case, the service performance of the elevator apparatus may be lowered; for example, the waiting time of the user may increase and the traffic volume may be lowered. Therefore, to assign the elevator car in accordance with a control method optimized for the actual traffic demand in order to improve the service performance, accurate prediction of a traffic demand is important.

SUMMARY OF THE INVENTION

According to one aspect, there is provided an elevator traffic demand prediction apparatus applied to up/down button group control to assign an elevator car in response to a hall call, the apparatus comprising: an acquisition unit configured to acquire an elevator control result including getting-on loads and getting-off loads for respective moving directions and respective floors; a calculation unit configured to calculate a feature amount of a traffic demand based on the elevator control result, the feature amount including a category feature amount representing a category of the traffic demand; a feature amount database configured to store the calculated feature amount of the traffic demand in association with attribute information and time information; a predictor configured to predict a traffic demand by referring to the feature amount database to generate a prediction result, the predictor comprising a plurality of experts configured to predict a category of a traffic demand by referring to different data items included in the feature amount database to generate

predicted values, and the prediction unit outputting, as the prediction result, one of the predicted values; and a selector configured to select a control method complying with the prediction result from a plurality of predetermined control methods, wherein the experts have weights, and every time prediction is performed, a weight of each of the experts is updated to relatively increase the weights when the prediction is correct, and relatively decrease the weights when the prediction is incorrect, and the predictor outputs, as the prediction result, a predicted value generated by an expert having a largest weight.

Also disclosed is an elevator traffic demand prediction apparatus applied to up/down button group control to assign an elevator car in response to a hall call. The apparatus includes

an acquisition unit configured to acquire an elevator control result including getting-on loads and getting-off loads for respective moving directions and respective floors;

a calculation unit configured to calculate a feature amount of a traffic demand based on the elevator control result, the feature amount including a category feature amount representing a category of the traffic demand;

a feature amount database configured to store the calculated feature amount in association with attribute

information and time information;

a predictor configured to predict a traffic demand by referring to the feature amount database, the predictor comprising a plurality of experts configured to predict a category of a traffic demand by referring to different data items included in the feature amount database to generate predicted values, and the prediction unit outputting, as a prediction result, one of the predicted values; and

a selector configured to select a control method complying with the prediction result from a plurality of predetermined control methods.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram schematically showing an elevator apparatus including a traffic demand prediction apparatus according to the first embodiment;

FIG. 2 is a diagram showing an example of an origin destination (OD) table;

FIG. 3 is a flowchart showing procedures to calculate the feature amount of the traffic demand by a feature amount calculation unit shown in FIG. 1;

FIG. 4 is a graph showing an example of getting-on ratios and getting-off ratios for the respective moving directions and the respective floors;

FIG. 5 is a graph showing another example of getting-on ratios and getting-off ratios for the respective moving directions and the respective floors;

FIG. 6 is a diagram showing an example of a method of

calculating the feature amount of the number of users by the feature amount calculation unit shown in FIG. 1;

FIG. 7 is a diagram showing an example of data stored by a feature amount database shown in FIG. 1;

WHAT IS CLAIMED IS:

1. An elevator traffic demand prediction apparatus applied to up/down button group control to assign an elevator car in response to a hall call, the apparatus comprising:

an acquisition unit configured to acquire an elevator control result including getting-on loads and getting-off loads for respective moving directions and respective floors;

a calculation unit configured to calculate a feature amount of a traffic demand based on the elevator control result, the feature amount including a category feature amount representing a category of the traffic demand;

a feature amount database configured to store the calculated feature amount of the traffic demand in association with attribute information and time information;

a predictor configured to predict a traffic demand by referring to the feature amount database to generate a prediction result, the predictor comprising a plurality of experts configured to predict a category of a traffic demand by referring to different data items included in the feature amount database to generate predicted values, and the prediction unit outputting, as the prediction result, one of the predicted values; and

a selector configured to select a control method complying with the prediction result from a plurality of predetermined control methods,

wherein the experts have weights, and every time prediction is performed, a weight of each of the experts is updated to relatively increase the weights when the prediction is correct, and relatively decrease the weights when the prediction is incorrect, and

the predictor outputs, as the prediction result, a predicted value generated by an expert having a largest weight.

2. The elevator traffic demand prediction apparatus according to claim 1, further comprising a prediction parameter database configured to store the weights of the experts in association with a day of the week and time information.

3. An elevator traffic demand prediction apparatus applied to up/down button group control to assign an elevator car in response to a hall call, the apparatus comprising:

an acquisition unit configured to acquire an elevator control result including getting-on loads and getting-off loads for respective moving directions and respective floors;

a calculation unit configured to calculate a feature amount of a traffic demand based on the elevator control result, the feature amount including a category feature amount representing a category of the traffic demand;

a feature amount database configured to store the calculated feature amount of the traffic demand in association with attribute information and time information;

a predictor configured to predict a traffic demand by referring to the feature amount database to generate a prediction result, the predictor comprising a plurality of experts configured to predict a category of a traffic demand by referring to different data items included in the feature amount database to generate predicted values, and the prediction unit outputting, as the prediction result, one of the predicted values; and

a selector configured to select a control method complying with the prediction result from a plurality of predetermined control methods,

wherein the plurality of experts include a first expert configured to perform past time zone prediction, a second expert configured to perform current time zone prediction, and a third expert configured to perform future time zone prediction.

4. The elevator traffic demand prediction apparatus according to any one of claims 1 to 3, wherein the attribute information includes at least one of a date and the number of elapsed days representing the number of days elapsed after an operation start day of the elevator traffic demand prediction apparatus.

5. The elevator traffic demand prediction apparatus according to claim 3, further comprising a reliability calculation unit configured to calculate reliabilities of the experts, the reliabilities representing a percentage of correct answers of prediction in a predetermined period,

wherein the predictor outputs, as the prediction result, a predicted value generated by an expert having the highest reliability.

6. The elevator traffic demand prediction apparatus according to any one of claims 1 to 5, further comprising:

an input unit configured to input working system information representing a working system of a company in a building; and

an expert creation unit configured to create the experts based on the working system information,

wherein the attribute information includes the working system information.