference to the accompanying drawings. Although exemplary embodiments of the present application are shown in the accompanying drawings, it should be understood that the present application can be implemented in various forms and should not be limited by the embodiments described herein. On the contrary, these embodiments are provided to enable a more thorough understanding of the present application and to fully convey the scope of the present application to those skilled in the art.

**[0040]** As an implementation solution, FIG. **1** is a schematic structural diagram of a hardware operating environment involved in an embodiment of the present application.

**[0041]** As shown in FIG. **1**, the air conditioner may include: a processor **1001**, such as a central processing unit (CPU), a memory **1005**, a user interface **1003**, a network interface **1004**, and a communication bus **1002**. The communication bus **1002** is used to realize the connection and communication between these components. The user interface **1003** may include a display, an input unit such as a keyboard, and the user interface **1003** may also include a standard wired interface and a wireless interface. The network interface **1004** may include a standard wired interface and a wireless interface (such as a Wireless-Fidelity interface). The memory **1005** may be a high-speed random access memory (RAM), or a stable memory (non-volatile memory), such as a disk memory. The memory **1005** may also be a storage device independent of the aforementioned processor **1001**.

**[0042]** Those skilled in the art will appreciate that the air conditioner structure shown in FIG. **1** does not limit the air conditioner and may include more or fewer components than shown, or a combination of certain components, or a different arrangement of components.

**[0043]** As shown in FIG. **1**, the memory **1005** as a storage medium may include an operating system, a network communication module, a user interface module and a program for controlling the air conditioner. The operating system is a program for managing and controlling the hardware and software resources of the air conditioner, based on the operation of the program for controlling the air conditioner and other software or programs.

**[0044]** In the structure shown in FIG. **1**, the user interface **1003** is mainly used to connect to the terminal and communicate data with the terminal; the network interface **1004** is mainly used for the background server and communicates data with the background server; the processor **1001** can be used to call the program for controlling the air conditioner stored in the memory **1005**.

**[0045]** In an embodiment, the air conditioner includes: a memory **1005**, a processor **1001**, and a program for controlling the air conditioner stored in the memory and executable on the processor.

**[0046]** When the processor **1001** calls the program for controlling the air conditioner stored in the memory **1005**, the following operations are performed:

**[0047]** obtaining at least two predicted control parameter combinations for a current cycle prediction of the air conditioner and obtaining a historical control parameter combination of the air conditioner from a previous cycle operation;

**[0048]** determining a target control parameter combination for the air conditioner according to parameter similarities between each of the predicted control parameter combinations and the historical control parameter combination; and

**[0049]** controlling the air conditioner to operate according to the parameter values in the target control parameter combination.

**[0050]** When the processor **1001** calls the program for controlling the air conditioner stored in the memory **1005**, the following operations are performed:

**[0051]** normalizing the parameters in the predicted control parameter combinations and the historical control parameter combination to obtain normalized values of each control parameter in the predicted control parameter combinations and the historical control parameter combination;

**[0052]** calculating the parameter similarity between the normalized values of the predicted control parameter combinations and the historical control parameter combination; and

**[0053]** determining the predicted control parameter combination corresponding to a largest parameter similarity as a target control parameter combination.

**[0054]** When the processor **1001** calls the program for controlling the air conditioner stored in the memory **1005**, the following operations are performed:

**[0055]** determining a relative numerical value between the normalized values of the predicted control parameter combinations and the historical control parameter combination based on a preset similarity calculation strategy, the similarity calculation strategy includes Manhattan distance calculation, Euclidean distance calculation, and cosine distance calculation; and

**[0056]** determining the parameter similarity based on the relative numerical value, the relative numerical value and the parameter similarity are negatively correlated.

**[0057]** When the processor **1001** calls the program for controlling the air conditioner stored in the memory **1005**, the following operations are performed:

**[0058]** determining a control parameter combination of the air conditioner that satisfies a preset parameter prediction model, the control parameter combination includes at least two predicted control parameters.

**[0059]** When the processor **1001** calls the program for controlling the air conditioner stored in the memory **1005**, the following operations are performed:

**[0060]** determining a control parameter combination formed by each parameter value of each predicted control parameter of the air conditioner based on the temperature model, and predicting an indoor temperature change corresponding to the control parameter combination; determining a control parameter combination that satisfies a target indoor temperature according to the indoor temperature change and using the control parameter combination that satisfies the target indoor temperature as the control parameter combination of the air conditioner that satisfies the temperature model; or

**[0061]** determining a control parameter combination formed by each parameter value of each predicted control parameter of the air conditioner based on the wind speed model, and predicting a target speed corresponding to the control parameter combination; determining a control parameter combination that satisfies the target speed and using the control parameter combination that satisfies the target speed as the control parameter combination of the air conditioner that satisfies the wind speed model; or

**[0062]** determining a control parameter combination formed by each parameter value of each predicted control parameter of the air conditioner based on the heating and cooling rate model, and predicting a temperature change rate corresponding to the control parameter combination; determining a control parameter combination that satisfies the temperature change rate and using the control parameter combination that satisfies the temperature change rate as the control parameter combination of the air conditioner that satisfies the heating and cooling rate model.

**[0063]** When the processor **1001** calls the program for controlling the air conditioner stored in the memory **1005**, the following operations are performed:

**[0064]** recording a controllable operating parameter and an uncontrollable operating parameter in each operating cycle of the air conditioner, and a historical indoor temperature change after each operating cycle of the air conditioner; performing training according to recorded historical operating data of the air conditioner to generate a first mapping relationship between the controllable operating parameters, the uncontrollable operating parameters, and the historical indoor temperature change to predict the indoor temperature change based on the first mapping relationship; or

**[0065]** recording the controllable operating parameter and the uncontrollable operating parameter in each operating cycle of the air conditioner, and a historical internal fan speed after each operating cycle of the air conditioner; performing training according to the recorded historical operating data of the air conditioner to generate a second mapping relationship between the controllable operating parameters, the uncontrollable operating parameters, and the historical internal fan speed to predict the target speed of the internal fan based on the second mapping relationship; or

**[0066]** recording the controllable operating parameters and uncontrollable operating parameters in each operating cycle of the air conditioner, and a historical compressor frequency and the historical internal fan speed after each operating cycle of the air conditioner; performing training according to the recorded historical operating data of the air conditioner to generate a third mapping relationship between the controllable operating parameters, the uncontrollable operating parameters, the historical compressor frequency, and the historical internal fan speed to predict the temperature change rate based on the third mapping relationship.

**[0067]** When the processor **1001** calls the program for controlling the air conditioner stored in the memory **1005**, the following operations are performed:

**[0068]** obtaining current environmental state parameters collected by the air conditioner in a current cycle and obtaining historical environmental state parameters determined by a plurality of historical cycles of the air conditioner; and

**[0069]** determining environmental state optimization parameters of the current cycle of the air conditioner based on the historical environmental state parameters and the current environmental state parameters to determine a plurality of predicted control parameter combinations according to the operating state parameters of the current cycle and the environmental state optimization parameters.

**[0070]** When the processor **1001** calls the program for controlling the air conditioner stored in the memory **1005**, the following operations are performed:

**[0071]** obtaining historical control parameter combinations executed in a plurality of historical cycles of the air conditioner and obtaining a predicted control parameter combination with the greatest similarity to the historical control parameter combination from a previous cycle; and

**[0072]** determining the target control parameter combination according to the plurality of historical control parameter combinations and the predicted control parameter combination with the greatest similarity.

**[0073]** According to the hardware architecture of the air conditioner based on the above-mentioned air conditioning control technology, an embodiment of the method for controlling the air conditioner of the present application is provided.

**[0074]** As shown in FIG. **2**, in an embodiment, the method for controlling the air conditioner includes the following steps:

**[0075]** step S**10**, obtaining a control scheme predicted by the air conditioner in a current cycle and historical control parameters executed by the air conditioner in historical cycles, the control scheme includes at least one predicted control parameter.

**[0076]** In an embodiment, at least two predicted control parameter combinations output by the main control logic module in the air conditioner in the current cycle are first obtained. The predicted control parameter combination is characterized as controllable operating parameters of the air conditioner that satisfy certain air conditioning parameter adjustment strategies, and the historical control parameter combination is characterized as controllable operating parameters executed by the air conditioner in the previous cycle.

**[0077]** Controllable operating parameters can be characterized as the controllable operating parameters of the air conditioner itself, such as the internal fan speed, external fan speed, and compressor frequency, etc. In addition, relatively speaking, uncontrollable operating parameters are characterized as the parameters that cannot be controlled by the air conditioner itself, such as indoor and outdoor temperature, indoor and outdoor humidity, exhaust valve temperature, and other environmental parameters that affect the operation of the air conditioner but cannot be set, or user-set parameters such as target temperature and set target wind speed.

**[0078]** The air conditioning parameter adjustment strategy is characterized as a strategy for adjusting the controllable operating parameters inside the air conditioner according to certain user needs.

**[0079]** It should be noted that the predicted control parameter combination is not the control parameter combination that the air conditioner is currently operating, but the control parameter combination that the air conditioner will operate in the next cycle, where the next cycle can be understood as the end of the current cycle or the beginning of the next cycle.

**[0080]** Step S**20**, determining a target control parameter combination for the air conditioner according to parameter similarities between each of the predicted control parameter combinations and the historical control parameter combination.

**[0081]** In an embodiment, after obtaining at least two prediction control parameter combinations and the historical control parameter combinations of the air conditioner operation in the previous cycle, in order to avoid the predicted control parameter combinations being determined to have too large a change compared to the historical control parameter combinations during the operation of the air conditioner, which may cause the air conditioner to experience a warm air oscillation phenomenon, the parameter similarity between each prediction control parameter combination and the historical control parameter combination is determined, and appropriate parameters are selected from each prediction control parameter combination as the target control parameter combination according to the parameter similarity.

**[0082]** In an embodiment, the target control parameter combination may be determined by selecting a predicted control parameter combination having the largest parameter similarity with the historical control parameter combination as the target control parameter combination.

**[0083]** Specifically, firstly, the predicted control parameter combination and the historical control parameter combination are normalized to obtain the normalized value of each control parameter combination, then the parameter similarity between the normalized values of the predicted control parameter combination and the historical control parameter combination is calculated, and the one with the largest parameter similarity is selected as the target control parameter combination.

**[0084]** Specifically, according to the method of calculating the similarity of the adopted numbers based on the normalized values, the relative numerical size between the normalized values of the predicted control parameter combination and the historical control parameter combination can be calculated by using similarity calculation strategies such as Manhattan distance calculation, Euclidean distance calculation or cosine distance calculation. Then the parameter similarity is determined based on the relative numerical size, and the larger the relative numerical value, the lower the parameter similarity.

**[0085]** Exemplarily, the prediction control parameter combination is set to include the compressor frequency P and the internal fan speed W. The three prediction control parameter combinations obtained are CR1=(P1=56, W1=45), CR2=(P2=60, W2=55), CR3=(P3=58, W3=58) and the historical control parameter combination CR0=(P0=63 Hz, W0=56) of the air conditioner operation in the previous historical cycle. The above prediction control parameter combination and historical control parameter combination are normalized respectively. For the operating frequency, "operating frequency/maximum operating frequency" is the normalized value; for the internal fan speed, "fan speed/maximum fan speed" is the normalized value. The normalized value of the compressor frequency of CR1 is H1=56/130=0.43, and the normalized value of the internal fan speed is Z1=45/100=0.45. The normalized value of the compressor frequency of CR2 is H2=60/130=0.46, and the normalized value of the internal fan speed is Z2=55/100=0.55. The normalized value of the compressor frequency of CR3 is H3=58/130=0.45, and the normalized value of the internal fan speed is Z3=58/100=0.58. The normalized value of the compressor frequency of CR0 is H0=63/130=0.48, and the normalized value of the internal fan speed is Z0=56/100=0.56.

**[0086]** Next, the normalized values of the predicted control parameter combinations in CR1 to CR3 are compared with the normalized values of the historical control parameter combinations in CR0. Manhattan distance, Euclidean distance or cosine distance can be used for calculation, where the shorter the distance, the higher the similarity.

**[0087]** Exemplarily, in an embodiment, Manhattan distance is used to calculate relative numerical values.

**[0088]** Manhattan distance between CR1 and CR0=10.48–0.43|+|0.56–0.45|=0.16;

**[0089]** Manhattan distance between CR2 and CR0=10.48–0.46|+|0.56–0.55|=0.03;

**[0090]** Manhattan distance between CR3 and CR0=10.48–0.45|+|0.56–0.58|=0.05;

**[0091]** Obviously, the Manhattan distance between CR2 and CR0 is the shortest, so CR2 is selected as the target control parameter combination with the highest similarity to the historical control parameter combination of the previous cycle.

**[0092]** Exemplarily, in an embodiment, Euclidean distance is used to calculate relative numerical values.

**[0093]** the Euclidean distance between CR1 and CR0=(|0.48–0.43 ^2+10.56–0.45 ^2)^0.5=0.12;

**[0094]** the Euclidean distance between CR2 and CR0=(0.48–0.46|^2+10.56–0.55| ^2)^0.5=0.02;

**[0095]** the Euclidean distance between CR3 and CR0=(|0.48–0.45 ^2+10.56–0.58|^2)^0.5=0.04;

**[0096]** Obviously, the Euclidean distance between CR2 and CR0 is the shortest, so CR2 is selected as the target control parameter combination with the highest similarity to the historical control parameter combination of the previous cycle.

**[0097]** Exemplarily, in an embodiment, cosine distance is used to calculate the relative numerical size.

**[0098]** Cosine distance between CR1 and CR0:

$$\cos\,(CR1,\,CR0)=\frac{CR1\times CR0}{|CR1|\cdot|CR0|}\approx 0.33$$

**[0099]** Cosine distance between CR2 and CR0 is:

$$\cos\,(CR2,\,CR0)=\frac{CR2\times CR0}{||CR1|\cdot|CR0||}=0.07$$

**[0100]** Cosine distance between CR3 and CR0 is:

$$\cos\,(CR3,\,CR0)=\frac{CR3\times CR0}{||CR1|\cdot|CR0||}=0.12$$

**[0101]** Obviously, the Euclidean distance between CR2 and CR0 is the shortest, so CR2 is selected as the target control parameter combination with the highest similarity to the historical control parameter combination of the previous cycle.

**[0102]** Step S**30**, controlling the air conditioner to operate according to the parameter values in the target control parameter combination.

**[0103]** In an embodiment, after the target control parameter combination is determined, the air conditioner is controlled to operate according to the parameter values in the target control parameter combination.

**[0104]** Exemplarily, assuming that the determined target control parameter combination is the corresponding parameter in CR2, CR2=(P2=60, W2=55), then the compressor frequency of the air conditioner is controlled to operate at 60 Hz, and the internal fan speed of the air conditioner is controlled to operate at 55 rpm.

**[0105]** In an embodiment, when multiple prediction control parameter combinations are obtained, the historical control parameter combinations of the air conditioner in the previous cycle are obtained, and the target control parameter combination finally executed by the air conditioner is determined according to the parameter similarity between the prediction control parameter combination and the historical control parameter combination. By selecting the one of the prediction control parameter combinations that is closest to the value of the historical control parameter combination in the previous cycle as the target control parameter combination, the phenomenon of warm air oscillation of the air conditioner is avoided due to the large difference in the control parameter combination values between adjacent cycles when the air conditioner is executed according to the prediction control parameter combination.

**[0106]** As shown in FIG. **3**, in an embodiment, the obtaining the at least two predicted control parameter combinations for the current cycle prediction of the air conditioner includes:

**[0107]** step S**11**, determining a control parameter combination of the air conditioner that satisfies a preset parameter prediction model, the control parameter combination includes at least two predicted control parameters.

**[0108]** In an embodiment, the predicted control parameter combination may be determined by using a parameter prediction model to determine the control parameter combination of the air conditioner, and each control parameter combination includes at least two predicted control parameter combinations.

**[0109]** As shown in FIG. **4**, the step S**11** includes:

**[0110]** step S**111**, determining a control parameter combination formed by each parameter value of each predicted control parameter of the air conditioner based on the temperature model, and predicting an indoor temperature change corresponding to the control parameter combination; determining a control parameter combination that satisfies a target indoor temperature according to the indoor temperature change and using the control parameter combination that satisfies the target indoor temperature as the control parameter combination of the air conditioner that satisfies the temperature model.

**[0111]** Specifically, the parameter prediction model may include a temperature model. The temperature model is characterized as predicting the future indoor temperature change in the room where the air conditioner is located. The air conditioner determines the control parameter combination composed of each parameter value of each predicted control parameter through the temperature model, and predicts the indoor temperature change corresponding to the control parameter combination, and determines the control parameter combination that satisfies the target indoor temperature according to the indoor temperature change, and uses it as the control parameter combination of the air conditioner that satisfies the temperature model.

**[0112]** Exemplarily, when the controllable operating parameters include the indoor fan speed, the outdoor fan speed and the compressor operating frequency, when the speed value of the indoor fan speed is 750 rpm, the speed value of the outdoor fan speed is 800 rpm, and the frequency value of the compressor operating frequency is 50 Hz, when the air conditioner is operated according to the parameter combination of (750 rpm, 800 rpm, 50 Hz), the predicted indoor temperature change of the air conditioner is ΔT1. When the speed value of the internal fan speed is 800 rpm, the speed value of the external fan speed is 900 rpm, and the frequency value of the compressor operating frequency is 40 Hz, when the air conditioner is operated according to the parameter combination of (800 rpm, 900 rpm, 40 Hz), the predicted indoor temperature change of the air conditioner is ΔT2. Similarly, since each parameter combination and the pre-established mapping relationship between each parameter combination and the indoor temperature change are also determined, when the air conditioner is operated according to the parameter combination, the indoor temperature change corresponding to the parameter combination can be determined through the above mapping relationship, that is, the indoor temperature change corresponding to the operation of the air conditioner according to the parameter values of the controllable operating parameters and the parameter values of the uncontrollable operating parameters can be determined. When it is determined that the temperature change corresponding to the target indoor temperature is ΔT2, the parameter combination (800 rpm, 900 rpm, 40 Hz) corresponding to ΔT2 is used as the prediction parameter combination.

**[0113]** In an embodiment, the method for predicting the indoor temperature change corresponding to the control parameter combination can be: recording a controllable operating parameter and an uncontrollable operating parameter in each operating cycle of the air conditioner, and a historical indoor temperature change after each operating cycle of the air conditioner; performing training according to recorded historical operating data of the air conditioner to generate a first mapping relationship between the controllable operating parameters, the uncontrollable operating parameters, and the historical indoor temperature change to predict the indoor temperature change based on the first mapping relationship.

**[0114]** For example, in an embodiment, the temperature model can predict the indoor temperature change ΔTin=Tin(N+1)−Tin(N) between the next cycle and the current cycle under various characteristic conditions. The temperature change expectation model training process mainly includes the following parts:

**[0115]** a. collecting the operation data of the air conditioner at every preset cycle T (e.g., 30 seconds). The operation data of the air conditioner includes: parameter values corresponding to controllable operation parameters and parameter values corresponding to uncontrollable operation parameters. The uncontrollable operation parameters include operation state parameters and user-set parameters. Specifically, the operation state parameters include environmental state parameters and air conditioner operation state parameters. For example, the environmental state parameters include indoor temperature Tin, outdoor temperature Tout, indoor humidity Hin, and outdoor humidity Hout, etc. The air conditioner operation state parameters include exhaust valve temperature Tp, etc. The user-set parameters are parameters actively set by the user, and the user-set parameters include: set temperature Ts, set wind speed Ws, etc.

**[0116]** For example, the air conditioner operates for a total of 30 minutes, including 60 cycles (30 seconds per cycle); and the operating state parameters, user-set parameters and controllable operating parameters of each cycle are collected, such as: in the 5th cycle, Tin=27.6, Tout=34.3, Hin=62, Hout=65, Tp=45, Ts=24, Ws=60.

**[0117]** b. for cycle i, extracting the characteristics of the cycle.

**[0118]** The operating state parameters, user-set parameters and controllable operating parameters of cycle i are used as the characteristics of cycle i. In addition, the statistical variables of cycles 1 to i need to be introduced as the characteristics of cycle i. Cycle 1 represents the first T after power-on, and cycle i represents the i-th T after power-on.

**[0119]** For example, for the 5th cycle (i.e., 120-150 seconds after power-on), Tin=27.6, Tout=34.3, Hin=62, Hout=65, Tp=45, Ts=24, and Ws=60 are used as the characteristics of cycle 5; within cycles 1-5, statistics such as avg(Tin)=28.3 and max(Pr)=46 are also used as the characteristics of cycle 5.

**[0120]** c. taking the characteristics of cycle i as the independent variable and the indoor temperature change ΔTin between cycle i+1 and cycle i as the dependent variable to train the temperature change expectation model. Each cycle, as a training data, includes independent variables and dependent variables. The independent variables are all the characteristics of the cycle. The dependent variable is the indoor temperature change ΔTin=Tin(N+1)−Tin(N) between the next cycle and the cycle.

**[0121]** For example, for the 5th cycle (i.e., 120-150 seconds after power-on), Tin5=27.6, Tout5=34.3, Hin5=62, Hout5=65, Tp5=45, Ts5=24, Ws5=60, avg(Tin5)=28.3, max(Pr5)=46 are used as the independent variables of cycle 5, and Tin6−Tin5 are used as the dependent variables of cycle 5. The temperature model (i.e., the first mapping relationship between controllable operating parameters, uncontrollable operating parameters and historical indoor temperature changes) is trained using machine learning/deep learning algorithms:

$$y_i(\Delta T\mathrm{in}_i)=f_i(T\mathrm{in},T\mathrm{out},H\mathrm{in},H\mathrm{out},Tp\ \ldots)$$

**[0122]** Similarly, as shown in FIG. **4**, the step S**11** includes:

**[0123]** step S**112**, determining a control parameter combination formed by each parameter value of each predicted control parameter of the air conditioner based on the wind speed model, and predicting a target speed corresponding to the control parameter combination; determining a control parameter combination that satisfies the target speed and using the control parameter combination that satisfies the target speed as the control parameter combination of the air conditioner that satisfies the wind speed model.

**[0124]** Specifically, the parameter prediction model may include the wind speed model. The wind speed model is characterized as predicting the air outlet wind speed of the air conditioner that the user hopes to achieve.

**[0125]** Exemplarily, when the controllable operating parameters include the internal fan speed and the compressor operating frequency, when the speed value of the internal fan speed is 750 rpm and the frequency value of the compressor operating frequency is 50 Hz, when the air conditioner is operated according to the parameter combination of (750 rpm, 50 Hz), the predicted air outlet wind speed of the air conditioner is V1. When the speed value of the internal fan speed is 800 rpm and the frequency value of the compressor operating frequency is 40 Hz, when the air conditioner is operated according to the parameter combination of (800 rpm, 40 Hz), the predicted air outlet wind speed of the air conditioner is V2. Similarly, each parameter combination, and the pre-established mapping relationship between each parameter combination and the air outlet wind speed are also determined. Therefore, when the air conditioner is operated according to the parameter combination, the air outlet wind speed corresponding to the parameter combination can be determined through the above mapping relationship, that is, the corresponding air outlet wind speed when the air conditioner is operated according to the parameter values of the controllable operating parameters and the parameter values of the uncontrollable operating parameters is determined. When it is determined that the air outlet speed corresponding to the target indoor temperature is V2, the parameter combination corresponding to V2 (800 rpm, 40 Hz) is used as the prediction parameter combination.

**[0126]** In an embodiment, a method for predicting the target speed corresponding to the control parameter combination may be: recording the controllable operating parameter and the uncontrollable operating parameter in each operating cycle of the air conditioner, and a historical internal fan speed after each operating cycle of the air conditioner; performing training according to the recorded historical operating data of the air conditioner to generate a second mapping relationship between the controllable operating parameters, the uncontrollable operating parameters, and the historical internal fan speed to predict the target speed of the internal fan based on the second mapping relationship.

**[0127]** For the specific determination process, please refer to the above-mentioned temperature model determination embodiment. The difference is that the predicted parameter is changed from the indoor temperature change to the internal fan speed of the air conditioner, which will not be repeated here.

**[0128]** Similarly, as shown in FIG. **4**, the step S**11** includes:

**[0129]** step S**113**, determining a control parameter combination formed by each parameter value of each predicted control parameter of the air conditioner based on the heating and cooling rate model, and predicting a temperature change rate corresponding to the control parameter combination; determining a control parameter combination that satisfies the temperature change rate and using the control parameter combination that satisfies the temperature change rate as the control parameter combination of the air conditioner that satisfies the heating and cooling rate model.

**[0130]** Specifically, the parameter prediction model may include a heating and cooling rate model. The heating and cooling rate model is characterized as predicting the heating speed/cooling speed of the air conditioner desired by the user.

**[0131]** Exemplarily, when the controllable operating parameters include the internal fan speed and the compressor operating frequency, when the speed value of the internal fan speed is 750 rpm and the frequency value of the compressor operating frequency is 50 Hz, when the air conditioner is operated according to the parameter combination of (750 rpm, 50 Hz), the predicted heating rate/cooling rate of the air conditioner is ΔV1. When the speed value of the internal fan speed is 800 rpm and the frequency value of the compressor operating frequency is 40 Hz, when the air conditioner is operated according to the parameter combination of (800 rpm, 40 Hz), the predicted air outlet speed of the air conditioner is ΔV2. Similarly, each parameter combination, and the pre-established mapping relationship between each parameter combination and the heating rate/cooling rate are also determined. Therefore, when the air conditioner is operated according to the parameter combination, the heating rate/cooling rate corresponding to the parameter combination can be determined through the above mapping relationship, that is, the corresponding heating rate/cooling rate when the air conditioner is operated according to the parameter values of the controllable operating parameters and the parameter values of the uncontrollable operating parameters is determined. When it is determined that the heating rate/cooling rate corresponding to the target indoor temperature is ΔV2, the parameter combination corresponding to ΔV2 (800 rpm, 40 Hz) is used as the prediction parameter combination.

**[0132]** In an embodiment, predicting the temperature change rate corresponding to the control parameter combination can be: recording the controllable operating parameters and uncontrollable operating parameters in each operating cycle of the air conditioner, and a historical compressor frequency and the historical internal fan speed after each operating cycle of the air conditioner; performing training according to the recorded historical operating data of the air conditioner to generate a third mapping relationship between the controllable operating parameters, the uncontrollable operating parameters, the historical compressor frequency, and the historical internal fan speed to predict the temperature change rate based on the third mapping relationship.

**[0133]** For the specific determination process, please refer to the above-mentioned temperature model determination embodiment. The difference is that the predicted parameters are changed from the indoor temperature change to the internal fan speed and compressor frequency of the air conditioner, which will not be repeated here.

**[0134]** In an embodiment, a parameter prediction model is used to predict multiple predicted control parameter combinations that will be executed by the air conditioner in the future, which provides a prerequisite for how to select one of the predicted control parameter combinations as the target control parameter combination in an embodiment. On the basis of one embodiment and combined with the technical solution in this embodiment, the effect of avoiding the air conditioner from experiencing warm air oscillation due to excessive differences in control parameter combination values between adjacent cycles when the air conditioner is executed according to the predicted control parameter combination is achieved.

**[0135]** As shown in FIG. **5**, in an embodiment, before step S**10**, the method further includes:

- **[0136]** step S**40**, obtaining current environmental state parameters collected by the air conditioner in a current cycle and obtaining historical environmental state parameters determined by a plurality of historical cycles of the air conditioner;
- **[0137]** step S**50**, determining environmental state optimization parameters of the current cycle of the air conditioner based on the historical environmental state parameters and the current environmental state parameters to determine a plurality of predicted control parameter combinations according to the operating state parameters of the current cycle and the environmental state optimization parameters.

**[0138]** In an embodiment, in order to avoid temperature oscillation of the air conditioner, the input side in the main control logic module of the air conditioner may be smoothed, and the parameters of the input side include environmental state parameters and operating state parameters.

**[0139]** In an embodiment, the environmental state parameters may include: indoor temperature, outdoor temperature, indoor humidity, outdoor humidity, and PM2.5. The operating state parameters may include: compressor operating frequency, operating power, operating current, and operating voltage.

**[0140]** In an embodiment, optimization is performed based on the collected environmental state parameters, and the environmental state optimization parameters of the current cycle of the air conditioner are determined according to the current environmental state parameters collected in the current cycle of the air conditioner and the historical environmental state parameters determined in multiple historical cycles, so as to determine multiple prediction control parameter combinations according to the operating state parameters of the current cycle and the environmental state optimization parameters.

**[0141]** In an embodiment, the current environment state parameter and the historical environment state parameter may be averaged.

**[0142]** Exemplarily, the environmental state parameters include indoor temperature T1 and outdoor temperature T4, the current environmental state parameter C0_x of the current cycle collected is (T1=26° C., T4=35.8° C.), and then the historical environmental state parameters C1, C2, and C3 determined in three historical cycles are obtained:

$$C1 = (T1 = 27.0^\circ\text{ C.}, T4 = 36.0^\circ\text{ C.});$$

$$C2 = (T1 = 26.5^\circ\text{ C.}, T4 = 36.0^\circ\text{ C.});$$

$$C3 = (T1 = 26.2^\circ\text{ C.}, T4 = 35.8^\circ\text{ C.}).$$

**[0143]** The average T1 value of the above 4 combinations is calculated=27.0+26.5+26.2+26.0)/4=26.4, and the average T4 value=26.0+36.0+35.8+35.8)/4=35.9.

**[0144]** Therefore, the optimized environmental state optimization parameter C0_y=(T1=26.3, T4=35.9) is obtained. C0_y is used as the input side data of the main control logic of the air conditioner, so that the main control logic of the air conditioner outputs the predicted control parameter combination.

**[0145]** In an embodiment, by optimizing the parameters at the input side of the main control logic of the air conditioner, on the one hand, oscillation of the output prediction control parameter combination due to errors in the air conditioner's sensors is avoided; on the other hand, when the temperature of the environment in which the air conditioner is located changes suddenly, the predicted control parameter combination output by the air conditioner is greatly different from the control parameter combination between the air conditioners, which causes the occurrence of temperature and wind shock.

**[0146]** As shown in FIG. **6**, in an embodiment, the method for controlling an air conditioner further includes:

- **[0147]** step S**101**, obtaining historical control parameter combinations executed in a plurality of historical cycles of the air conditioner and obtaining a predicted control parameter combination with the greatest similarity to the historical control parameter combination from a previous cycle;
- **[0148]** step S**102**, determining the target control parameter combination according to the plurality of historical control parameter combinations and the predicted control parameter combination with the greatest similarity;
- **[0149]** step S**103**, controlling the air conditioner to operate according to the target control parameter combination.

**[0150]** In an embodiment, in order to avoid the occurrence of warm air oscillation, the predicted control parameter combination with the greatest similarity determined can be further optimized and smoothed with the historical control parameter combination executed in the historical cycles of multiple air conditioners, and the optimized and smoothed control parameter combination can be used as the target control parameter combination to enable the air conditioner to operate according to the target control parameter combination.

**[0151]** In an embodiment, the optimization smoothing method may be to average the prediction control parameter combination with the greatest similarity (hereinafter referred to as the most similar prediction control parameter combination) and the historical control parameter combinations of multiple historical cycles.

**[0152]** Exemplarily, the predicted control parameter combination includes the compressor frequency P and the internal fan speed W. Assuming that the most likely predicted control parameter combination is C0_x=(P0=60, W0=60), three historical control parameter combinations C1, C2, and C3 are obtained:

$$C1 = (P1 = 65, W1 = 65);$$

$$C2 = (P2 = 67, W2 = 70);$$

$$C3 = (P3 = 70, W3 = 75);$$

- **[0153]** the average compressor frequency of the above 4 combinations are calculated, P=(60+65+67+70)/4=66, W=(60+65+70+75)/4=68.

**[0154]** Therefore, the optimized target control parameter combination C0_y=(P=66, W=68) is obtained, and the air conditioner is controlled to operate at a compressor frequency of 66 Hz and an internal fan speed of 68 rpm.

**[0155]** In an embodiment, the predicted control parameter combination with the greatest similarity is further optimized and smoothed with the historical control parameter combination executed in the historical cycles of multiple air conditioners, and the optimized and smoothed control parameter combination is used as the target control parameter combination, so that the air conditioner operates according to the target control parameter combination, thereby achieving the effect of avoiding the occurrence of warm air oscillation.

**[0156]** The present application also performs smoothing between at least one predicted control parameter determined and historical control parameters executed in multiple historical cycles of the air conditioners, and then uses the smoothed control parameters as target control parameters so that the air conditioner operates according to the target control parameters, thereby achieving the effect of avoiding the occurrence of warm air oscillation.

**[0157]** In an embodiment, the air conditioner includes: a memory **1005**, a processor **1001**, and a program for controlling the air conditioner stored in the memory and executable on the processor.

**[0158]** When the processor **1001** calls the program for controlling the air conditioner stored in the memory **1005**, the following operations are performed:

- **[0159]** obtaining a control scheme predicted by the air conditioner in a current cycle and historical control parameters executed by the air conditioner in historical cycles, the control scheme includes at least one predicted control parameter;
- **[0160]** determining a target control parameter of the air conditioner according to the historical control parameter and the predicted control parameter, the target control parameter is obtained by smoothing the predicted control parameter according to the historical control parameter; and
- **[0161]** controlling the air conditioner to operate according to the target control parameter.

**[0162]** When the processor **1001** calls the program for controlling the air conditioner stored in the memory **1005**, the following operations are performed:

- **[0163]** determining, based on a preset smoothing strategy, a target control parameter of the air conditioner according to the historical control parameters and the predicted control parameters of one or more historical cycles.

**[0164]** When the processor **1001** calls the program for controlling the air conditioner stored in the memory **1005**, the following operations are performed:

- **[0165]** calculating an average value of one or more historical control parameters and each predicted control parameter as the target control parameter corresponding to the each predicted control parameter.

**[0166]** When the processor **1001** calls the program for controlling the air conditioner stored in the memory **1005**, the following operations are performed:

- **[0167]** obtaining a parameter value corresponding to the predicted control parameter in the historical control parameters;
- **[0168]** determining a weight value of the obtained parameter value; and performing a weighted calculation on the obtained parameter value according to the determined weight value to obtain the target control parameter of the air conditioner.

**[0169]** When the processor **1001** calls the program for controlling the air conditioner stored in the memory **1005**, the following operations are performed:

- **[0170]** determining a control parameter combination of the air conditioner that satisfies a preset parameter prediction model, the control parameter combination includes at least two control parameters;
- **[0171]** in response to that at least two control parameter combinations are determined, determining a control parameter combination that satisfies a preset combination selection strategy in the control parameter combinations as the control scheme.

**[0172]** When the processor **1001** calls the program for controlling the air conditioner stored in the memory **1005**, the following operations are performed:

- **[0173]** determining, based on the temperature model, a control scheme formed by each parameter value of the predicted control parameter of the air conditioner, and predicting an indoor temperature change corresponding to the control parameter combination; determining a control parameter combination that satisfies the target indoor temperature according to the indoor temperature change and using the control parameter combination that satisfies the target indoor temperature as the control parameter combination; or
- **[0174]** determining, based on the wind speed model, a control parameter combination formed by each parameter value of the predicted control parameter of the air conditioner and predicting a target speed corresponding to the control parameter combination; determining a control parameter combination that satisfies the target speed and using the control parameter combination that satisfies the target speed as the control parameter combination; or
- **[0175]** determining, based on the heating and cooling rate model, a control parameter combination formed by each parameter value of the predicted control parameter of the air conditioner and predicting a temperature change rate corresponding to the control parameter combination; determining a control parameter combination that satisfies the temperature change rate and using the control parameter combination that satisfies the temperature change rate as the control parameter combination.

**[0176]** When the processor **1001** calls the program for controlling the air conditioner stored in the memory **1005**, the following operations are performed:

- **[0177]** calculating an energy efficiency ratio corresponding to the control parameter combination and determining the control parameter combination corresponding to a highest energy efficiency ratio as the control scheme; or
- **[0178]** obtaining a comfort value corresponding to an operation of the air conditioner according to each control parameter combination, and determining the control parameter combination whose comfort value is closest to a preset comfort value as the control scheme; or
- **[0179]** obtaining a health value corresponding to the operation of the air conditioner according to each control parameter combination, and determining the

control parameter combination whose health value is closest to a preset health value as the control scheme.

**[0180]** When the processor **1001** calls the program for controlling the air conditioner stored in the memory **1005**, the following operations are performed:

**[0181]** obtaining current environmental state parameters collected in a current cycle of the air conditioner and obtaining historical environmental state parameters determined in a plurality of historical cycles of the air conditioner; and

**[0182]** determining environmental state optimization parameters corresponding to the environmental state parameters of the air conditioner based on the historical environmental state parameters and the current environmental state parameters to determine the control scheme according to the operating state parameters of the current cycle and the environmental state optimization parameters.

**[0183]** Based on the hardware architecture of the air conditioner based on the above-mentioned air conditioner control technology, another embodiment of the method for controlling the air conditioner of the present application is provided.

**[0184]** As shown in FIG. **7**, in an embodiment, the method for controlling the air conditioner includes the following steps:

**[0185]** step S**210**, obtaining a control scheme predicted by the air conditioner in a current cycle and historical control parameters executed by the air conditioner in historical cycles, the control scheme includes at least one predicted control parameter.

**[0186]** In an embodiment, a control scheme output by a main control logic module in an air conditioner in a current cycle is first obtained, and the control scheme includes at least one predicted control parameter. The predicted control parameter is characterized as an optimal predicted control parameter selected based on a preset selection strategy from the controllable operating parameters predicted by multiple air conditioners in the next cycle. The historical control parameter is characterized as the controllable operating parameter executed by the air conditioner in the previous cycle.

**[0187]** Controllable operating parameters are characterized as the controllable operating parameters of the air conditioner itself, such as the internal fan speed, external fan speed, and compressor frequency, etc. In addition, relatively speaking, uncontrollable operating parameters are characterized as the parameters that the air conditioner itself cannot control, such as indoor and outdoor temperature, indoor and outdoor humidity, exhaust valve temperature, and other environmental parameters that affect the operation of the air conditioner but cannot be set, or user-set parameters such as target temperature and set target wind speed.

**[0188]** It should be noted that the predicted control parameter is not the control parameter of the air conditioner currently operating, but the control parameter that the air conditioner will operate in the next cycle, the next cycle can be understood as the end of the current cycle or the beginning of the next cycle.

**[0189]** Step S**220**, determining a target control parameter of the air conditioner according to the historical control parameter and the predicted control parameter, the target control parameter is obtained by smoothing the predicted control parameter according to the historical control parameter.

**[0190]** In an embodiment, after obtaining at least one predicted control parameter and multiple historical control parameters, in order to avoid the determined predicted control parameters having too large a change compared to the historical control parameters during the operation of the air conditioner, which may cause warm air oscillation in the air conditioner, this embodiment smoothes the determined predicted control parameters and the historical control parameters executed in multiple historical cycles of the air conditioners, and then uses the smoothed control parameters as the target control parameters.

**[0191]** In an embodiment, the smoothing method of the target control parameter can be based on a preset smoothing strategy, according to the historical control parameters and the predicted control parameters of multiple historical cycles, to determine the parameter optimization value corresponding to each of the predicted control parameters in the current cycle as the target control parameter of the air conditioner.

**[0192]** Specifically, the smoothing strategy may be arithmetic average optimization, which averages the prediction control function and historical control parameters of multiple historical cycles, and uses the average value as the parameter optimization value corresponding to each prediction control parameter.

**[0193]** Exemplarily, in an embodiment, the predicted control parameters include the compressor frequency P and the internal fan speed W. The above arithmetic mean optimization process is the same as the parameter averaging process in the optimization smoothing method of one embodiment, and will not be repeated here.

**[0194]** Therefore, the parameter optimization value C0_y=(P=66, W=68) can be obtained, and the air conditioner is controlled to operate at a compressor frequency of 66 Hz and an internal fan speed of 68 rpm.

**[0195]** Specifically, the smoothing strategy can be weighted average optimization, which obtains the parameter value corresponding to the predicted control parameter in the historical control data, then determines the weight value of the obtained parameter value, and performs weighted calculation on the obtained parameter value based on the determined weight value, so as to obtain the parameter optimization value corresponding to the predicted control parameter.

**[0196]** Exemplarily, in an embodiment, the predicted control parameters include the compressor frequency P and the internal fan speed W. Assuming that the predicted control parameters are C0_x=(P0=60, W0=60), the historical control parameters C1, C2, and C3 of three cycles are obtained:

$$C1 = (P1 = 65,\ W1 = 65);$$

$$C2 = (P2 = 67,\ W2 = 70);$$

$$C3 = (P3 = 70,\ W3 = 75).$$

**[0197]** The weight value corresponding to the C1 cycle is 0.3, the weight value corresponding to the C2 cycle is 0.2, the weight value corresponding to the C3 cycle is 0.1, and the weight value corresponding to the current cycle is 0.4.

**[0198]** The compressor frequencies of the above four combinations are weightedly calculated, and the obtained compressor frequency optimization value Py=70*0.1+67*0.2+65*0.3+60*0.4=64, and the obtained internal fan speed optimization value Wy=75*0.1+70*0.2+65*0.3+60*0.4=65.

**[0199]** Therefore, the parameter optimization value C0_y=(P=64, W=65) is obtained, and the air conditioner is controlled to operate at a compressor frequency of 64 Hz and an internal fan speed of 65 rpm.

**[0200]** Step S**230**, controlling the air conditioner to operate according to the target control parameter.

**[0201]** In an embodiment, after the target control parameter is determined, the air conditioner is controlled to operate according to the target control parameter.

**[0202]** In an embodiment, at least one acquired predicted control parameter is smoothed with historical control parameters in multiple cycles, and the smoothed control parameter is used as the target control parameter, thereby avoiding the phenomenon of warm air oscillation in the air conditioner due to excessive difference in control parameter values between adjacent cycles when the air conditioner is executed according to the predicted control parameter.

**[0203]** As shown in FIG. **8**, in an embodiment, the step of obtaining at least one prediction control parameter of the current cycle prediction of the air conditioner includes the following steps:

- **[0204]** step S**211**, determining a control parameter combination of the air conditioner that satisfies a preset parameter prediction model, the control parameter combination includes at least two control parameters;
- **[0205]** step S**212**: in response to that at least two control parameter combinations are determined, determining a control parameter combination that satisfies a preset combination selection strategy in the control parameter combinations as the control scheme.

**[0206]** In an embodiment, the control scheme can be determined by determining a control parameter combination of the air conditioner through a parameter prediction model, each control parameter combination includes at least two control parameters. Furthermore, when at least two control parameter combinations that satisfy the parameter prediction model are determined, a control parameter combination that satisfies the strategy is selected through a combination selection strategy as the control scheme.

**[0207]** Specifically, the parameter prediction model may include a temperature model, a wind speed model, and a heating and cooling rate model, which have been described in detail in an embodiment and will not be repeated here.

**[0208]** Furthermore, the combined selection strategy can be an energy-saving strategy, a comfort strategy, and a health strategy.

**[0209]** Specifically, the energy-saving strategy is characterized as selecting a combination with the highest energy efficiency ratio among various control parameter combinations as a control scheme.

**[0210]** Specifically, the comfort strategy is characterized as selecting a control parameter combination whose comfort value corresponding to each control parameter combination is closest to a preset comfort value as a control scheme.

**[0211]** For example, in an embodiment, in order to ensure the comfort level of a human body when the air conditioner is operating, the target operating parameter combination can be determined by a comfort value, which is a quantitative value representing the comfort level of a human body in an environment under the air conditioner. The preset comfort value can be the theoretically most comfortable value of the temperature, relative humidity, and wind speed in the environment for a human body.

**[0212]** In an embodiment, the comfort value determination parameters may be determined by temperature, relative humidity and/or the air outlet speed of the air conditioner.

**[0213]** Exemplarily, the predicted control parameters include the internal fan speed, the external fan speed and the compressor frequency. The temperature T0 when the human body is in a relatively comfortable state is set to 24° C., the relative humidity RH0 is set to 30%, and the air outlet speed V0 is set to 0.2 m/S. Under the aforementioned temperature T0, relative humidity RH0 and air outlet speed V0, the preset comfort value is 0, that is, the optimal comfort value. If the comfort value determined in the subsequent parameter combination is greater than 0, it means that under this parameter combination, the user will feel hotter, and if it is less than 0, it means that under this parameter combination, the user will feel colder.

**[0214]** Then, the parameter combination of the air conditioner at the preset comfort value is used as the reference parameter combination at the optimal comfort value, and the following are obtained: the internal fan speed Sin0=1000, the external fan speed Sout0=800, and the compressor frequency Pr0=35.

**[0215]** Next, based on the aforementioned parameter prediction model, multiple parameter combinations are obtained:

$$H1 = [\mathrm{Sin}\ 1 = 1100, Sout\ 1 = 770, Pr1 = 40];$$

$$H2 = [\mathrm{Sin}\ 2 = 900, Sout\ 2 = 7300, Pr2 = 30];$$

$$H3 = [\mathrm{Sin}\ 3 = 1300, Sout\ 2 = 760, Pr2 = 40].$$

**[0216]** The corresponding comfort values of the three are −1, 2, and −1.5 respectively, so H1, which is closest to the preset comfort value of 0, is selected as the control scheme.

**[0217]** Specifically, the health strategy is characterized as selecting the control parameter combination closest to the preset comfort value and determining it as the control scheme. Since the air-conditioned room is tightly sealed and the indoor and outdoor air cannot be exchanged, harmful microorganisms such as bacteria and viruses in the indoor air are easy to breed and multiply, which can easily cause low air quality. Therefore, this embodiment further provides a method for determining the most suitable target parameter combination from multiple parameter combinations based on the health value. The health value is characterized as a quantitative value of the degree of health impact on the human body caused by being under the air conditioner for a long time.

**[0218]** In an embodiment, the preset health value may be determined by the indoor and outdoor temperature difference and the relative humidity.

**[0219]** Exemplarily, the indoor and outdoor temperature difference ΔT=5° C. when the human body is in a state with a relatively small impact on health is set. The relative humidity RH=40%, and based on the preset mapping relationship, the preset health value determined is 100.

**[0220]** Among the determined parameter combinations H4, H5, and H6, the corresponding health values are 73, 85, and 92, respectively, so H6 is selected as the control scheme.

**[0221]** In an embodiment, a parameter prediction model is used to predict the control parameter combination to be executed by the air conditioner in the future, and when there are multiple control parameter combinations, a parameter combination that satisfies the selection strategy is selected as a control scheme based on the combination selection strategy. This provides a prerequisite for how to select one of the predicted control parameters as the target control parameter in an embodiment. On the basis of one embodiment and in combination with the technical solution in this embodiment, the effect of avoiding the phenomenon of warm air oscillation in the air conditioner due to the large difference in the control parameter values between adjacent cycles when the air conditioner is executed according to the predicted control parameters is achieved.

**[0222]** As shown in FIG. **9**, in an embodiment, before step S**210**, the steps include:

**[0223]** s**240**, obtaining current environmental state parameters collected in a current cycle of the air conditioner and obtaining historical environmental state parameters determined in a plurality of historical cycles of the air conditioner;

**[0224]** s**250**, determining environmental state optimization parameters corresponding to the environmental state parameters of the air conditioner based on the historical environmental state parameters and the current environmental state parameters to determine the control scheme according to the operating state parameters of the current cycle and the environmental state optimization parameters.

**[0225]** In an embodiment, the optimization is performed based on the collected environmental state parameters, and the optimization process is the same as in the above embodiment, which will not be repeated here, so the optimized environmental state optimization parameter C0_y=(T1=26.3, T4=35.9) can also be obtained. C0_y is used as the input side data of the main control logic of the air conditioner, so that the main control logic of the air conditioner outputs the predicted control parameter.

**[0226]** The present application optimizes the environmental state parameters on the input side of the main control logic of the air conditioner. On the one hand, it avoids oscillation of the output control parameter combination due to errors in the air conditioner's sensors. On the other hand, it also avoids the occurrence of temperature and wind shock caused by a large difference between the control parameter combination output by the air conditioner and the control parameters between the air conditioners when the temperature of the environment in which the air conditioner is located changes suddenly.

**[0227]** In an embodiment, the air conditioner includes: a memory **1005**, at least one processor **1001**, and a program for controlling the air conditioner stored in the memory and executable on the processor.

**[0228]** When the processor **1001** calls the program for controlling the air conditioner stored in the memory **1005**, the following operations are performed:

**[0229]** obtaining current environmental state parameters collected by the air conditioner in a current cycle and obtaining historical environmental state parameters determined in a plurality of historical cycles of the air conditioner;

**[0230]** determining environmental state optimization parameters of the current cycle of the air conditioner according to the historical environmental state parameters and the current environmental state parameters; and

**[0231]** controlling the air conditioner to operate according to the environmental state optimization parameters.

**[0232]** When the processor **1001** calls the program for controlling the air conditioner stored in the memory **1005**, the following operations are performed:

**[0233]** determining an optimized value of the environmental parameter corresponding to the air conditioner in the current cycle as the environmental state optimization parameter based on a preset environmental parameter optimization strategy according to the historical environmental state parameters of the plurality of historical cycles and the current environmental state parameters.

**[0234]** When the processor **1001** calls the program for controlling the air conditioner stored in the memory **1005**, the following operations are performed:

**[0235]** calculating an average value of the historical environmental state parameters and the current environmental state parameters as the environmental parameter optimization value corresponding to the air conditioner in the current cycle.

**[0236]** When the processor **1001** calls the program for controlling the air conditioner stored in the memory **1005**, the following operations are performed:

**[0237]** obtaining a parameter value corresponding to the environmental state parameter in the historical environmental state parameters;

**[0238]** determining weight values of the obtained parameter values; and performing a weighted average calculation on the obtained parameter values according to the determined weight values to obtain the environmental parameter optimization value corresponding to the air conditioner in the current cycle

**[0239]** When the processor **1001** calls the program for controlling the air conditioner stored in the memory **1005**, the following operations are performed:

**[0240]** obtaining operating state parameters of the air conditioner in the current cycle;

**[0241]** determining a control parameter combination of the air conditioner that satisfies a preset parameter prediction model according to the operating state parameters of the current cycle and the environmental state optimization parameter, the control parameter combination includes at least two control parameters;

**[0242]** in response to that more than two control parameter combinations are determined, determining a target control parameter combination that satisfies a preset parameter combination selection strategy in each of the control parameter combinations; and

**[0243]** controlling the air conditioner to operate according to the control parameter value corresponding to the target control parameter combination.

**[0244]** When the processor **1001** calls the program for controlling the air conditioner stored in the memory **1005**, the following operations are performed:

[0245] inputting the operating state parameters of the current cycle and the environmental state optimization parameters into the power model, and predicting an operating energy efficiency and/or an output capability corresponding to each control parameter combination of the operating state parameters of a next cycle of the air conditioner; determining the control parameter combination that satisfies a target operating energy efficiency and/or a target output capability according to the operating energy efficiency and/or the output capability; or

[0246] inputting the operating state parameters of the current cycle and the environmental state optimization parameters into the capacity energy efficiency model, and predicting the operating energy efficiency and/or the output capacity corresponding to each control parameter combination of the operating state parameters of the next cycle of the air conditioner; and determining the control parameter combination that satisfies the target operating energy efficiency and/or the target output capacity according to the operating energy efficiency and/or the output capacity; or

[0247] inputting the operating state parameters of the current cycle and the environmental state optimization parameters into the temperature model, and predicting an indoor temperature change corresponding to each of the control parameter combination of the operating state parameters of the next cycle of the air conditioner; and determining the control parameter combination that satisfies the target indoor temperature according to the indoor temperature change.

[0248] When the processor **1001** calls the program for controlling the air conditioner stored in the memory **1005**, the following operations are performed:

[0249] calculating energy efficiency ratios corresponding to each of the control parameter combinations and determining the control parameter combination corresponding to a highest energy efficiency ratio as the target control parameter combination; or

[0250] obtaining a comfort value corresponding to an operation of the air conditioner according to each of the control parameter combinations, and determining the control parameter combination with the comfort value closest to a preset comfort value as the target control parameter combination; or

[0251] obtaining a health value corresponding to an operation of the air conditioner according to each of the control parameter combinations, and determining the control parameter combination with the health value closest to a preset health value as the target control parameter combination; or

[0252] calculating a similarity between each of the control parameter combinations and the historical control parameters of the air conditioner in the previous cycle, and determining the control parameter combination with a largest similarity as the target control parameter combination.

[0253] When the processor **1001** calls the program for controlling the air conditioner stored in the memory **1005**, the following operations are performed:

[0254] obtaining the operating state parameters of the air conditioner in the current cycle;

[0255] determining the control parameter combination of the air conditioner that satisfies a preset parameter prediction model according to an operating state parameter of the current cycle and the environmental state optimization parameter, the control parameter combination includes at least two control parameters; and

[0256] determining a target control parameter combination of the air conditioner according to the control parameter combination determined in the current cycle and a historical control parameter combination of the air conditioner in a plurality of historical cycles; and controlling the air conditioner to operate according to the control parameters in the target control parameter combination.

[0257] Based on the hardware architecture of the air conditioner based on the above-mentioned air conditioner control technology, an embodiment of the method for controlling an air conditioner of the present application is provided.

[0258] As shown in FIG. **10**, in an embodiment, the method for controlling an air conditioner includes the following steps:

[0259] step S**310**, obtaining current environmental state parameters collected by the air conditioner in a current cycle and obtaining historical environmental state parameters determined in a plurality of historical cycles of the air conditioner.

[0260] In an embodiment, optimization is performed based on collected environmental state parameters.

[0261] Step S**320**, determining environmental state optimization parameters of the current cycle of the air conditioner according to the historical environmental state parameters and the current environmental state parameters.

[0262] In an embodiment, the process of determining the environmental state optimization parameters of the current cycle of the air conditioner is the same as in the first embodiment, and will not be repeated here.

[0263] In an embodiment, a weighted average optimization can be performed between the current environmental state parameters and the historical environmental state parameters, and the parameter values corresponding to the environmental state parameters in the historical environmental state parameters are obtained, and then the weight values of the obtained parameter values are determined. Based on the determined weight values, the obtained parameter values are weighted averaged to obtain the optimized values of the environmental parameters corresponding to the air conditioner in the current cycle.

[0264] Exemplarily, in an embodiment, the environmental state parameters include indoor temperature T1 and outdoor temperature T4. Assuming that the current environmental state parameters of the space where the air conditioner is located collected in the current cycle are C0_x=(T1=26° C., T4=35.8° C.), the historical control parameters C1, C2, and C3 of the three cycles are obtained:

$$C1 = (T1 = 27.0^\circ\text{C.},\ T4 = 36.0^\circ\text{C.});$$

$$C2 = (T1 = 26.5^\circ\text{C.},\ T4 = 36.0^\circ\text{C.});$$

$$C3 = (T1 = 26.2^\circ\text{C.},\ T4 = 35.8^\circ\text{C.}).$$

[0265] The weight value corresponding to the C1 cycle is 0.3, the weight value corresponding to the C2 cycle is 0.2, the weight value corresponding to the C3 cycle is 0.1, and the weight value corresponding to the current cycle is 0.4.

**[0266]** The above four combinations of indoor temperatures T1 are weightedly calculated, and the weighted average indoor temperature T1_y=27.0+26.5+26.2+26.0)/4=26.4 is obtained, and the weighted average outdoor temperature T4_y=36.0*0.1+36.0*0.2+35.8*0.3+35.8*0.4=35.9 is obtained.

**[0267]** Therefore, the environmental state optimization parameters C0_y=(T1=26.4, T4==35.9) are obtained.

**[0268]** Step S**330**, controlling the air conditioner to operate according to the environmental state optimization parameters.

**[0269]** In an embodiment, after the environmental state optimization parameters are determined, the environmental state optimization parameters are used as input side data of the main control logic of the air conditioner, so that the main control logic of the air conditioner outputs a control parameter combination.

**[0270]** Exemplarily, in an embodiment, the obtained environmental state optimization parameter is C0_y=(T1=26.4, T4==35.9), C0_y is input into the main control logic, and its corresponding parameter combination is obtained as (internal fan speed Sin0=1000, external fan speed Sout0=800, compressor frequency Pr0=35), then the air conditioner is controlled to operate according to the inner fan 1000 rpm, the outer fan 800 rpm, and the compressor frequency 35 Hz.

**[0271]** As shown in FIG. **11**, in an embodiment, the step S**330** includes:

**[0272]** step S**331**, obtaining operating state parameters of the air conditioner in the current cycle;

**[0273]** step S**332**, determining a control parameter combination of the air conditioner that satisfies a preset parameter prediction model according to the operating state parameters of the current cycle and the environmental state optimization parameter, the control parameter combination includes at least two control parameters;

**[0274]** step S**333**, in response to that more than two control parameter combinations are determined, determining a target control parameter combination that satisfies a preset parameter combination selection strategy in each of the control parameter combinations;

**[0275]** step S**334**, controlling the air conditioner to operate according to the control parameter value corresponding to the target control parameter combination.

**[0276]** In an embodiment, the determined environmental state optimization parameters and the operating state parameters of the air conditioner in the current cycle are input into the parameter prediction model to determine the control parameter combination of the air conditioner. Furthermore, when the determined control parameter combinations that satisfy the parameter prediction model are at least two, the control parameter combination that satisfies the strategy is selected through the combination selection strategy.

**[0277]** Specifically, the parameter prediction model may include an operating power model, which is characterized as a prediction based on the operating power of the air conditioner expected by the user. The air conditioner determines the control parameter combination composed of the parameter values of each control parameter combination through the operating power model, and predicts the operating power corresponding to the control parameter combination, and determines the control parameter combination that satisfies the target operating power based on the operating power, and uses it as the control parameter combination of the air conditioner that satisfies the operating power model.

**[0278]** Exemplarily, when the controllable operating parameters include the internal fan speed, the external fan speed and the compressor operating frequency, when the internal fan speed is 750 rpm, the external fan speed is 800 rpm, and the compressor operating frequency is 50 Hz, when the air conditioner operates according to the parameter combination of (750 rpm, 800 rpm, 50 Hz), the predicted operating power of the air conditioner is P1. When the speed value of the internal fan speed is 800 rpm, the speed value of the external fan speed is 900 rpm, and the frequency value of the compressor operating frequency is 40 Hz. When the air conditioner is operated according to the parameter combination of (800 rpm, 900 rpm, 40 Hz), the predicted operating power of the air conditioner is P2. Similarly, since each parameter combination and the pre-established mapping relationship between each parameter combination and the operating power are also determined, when the air conditioner is operated according to the parameter combination, the operating power corresponding to the parameter combination can be determined through the above mapping relationship, that is, the target operating power corresponding to the air conditioner when the air conditioner is operated according to the parameter values of the controllable operating parameters and the parameter values of the uncontrollable operating parameters is determined. When it is determined that the operating power corresponding to the target indoor temperature is P2, the parameter combination corresponding to P2 (800 rpm, 900 rpm, 40 Hz) is used as the target control parameter combination.

**[0279]** Specifically, the parameter prediction model may also include a capacity energy efficiency model, which is characterized as a prediction based on the operating energy efficiency and/or output capacity of the air conditioner expected by the user. The air conditioner inputs the operating state parameters of the current cycle and the environmental state optimization parameters into the capacity energy efficiency model to predict the operating energy efficiency and/or output capacity corresponding to each control parameter combination of the operating state parameters of the next cycle of the air conditioner; and determines the control parameter combination that satisfies the target operating energy efficiency and/or target output capacity based on the operating energy efficiency and/or the output capacity.

**[0280]** Exemplarily, take the operation energy efficiency as an example. When the controllable operation parameters include the internal fan speed, the external fan speed and the compressor operating frequency, when the speed value of the internal fan speed is 750 rpm, the speed value of the external fan speed is 800 rpm, and the frequency value of the compressor operating frequency is 50 Hz, when the air conditioner is operated according to the parameter combination of (750 rpm, 800 rpm, 50 Hz), the predicted operation energy efficiency of the air conditioner is Q1. When the speed value of the internal fan speed is 800 rpm, the speed value of the external fan speed is 900 rpm, and the frequency value of the compressor operating frequency is 40 Hz. When the air conditioner is operated according to the parameter combination of (800 rpm, 900 rpm, 40 Hz), the predicted operating energy efficiency of the air conditioner is Q2. Similarly, since each parameter combination and the pre-established mapping relationship between each parameter combination and the operating power are also determined, when the air conditioner is operated according to the parameter combination, the operating power corresponding to the parameter combination can be determined through the above mapping relationship. That is, the target operating energy efficiency corresponding to the air conditioner when it is operated according to the parameter values of the controllable operating parameters and the parameter values of the uncontrollable operating parameters. When it is determined that the operating energy efficiency corresponding to the target operation is Q2, the parameter combination corresponding to Q2 (800 rpm, 900 rpm, 40 Hz) is used as the target control parameter combination.

**[0281]** Specifically, the parameter prediction model may include a temperature model, which has been described in detail in the above embodiment and will not be described again here.

**[0282]** Furthermore, the combined selection strategy may be an energy-saving strategy, a comfort strategy, a health strategy, and a similarity strategy. The energy-saving strategy, the comfort strategy, and the health strategy have been described in detail in the above embodiment and will not be repeated here.

**[0283]** In an embodiment, the similarity strategy is characterized as selecting the one with the largest parameter similarity with the historical control parameters among the control parameter combinations as the target control parameter combination.

**[0284]** Specifically, the detailed process of the similarity strategy has been described in the above embodiment and will not be repeated here.

**[0285]** In an embodiment, a parameter prediction model is used to predict the control parameter combination to be executed by the air conditioner in the future, and when there are multiple control parameter combinations, a parameter combination that satisfies the selection strategy is selected as the control parameter combination based on the combination selection strategy, which provides a prerequisite for how to select one of the control parameter combinations as the target control parameter in an embodiment. On the basis of one embodiment and combined with the technical solution in this embodiment, the effect of avoiding the warm air oscillation phenomenon of the air conditioner due to the large difference in the control parameter values between adjacent cycles when the air conditioner is executed according to the control parameter combination is achieved.

**[0286]** As shown in FIG. **12**, in an embodiment, the step S**330** further includes:

- **[0287]** step S**335**, obtaining the operating state parameters of the air conditioner in the current cycle;
- **[0288]** step S**336**, determining the control parameter combination of the air conditioner that satisfies a preset parameter prediction model according to an operating state parameter of the current cycle and the environmental state optimization parameter, the control parameter combination includes at least two control parameters; and
- **[0289]** step S**337**, determining a target control parameter combination of the air conditioner according to the control parameter combination determined in the current cycle and a historical control parameter combination of the air conditioner in a plurality of historical cycles; and controlling the air conditioner to operate according to the control parameters in the target control parameter combination.

**[0290]** In an embodiment, in order to avoid the temperature oscillation phenomenon of the air conditioner due to the determined control parameter combination changing too much compared with the historical control parameter combination when the air conditioner is operating, therefore, this embodiment optimizes and smoothes the determined control parameter combination and the historical control parameter combination executed in the historical cycles of multiple air conditioners, and then uses the optimized and smoothed control parameters as the target control parameters.

**[0291]** The optimization smoothing method of the control parameter combination can be based on a preset parameter optimization strategy, according to the historical control parameter combinations and the control parameter combinations of multiple historical cycles, to determine the parameter optimization value corresponding to each control parameter combination in the current cycle as the target control parameter of the air conditioner.

**[0292]** Specifically, the parameter optimization strategy may be arithmetic mean optimization, and the arithmetic mean optimization process has been described in detail in the above embodiment, which will not be repeated here.

**[0293]** Specifically, the parameter optimization strategy may be weighted average optimization, and the weighted average optimization process has been described in detail in the above embodiment and will not be repeated here.

**[0294]** In an embodiment, at least one acquired control parameter combination is optimized and smoothed with historical control parameter combinations in multiple cycles, and the control parameters in the optimized and smoothed control parameter combination are used as target control parameters, thereby avoiding the phenomenon of warm air oscillation in the air conditioner due to excessive difference in control parameter values between adjacent cycles when the air conditioner is executed according to the control parameter combination.

**[0295]** In addition, it can be understood by those skilled in the art that all or part of the processes in the method for implementing the above embodiment can be completed by instructing the relevant hardware through a computer program. The computer program includes program instructions, and the computer program can be stored in a storage medium, which is a computer-readable storage medium. The program instructions are executed by at least one processor in the air conditioner to implement the process steps of the embodiment of the above method.

**[0296]** Therefore, the present application further provides a computer-readable storage medium, which stores a program for controlling an air conditioner. When the program for controlling the air conditioner is executed by a processor, the steps of the method for controlling the air conditioner described in the above embodiment are implemented.

**[0297]** The computer-readable storage medium may be a universal serial bus (USB) flash drive, a mobile hard disk, a read-only memory (ROM), a magnetic disk, or an optical disk, etc., which are computer-readable storage medium that can store program codes.

**[0298]** It should be noted that since the storage medium provided in the embodiment of the present application is the storage medium used to implement the method of the embodiment of the present application, based on the method introduced in the embodiment of the present application, those skilled in the art can understand the specific structure and deformation of the storage medium, so it is not repeated here. All storage medium used in the method of the embodiment of the present application belong to the scope of protection of the present application.

**[0299]** Those skilled in the art will appreciate that the embodiments of the present application may be provided as methods, systems or computer program products. Therefore, the present application may take the form of a complete hardware embodiment, a complete software embodiment, or an embodiment combining software and hardware. Moreover, the present application may take the form of a computer program product implemented on one or more computer-usable storage medium (including but not limited to disk storage, CD-ROM, optical storage, etc.) including computer-usable program codes.

**[0300]** The present application is described with reference to the flowcharts and/or block diagrams of the methods, devices (systems), and computer program products according to the embodiments of the present application. It should be understood that each process and/or box in the flowchart and/or block diagram, as well as the combination of the processes and/or boxes in the flowchart and/or block diagram, can be implemented by computer program instructions. These computer program instructions can be provided to a processor of a general-purpose computer, a special-purpose computer, an embedded processor, or other programmable data processing device to generate a machine, so that the instructions executed by the processor of the computer or other programmable data processing device generate a device for implementing the functions specified in one process or multiple processes in the flowchart and/or one box or multiple boxes in the block diagram.

**[0301]** These computer program instructions may also be stored in a computer-readable memory that can direct a computer or other programmable data processing device to work in a specific manner, so that the instructions stored in the computer-readable memory produce a manufactured product including an instruction device that implements the functions specified in one or more processes in the flowchart and/or one or more boxes in the block diagram.

**[0302]** These computer program instructions may also be loaded onto a computer or other programmable data processing device so that a series of operational steps are executed on the computer or other programmable device to produce a computer-implemented process, whereby the instructions executed on the computer or other programmable device provide steps for implementing the functions specified in one or more processes in the flowchart and/or one or more boxes in the block diagram.

**[0303]** It should be noted that in the claims, any reference signs placed between brackets shall not be construed as limiting the claims. The word "comprising" does not exclude the presence of components or steps not listed in the claims. The word "a" or "an" preceding a component does not exclude the presence of a plurality of such components. The present application may be implemented by means of hardware comprising several different components and by means of a suitably programmed computer. In a unit claim enumerating several means, several of these means may be embodied by the same item of hardware. The use of the words first, second, and third etc., does not indicate any order. These words may be interpreted as names.

**[0304]** Although some embodiments of the present application have been described, those skilled in the art, once aware of the basic inventive concept, may make further changes and modifications to these embodiments. Therefore, the appended claims are intended to be interpreted as encompassing the embodiments as well as all changes and modifications that fall within the scope of the present application.

**[0305]** It is apparent that those skilled in the art may make various modifications and variations to the present application without departing from its spirit and scope. Accordingly, if such modifications and variations fall within the scope of the claims of the present application and their equivalents, the present application is also intended to encompass these modifications and variations.

**1**. A method for controlling an air conditioner, comprising:

obtaining at least two predicted control parameter combinations for a current cycle prediction of the air conditioner and obtaining a historical control parameter combination of the air conditioner from a previous cycle operation;

determining a target control parameter combination for the air conditioner according to parameter similarities between each of the predicted control parameter combinations and the historical control parameter combination; and

controlling the air conditioner to operate according to parameter values in the target control parameter combination.

**2**. The method of claim **1**, wherein the determining the target control parameter combination for the air conditioner according to the parameter similarities between each of the predicted control parameter combinations and the historical control parameter combination comprises:

normalizing the parameters in the predicted control parameter combinations and the historical control parameter combination to obtain normalized values of each control parameter in the predicted control parameter combinations and the historical control parameter combination;

calculating the parameter similarity between the normalized values of the predicted control parameter combinations and the historical control parameter combination; and

determining the predicted control parameter combination corresponding to a largest parameter similarity as a target control parameter combination.

**3**. The method of claim **2**, wherein the calculating the parameter similarity between the normalized values of the predicted control parameter combinations and the historical control parameter combination comprises:

determining a relative numerical value between the normalized values of the predicted control parameter combinations and the historical control parameter combination based on a preset similarity calculation strategy, wherein the similarity calculation strategy comprises Manhattan distance calculation, Euclidean distance calculation, and cosine distance calculation; and

determining the parameter similarity based on the relative numerical value, wherein the relative numerical value and the parameter similarity are negatively correlated.

**4**. The method of claim **1**, wherein the obtaining the at least two predicted control parameter combinations for the current cycle prediction of the air conditioner comprises:

determining a control parameter combination of the air conditioner that satisfies a preset parameter prediction model, wherein the control parameter combination comprises at least two predicted control parameters.

**5**. The method of claim **4**, wherein the parameter prediction model comprises a temperature model, a wind speed model, and a heating and cooling rate model, and the determining the control parameter combination of the air conditioner that satisfies the preset parameter prediction model comprises:

determining a control parameter combination formed by each parameter value of each predicted control parameter of the air conditioner based on the temperature model, and predicting an indoor temperature change corresponding to the control parameter combination; determining a control parameter combination that satisfies a target indoor temperature according to the indoor temperature change and using the control parameter combination that satisfies the target indoor temperature as the control parameter combination of the air conditioner that satisfies the temperature model; or

determining a control parameter combination formed by each parameter value of each predicted control parameter of the air conditioner based on the wind speed model, and predicting a target speed corresponding to the control parameter combination; determining a control parameter combination that satisfies the target speed and using the control parameter combination that satisfies the target speed as the control parameter combination of the air conditioner that satisfies the wind speed model; or

determining a control parameter combination formed by each parameter value of each predicted control parameter of the air conditioner based on the heating and cooling rate model, and predicting a temperature change rate corresponding to the control parameter combination; determining a control parameter combination that satisfies the temperature change rate and using the control parameter combination that satisfies the temperature change rate as the control parameter combination of the air conditioner that satisfies the heating and cooling rate model.

**6**. The method of claim **5**, further comprising:

recording a controllable operating parameter and an uncontrollable operating parameter in each operating cycle of the air conditioner, and a historical indoor temperature change after each operating cycle of the air conditioner; performing training according to recorded historical operating data of the air conditioner to generate a first mapping relationship between the controllable operating parameters, the uncontrollable operating parameters, and the historical indoor temperature change to predict the indoor temperature change based on the first mapping relationship; or

recording the controllable operating parameter and the uncontrollable operating parameter in each operating cycle of the air conditioner, and a historical internal fan speed after each operating cycle of the air conditioner; performing training according to the recorded historical operating data of the air conditioner to generate a second mapping relationship between the controllable operating parameters, the uncontrollable operating parameters, and the historical internal fan speed to predict the target speed of the internal fan based on the second mapping relationship; or

recording the controllable operating parameters and uncontrollable operating parameters in each operating cycle of the air conditioner, and a historical compressor frequency and the historical internal fan speed after each operating cycle of the air conditioner; performing training according to the recorded historical operating data of the air conditioner to generate a third mapping relationship between the controllable operating parameters, the uncontrollable operating parameters, the historical compressor frequency, and the historical internal fan speed to predict the temperature change rate based on the third mapping relationship.

**7**. The method of claim **1**, wherein before the obtaining the at least two predicted control parameter combinations for the current cycle prediction of the air conditioner, the method further comprises:

obtaining current environmental state parameters collected by the air conditioner in a current cycle and obtaining historical environmental state parameters determined by a plurality of historical cycles of the air conditioner; and

determining environmental state optimization parameters of the current cycle of the air conditioner based on the historical environmental state parameters and the current environmental state parameters to determine a plurality of predicted control parameter combinations according to the operating state parameters of the current cycle and the environmental state optimization parameters.

**8**. The method of claim **1**, further comprising:

obtaining historical control parameter combinations executed in a plurality of historical cycles of the air conditioner and obtaining a predicted control parameter combination with the greatest similarity to the historical control parameter combination from a previous cycle; and

determining the target control parameter combination according to the plurality of historical control parameter combinations and the predicted control parameter combination with the greatest similarity.

**9**. A method for controlling an air conditioner, comprising:

obtaining a control scheme predicted by the air conditioner in a current cycle and historical control parameters executed by the air conditioner in historical cycles, wherein the control scheme comprises at least one predicted control parameter;

determining a target control parameter of the air conditioner according to the historical control parameter and the predicted control parameter, wherein the target control parameter is obtained by smoothing the predicted control parameter according to the historical control parameter; and

controlling the air conditioner to operate according to the target control parameter.

**10**. The method of claim **9**, wherein the determining the target control parameter of the air conditioner according to the historical control parameter and the predicted control parameter comprises:

determining, based on a preset smoothing strategy, a target control parameter of the air conditioner according to the historical control parameters and the predicted control parameters of one or more historical cycles.

**11**. The method of claim **10**, wherein the smoothing strategy comprises an arithmetic mean optimization strategy, and the determining, based on the preset smoothing strategy, the target control parameter of the air conditioner according to the historical control parameters and the predicted control parameters of one or more historical cycles comprises:

calculating an average value of one or more historical control parameters and each predicted control parameter as the target control parameter corresponding to the each predicted control parameter.

**12**. The method of claim **10**, wherein the smoothing strategy comprises a weighted average optimization strategy, and the determining, based on the preset smoothing strategy, the target control parameter of the air conditioner according to the historical control parameters and the predicted control parameters of one or more historical cycles comprises:

obtaining a parameter value corresponding to the predicted control parameter in the historical control parameters;

determining a weight value of the obtained parameter value; and

performing a weighted calculation on the obtained parameter value according to the determined weight value to obtain the target control parameter of the air conditioner.

**13**. The method of claim **9**, wherein the obtaining a control scheme predicted by the air conditioner in a current cycle comprises:

determining a control parameter combination of the air conditioner that satisfies a preset parameter prediction model, wherein the control parameter combination comprises at least two control parameters;

in response to that at least two control parameter combinations are determined, determining a control parameter combination that satisfies a preset combination selection strategy in the control parameter combinations as the control scheme.

**14**. The method of claim **13**, wherein the parameter prediction model comprises a temperature model, a wind speed model, and a heating and cooling rate model, and the determining the control parameter combination of the air conditioner that satisfies the preset parameter prediction model comprises:

determining, based on the temperature model, a control scheme formed by each parameter value of the predicted control parameter of the air conditioner, and predicting an indoor temperature change corresponding to the control parameter combination; determining a control parameter combination that satisfies the target indoor temperature according to the indoor temperature change and using the control parameter combination that satisfies the target indoor temperature as the control parameter combination; or

determining, based on the wind speed model, a control parameter combination formed by each parameter value of the predicted control parameter of the air conditioner and predicting a target speed corresponding to the control parameter combination; determining a control parameter combination that satisfies the target speed and using the control parameter combination that satisfies the target speed as the control parameter combination; or

determining, based on the heating and cooling rate model, a control parameter combination formed by each parameter value of the predicted control parameter of the air conditioner and predicting a temperature change rate corresponding to the control parameter combination; determining a control parameter combination that satisfies the temperature change rate and using the control parameter combination that satisfies the temperature change rate as the control parameter combination.

**15**. The method of claim **13**, wherein the determining the control parameter combination that satisfies the preset combination selection strategy in the control parameter combinations as the control scheme comprises:

calculating an energy efficiency ratio corresponding to the control parameter combination and determining the control parameter combination corresponding to a highest energy efficiency ratio as the control scheme; or

obtaining a comfort value corresponding to an operation of the air conditioner according to each control parameter combination, and determining the control parameter combination whose comfort value is closest to a preset comfort value as the control scheme; or

obtaining a health value corresponding to the operation of the air conditioner according to each control parameter combination, and determining the control parameter combination whose health value is closest to a preset health value as the control scheme.

**16**. The method of claim **9**, wherein before obtaining the control scheme predicted by the air conditioner in the current cycle, the method further comprises:

obtaining current environmental state parameters collected in a current cycle of the air conditioner and obtaining historical environmental state parameters determined in a plurality of historical cycles of the air conditioner; and

determining environmental state optimization parameters corresponding to the environmental state parameters of the air conditioner based on the historical environmental state parameters and the current environmental state parameters to determine the control scheme according to operating state parameters of the current cycle and the environmental state optimization parameters.

**17**. An air conditioner comprising:

a memory;

at least one processor; and

a program for controlling the air conditioner stored in the memory and executable on the at least one processor,

wherein when the program for controlling the air conditioner is executed by the at least one processor, the method for controlling the air conditioner according to claim **1** is implemented.

**18**. A computer-readable storage medium, wherein a program for controlling an air conditioner is stored on the computer-readable storage medium, and when the program for controlling the air conditioner is executed by at least one processor, the method for controlling the air conditioner according claim **1** is implemented.

**19**. An air conditioner comprising:
a memory;
at least one processor; and
a program for controlling the air conditioner stored in the memory and executable on the at least one processor,
wherein when the program for controlling the air conditioner is executed by the at least one processor, the method for controlling the air conditioner according to claim **9** is implemented.

**20**. A computer-readable storage medium, wherein a program for controlling an air conditioner is stored on the computer-readable storage medium, and when the program for controlling the air conditioner is executed by at least one processor, the method for controlling the air conditioner according claim **9** is implemented.

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