

words, the technique in this document deals with loads caused by general environmental factors and is not intended to save energy in a case that a certain level of load is predictable.

[0009]

The electronic device cooling system described in the Patent Document 2 is intended to cool electronic devices like ones in a datacenter to a given temperature, in which detailed data on loads is available and thus a higher level of energy saving than before can be achieved. However, even in the technique described in the Patent Document 3, there is a need for further energy saving and more active acquisition of load data is an important issue.

[0010]

The air conditioner described in the Patent Document 3 is intended to quickly resolve the temperature distribution in the vertical direction of the air-conditioned area. If this system is applied to an area with a high heat generation density in which servers or the like are densely installed, such as a datacenter, there is a restriction on the locations of temperature sensors or the like, so the system does not always bring about an effect which is required for electronic devices.

[0011]

Embodiments of the present invention ~~seekis-intended~~ to solve the problem of the above related art and ~~has an object~~ to provide an air-conditioning system and air-conditioning control method for efficiently cooling an electronic device which is required to

operate with high precision and generates a large amount of heat, such as a computer or server.

MEANS FOR SOLVING THE PROBLEMS

[0012]

~~In order to achieve the above object,~~ According to one aspect of the present invention, there is provided an air-conditioning control system for air-conditioning an electronic device installation room housing a plurality of electronic devices by a plurality of air conditioners and the system includes an integrated management server which calculates a required amount of cooling energy based on power data on the electronic devices as sent from a first client server including a job management means for managing jobs for the electronic devices and outputs information to control operation of the air conditioners, and a control panel which controls operation of the air conditioners based on a command from the integrated management server, wherein ~~in which~~ the integrated management server includes an environment optimization means to calculate a temperature distribution in the electronic device installation room in controlling operation of the air conditioners based on the required amount of cooling energy and sends a command for controlling operation of the air conditioners to the control panel so that the temperature distribution calculated using the environment optimization means is within a predetermined permissible range-, wherein each air conditioner includes a return air temperature sensor for detecting a temperature of air flowing into the air conditioner, a supply air temperature sensor for detecting a temperature of outflowing air, and a means for detecting a frequency

of a fan of the air conditioner; and wherein the second client server or the integrated management server calculates an amount of currently used cooling energy based on outputs from the return air temperature sensor, the supply air temperature sensor, and the frequency detecting means; and wherein the required amount of cooling energy is a sum of actual power consumption of the electronic devices, or a sum of future power consumption of the electronic devices as predicted by the first client server according to a job plan which the first client server receives, or the calculated amount of currently used cooling energy, whichever is the largest.

[0013]

~~In order to achieve the above object,~~ According to another aspect of the present invention, there is provided an air-conditioning control method for air-conditioning an electronic device installation room housing a plurality of electronic devices by a plurality of air conditioners and the method includes the steps of obtaining power data on the electronic devices by a first client server including a job management means for managing jobs for the electronic devices, calculating a required amount of cooling energy needed for air-conditioning the electronic devices, based on the power data on the electronic devices as obtained by the first client server and calculating information to control operation of the air conditioners, and the integrated management server giving an operation command to the control panel, ~~wherein~~ wherein at the step of the integrated management server giving the operation command to the control panel, a command to control operation of the air conditioners is sent to the control panel so that a temperature distribution obtained using an environment optimization means for calculating a temperature distribution and an air current in the electronic device installation room is within a predetermined permissible range when operation of the air conditioners is controlled based on the power data on the electronic devices and the required amount of cooling energy-, wherein the second client server or the integrated management server calculates an amount of currently used cooling energy based on outputs from a return air temperature sensor, a supply air temperature sensor, and a frequency detecting means which are provided in each air conditioner; and wherein the required amount of cooling energy is a sum of actual

power consumption of the electronic devices, or a sum of future power consumption of the electronic devices as predicted by the first client server according to a job plan which the first client server receives, or the calculated amount of currently used cooling energy, whichever is the largest.

[0014]

In the above system and method, the required amount of cooling energy may be a sum of actual power consumption of the electronic

devices, or the required amount of cooling energy may be a sum of actual power consumption of the electronic devices or a sum of future power consumption of the electronic devices as predicted by the first client server according to a job plan which the first client server receives, whichever is larger, or provided that each air conditioner includes a return air temperature sensor for detecting a temperature of air flowing into the air conditioner, a supply air temperature sensor for detecting a temperature of outflowing air, and a means for detecting a frequency of a fan of the air conditioner and the second client server or the integrated management server calculates an amount of currently used cooling energy based on outputs from the return air temperature sensor, the supply air temperature sensor, and the frequency detecting means, the required amount of cooling energy may be a sum of actual power consumption of the electronic devices, or a sum of future power consumption of the electronic devices as predicted by the first client server according to a job plan which the first client server receives, or the calculated amount of currently used cooling energy, whichever is the largest.

EFFECT OF THE INVENTION

[0015]

According to embodiments of the present invention, the amount of heat generated by an electronic device itself can be estimated from data on the operation of the electronic device, so the air-conditioning system can prevent a computer or server from malfunctioning due

CLAIMS

[Claim 1]

An air-conditioning control system for air-conditioning an electronic device installation room housing a plurality of electronic devices by a plurality of air conditioners, comprising:

an integrated management server which calculates a required amount of cooling energy based on power data on the electronic devices as sent from a first client server including a job management means for managing jobs for the electronic devices and outputs information to control operation of the air conditioners; and

a control panel which controls operation of the air conditioners based on a command from the integrated management server,

wherein the integrated management server includes an environment optimization means to calculate a temperature distribution in the electronic device installation room in controlling operation of the air conditioners based on the required amount of cooling energy and sends a command for controlling operation of the air conditioners to the control panel so that the temperature distribution calculated using the environment optimization means is within a predetermined permissible range,

wherein each air conditioner includes a return air temperature sensor for detecting a temperature of air flowing into the air conditioner, a supply air temperature sensor for detecting

[Claim 4]

An air-conditioning control method for air-conditioning an electronic device installation room housing a plurality of electronic devices by a plurality of air conditioners, comprising
5 the steps of:

obtaining power data on the electronic devices by a first client server including a job management means for managing jobs for the electronic devices;

calculating a required amount of cooling energy needed for
10 air-conditioning the electronic devices, based on the power data on the electronic devices as obtained by the first client server and calculating information to control operation of the air conditioners; and

the integrated management server giving an operation command
15 to the control panel,

wherein at the step of the integrated management server giving the operation command to the control panel, a command to control operation of the air conditioners is sent to the control panel so that a temperature distribution obtained using an environment
20 optimization means for calculating a temperature distribution and an air current in the electronic device installation room is within a predetermined permissible range when operation of the air conditioners is controlled based on the power data on the electronic devices and the required amount of cooling energy-L