DESCRIPTION

TITLE OF THE INVENTION: THERMAL LOAD PREDICTION SYSTEM

TECHNICAL FIELD

The present disclosure relates to a thermal load prediction system.

BACKGROUND ART

As disclosed in PTL 1 (Japanese Patent No. 5572799), there is a technique of learning and predicting a thermal load in a building.

SUMMARY OF INVENTION

Technical Problem

When the thermal load is learned for each outdoor unit as described in PTL 1, there is a problem in that it is difficult to predict the thermal load for each air-conditioning zone.

Solution to Problem

A thermal load prediction system according to an aspect predicts a thermal load of an air-conditioning zone in a building. The thermal load prediction system includes an environmental data acquisition unit, an operation data acquisition unit, a storage unit, a learning unit, and a prediction unit. The environmental data acquisition unit acquires external environmental data related to the environment outside the building and/or internal environmental data related to the environment inside the building, both of which affect the thermal load of the air-conditioning zone. The operation data acquisition unit acquires operation data of an air conditioner configured to perform air conditioning for the air-conditioning zone. The storage unit stores the data acquired by the environmental data acquisition unit and the operation data acquisition unit. The learning unit trains a model for predicting the thermal load of the air-conditioning zone using learning data obtained from the storage unit. The prediction unit predicts the thermal load of the air-conditioning zone by using the model. An indoor unit forming the air conditioner is installed in the air-conditioning zone. The thermal load of the air-conditioning zone in the learning data is calculated based on a heat exchange amount in the indoor unit installed in the air-conditioning zone. The heat exchange amount in the indoor unit is calculated based on the operation data.

In the above aspect of the thermal load prediction system, the learning unit trains the model for predicting the thermal load of the air-conditioning zone using the learning data

obtained from the storage unit. The prediction unit predicts the thermal load of the air-conditioning zone by using the model. The thermal load of the air-conditioning zone in the learning data is calculated based on a heat exchange amount in the indoor unit installed in the air-conditioning zone. As a result, the thermal load prediction system can learn and predict the thermal load for each air-conditioning zone.

In an embodiment of the above thermal load prediction system, the external environmental data includes at least an outside air temperature of the building. The internal environmental data includes at least the indoor temperature of the air-conditioning zone.

In an embodiment of the above thermal load prediction system, the learning unit excludes a record including a missing value or an abnormal value from the learning data before training the model.

In an embodiment of the above thermal load prediction system, the learning unit complements a missing value or an abnormal value included in the learning data before training the model.

In an embodiment of the above thermal load prediction system, the learning unit processes the learning data based on an operating state of the air conditioner or a schedule of the air conditioner before training the model.

The thermal load prediction system of the above embodiment can improve the accuracy of the model for predicting the thermal load of the air-conditioning zone by excluding data that is weakly related to the thermal load of the air-conditioning zone based on the operating state of the air conditioner or the schedule of the air conditioner.

In an embodiment of the above thermal load prediction system, the learning unit uses second learning data for a second air-conditioning zone similar to a first air-conditioning zone, instead of first learning data for the first air-conditioning zone.

With such a configuration, the thermal load prediction system according to the above embodiment can use common learning data for similar air-conditioning zones.

In an embodiment of the above thermal load prediction system, the model is a machine learning model, a statistical model, a physical model, or a combination of these.

In an embodiment of the above thermal load prediction system, the learning unit trains the model using learning data of a predetermined unit.

In an embodiment of the above thermal load prediction system, the learning unit updates the model at a predetermined timing.

In an embodiment of the above thermal load prediction system, the heat exchange

amount in the indoor unit is calculated based on a suction temperature, an air volume, and a refrigerant temperature in the indoor unit.

In an embodiment of the above thermal load prediction system,, wherein the heat exchange amount in the indoor unit is calculated based on a suction temperature, a blow-out temperature, and an air volume in the indoor unit.

BRIEF DESCRIPTION OF DRAWINGS

<Fig. 1> Fig. 1 is a schematic configuration diagram of a thermal load prediction system.

<Fig. 2> Fig. 2 is a diagram illustrating a refrigerant circuit of the air conditioner.

<Fig. 3> Fig. 3 is a control block diagram of the air conditioner.

<Fig. 4> Fig. 4 is a control block diagram of the thermal load prediction device.

<Fig. 5> Fig. 5 is a flowchart for explaining processing executed by the thermal load prediction system.

DESCRIPTION OF EMBODIMENTS

(1) Overall configuration

The thermal load prediction system 1 is a system that predicts thermal loads of air-conditioning zones Z1 and Z2 in a building BL. Fig. 1 is a schematic configuration diagram of the thermal load prediction system 1. As illustrated in Fig. 1, the thermal load prediction system 1 includes an air conditioner 2 and a thermal load prediction device 3. The air conditioner 2 and the thermal load prediction device 3 are communicably connected via a network NW. The network NW is, for example, the Internet.

The air conditioner 2 forms a vapor compression refrigeration cycle and performs air conditioning for the air-conditioning zones Z1 and Z2 in the building BL. In the present embodiment, the air conditioner 2 is a so-called multi-type air conditioning system for a building. As illustrated in Fig. 1, the air conditioner 2 includes indoor units 20a to 20c and an outdoor unit 30. The indoor units 20a and 20b are installed in the air-conditioning zone Z1. The indoor unit 20c is installed in the air-conditioning zone Z2. The indoor units 20a to 20c and the outdoor unit 30 are communicably connected via a communication line 80. Fig. 2 is a diagram illustrating a refrigerant circuit 50 of the air conditioner 2. As illustrating in Fig. 2, the indoor units 20a to 20c and the outdoor unit 30 are connected by a liquid refrigerant connection pipe