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(54) METHOD AND DEVICE FOR CONTROLLING AIR CONDITIONER

(57) The present invention discloses a method and device for controlling an air conditioner. The method includes: determining a current operating mode of the air conditioner; determining one or more control parameters for controlling at least two air outlets of the air conditioner according to a current ambient temperature in the operating mode; and controlling the air conditioner to output airflow corresponding to one or more distribution patterns according to the one or more control parameters. The present invention solves the technical problem that the air conditioner is poor in cooling and heating comfort in related arts.

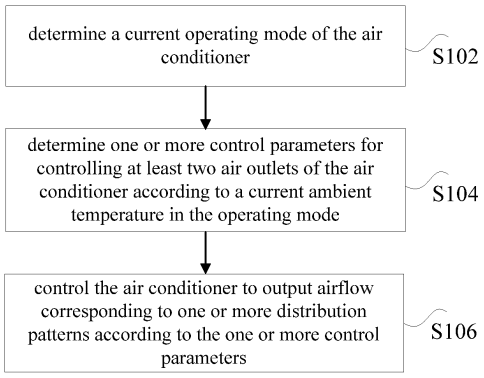

FIG. 1

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Description

Field of the Invention

[0001] The present invention relates to the field of air conditioners, in particular to a method and a device for controlling an air conditioner.

Background of the Invention

[0002] At present, the energy consumed by air conditioning systems for meeting indoor temperature and humidity requirements accounts for about 50% of the energy annually consumed by buildings. Domestic heat pump air conditioners, as typical decentralized cooling and heating products, have been greatly popularized in people's lives. In addition, with the incorporation of air energy into the scope of renewable energy and further deepening of reduction and replacement of heating coal, heat pump heating will usher in a new spring in the heating market in the north. However, under the emphasis on sustainable development nowadays, the control of building environments faces many problems that are required to be solved urgently, such as how to mediate the contradiction between meeting the requirement of comfortability of the building environments and realizing energy conservation and environmental protection. At present, insufficient heating capacity at low temperature, poor thermal comfort and energy consumption are still prominent problems of the domestic heat pump air conditioners when in use. With the development of two-stage compression systems and variable-capacity compression systems, the problems of insufficient heating capacity at low temperature and operating reliability at low temperature are effectively solved. However, there is no effective solution for solving the problem that the air conditioner is poor in cooling and heating comfort.

Summary of the Invention

[0003] Some embodiments of the present invention provide a method and a device for controlling an air conditioner, in order to solve the technical problem that the air conditioner is poor in cooling and heating comfort in related arts.

[0004] According to an aspect of some embodiments of the present invention, the method for controlling an air conditioner is provided, comprising: determining a current operating mode of the air conditioner; determining one or more control parameters for controlling at least two air outlets of the air conditioner according to a current ambient temperature in the operating mode; and controlling the air conditioner to output airflow corresponding to one or more distribution patterns according to the one or more control parameters.

[0005] Optionally, the at least two air outlets comprise a first air outlet and a second air outlet, wherein the first air outlet is disposed to be higher than the second air outlet; if the operating mode is a cooling mode, the determining one or more control parameters for controlling at least two air outlets of the air conditioner according to a current ambient temperature in the operating mode comprises: detecting the current ambient temperature of the environment where the air conditioner is located; judging if the current ambient temperature is greater than a first preset temperature; determining one or more first control subparameters used for controlling the first air outlet and the second air outlet to simultaneously output airflow corresponding to distribution patterns if the current ambient temperature is greater than the first preset temperature; determining one or more second control subparameters used for controlling the first air outlet to output airflow corresponding to a distribution pattern and controlling the second air outlet to be closed if the current ambient temperature is less than or equal to the first preset temperature.

[0006] Optionally, at least two air outlets comprise a first air outlet and a second air outlet, wherein the first air outlet is disposed to be higher than the second air outlet; if the operating mode is a heating mode, the determining one or more control parameters for controlling at least two air outlets of the air conditioner according to a current ambient temperature in the operating mode comprises: determining one or more third control subparameters used for controlling the first air outlet to deflect airflow downwardly to output airflow corresponding to a distribution pattern and controlling the second air outlet to output airflow corresponding a distribution pattern; detecting the current ambient temperature of the environment where the air conditioner is located; determining one or more fourth control subparameters used for controlling the first air outlet to output airflow corresponding to a distribution pattern and controlling the second air outlet to output airflow corresponding to a distribution pattern if the current ambient temperature is greater than a second preset temperature.

[0007] Optionally, after controlling the air conditioner to output airflow corresponding to one or more distribution patterns according to the one or more control parameters, the method further comprises: acquiring temperatures of a plurality of sampling points preset in a space where the air conditioner is located to obtain a plurality of temperature values; and generating a temperature distribution diagram within the space based on the plurality of temperature values and positions of the sampling points corresponding to the plurality of temperature values.

[0008] Optionally, the at least two air outlets comprise a first air outlet and a second air outlet, wherein the first air outlet is disposed to be higher than the second air outlet; if the operating mode is a heating mode, after controlling the air conditioner to output airflow corresponding to one or more distribution patterns according to the one or more control parameters, the method further comprises: obtaining a temperature value of a first sampling point and a temperature value of a second sampling point in

the space where the air conditioner is located; judging if the difference between the temperature value of the first sampling point and the temperature value of the second sampling point is greater than a first temperature difference; determining one or more fifth control subparameters used for controlling the first air outlet to output airflow corresponding to a distribution pattern and adjusting the speed at which the first air outlet outputs the airflow if the difference between the temperature value of the first sampling point and the temperature value of the second sampling point is greater than the first temperature difference; and controlling the air conditioner to output airflow corresponding to one or more airflow distribution patterns according to the one or more fifth control subparameters.

[0009] Optionally, the at least two air outlets comprise a first air outlet and a second air outlet, wherein the first air outlet is disposed to be higher than the second air outlet; if the operating mode is a cooling mode, after controlling the air conditioner to output airflow corresponding to one or more distribution patterns according to the one or more control parameters, the method further comprises: obtaining a temperature value of a third sampling point and a temperature value of a fourth sampling point in the space where the air conditioner is located; determining one or more sixth control subparameters used for controlling the first air outlet to output airflow corresponding to a distribution pattern and controlling the second air outlet to be closed if the temperature value of the third sampling point and/or the temperature value of the fourth sampling point is less than a second temperature difference; and controlling the air conditioner to output airflow corresponding to one or more distribution patterns according to the one or more sixth control subparameters.

[0010] According to another aspect of some embodiments of the present invention, the device for controlling an air conditioner is further provided, comprising: a first determining unit configured to determine a current operating mode of the air conditioner; a second determining unit configured to determine one or more control parameters for controlling at least two air outlets of the air conditioner according to a current ambient temperature in the operating mode; and a control unit configured to control the air conditioner to output airflow corresponding to one or more distribution patterns according to the one or more control parameters.

[0011] Optionally, the at least two air outlets comprise a first air outlet and a second air outlet, wherein the first air outlet is disposed to be higher than the second air outlet; if the operating mode is a cooling mode, the second determining unit comprises: a first detection module configured to detect the current ambient temperature of the environment where the air conditioner is located; a judging module configured to judge if the current ambient temperature is greater than a first preset temperature; a first determining module configured to determine one or more first control subparameters used for controlling the first air outlet and the second air outlet to simultaneously output airflow corresponding to distribution patterns if the current ambient temperature is greater than the first preset temperature; and a second determining module configured to one or more second control subparameters used for controlling the first air outlet to output airflow corresponding to a distribution pattern and controlling the second air outlet to be closed if the current ambient temperature is less than or equal to the first preset temperature.

[0012] Optionally, the at least two air outlets comprise a first air outlet and a second air outlet, wherein the first air outlet is disposed to be higher than the second air outlet, the determining one or more control parameters for controlling at least two air outlets of the air conditioner according to a current ambient temperature in the operating mode comprises: a third determining module configured to determine one or more third control subparameters used for controlling the first air outlet to deflect airflow downwardly to output airflow corresponding to a distribution pattern and controlling the second air outlet to output airflow corresponding a distribution pattern; a second detection module configured to detect the current ambient temperature of the environment where the air conditioner is located; and a fourth determining module configured to determine one or more fourth control subparameters used for controlling the first air outlet to output airflow corresponding to a distribution pattern and controlling the second air outlet to output airflow corresponding to a distribution pattern if the current ambient temperature is greater than a second preset temperature.

[0013] According to another aspect of some embodiments of the present invention, a storage medium comprising a stored program is further provided, wherein the program controls a device where the storage medium is located to perform any one of the above methods for controlling the air conditioner while operating.

[0014] According to another aspect of some embodiments of the present invention, a processor for operating a program is further provided, wherein the processor performs the method for controlling the air conditioner any one of the above methods while the program is operating.

[0015] According to another aspect of some embodiments of the present invention, an air conditioner is further provided, comprising: a sensor configured to determine a current operating mode of the air conditioner; a processor configured to determine, in the current operating mode, one or more control parameters for controlling at least two air outlets of the air conditioner according to the current ambient temperature and generate a control instruction; and an actuator configured to control the air conditioner to output airflow corresponding to one or more distribution patterns according to the one or more control parameters.

[0016] In some embodiments of the present invention, the current operating mode of the air conditioner is determined; in the current operating mode, the control parameter for controlling the at least two air outlets of the air conditioner is determined according to the current am-

bient temperature; and the air conditioner is controlled to output a corresponding airflow distribution pattern according to the control parameter. In different operating modes, the air conditioner is controlled to output the corresponding airflow distribution pattern according to the ambient temperature, thus achieving the purpose of optimizing the cooling and heating comfort of the air conditioner; and the air conditioner achieves the function of energy-saving operating, thereby achieving the technical effect of improving the cooling and heating comfort of the air conditioner, and then solving the technical problem that the air conditioner is poor in cooling and heating comfort in related arts.

Brief Descriptions of the Drawings

[0017] The accompanying drawings illustrated herein are used to provide further understanding of the present invention and constitute a part of the present application, and the illustrative embodiments of the present invention and the illustration thereof are intended to interpret the present invention, but do not constitute improper limitation to the present invention.

FIG. 1 is a flowchart showing a method for controlling an air conditioner according to some embodiments of the present invention.

FIG. 2 is a schematic view showing an optional arrangement of air outlets of the air conditioner according to some embodiments of the present invention.

FIG. 3 is a schematic view showing controlling air outlets to output airflow corresponding to distribution patterns according to the ambient temperature when the air conditioner is in a cooling mode according to some embodiments of the present invention.

FIG. 4 is a temperature cloud diagram when a first air outlet and a second air outlet are controlled to simultaneously output airflow corresponding to distribution patterns according to some embodiments of the present invention.

FIG. 5 is a temperature cloud diagram when a frontal air-out is adopted according to related arts.

FIG. 6 is a schematic view showing controlling air outlets to output airflow corresponding to a distribution pattern according to the ambient temperature when the air conditioner is in a cooling mode according to some embodiments of the present invention.

FIG. 7 is a temperature cloud diagram showing controlling the first air outlet to output airflow corresponding to a distribution pattern and controlling the second air outlet to be closed according to some embodiments of the present invention.

FIG. 8 is a temperature cloud diagram when frontal air-out is adopted according to the related arts.

FIG. 9 is a schematic view showing controlling air outlets to output airflow corresponding to distribution patterns according to the ambient temperature when the air conditioner is in a heating mode according to some embodiments of the present invention.

FIG. 10 is a schematic view showing controlling air outlets to output airflow corresponding to distribution patterns according to the ambient temperature when the air conditioner is in a heating mode according to some embodiments of the present invention.

FIG. 11 is a schematic view showing the comparison of relevant indicators in different air-deflecting airflow distribution patterns.

FIG. 12 is a schematic view showing an arrangement of sampling points according to some embodiments of the present invention.

FIG. 13 is a schematic view showing obtaining temperature values of different sampling points when the air conditioner is in the heating mode according to some embodiments of the present invention.

FIG. 14 is a schematic view of obtaining temperature values of different sampling points when the air conditioner is in the cooling and heating mode according to some embodiments of the present invention.

FIG. 15 is a schematic view showing a device for controlling an air conditioner according to some embodiments of the present invention.

Detailed Description of the Embodiments

[0018] In order to provide a better understanding of the solutions of the present invention to those skilled in the art, the technical solutions in the embodiments of the present invention will be clearly and completely described below in conjunction with the accompanying drawings in the embodiments of the present invention. Apparently, embodiments described are merely part of the embodiments of the present invention, rather than all of the embodiments. All other embodiments obtained by those skilled in the art based on the embodiments in the present invention without creative efforts should fall within the protection scope of the present invention.

[0019] It should be stated that the terms "first", "second" and the like in the description and claims of the present invention are used to distinguish similar objects, and are not necessarily used to describe a specific order or sequence. It should be understood that the data so used may be interchanged where appropriate, so that the embodiments of the present invention described here

can be implemented in a sequence other than those illustrated or described herein. In addition, the terms "comprise" and "have" and any variations thereof are intended to cover a non-exclusive inclusion, for example, a process, method, system, product or device that comprises a series of steps or units is not necessarily limited to those steps or units explicitly listed, but may include other steps or units not explicitly listed or inherent to such process, method, product or device.

[0020] According to some embodiments of the present invention, a method for controlling an air conditioner is provided. It should be noted that the steps illustrated in the flowcharts of the drawings may be performed in a computer system such as a set of computer executable instructions. In addition, although logical sequences are shown in the flowcharts, the steps shown or described may be performed in a different order than the ones described herein in some cases.

[0021] FIG. 1 is a flowchart showing a method for controlling an air conditioner according to some embodiments of the present invention. As shown in Fig. 1, the method comprises the following steps.

[0022] In step S102, a current operating mode of the air conditioner is determined.

[0023] In some embodiments of the present invention, the operating mode of the air conditioner may include a heating mode and a cooling mode. In the case that the current operating mode of the air conditioner is the heating mode, the air conditioner raises the ambient temperature by outputting hot air to the surrounding environment; and in the case that the current operating mode of the air conditioner is the cooling mode, the air conditioner reduces the ambient temperature by outputting cold air to the surrounding environment.

[0024] In step S104, one or more control parameters for controlling at least two air outlets of the air conditioner are determined according to the current ambient temperature in the operating mode.

[0025] In some embodiments of the present invention, the air conditioner may comprise two or more air outlets, all of which may output airflow to the surrounding environment so as to change the ambient temperature. When the air conditioner is in the heating mode or the cooling mode, the one or more control parameters for the air outlets of the air conditioner are determined according to the current ambient temperature of the air conditioner. Optionally, control parameters for each of the air outlets of the air conditioner comprise the direction, the intensity, the temperature or the like of the airflow output from the air outlet.

[0026] In step S 106, the air conditioner is controlled to output airflow corresponding to one or more distribution patterns according to the one or more control parameters.

[0027] After the one or more control parameters for the air outlets are determined, the direction, the intensity and/or the temperature of the airflow output from the air outlets are controlled according to the one or more control parameters, thereby controlling the air conditioner to output airflow corresponding to the one or more distribution patterns.

[0028] In some embodiments of the present invention, the current operating mode of the air conditioner is determined as follows: in the current operating mode, one or more control parameters for controlling at least two air outlets of the air conditioner are determined according to the current ambient temperature; and the air conditioner is controlled to output airflow corresponding to one or more distribution patterns according to the one or more control parameters. In different operating modes, the air conditioner is controlled to output airflow corresponding to one or more distribution patterns according to the ambient temperature, thus achieving the purpose of optimizing the cooling and heating comfort of the air conditioner; and the air conditioner achieves the function of energy-conservation operating. Thereby the technical effect of improving the cooling and heating comfort of the air conditioner is achieved, and then solving the technical problem that the air conditioner is poor in cooling and heating comfort in related arts.

[0029] Optionally, in the method for controlling the air conditioner according to some embodiments of the present invention, the at least two air outlets comprise a first air outlet and a second air outlet, wherein the first air outlet is disposed to be higher than the second air outlet. If the operating mode is a cooling mode, the determining one or more control parameters for controlling at least two air outlets of the air conditioner according to a current ambient temperature in the operating mode comprises: detecting the current ambient temperature of the environment where the air conditioner is located; judging if the current ambient temperature is greater than a first preset temperature; determining one or more first control subparameters used for controlling the first air outlet and the second air outlet to simultaneously output airflow corresponding to distribution patterns if the current ambient temperature is greater than the first preset temperature; determining one or more second control subparameters used for controlling the first air outlet to output airflow corresponding to a distribution pattern and controlling the second air outlet to be closed if the current ambient temperature is less than or equal to the first preset temperature.

[0030] As an optional implementing manner of some embodiments of the present invention, the air conditioner may comprise two air outlets, a first air outlet disposed to be higher than a second air outlet and the second air outlet. As shown in Fig. 2, the first air outlet is disposed in the upper part of the air conditioner, and the second air outlet is disposed in the lower part of the air conditioner. The air conditioner may also comprise more than two air outlets, which are disposed at different heights to achieve staggered arrangement of the air outlets of the air conditioner. When it is determined that the air conditioner is in a cooling mode, the current ambient temperature of the environment where the air conditioner is lo-

cated is detected, and the ambient condition of the environment where the air conditioner is located is determined by determining the sizes of the current ambient temperature and a first preset temperature. The first preset temperature may be a preset temperature threshold that makes people feel comfortable. For example, the first preset temperature is 27°C. When the ambient temperature is greater than 27°C, the human body feels hot, and the surrounding environment is determined to be in a hot ambient condition. By this time, the first air outlet and the second air outlet are controlled to simultaneously output airflow corresponding to distribution patterns according to the one or more first control subparameters. Optionally, as shown in FIG. 3, the first air outlet could deflect the airflow horizontally or downwardly, and the second air outlet could deflect airflow horizontally, so that the air conditioner outputs airflow of upper and lower encircling air-out to achieve rapid cooling of the surrounding environment, making the current hot environment transit to a comfortable environment quickly. FIG. 4 shows a temperature cloud diagram when the ambient air temperature is about to reach a comfortable temperature, in the case that the first air outlet and the second air outlet simultaneously output airflow corresponding to the distribution patterns. FIG. 5 shows a temperature cloud diagram when the ambient air temperature is about to reach a comfortable temperature in the case that the air conditioner adopts one air outlet for frontal air-out in the related art. Through the comparison of Fig. 4 and Fig. 5, it can be seen that when the first air outlet and the second air outlet simultaneously output airflow corresponding to the distribution patterns, the distribution of the ambient temperature is more uniform and it is more conducive to reduce the ambient temperature. When the ambient temperature is less than the first preset temperature, the human body does not feel hot, and the surrounding environment is in a more comfortable ambient condition. By this time, the airflow corresponding to the distribution pattern output from the first air outlet is controlled according to the one or more second control subparameters, and the second air outlet is controlled to be closed. As shown in Fig. 6, optionally, the first air outlet could deflect the air horizontally or downwardly, thereby reducing the blowing feeling of the human body and improving the comfort level of the human body. FIG. 7 shows a temperature cloud diagram after the first air outlet is controlled to output the airflow corresponding to the distribution pattern and the second air outlet is controlled to be closed according to the one or more second control subparameters, in the case that the ambient temperature reaches the comfortable temperature. FIG. 8 shows a temperature cloud diagram of the environment in the case that one air outlet is still used for frontal air-out when the ambient temperature of the air conditioner reaches a comfortable temperature in the related art. Through the comparison of FIG. 7 and FIG. 8, it can be seen that the overall ambient temperature could be effectively controlled and the blowing feeling of the human body in the spatial range of the air conditioner could be reduced by controlling the first air outlet to output airflow corresponding to the distribution pattern and controlling the second air outlet to be closed according to the one or more second subparameters when the ambient temperature reaches the comfortable temperature, thereby enhancing the comfort level of the human body.

[0031] Optionally, in the method for controlling the air conditioner according to some embodiments of the present invention, the at least two air outlets comprise a first air outlet and a second air outlet, wherein the first air outlet is disposed to be higher than the second air outlet. if the operating mode is a heating mode, the determining one or more control parameters for controlling at least two air outlets of the air conditioner according to a current ambient temperature in the operating mode comprises: determining one or more third control subparameters used for controlling the first air outlet to deflect airflow downwardly to output airflow corresponding to a distribution pattern and controlling the second air outlet to output airflow corresponding a distribution pattern; detecting the current ambient temperature of the environment where the air conditioner is located; determining one or more fourth control subparameters used for controlling the first air outlet to output airflow corresponding to a distribution pattern and controlling the second air outlet to output airflow corresponding to a distribution pattern if the current ambient temperature is greater than a second preset temperature.

[0032] As an optional implementing manner of some embodiments of the present invention, the air conditioner may comprise two air outlets, a first air outlet disposed to be higher than a second air outlet and the second air outlet. For example, the first air outlet is disposed in the upper part of the air conditioner, and the second air outlet is disposed in the lower part of the air conditioner. The air conditioner may also comprise more than two air outlets, which are disposed at different heights to achieve staggered arrangement of the air outlets of the air conditioner. When it is determined that the air conditioner is in the heating mode, the first air outlet is controlled to deflect air downwardly to output airflow corresponding to a distribution pattern and the second air outlet is controlled to output airflow corresponding to a distribution pattern according to the one or more third control subparameters. As shown in FIG. 9, at this time, the second air outlet deflects hot air towards the lower area of the environment to heat the space where the human feet are located, in the spatial range of the air conditioner; the first air outlet deflects hot air downwardly to heat the space where the body of the human body is located, in the spatial range of the air conditioner. The airflow output by the air conditioner is concentrated in the lower area and a space where the trunk area of the human body is located. Due to such airflow distribution patterns, the surrounding environment has a small temperature gradient and the ambient temperature distribution has good temperature uniformity; at the same time, the airflow output

by the air conditioner in the heating mode is the hot airflow, so the ascent of the hot airflow in the lower area is favorable for effectively heating the environment in the spatial range of the air conditioner. The air conditioner could also detect the current ambient temperature, and the ambient condition of the air conditioner is determined by determining the sizes of the current ambient temperature and a second preset temperature. The second preset temperature may be a preset temperature threshold that makes people feel comfortable. For example, the second preset temperature is 22°C. When the ambient temperature is less than 22°C, the human body feels cold and the surrounding environment is in a cold ambient condition, thus the airflow corresponding to the one or more distribution patterns output by the air conditioner is kept unchanged to heat the surrounding environment. When the ambient temperature is greater than 22°C, the human body does not feel cold and the surrounding environment is in a comfort ambient condition. By this time, the first air outlet is controlled to output airflow corresponding to a distribution pattern and the second air outlet is controlled to output airflow corresponding to a distribution pattern simultaneously according to one or more fourth control subparameters, as shown in FIG. 10. Thus, the airflow output by the air conditioner is no longer concentrated in the trunk area space of the human body, thereby preventing high-temperature hot air from directly impacting the body and head areas of people or from being excessively conveyed to a space at such a height to cause discomfort of the human body after the ambient temperature reaches a comfortable temperature.

[0033] In addition, since the air conditioner has heated the environment for a period of time, the hot air in the surrounding environment is mainly concentrated on the top of the environment. By controlling the first air outlet, the hot air at the top of the environment could be promoted to circulate downward to other areas. Optionally, the temperature of the airflow output by the first air outlet could be reduced, and the intensity of the airflow output by the first air outlet could be enhanced, thereby accelerating the circulation of heat in the surrounding environment and achieving energy-conservation operation function of the air conditioner.

[0034] FIG. 11 shows the comparison of the relevant indicators when different air-deflecting airflow distribution patterns are used after the air conditioner performs heating operation for 3 hours, wherein centrifugal layered air-out is the air-deflecting airflow distribution pattern used in some embodiments of the present invention. It can be seen from the comparison of indicators that when the centrifugal layered air-out is used, the average ambient temperature reaches and stabilizes at about 20°C, and the vertical air temperature difference between a plane being 2.1m high and a plane being 0.1m high is 2.26°C, which is smaller than the vertical air temperature differences between the corresponding planes when other airflow distribution patterns are used; the ambient average temperature uniformity is 1.24°C, which is 2.12°C -2.51°C lower than those when other airflow distribution patterns are used, wherein the temperature uniformity is improved by 63%-74%; and the temperature rise rate of the area lower than 1.1 meters is 0.6°C/min in the first 30 minutes, which is 20%-50% higher than those when other airflow distribution patterns are used. Compared with several other airflow distribution patterns, after the air conditioner operates for 3 hours, the power consumption is the lowest, thus energy conservation of the air conditioner is achieved. In addition, by comparing the temperature cloud diagrams of the environment under different airflow distribution patterns, in the case that the one or more airflow distribution patterns of some embodiments of the present invention are used, when the air conditioner performs heating operation, the heat distribution in each area of the environment is uniform and the heat utilization efficiency in the environment is higher. But in the case that other airflow distribution patterns are used (for example, frontal air-out, encircling air-out, upper air-out and the like of the air conditioner), the heat distribution in the environment is mostly concentrated in the upper area and the ambient heat distribution is not uniform, thus the heat utilization efficiency is low.

[0035] Optionally, after controlling the air conditioner to output airflow corresponding to one or more distribution patterns according to the one or more control parameters, the method further comprises: acquiring temperatures of a plurality of sampling points preset in a space where the air conditioner is located to obtain a plurality of temperature values; and generating a temperature distribution diagram within the space based on the plurality of temperature values and positions of the sampling points corresponding to the plurality of temperature values.

[0036] As an optional implementation manner of some embodiments of the present invention, a plurality of sampling points may be selected in the space where the air conditioner is located, temperature sensors are disposed at the sampling points to acquire temperatures of the plurality of sampling points, and one or more temperature distribution patterns for the space where the air conditioner is located are generated according to the plurality of sampling points.

[0037] For example, the placement position of the air conditioner is shown in FIG. 12, and the arrangement of the temperature sampling points in FIG. 12 comprises: in the vertical direction, a plane of temperature sensors is disposed at each height of 0.1m, 0.6m, 1.1m, 1.6m, and 2.1m from the ground. Totally 17 rows (1 to 17) of temperature sensors are uniformly disposed in the length direction of each plane, and totally 10 rows (A to J) of temperature sensors are uniformly disposed in the width direction. Totally 850 temperature sensors are disposed in a room for acquiring the temperature in the spatial range where the air conditioner is located, that is, 850 sampling points are disposed in the space where the air conditioner is located.

[0038] Optionally, the at least two air outlets comprise

a first air outlet and a second air outlet, wherein the first air outlet is disposed to be higher than the second air outlet. If the operating mode is a heating mode, after controlling the air conditioner to output airflow corresponding to one or more distribution patterns according to the one or more control parameters, the method further comprises: obtaining a temperature value of a first sampling point and a temperature value of a second sampling point in the space where the air conditioner is located; judging if the difference between the temperature value of the first sampling point and the temperature value of the second sampling point is greater than a first temperature difference; determining one or more fifth control subparameters used for controlling the first air outlet to output airflow corresponding to a distribution pattern and adjusting the speed at which the first air outlet outputs the airflow if the difference between the temperature value of the first sampling point and the temperature value of the second sampling point is greater than the first temperature difference; and controlling the air conditioner to output airflow corresponding to one or more distribution patterns according to the one or more fifth control subparameters.

[0039] As an optional implementing manner of some embodiments of the present invention, the air conditioner may comprise two air outlets comprising a first air outlet disposed to be higher than a second air outlet and the second air outlet. For example, the first air outlet is disposed in the upper part of the air conditioner, and the second air outlet is disposed in the lower part of the air conditioner. The air conditioner may also comprise more than two air outlets, which are disposed at different heights to achieve staggered arrangement of the air outlets of the air conditioner. When it is determined that the air conditioner is in the heating mode, the temperature values of the first sampling point and the second sampling point could be obtained, and whether the difference between the temperature value of the first sampling point and the temperature value of the second sampling point is greater than a first temperature difference is judged, wherein the first temperature difference may be set according to actual situations. The first sampling point is at a height different from the second sampling point, as shown in FIG. 13. The first sampling point could be disposed in a top area of the environment where the air conditioner is located, that is, a preset area 1, the second sampling point can be disposed in a middle area of the environment where the air conditioner is located, that is, a preset area 2. The air conditioner obtains the temperature value of the preset area 1 (the first sampling point) and the temperature value of the preset area 2 (the second sampling point) through an infrared monitor. When the difference between the temperature value of the first sampling point and the temperature value of the second sampling point is greater than the first temperature difference, it is determined that the heat in the surrounding environment is concentrated in the top area. The first air outlet is controlled to output airflow corresponding to the distribution pattern according to the one or more fifth control subparameters, and the speed at which the first air outlet outputs the airflow is adjusted to promote circulation of the heat from the top area of the environment to other areas, thereby achieving the function of energy-conservation operating of the air conditioner.

[0040] Optionally, the at least two air outlets comprise a first air outlet and a second air outlet, wherein the first air outlet is disposed to be higher than the second air outlet; if the operating mode is a cooling mode, after controlling the air conditioner to output airflow corresponding to one or more distribution patterns according to the one or more control parameters, the method further comprises: obtaining a temperature value of a third sampling point and a temperature value of a fourth sampling point in the space where the air conditioner is located; determining one or more sixth control subparameters used for controlling the first air outlet to output airflow corresponding to a distribution pattern and controlling the second air outlet to be closed if the temperature value of the third sampling point and/or the temperature value of the fourth sampling point is less than a second temperature difference; and controlling the air conditioner to output airflow corresponding to one or more distribution patterns according to the one or more sixth control subparameters.

[0041] As an optional implementing manner of some embodiments of the present invention, the air conditioner may comprise two air outlets, a first air outlet disposed to be higher than a second air outlet and the second air outlet. For example, the first air outlet is disposed in the upper part of the air conditioner, and the second air outlet is disposed in the lower part of the air conditioner. The air conditioner may also comprise more than two air outlets, which are disposed at different heights to achieve staggered arrangement of the air outlets of the air conditioner. When it is determined that the air conditioner is in the cooling mode, the temperature values of the first sampling point and the second sampling point could be obtained, and sizes of the temperature value of the first sampling point, the temperature value of the second sampling point and a second temperature difference are judged, wherein the second temperature difference may be set according to actual situations. The first sampling point may be at a height different from the second sampling point. As shown in FIG. 14, a third sampling point could be disposed in a lower area of the environment where the air conditioner is located, that is, a preset area 3; a fourth sampling point could be disposed in the middle area of the environment where the air conditioner is located, that is, a preset area 4. The air conditioner obtains the temperature value of the preset area 3 (the third sampling point) and the temperature value of the preset area 4 (the fourth sampling point) through an infrared monitor. When the temperature value of the third sampling point and/or the temperature value of the fourth sampling point is less than a preset temperature, it could be determined that the temperature of the surrounding environment has reached the upper limit of the comfortable temperature. People will feel uncomfortable if air is still supplied. By

this time, the air outlet could be controlled to be closed and the first air outlet could be controlled to deflect airflow downwardly to form the corresponding distribution pattern according to the one or more sixth subparameters, so as to avoid that the human body feels uncomfortable due to the generated blowing feeling.

[0042] According to some embodiments of the present invention, a storage medium comprising a stored program is further provided, wherein the program controls a device where the storage medium is located to perform the above method for controlling the air conditioner while operating.

[0043] According to some embodiments of the present invention, an embodiment of a processor for operating a program is further provided, wherein the processor performs the above method for controlling the air conditioner while the program is operating.

[0044] It should be noted that the steps shown in the flowcharts of the drawings may be performed in a computer system such as a set of computer executable instructions. In addition, although logical sequences are shown in the flowcharts, the steps shown or described may be performed in a different order than the ones described herein in some cases.

[0045] Some embodiments of the present invention further provide a device for controlling the air conditioner. It should be noted that the device for controlling the air conditioner provided by the embodiments of the present invention could be used for performing the method for controlling the air conditioner provided by the embodiments of the present invention. The device for controlling the air conditioner provided by the embodiments of the present invention will be introduced below.

[0046] According to some embodiments of the present invention, an embodiment of a device for controlling the air conditioner is further provided. FIG. 15 is a schematic view showing an optional device for controlling an air conditioner according to some embodiments of the present invention. As shown in FIG. 15, the device comprises the followings.

[0047] A first determining unit 1410 is configured to determine a current operating mode of the air conditioner. In some embodiments of the present invention, the operating mode of the air conditioner may comprise a heating mode and a cooling mode. When the current operating mode of the air conditioner is the heating mode, the air conditioner raises the ambient temperature by outputting hot air to the surrounding environment; and when the current operating mode of the air conditioner is the cooling mode, the air conditioner reduces the ambient temperature by outputting cold air to the surrounding environment;

[0048] A second determining unit 1420 is configured to determining unit configured to determine one or more control parameters for controlling at least two air outlets of the air conditioner according to a current ambient temperature in the operating mode. In some embodiments of the present invention, the air conditioner may comprise two or more air outlets, all of which may output airflow to the surrounding environment so as to change the ambient temperature. When the air conditioner is in the heating mode or the cooling mode, the one or more control parameters for the air outlet of the air conditioner are determined according to the current ambient temperature of the air conditioner. Optionally, the one or more control parameters for the air outlet of the air conditioner may comprise the direction, the intensity or the temperature of the output airflow from the air outlet.

[0049] A control unit 1430 is configured to control the air conditioner to output airflow corresponding to one or more distribution patterns according to the one or more control parameters. After the one or more control parameters for the air outlet are determined, the direction, intensity or temperature of the output airflow from the air outlet could be controlled according to the one or more control parameters, thereby controlling the air conditioner to output airflow corresponding to one or more distribution patterns.

[0050] It should be noted herein that the first determining unit 1410, the second determining unit 1420 and the control unit 1430 aforementioned may be operated in a computer terminal as part of the device, and the functions realized by the above modules may be performed by a processor in the computer terminal. The computer terminal could also be a smart phone (such as an Android phone, an iOS phone, etc.), a tablet computer, a handheld computer and mobile Internet devices (Mobile Internet Devices, MIDs), a PAD, etc.

[0051] In some embodiments of the present invention, in different operating modes, the air conditioner is controlled to output airflow corresponding to one or more distribution patterns according to the ambient temperature, thus achieving the purpose of optimizing the cooling and heating comfort of the air conditioner, and the air conditioner achieves the function of energy-saving operating, thereby achieving the technical effect of improving the cooling and heating comfort of the air conditioner, and then solving the technical problem that the air conditioner is poor in cooling and heating comfort in related arts.

[0052] Optionally, the at least two air outlets comprise a first air outlet disposed to be higher than a second air outlet and the second air outlet. If the operating mode is a cooling mode, the second determining unit comprises: a first detection module configured to detect the current ambient temperature of the environment where the air conditioner is located; a judging module configured to judge if the current ambient temperature is greater than a first preset temperature; a first determining module configured to determine one or more first control subparameters if the current ambient temperature is greater than the first preset temperature, wherein the one or more first control subparameters are used for controlling the first air outlet and the second air outlet to simultaneously output airflow corresponding to distribution patterns; and a second determining module configured to determine one

or more second control subparameters if the current ambient temperature is less than or equal to the first preset temperature, wherein the one or more second control subparameters are used for controlling the first air outlet to output airflow corresponding to a distribution pattern and controlling the second air outlet to be closed.

[0053] As an optional implementing manner of some embodiments of the present invention, the air conditioner may comprise two air outlets, a first air outlet disposed to be higher than a second air outlet and the second air outlet. As shown in Fig. 2, the first air outlet is disposed in the upper part of the air conditioner, and the second air outlet is disposed in the lower part of the air conditioner. The air conditioner may also comprise more than two air outlets, which are disposed at different heights to achieve staggered arrangement of the air outlets of the air conditioner. When it is determined that the air conditioner is in a cooling mode, the current ambient temperature of the environment where the air conditioner is located is detected, and the ambient condition of the environment where the air conditioner is located is determined by determining the sizes of the current ambient temperature and a first preset temperature. The first preset temperature may be a preset temperature threshold that makes people feel comfortable. When the ambient temperature is greater than the first preset temperature, the human body feels hot, and the surrounding environment is in a hot ambient condition. By this time, the first air outlet and the second air outlet are controlled to simultaneously output airflow corresponding to distribution patterns according to the one or more first control subparameters. Optionally, as shown in FIG. 3, the first air outlet could deflect the airflow horizontally or downwardly, and the second air outlet could deflect airflow horizontally, so that the air conditioner outputs airflow of upper and lower encircling air-out to achieve rapid cooling of the surrounding environment, making the current hot environment transit to a comfortable environment quickly. FIG. 4 shows a temperature cloud diagram when the ambient air temperature is about to reach a comfortable temperature, in the case that the first air outlet and the second air outlet simultaneously output airflow corresponding to the distribution patterns. FIG. 5 shows a temperature cloud diagram when the ambient air temperature is about to reach a comfortable temperature in the case that the air conditioner adopts one air outlet for frontal air-out. Through the comparison of Fig. 4 and Fig. 5, it can be seen that when the first air outlet and the second air outlet simultaneously output airflow corresponding to the distribution patterns, the distribution of the ambient temperature is more uniform and it is more conducive to reduce the ambient temperature. When the ambient temperature is less than the first preset temperature, the human body does not feel hot, and the surrounding environment is in a more comfortable ambient condition. By this time, the airflow corresponding to the distribution pattern output from the first air outlet is controlled according to the one or more second control subparameters, and the second air outlet is controlled to be closed. As shown in Fig. 6, optionally, the first air outlet could deflect the air horizontally or downwardly, thereby reducing the blowing feeling of the human body and improving the comfort level of the human body. FIG. 7 shows a temperature cloud diagram after the first air outlet is controlled to output the airflow corresponding to the distribution pattern and the second air outlet is controlled to be closed according to the one or more second control subparameters, in the case that the ambient temperature reaches the comfortable temperature. FIG. 8 shows a temperature cloud diagram of the environment in the case that one air outlet is still used for frontal air-out when the ambient temperature of the air conditioner reaches a comfortable temperature in the related art. Through the comparison of FIG. 7 and FIG. 8, it can be seen that the overall ambient temperature could be effectively controlled and the blowing feeling of the human body in the spatial range of the air conditioner could be reduced by controlling the first air outlet to output airflow corresponding to the distribution pattern and controlling the second air outlet to be closed according to the one or more second subparameters when the ambient temperature reaches the comfortable temperature, thereby enhancing the comfort level of the human body.

[0054] Optionally, the at least two air outlets comprise a first air outlet and a second air outlet, wherein the first air outlet is disposed to be higher than the second air outlet, the determining one or more control parameters for controlling at least two air outlets of the air conditioner according to a current ambient temperature in the operating mode comprises: a third determining module configured to determine one or more third control subparameters used for controlling the first air outlet to deflect airflow downwardly to output airflow corresponding to a distribution pattern and controlling the second air outlet to output airflow corresponding a distribution pattern; a second detection module configured to detect the current ambient temperature of the environment where the air conditioner is located; and a fourth determining module configured to determine one or more fourth control subparameters used for controlling the first air outlet to output airflow corresponding to a distribution pattern and controlling the second air outlet to output airflow corresponding to a distribution pattern if the current ambient temperature is greater than a second preset temperature.

[0055] As an optional implementing manner of some embodiments of the present invention, the air conditioner may comprise two air outlets, a first air outlet disposed to be higher than a second air outlet and the second air outlet. For example, the first air outlet is disposed in the upper part of the air conditioner, and the second air outlet is disposed in the lower part of the air conditioner. The air conditioner may also comprise more than two air outlets, which are disposed at different heights to achieve staggered arrangement of the air outlets of the air conditioner. When it is determined that the air conditioner is in the heating mode, the first air outlet is controlled to deflect air downwardly to output airflow corresponding to

a distribution pattern and the second air outlet is controlled to output airflow corresponding to a distribution pattern according to the one or more third control subparameters. As shown in FIG. 9, at this time, the second air outlet deflects hot air towards the lower area of the environment to heat the space where the human feet are located; the first air outlet deflects hot air downwardly to heat the space where the body of the human body is located. The airflow output by the air conditioner is concentrated in the lower area and a space where the trunk area of the human body is located. Due to such airflow distribution patterns, the surrounding environment has a small temperature gradient and the ambient temperature distribution has good temperature uniformity; at the same time, the airflow output by the air conditioner in the heating mode is the hot airflow, so the ascent of the hot airflow in the lower area is favorable for effectively heating the environment in the spatial range of the air conditioner. The air conditioner could also detect the current ambient temperature, and the ambient condition of the air conditioner is determined by determining the sizes of the current ambient temperature and a second preset temperature. The second preset temperature may be a preset temperature threshold that makes people feel comfortable. When the ambient temperature is less than the second preset temperature, the human body feels cold, and the surrounding environment is in a cold ambient condition, thus airflow corresponding to one or more distribution patterns output by the air conditioner are kept unchanged to heat the surrounding environment. When the ambient temperature is greater than the second preset temperature, the human body does not feel cold, and the surrounding environment is in a comfort ambient condition. By this time, the first air outlet is controlled to output airflow corresponding to a distribution pattern and the second air outlet is controlled to output airflow corresponding to a distribution pattern simultaneously according to one or more fourth control subparameters, as shown in FIG. 10. Thus, the airflow output by the air conditioner is no longer concentrated in the trunk area space of the human body, thereby preventing high-temperature hot air from directly impacting the body and head areas of people or from being excessively conveyed to a space at such a height to cause discomfort of the human body after the ambient temperature reaches a comfortable temperature.

[0056] In addition, since the air conditioner has heated the environment for a period of time, the hot air in the surrounding environment is mainly concentrated on the top of the environment. By controlling the first air outlet, the hot air at the top of the environment could be promoted to circulate downward to other areas. Optionally, the temperature of the airflow output by the first air outlet could be reduced, and the intensity of the airflow output by the first air outlet could be enhanced, thereby accelerating the circulation of heat in the surrounding environment and achieving energy-conservation operation function of the air conditioner.

[0057] FIG. 11 shows the comparison of the relevant indicators when different air-deflecting airflow distribution patterns are used after the air conditioner performs heating operation for 3 hours, wherein centrifugal layered air-out is the air-deflecting airflow distribution pattern used in some embodiments of the present invention. It can be seen from the comparison of indicators that when the centrifugal layered air-out is used, the average ambient temperature reaches and stabilizes at about 20°C, and the vertical air temperature difference between a plane being 2.1m high and a plane being 0.1m high is 2.26°C, which is smaller than the vertical air temperature differences between the corresponding planes when other airflow distribution patterns are used; the ambient average temperature uniformity is 1.24°C, which is 2.12°C -2.51°C lower than those when other airflow distribution patterns are used, wherein the temperature uniformity is improved by 63%-74%; and the temperature rise rate of the area lower than 1.1 meters is 0.6°C/min in the first 30 minutes, which is 20%-50% higher than those when other airflow distribution patterns are used. Compared with several other airflow distribution patterns, after the air conditioner operates for 3 hours, the power consumption is the lowest, thus energy conservation of the air conditioner is achieved. In addition, by comparing the temperature cloud diagrams of the environment under different airflow distribution patterns, in the case that the one or more airflow distribution patterns of some embodiments of the present invention are used, when the air conditioner performs heating operation, the heat distribution in each area of the environment is uniform and the heat utilization efficiency in the environment is higher. But in the case that other airflow distribution patterns are used, the heat distribution in the environment is mostly concentrated in the upper area and the ambient heat distribution is not uniform, thus the heat utilization efficiency is low.

[0058] According to some embodiments of the present invention, an air conditioner is further provided, comprising the followings.

[0059] A sensor is configured to determine a current operating mode of the air conditioner. In some embodiments of the present invention, the operating mode of the air conditioner may comprise a heating mode and a cooling mode. When the current operating mode of the air conditioner is the heating mode, the air conditioner raises the ambient temperature by outputting hot air to the surrounding environment; and when the current operating mode of the air conditioner is the cooling mode, the air conditioner reduces the ambient temperature by outputting cold air to the surrounding environment.

[0060] A processor is configured to determine, in the current operating mode, one or more control parameters for controlling at least two air outlets of the air conditioner according to the current ambient temperature and generate a control instruction. In some embodiments of the present invention, the air conditioner may comprise two or more air outlets, all of which may output airflow to the

surrounding environment so as to change the ambient temperature. When the air conditioner is in the heating mode or the cooling mode, the one or more control parameters for the air outlet of the air conditioner are determined according to the current ambient temperature of the air conditioner. Optionally, the one or more control parameters for the air outlet of the air conditioner may comprise the direction, the intensity or the temperature of the output airflow from the air outlet.

[0061] An actuator is configured to control the air conditioner to output airflow corresponding to one or more distribution patterns according to the one or more control parameters. After the one or more control parameters for the air outlet are determined, the direction, the intensity or the temperature of the output airflow of the air outlet can be controlled according to the one or more control parameter, thereby controlling the air conditioner to output airflow corresponding to the distribution pattern.

[0062] The above-described embodiments of the present invention are merely for the purpose of description, and do not represent the merits of the embodiments.

[0063] In the above embodiments of the present invention, the description of each embodiment has its own emphasis, and for a part not detailed in a certain embodiment, reference can be made to the related description of other embodiments.

[0064] In the several embodiments provided by the present application, it should be understood that the disclosed technical contents may be implemented in other ways. The device embodiments described above are only schematic. For example, the division of the unit may be a logical function division, but may be a division in other manner. For instance, a plurality of units or components may be combined or integrated into another system, or some features can be ignored or not performed. In addition, the mutual coupling or direct coupling or communication connection shown or discussed may be an indirect coupling or communication connection through some interfaces, units or modules, and may be electrical or otherwise.

[0065] The units illustrated as separate components may or may not be physically separated, and the components shown as units may or may not be physical units, that is, they may be located in one place, or may be distributed on multiple units. Part or all of the units may be selected according to actual needs to achieve the purpose of the solution of the embodiment.

[0066] In addition, respective functional units in respective embodiments of the present invention may be integrated in one processing unit, or may be present physically separately, or two or more units may be integrated in one unit. The integrated unit above can be implemented in the form of hardware or a software functional unit.

[0067] The integrated unit, if implemented in the form of a software functional unit and sold or used as a standalone product, may be stored in a computer readable storage medium. Based on such an understanding, in essence, the technical solution of the present invention, or the part of the technical solution making contribution to the prior art, or all or part of the technical solution may be embodied in the form of a software product. The computer software product is stored in a storage medium, and includes a number of instructions for enabling a computer device (which may be a personal computer, a server or a network device, etc.) to perform all or part of the steps of the method described in the embodiments of the present invention. The foregoing storage medium includes: a U disk, a read-only memory (ROM, Read-Only Memory), a random access memory (RAM, Read-Only Memory), a removable hard disk, a magnetic disk, or an optical disk or other medium capable of storing program codes.

[0068] The above description are merely preferred embodiments of the present invention. It should be noted that various improvements and modifications may also be made for those of ordinary skill in the art without departing from the principles of the present invention, and these improvements and modifications also should be contemplated as being within the protection scope of the present invention.

Claims

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

   determining a current operating mode of the air conditioner;
   determining one or more control parameters for controlling at least two air outlets of the air conditioner according to a current ambient temperature in the operating mode; and
   controlling the air conditioner to output airflow corresponding to one or more distribution patterns according to the one or more control parameters.

2. The method according to claim 1, **characterized in that** the at least two air outlets comprise a first air outlet and a second air outlet, wherein the first air outlet is disposed to be higher than the second air outlet;
   if the operating mode is a cooling mode, the determining one or more control parameters for controlling at least two air outlets of the air conditioner according to a current ambient temperature in the operating mode comprises:

   detecting the current ambient temperature of the environment where the air conditioner is located;
   judging if the current ambient temperature is greater than a first preset temperature;
   determining one or more first control subparam-

eters used for controlling the first air outlet and the second air outlet to simultaneously output airflow corresponding to distribution patterns if the current ambient temperature is greater than the first preset temperature;
determining one or more second control subparameters used for controlling the first air outlet to output airflow corresponding to a distribution pattern and controlling the second air outlet to be closed if the current ambient temperature is less than or equal to the first preset temperature.

3. The method according to claim 1, **characterized in that** the at least two air outlets comprise a first air outlet and a second air outlet, wherein the first air outlet is disposed to be higher than the second air outlet;
if the operating mode is a heating mode, the determining one or more control parameters for controlling at least two air outlets of the air conditioner according to a current ambient temperature in the operating mode comprises:

determining one or more third control subparameters used for controlling the first air outlet to deflect airflow downwardly to output airflow corresponding to a distribution pattern and controlling the second air outlet to output airflow corresponding a distribution pattern;
detecting the current ambient temperature of the environment where the air conditioner is located;
determining one or more fourth control subparameters used for controlling the first air outlet to output airflow corresponding to a distribution pattern and controlling the second air outlet to output airflow corresponding to a distribution pattern if the current ambient temperature is greater than a second preset temperature.

4. The method according to claim 1, **characterized in that** after controlling the air conditioner to output airflow corresponding to one or more distribution patterns according to the one or more control parameters, the method further comprises:

acquiring temperatures of a plurality of sampling points preset in a space where the air conditioner is located to obtain a plurality of temperature values; and
generating a temperature distribution diagram within the space based on the plurality of temperature values and positions of the sampling points corresponding to the plurality of temperature values.

5. The method according to claim 4, **characterized in that** the at least two air outlets comprise a first air outlet and a second air outlet, wherein the first air outlet is disposed to be higher than the second air outlet;
if the operating mode is a heating mode, after controlling the air conditioner to output airflow corresponding to one or more distribution patterns according to the one or more control parameters, the method further comprises:

obtaining a temperature value of a first sampling point and a temperature value of a second sampling point in the space where the air conditioner is located;
judging if the difference between the temperature value of the first sampling point and the temperature value of the second sampling point is greater than a first temperature difference;
determining one or more fifth control subparameters used for controlling the first air outlet to output airflow corresponding to a distribution pattern and adjusting the speed at which the first air outlet outputs the airflow if the difference between the temperature value of the first sampling point and the temperature value of the second sampling point is greater than the first temperature difference; and
controlling the air conditioner to output airflow corresponding to one or more distribution patterns according to the one or more fifth control subparameters.

6. The method according to claim 4, **characterized in that** the at least two air outlets comprise a first air outlet and a second air outlet, wherein the first air outlet is disposed to be higher than the second air outlet;
if the operating mode is a cooling mode, after controlling the air conditioner to output airflow corresponding to one or more distribution patterns according to the one or more control parameters, the method further comprises:

obtaining a temperature value of a third sampling point and a temperature value of a fourth sampling point in the space where the air conditioner is located;
determining one or more sixth control subparameters used for controlling the first air outlet to output airflow corresponding to a distribution pattern and controlling the second air outlet to be closed if the temperature value of the third sampling point and/or the temperature value of the fourth sampling point is less than a second temperature difference; and
controlling the air conditioner to output airflow corresponding to one or more distribution patterns according to the one or more sixth control subparameters.

7. A device for controlling an air conditioner, **characterized by** comprising:

a first determining unit configured to determine a current operating mode of the air conditioner;
a second determining unit configured to determine one or more control parameters for controlling at least two air outlets of the air conditioner according to a current ambient temperature in the operating mode; and
a control unit configured to control the air conditioner to output airflow corresponding to one or more distribution patterns according to the one or more control parameters.

8. The device according to claim 7, **characterized in that** the at least two air outlets comprise
a first air outlet and a second air outlet, wherein the first air outlet is disposed to be higher than the second air outlet;
if the operating mode is a cooling mode, the second determining unit comprises:

a first detection module configured to detect the current ambient temperature of the environment where the air conditioner is located;
a judging module configured to judge if the current ambient temperature is greater than a first preset temperature;
a first determining module configured to determine one or more first control subparameters used for controlling the first air outlet and the second air outlet to simultaneously output airflow corresponding to distribution patterns if the current ambient temperature is greater than the first preset temperature; and
a second determining module configured to one or more second control subparameters used for controlling the first air outlet to output airflow corresponding to a distribution pattern and controlling the second air outlet to be closed if the current ambient temperature is less than or equal to the first preset temperature.

9. The device according to claim 7, **characterized in that** the at least two air outlets comprise a first air outlet and a second air outlet, wherein the first air outlet is disposed to be higher than the second air outlet, the determining one or more control parameters for controlling at least two air outlets of the air conditioner according to a current ambient temperature in the operating mode comprises:

a third determining module configured to determine one or more third control subparameters used for controlling the first air outlet to deflect airflow downwardly to output airflow corresponding to a distribution pattern and controlling the second air outlet to output airflow corresponding a distribution pattern;
a second detection module configured to detect the current ambient temperature of the environment where the air conditioner is located; and
a fourth determining module configured to determine one or more fourth control subparameters used for controlling the first air outlet to output airflow corresponding to a distribution pattern and controlling the second air outlet to output airflow corresponding to a distribution pattern if the current ambient temperature is greater than a second preset temperature.

10. A storage medium comprising a stored program, **characterized in that** the program controls a device where the storage medium is located to perform the method for controlling the air conditioner according to any one of claims 1 to 6 while operating.

11. A processor for operating a program, **characterized in that** the processor performs the method for controlling the air conditioner according to any one of claims 1 to 6 while the program is operating.

12. An air conditioner, **characterized by** comprising:

a sensor configured to determine a current operating mode of the air conditioner;
a processor configured to determine, in the current operating mode, one or more control parameters for controlling at least two air outlets of the air conditioner according to the current ambient temperature and generate a control instruction; and
an actuator configured to control the air conditioner to output airflow corresponding to one or more distribution patterns according to the one or more control parameters.

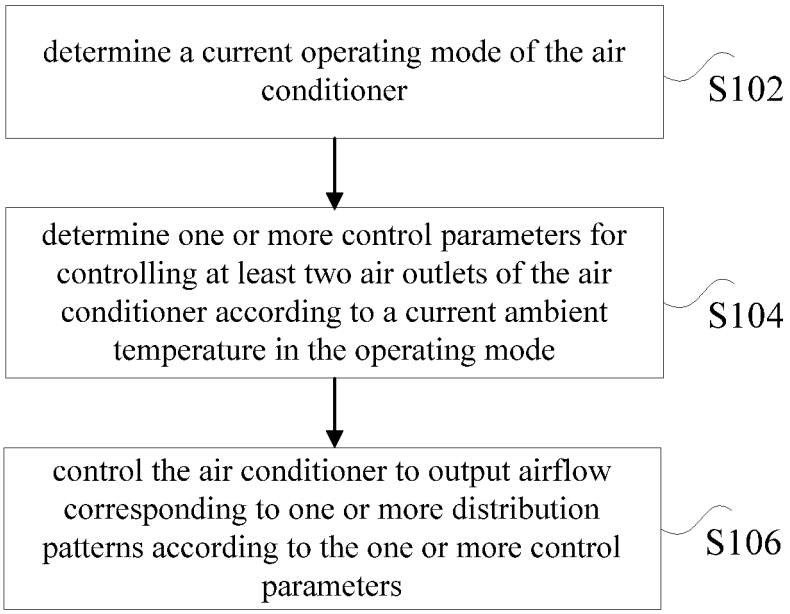

determine a current operating mode of the air conditioner
S102
determine one or more control parameters for controlling at least two air outlets of the air conditioner according to a current ambient temperature in the operating mode
S104
control the air conditioner to output airflow corresponding to one or more distribution patterns according to the one or more control parameters
S106

FIG. 1

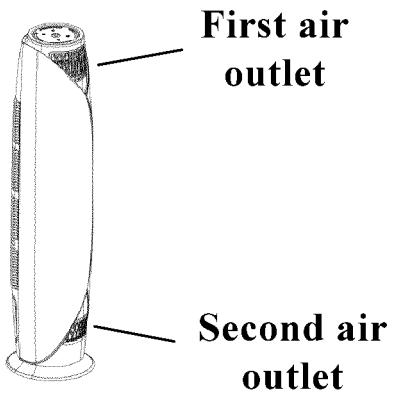

First air outlet
Second air outlet

FIG. 2

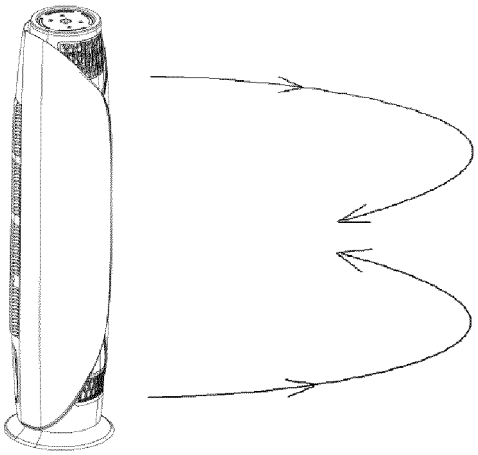
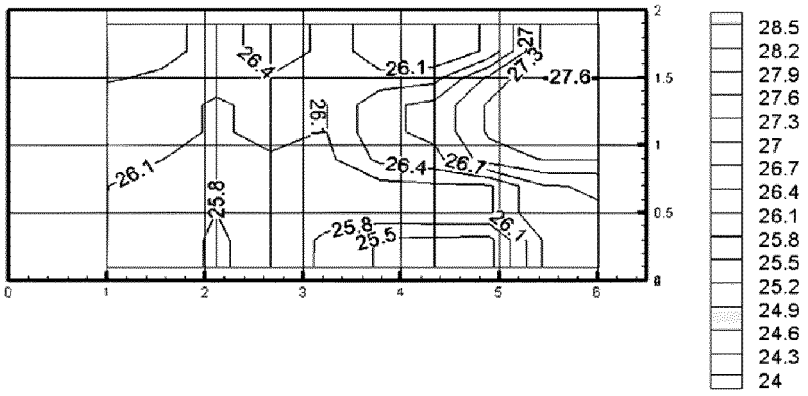


FIG. 3


26.4
26.1
27.27
27.3
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26.1
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FIG. 4

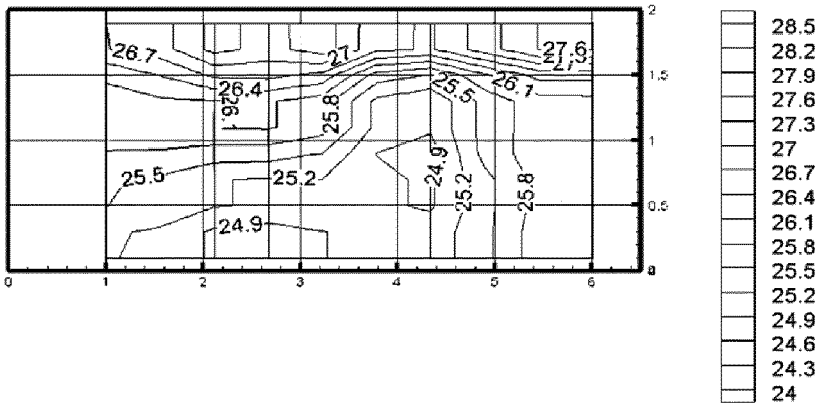
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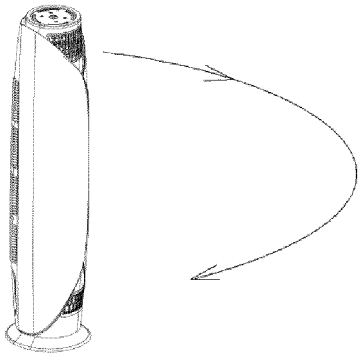
FIG. 5



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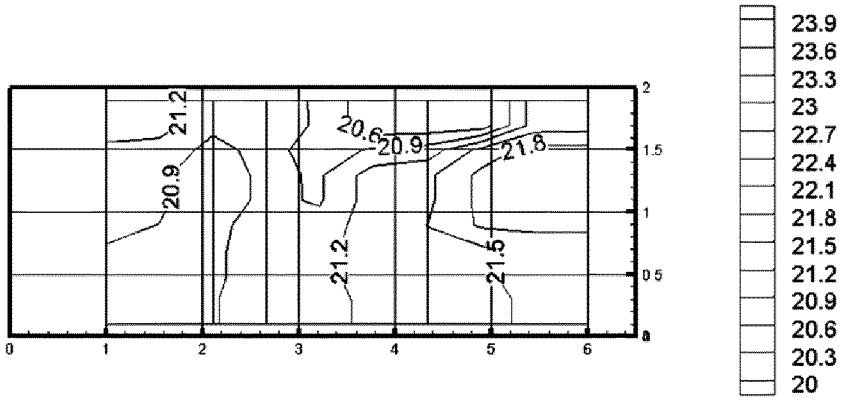
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FIG. 7

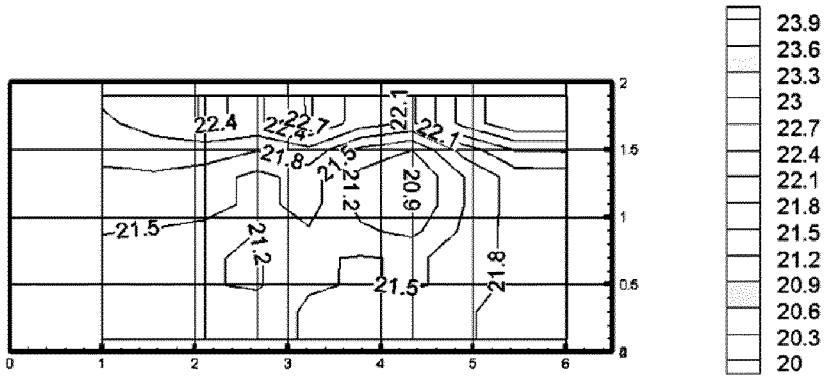
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FIG. 8

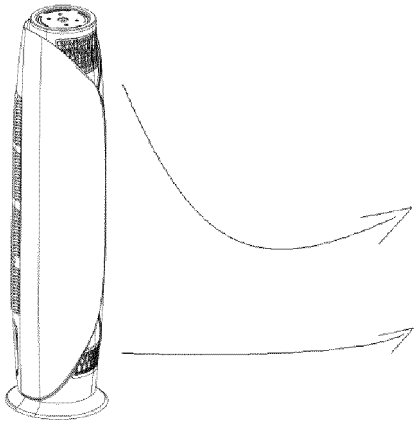

FIG. 9

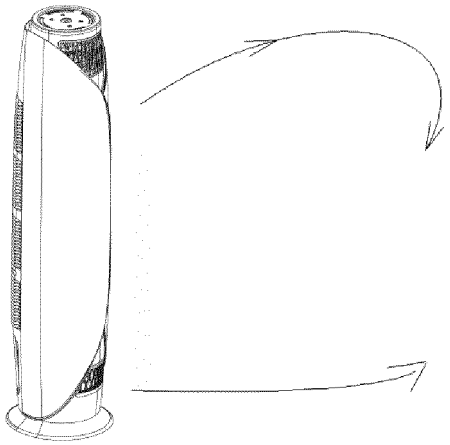

FIG. 10

Compared item	Airflow distribution pattern			
	Centrifugal layered air-out	Single-perfusion frontal air-outlet	Dual-perfusion encircling air-out	Centrifugal upper air-out
Vertical temperature difference(°C) 0.6m-0.1m	1.22 (19.70-18.48)	7.04 (19.53-12.49)	5.3 (18.18-12.88)	4.78 (18.93-14.15)
Vertical temperature difference(°C) 1.1m-0.1m	1.65 (20.13-18.48)	10.7 (23.19-12.49)	8 (20.88-12.88)	7.37 (21.52-14.15)
Vertical temperature difference(°C) 1.6m-0.1m	2.21 (20.69-18.48)	11.71 (24.20-12.49)	8.73 (21.61-12.88)	8.29 (22.45-14.15)
Vertical temperature difference(°C) 2.1m-0.1m	2.26 (20.74-18.48)	12.18 (24.67-12.49)	9.15 (22.03-12.88)	8.41 (22.57-14.15)
Temperature uniformity(°C)	1.24	4.75	3.61	3.36
Power consumption (kW·h)	7.3	12.7	10.9	10.7
Comparison of temperature rise rates of active areas (0.1m to 1.1m) in the first 30 min(°C/min)	0.60	0.45	0.50	0.40

FIG. 11

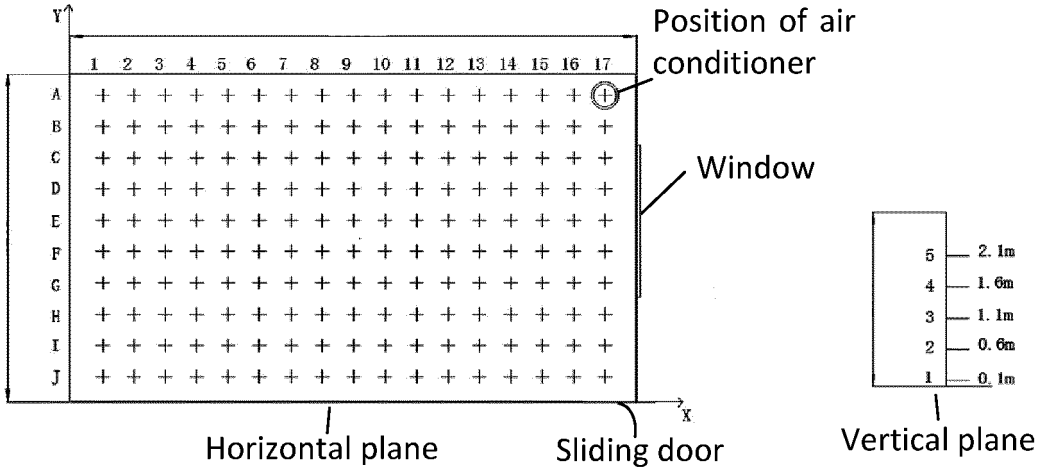

FIG. 12

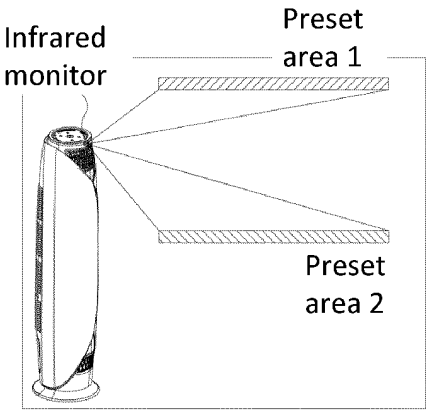

FIG. 13

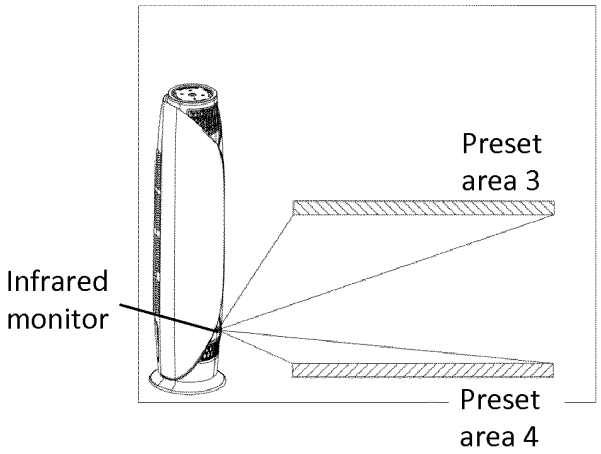

FIG. 14

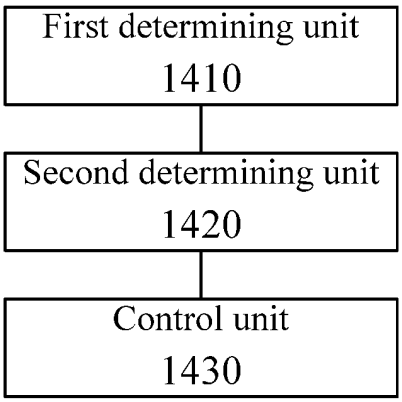

FIG. 15

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2017/087744

A. CLASSIFICATION OF SUBJECT MATTER

F24F 11/00 (2018.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F24F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNKI, CNPAT, WPI, EPODOC: 空调, 出风口, 温度, air conditioner, air outlet, temperature

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 106091264 A (MIDEA GROUP WUHAN REFRIGERATION EQUIPMENT CO., LTD. et al.), 09 November 2016 (09.11.2016), description, paragraphs [0055]-[0105], and figures 1-7	1, 4-7, 10-12
A	CN 106288179 A (QINGDAO HAIER AIR CONDITIONER CO., LTD.), 04 January 2017 (04.01.2017), entire document	1-12
A	CN 105650811 A (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.), 08 June 2016 (08.06.2016), entire document	1-12
A	CN 106440227 A (GREE ELECTRIC APPLIANCES, INC. OF ZHUHAI), 22 February 2017 (22.02.2017), entire document	1-12

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

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"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 January 2018	01 February 2018
Name and mailing address of the ISA State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10) 62019451	Authorized officer MA, Yongxiang Telephone No. (86-10) 61648442

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2017/087744

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 106091264 A	09 November 2016	None	
CN 106288179 A	04 January 2017	None	
CN 105650811 A	08 June 2016	None	
CN 106440227 A	22 February 2017	None	

Form PCT/ISA/210 (patent family annex) (July 2009)