

TITLE OF THE INVENTION

ELEVATOR OPERATION INFORMATION NOTIFICATION SYSTEM,
ELEVATOR OPERATION INFORMATION PROVISION METHOD, ELEVATOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001]

The present invention relates to an elevator system, and particularly, to an elevator operation information notification system, an elevator operation information provision method, and an elevator which provide operation information related to an operation of an elevator operation to a user in advance.

2. Description of the Related Art

[0002]

An elevator is a vertical movement traffic system in a building, and supports smooth movement of users in the building. In particular, in a case where a plurality of elevators is operated, an "elevator group management system" that integrally controls the plurality of elevators as a "group" realizes an efficient operation in consideration of a wait time of the user.

[0003]

In recent years, control for further reducing the wait time by predicting an operation trajectory of a car is

performed in the elevator group management system.
However, the operation efficiency of the elevator may decrease depending on use conditions on the user side.

[0004]

In order to solve such a problem, for example, JP 2002-092487 A discloses a method of notifying of use situations of facilities in a building based on operation information of an elevator. JP 2002-092487 A describes that congestion situations of the facility in the building, a car of the elevator, and an elevator hall are predicted based on the operation information of the elevator and information is provided as use situation information to the user.

[0005]

For example, JP H11-278766 A discloses a method of detecting a long wait at an elevator hall or a congestion state of a car and notifying a user of notification information related to these situations. JP H11-278766 A describes that the frustration of the user is reduced by notifying the user of a notification content which is an apology message.

[0006]

In addition to these methods, W02006/006205 A describes that congestion information of the entire building is detected from a congestion state of an elevator

hall at a current time, a wait time at this time is measured, and the congestion information and wait time information are displayed on a guide display device.

SUMMARY OF THE INVENTION

[0008]

Incidentally, in the elevator described in JP 2002-092487 A, the congestion state of the elevator car and the elevator hall is predicted based on the operation information of the elevator, and the predicted use situation information can be provided to the user.

[0009]

However, when the predicted usage situation information is merely provided to the user, an event in which use situation information in a situation in which the elevator car and the elevator hall are not congested is continuously provided or the use situation information is wastefully provided to users who are not interested in the use situation information occurs.

[0010]

Thus, there is a problem that it is not possible to appropriately provide the use situation information to users who need the use situation information. For example, an unsteady situation different from a normal situation (= steady operation state) occurs in the building. Thus, the

number of users may temporarily increase, and the elevator car and the elevator hall may be congested.

[0011]

However, the user cannot recognize the occurrence of such an event in advance, and may wait for the car of the elevator for a long time under the unsteady situation.

[0012]

In the elevator described in JP H11-278766 A, it is possible to reduce the frustration of the user by notifying the user of the notification content corresponding to the operation situation. However, since such notification is performed after the congestion of the user occurs, it is difficult for the user to avoid a long wait time for the elevator.

[0013]

Similarly, in the elevator described in W02006/006205 A, since the congestion state and the wait time information at the current time are merely displayed, it is difficult for the user to avoid a long wait time for the elevator.

[0014]

The present invention has been made in order to solve one or more of the above-described problems, and an object of the present invention is to provide an elevator operation information notification system, an elevator

operation information provision method, and an elevator capable of suppressing a long wait at an elevator hall by providing operation information indicating a decrease in operation event to a user in advance before an event in which the operation efficiency decreases occurs.

Solution to Problem

[0015]

In the present invention, a decrease in operation efficiency of an elevator under an unsteady situation from a schedule related to a behavior of a user of a building, and/or data of a schedule related to an operation of the elevator, and/or data of a past use state of the elevator, and operation information related to the decrease in the operation efficiency is provided to a display device in a hall or a car of the elevator before an event in which the operation efficiency decreases occurs.

[0016]

In the present invention, means for predicting the number of elevator users based on data of a behavior schedule of a user in a building or data of the past number of elevator users, means for determining whether or not operation efficiency decreases in an unsteady situation of an elevator based on the predicted number of users, means for deciding a predetermined "provision date" and a predetermined "provision time" earlier than an "occurrence

date" and an "occurrence time" at which the operation efficiency decreases when it is determined that the operation efficiency decreases, and means for providing information on the number of elevator users related to the decrease in the operation efficiency and/or the operation information related to the decrease in the operation efficiency to a display device in a hall or a car of the elevator at the "provision time" of the "provision date" are provided.

[0017]

In the present invention, means for predicting an operation state of an elevator based on an operation schedule of the elevator in a building, means for determining whether or not operation efficiency decreases under an unsteady situation of the elevator based on the predicted operation state, means for deciding a predetermined "provision date" and a predetermined "provision time" earlier than an "occurrence date" and an "occurrence time" at which the operation efficiency decreases when it is determined that the operation efficiency decreases, and means for providing operation state information of the elevator related to the decrease in the operation efficiency and/or the operation information related to the decrease in the operation efficiency to a display device in a hall or a car of the

elevator at the "provision time" of the provision date" are provided.

[0018]

According to the present invention, since the operation information indicating the decrease in the operation efficiency of the elevator based on the temporary increase in the number of users can be provided to the user at an appropriate timing before the event in which the operation efficiency decreases occurs under the unsteady situation in which the operation efficiency of the elevator decreases, it is possible to suppress an occurrence of a situation in which the user waits for a long time at the elevator hall.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

Fig. 1 is an overall functional block diagram of an elevator system according to an embodiment of the present invention;

Fig. 2 is a control flowchart related to functional blocks illustrated in Fig. 1;

Fig. 3 is a configuration diagram illustrating an overall configuration of the elevator system according to the embodiment of the present invention;

Fig. 4 is a control flowchart of information

provision determination processing in the embodiment of the present invention;

Fig. 5 is an explanatory diagram illustrating details of a guidance information output condition setting unit in the embodiment of the present invention;

Fig. 6 is an explanatory diagram illustrating output conditions for guidance information in the embodiment of the present invention;

Fig. 7 is an explanatory diagram illustrating different output conditions for the guidance information in the embodiment of the present invention;

Fig. 8 is a control flowchart of an output condition determination unit for the guidance information in the embodiment of the present invention;

Fig. 9 is an explanatory diagram for describing information output conditions and contents of the guidance information indicating a decrease in operation efficiency corresponding to the information output conditions in the embodiment of the present invention;

Fig. 10A is an explanatory diagram for describing first setting processing of a provision date at which the guidance information is provided in the embodiment of the present invention;

Fig. 10B is an explanatory diagram for describing second setting processing of the provision date at which

the guidance information is provided in the embodiment of the present invention;

Fig. 11A is an explanatory diagram illustrating first guidance information indicating the decrease in the operation efficiency in the embodiment of the present invention;

Fig. 11B is an explanatory diagram illustrating second guidance information indicating the decrease in the operation efficiency in the embodiment of the present invention;

Fig. 12A is an explanatory diagram illustrating third guidance information indicating the decrease in the operation efficiency in the embodiment of the present invention;

Fig. 12B is an explanatory diagram illustrating fourth guidance information indicating the decrease in the operation efficiency in the embodiment of the present invention;

Fig. 13 is an explanatory diagram illustrating fifth guidance information indicating the decrease in the operation efficiency in the embodiment of the present invention;

Fig. 14 is an explanatory diagram illustrating sixth guidance information indicating the decrease in the operation efficiency in the embodiment of the present

invention;

Fig. 15 is an explanatory diagram illustrating seventh guidance information indicating the decrease in the operation efficiency in the embodiment of the present invention;

Fig. 16A is an explanatory diagram illustrating eighth guidance information indicating the decrease in the operation efficiency in the embodiment of the present invention;

Fig. 16B is an explanatory diagram illustrating ninth guidance information indicating the decrease in the operation efficiency in the embodiment of the present invention;

Fig. 17 is a control flowchart illustrating a procedure for notifying a user in the embodiment of the present invention;

Fig. 18 is an explanatory diagram for describing a first event in which the operation efficiency of the elevator system decreases;

Fig. 19 is an explanatory diagram for describing the event illustrated in Fig. 18 in more detail;

Fig. 20 is an explanatory diagram for describing a second event in which the operation efficiency of the elevator system decreases;

Fig. 21 is an explanatory diagram for describing a

third event in which the operation efficiency of the elevator system decreases; and

Fig. 22 is an explanatory diagram for describing the event illustrated in Fig. 21 in more detail.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020]

Hereinafter, although embodiments of the present invention will be described in detail with reference to the drawings, the present invention is not limited to the following embodiment, and various modifications and applications can be made within a technical concept of the present invention.

[0021]

First, an event in which the operation efficiency decreases which is a problem of the present invention will be briefly described before a specific embodiment of the present invention is described.

[0022]

<<Event in which operation efficiency of elevator system decreases>>

Fig. 18 illustrates a first event in which operation efficiency of an elevator system decreases. The first event indicates an event in which the number of users increases under an unsteady situation and operation

efficiency of an elevator decreases.

[0023]

In Fig. 18, an example in which many users (external users who are not usually resident in this building) enter the building to attend a monthly meeting in a large meeting room within the building and move from a lobby floor 24 to a floor 26 having the large meeting room by using a plurality of elevator groups 25 is illustrated.

[0024]

In this event, since many users from outside temporarily use elevators, a transport capacity of the elevator is limited to the number of users, and as a result, a wait time becomes long for all elevator users in the building.

[0025]

Especially for users who usually use the elevator, since this situation is not a usual steady situation and an operation efficiency decreases under the unsteady situation, there is a possibility that the wait time becomes long and a time is wasted. Since users on floors other than the lobby floor 24 cannot grasp a congestion situation on the lobby floor 24, it is difficult to understand the reason why the elevator does not arrive at the call, and thus, there is a concern that psychological stress becomes large.

[0026]

Fig. 19 illustrates a change in the number of users when the event illustrated in Fig. 18 occurs, and is a graph representing a time transition in the number of users when a horizontal axis indicates a time axis and a vertical axis indicates the number of elevator users. Here, a curve I3 indicates the number of elevator users in the steady situation, and a reference numeral I4 indicates an increase in the number of users in the steady situation when the event in which the operation efficiency decreases occurs. The increase in the number of users is the predicted number of users.

[0027]

A reference numeral I5 indicates a transport capacity of an elevator operating at a current point in time or a transport capacity of an elevator group managed as a group. This transport capacity is a maximum value of the number of persons transported per hour which is decided by facility specifications (car speed, capacity, and number of floors). A region I6 is shaded with oblique lines as much as an excess of the transport capacity with respect to the total number of users added with the increase, and a region in this time zone satisfies a relationship of predicted number of users $\geq$ transport capacity.

[0028]

Therefore, when the number of users exceeds the transport capacity, there are some users who cannot get on the car at an elevator hall (users who cannot be transported in terms of a facility capacity). Accordingly, the users who cannot get on the elevator are accumulated, and thus, an event in which a queue is formed occurs. In such a case, since the users cannot use the elevator for a while, a long wait time is required for the user.

[0029]

Fig. 20 illustrates a second event in which the operation efficiency of the elevator system decreases. This second event indicates an event in which the number of users increases under the unsteady situation and the operation efficiency of the elevator decreases.

[0030]

Fig. 20 illustrates a case where there is a tenant company A having offices on a plurality of floors (for example, five floors) in a building, the tenant company A holds an all-attendance meeting once every other week, and the elevators simultaneously move to the 27th floor on which the meeting is held in a certain time zone.

[0031]

Even in this event, since the operation efficiency of the elevators temporarily decreases once every other week, elevator users on other floors who use the elevators

in this time zone are influenced by the increase in wait time. Unlike an operation state in the steady situation, since the wait time becomes temporarily long, the users do not know the reason for the long time and cannot predict the wait time, psychological stress will increase in addition to waste time.

[0032]

Fig. 21 illustrates a third event in which the operation efficiency of the elevator system decreases. The third event is an event in which the effective number of operated elevators for general users decreases due to a special operation of the elevators such as a VIP operation and a maintenance and inspection operation, and thus, a decrease in the transport capacity and a decrease in operation efficiency of the elevators are caused.

[0033]

In Fig. 21, a situation in which one elevator 28 of four elevators managed as a group is separated from group management control due to a dedicated operation (such as VIP operation) or a maintenance and inspection operation is assumed. Although this event is planned in advance, this event is an event in which the operation efficiency under the unsteady situation decreases in terms of a normal operation of the elevator.

[0034]

As a result, the effective number of operated elevators by group management decreases from four to three, and thus, the transport capacity decreases. Here, the VIP operation is, for example, an operation mode in which the elevator is operated as a dedicated elevator for an executive of a certain office building or an important visitor who occupies in the building in order to secure security and reduce an unnecessary time.

[0035]

Fig. 22 illustrates a change in the number of users when the event illustrated in Fig. 21 occurs, and is a graph representing a time transition in the number of users when a horizontal axis indicates a time axis and a vertical axis indicates the number of elevator users. Here, a reference numeral J3 indicates the number of elevator users in a time zone in which the effective number of operated elevators decreases. Reference numerals J4 and J5 are values of the time transition in the transport capacity of the elevator.

[0036]

Although the transport capacity is the value indicated by the reference numeral J4 is represented in the steady situation, since the special operation is performed in a time zone before and after 10:20 and the effective number of operated elevators for the general users

decreases, the transport capacity decreases to the value indicated by the reference numeral J5.

[0037]

As a result, in the time zone in which the special operation is performed, the transport capacity is lower than the predicted number of users indicated by reference numeral J3, and in this time zone, a relationship of predicted number of users $\geq$ transport capacity is satisfied. In this case, when the number of users exceeds the transport capacity, there are some users who cannot get on the car at the elevator hall (users who cannot be transported in terms of the facility capacity).

[0038]

Therefore, an event occurs in which a queue is formed due to the accumulation of users who cannot get on the car. In such a case, since the users cannot use the elevator for a while, a long wait time is required for the user.

[0039]

<<Basic concept of present invention>>

In order to prepare for the event in which the operation efficiency of the elevator system decrease, the present invention proposes the following concepts. First, before describing the embodiment of the present invention, the essential points of the basic concept of the present

invention will be briefly described.

[0040]

As mentioned above, there is a problem that the decrease in the operation efficiency of the elevators is caused by the temporary increase in the number of elevator users due to the holding of events and the temporary increase in the number of users due to the decrease in the effective number of operated elevators.

[0041]

Therefore, in the present invention, the user can avoid the use of the elevator in a time when the event in which the operation efficiency of the elevator decreases by providing operation information indicating that the operation efficiency of the elevator decreases (in the embodiment, is used as the guidance information) to the user in advance, and can accordingly reduce the wait time at the elevator hall.

[0042]

In the present invention, for the event (hereinafter, referred to as an operation efficiency decrease event) in which the operation efficiency of the elevator decreases under the unsteady situation, an "occurrence date" and an "occurrence time" at which the operation efficiency decrease event occurs are predicted in advance. The operation information indicating that the

operation efficiency decreases is provided to users who are predicted to use the elevators at the "occurrence date" and the "occurrence time" at which the operation efficiency decrease event occurs at a predetermined "provision date" and a predetermined "provision time" set earlier than the "occurrence date" and the "occurrence time" of the operation efficiency decrease event.

[0043]

The operation efficiency decrease event under the unsteady situation focused on herein is a case where the number of users increases due to the holding of unsteady events or a case where the number of users per car due to the decrease in the effective number of elevators operated increases.

[0044]

For example, as described above, a congestion based on the increase in the number of users due to the unsteady events such as regular large meetings held every other week or once a month and a congestion based on the increase in the number of users due to the decrease in the effective number of operated elevators in the unsteady special operation of the elevator such as the dedicated operation for VIP or the maintenance and inspection operation corresponds to the operation efficiency decrease event. It should be noted that the unsteady event is not limited to

the regular meeting and the special operation described above.

[0045]

As described above, even in a time zone in which a congestion is not normally caused under a steady operation state, a congestion due to the increase in the number of users is temporarily caused by the occurrence of the aforementioned unsteady event. Therefore, when the occurrence of this unsteady event can be predicted, it is possible to provide information indicating that the congestion is caused to the user in advance.

[0046]

Thus, it is important that this unsteady event can be predicted in advance. For example, in the case of the unsteady events such as a meeting that is held regularly, an event in which large numbers of persons gather, and the special operation of the elevator, the unsteady event can be predicted in advance from a history of the use situation of the elevator in the past, and schedules of the building users and tenant companies.

[0047]

The operation information (guidance information) indicating that the operation efficiency decreases to the users who use the elevators at the predetermined "provision date" and the predetermined "provision time" set earlier

than the "occurrence date" and the "occurrence time" of the operation efficiency decrease event can be provided by predicting the "occurrence date" and the "occurrence time" at which the operation efficiency decrease event in which the operation efficiency of the elevator decreases occurs from the prediction of such an unsteady event.

[0048]

Here, the display of the operation information to be provided is characterized in that the operation efficiency (for example, the wait time and the number of users) under the steady operation state at the "occurrence date" and the "occurrence time" of the operation efficiency decrease event is compared with the operation efficiency (for example, the wait time and the number of users) under the unsteady operation state and the operation information including a difference therebetween is output.

[0049]

A degree of influence can be clarified by comparing and displaying the influence of the decrease in the operation efficiency in this manner, and the user can accurately grasp the influence of the decrease in the operation efficiency. As a result, since the user can grasp in advance the occurrence of the operation efficiency decrease event of the elevator under the unsteady situation, the user can avoid the use of the elevator at

the "occurrence date" and the "occurrence time" of the operation efficiency decrease event, and the user can avoid an increase in waste time and an increase in psychological stress.

[0050]

The aforementioned points are the essential points of the concept of the elevator system according to the present invention. Hereinafter, the elevator system according to the embodiment of the present invention will be described in detail with reference to the drawings based on the essential points of this concept.

[0051]

<<First embodiment of present invention>>

An elevator system according to a first embodiment of the present invention will be described in detail with reference to Figs. 1 to 18.

[0052]

<<Functional block of elevator system of present embodiment>>

Fig. 1 illustrates overall functional blocks (control means) of the elevator system according to the first embodiment of the present invention. These function blocks are executed by an elevator remote management system, an elevator group management device, and an elevator control device which are shown in Fig. 3 to be

described below.

[0053]

A configuration of the functional blocks can be divided into "(A) a processing system related to input information", "(B) a processing system related to prediction of the number of users of elevators, calculation of a transport capacity, and evaluation of an operation state based on both the number of users and the transport capacity", "(C) a processing system related to control of output of the guidance information related to the operation state", and "(D) a processing system related to the output of the guidance information". Here, the guidance information is information indicating the decrease in the operation efficiency to be described below or information indicating the decrease in the operation efficiency.

[0054]

The most important of these pieces of information is "(C) the processing system related to the output of the guidance information related to the operation state". In this processing system, the control of the output of the guidance information for users who are directly influenced by the decrease in the operation efficiency and the creation of the display content for providing effective guidance information to the user are performed.

[0055]

In Fig. 1, first, "(A) the processing system related to the input information" includes an operation state prediction condition setting unit 1, a database unit 3 for past person flows in a target building, a building tenant and building user schedule database unit 4, a building and elevator specification database unit 6, and an elevator operation schedule database unit 7.

[0056]

The operation state prediction condition setting unit 1 sets a "date" and a "time" to be predicted. Loop processing (repetition processing) is executed from the "date" and the "time", and search processing for the "occurrence date" and the "occurrence time" at which the operation efficiency decrease event occurs is performed. For example, the search is performed by setting a period to one week or two weeks later.

[0057]

The database unit 3 related to the past people flows in the building in the target building is, for example, a database of person flows in the building measured by stop floor data of the elevator and data of the number of users who get on and off the elevator on this floor (measured by a load sensor of the car).

[0058]

For example, in the case of an office building, an

up-peak person flow in working hours and a down-peak person flow at the start of lunch, and in the case of an apartment building, a down-crossing person flow in commuting or working hours in the morning is a typical person flow pattern. From a past history of this person flow data, it is possible to detect an event which is held once a week, once every other week, or once a month and in which a large number of users gather.

[0059]

Here, data on the past person flow in the building corresponds to "data on a use state of the elevator in the past" in the claims. The "data on the use state of the elevator in the past" can also include past person flow data other than the above-described examples.

[0060]

For example, in the building tenant and building user schedule database unit 4, appropriate management such as protection of personal information or filtering processing is performed on even schedule data of the tenant companies occupying the building, the users working or living in the building, and users who visit the meeting or event from the outside, and the processed data is accumulated. It is possible to accurately predict the occurrence of an event in which a large number of persons gather from the schedule data thereof. The number of users

can be predicted based on the event prediction.

[0061]

Here, building tenant and building user schedule data corresponds to "data on a schedule related to a behavior of a user in a building" in the claims. The "data on the schedule related to the behavior of the user in the building" may include schedule data other than the aforementioned examples.

[0062]

The building and elevator specification database unit 6 stores specification data of an elevator such as a floor pitch of the building, the number of installed elevators, a service floor, a speed, and a capacity of the car in order to calculate the elevator transport capacity to be described below.

[0063]

The elevator operation schedule database unit 7 stores, for example, an operation schedule related to the operations of the elevators in the building, and can specify date and time when the special operation of the elevator such as the dedicated operation for VIP or the maintenance and inspection operation is executed from the information related to the operation schedule.

[0064]

Here, the operation schedule data of the elevator

corresponds to "data on a schedule related to an operation of an elevator" in the claims. The "data on the schedule related to the operation of the elevator" may include operation schedule data other than the above-described examples.

[0065]

Subsequently, "(B) the processing system related to the prediction of the number of elevator users, the calculation of the transport capacity, and the elevation related to the operation state based on both the number of elevator users and the transport capacity" executes the prediction of the number of elevator users, the calculation of the transport capacity, and the evaluation of the operation state of the elevator based on both the number of elevator users and the transport capacity from the input information obtained by "(A) the processing system related to the input information".

[0066]

First, an elevator user demand prediction unit 2 predicts an elevator use demand in an "occurrence date and time" set by the operation state prediction condition setting unit 1 from each data of the database unit 3 for the past person flow in the building in the target building and the building tenant and building user schedule database unit 4.

[0067]

A point of the prediction mentioned herein is to predict two demand components, that is, prediction of a steady demand component (processing of reference numeral 201) and prediction of an unsteady demand component (processing of reference numeral 202), and the latter prediction of the demand component is particularly important. Here, the demand component is, for example, the number of users who use the elevators.

[0068]

This unsteady demand component corresponds to a case where the number of users of the elevators temporarily increases under the above-mentioned unsteady situation in a time zone in which the congestion is not usually caused, and corresponds to a case where the users of the elevators attend a large meeting once a month to be held in the morning. The demand component under this unsteady situation is predicted by analyzing the past history of the person flow data in the building and the schedule data of tenants, users, and meeting rooms.

[0069]

An elevator transport capacity calculation unit 5 calculates the transport capacity which is the number of transported persons of the elevator per hour based on the building and elevator specification data of the building

and elevator specification database unit 6. Here, it is important to obtain the effective number of operated elevators at the "occurrence date and time" from the elevator operation schedule database unit 7 for the "occurrence date and time" set by the operation state prediction condition setting unit 1.

[0070]

For example, when the special operation such as the dedicated operation for VIP or the maintenance and inspection operation, since a part of the elevators is used for the special operation, the effective number of operated elevators for general users decreases (a plurality of elevators such as elevators managed as a group is assumed). Such a situation is detected from the operation schedule database unit 7, the effective number of operated elevators is calculated, and the value of the transport capacity at the "occurrence date and time" predicted from a value of a basic transport capacity based on the calculated effective number of operated elevators is corrected. That is, the number of facilities being operated in the steady state is corrected by the number of facilities required for the special operation.

[0071]

This modified transport capacity is different from the steady transport capacity, and can be regarded as a

transport capacity under the unsteady situation. A change in the transport capacity due to a change in the effective number of operated elevators under this unsteady situation is an important point in the present embodiment. Here, the transport capacity is calculated, but the effective number of operated elevators serviced for general users may be used instead. This effective number of operated elevators can be calculated by, for example, subtracting the number of elevators used for the dedicated operation such as the VIP operation or the maintenance and inspection operation from the number of elevator facilities.

[0072]

The elevator operation state evaluation unit 8 for the demand evaluates the operation state of the elevator by comparing the number of elevator users (demand amount) calculated as described above with the transport capacity of the elevator. Here, in a situation where the number of users exceeds the transport capacity (number of users $\geq$ transport capacity), it is determined that the operation efficiency of the elevator decreases.

[0073]

Here, in particular, it is important to detect a decrease in the operation efficiency due to the unsteady event such as a decrease in the operation efficiency due to an increase in the number of demand components under the

unsteady situation and/or a decrease in the operation efficiency due to a decrease in the transport capacity under the unsteady situation.

[0074]

When it is determined that the operation efficiency decreases, the guidance information is notified to an information terminal 9 of a building manager or a tenant. The building manager is inquired whether or not to output the guidance information related to the operation state to be described below.

[0075]

In "(C) the processing system related to the control of the output of the guidance information related to the operation state" performs output control (control under what condition the guidance information is output) for the guidance information related to the operation state when it is determined that the operation efficiency decreases. A series of processing is performed by a guidance information output control unit 10 related to the elevator operation.

[0076]

The guidance information output control unit 10 executes important processing for narrowing down the users who are influenced by using the elevators in the "occurrence date and time" at which the decrease in the operation efficiency is predicted and providing the

guidance information in the predetermined "provision time" of the set predetermined "provision date".

[0077]

The guidance information is operation efficiency information that is related to the decrease in the operation efficiency and is provided to the user in advance, and is particularly guide information related to the decrease in the operation efficiency under the unsteady situation. The guidance information (guide information) is, for example, information related to an increase in the number of users, information related to an increase in wait time, information related to a decrease in the number of movable elevators, and information obtained by numerically indexing such information. This guidance information will be described below.

[0078]

Next, the guidance information output control unit 10 related to the operation of the elevator will be described. The guidance information output condition setting unit 101 sets a condition for outputting the guidance information related to the decrease in the operation efficiency. The condition set herein is a condition of a specific date and time such as the predetermined "provision time" of the predetermined "provision date" set earlier than the "occurrence date" and

the "occurrence time" at which the decrease in the operation efficiency is predicted and an information provision location that sends the guidance information.

[0079]

These conditions are date and time and a location in which the users who are influenced by the decrease in the operation efficiency by using the elevators in the occurrence date and time when the occurrence of the operation efficiency decrease event is predicted is expected to use the elevators earlier than the occurrence date and time when the occurrence of the operation efficiency decrease event is predicted. For example, the condition includes one week ago of the occurrence date and time when the occurrence of the operation efficiency decrease event is predicted, the morning of the previous day, and the same time as the occurrence time.

[0080]

Here, as described in Fig. 1, the processing up to the processing of the guidance information output condition setting unit 101 is processing that is performed as advance preparation, for example, one week ago, and two weeks ago. Processing (processing after reference numeral 102) subsequent to this processing is processing to be executed in real time as the daily time elapses.

[0081]

A guidance information output condition determination unit 102 determines whether or not current conditions (a date, a time, a call, and a location) match output conditions set by the guidance information output condition setting unit 101.

[0082]

For example, as the set output condition, a condition of whether the location is a hall of a floor on which a floor call is registered or the inside of a car in which a car call is registered is determined at the same time of the previous day at which the operation efficiency decrease event occurs. When these conditions match each other, processing for providing the guidance information to the elevator user at this location is performed.

[0083]

When it is determined that the guidance information is provided, a guidance information content creation unit 103 creates the content of the guidance information related to the decrease in the operation efficiency. An information content indicating that this guidance information has a degree of influence by comparing the case of the operation state in the steady state (normal state) with the case of the operation state in which the operation efficiency decreases in order to give a warning that the operation efficiency decreases due to the unsteady event

which does not normally occur. Details of this guidance information will be described with reference to Figs. 11A to 16B.

[0084]

Finally, in "(D) the processing system related to the output of the guidance information", processing for outputting the created guidance information according to the output condition is executed. Specifically, in a guidance information output unit 11, data on the content of the guidance information is output to one or more information display devices such as an information display device 12 in the car, an information display device 13 at the elevator hall, and a user information terminal 14.

[0085]

In the information display device 12 in the car, the information display device 13 at the elevator hall, and the user information terminal 14, the guidance information related to the decrease in the operation efficiency is output to the user of the elevator on each device.

[0086]

Next, a control flow of the functional blocks illustrated in Fig. 1 will be described. Fig. 2 illustrates a control flow relating to the functional blocks described in Fig. 1. Hereinafter, a flow of this processing will be described.

[0087]

First, the control flow of Fig. 2 is started at a predetermined start timing. Conditions such as date and time for predicting the operation state are set (S2). This processing corresponds to the processing in the operation state prediction condition setting unit 1 of Fig. 1.

Subsequently, processing for predicting the demand (the steady state component and the unsteady component) of the elevator user under the above-described prediction condition is performed (S3). This processing is performed by the elevator user demand prediction unit 2 of Fig. 1.

[0088]

The transport capacity of the elevator under the above-described prediction condition is calculated (S4).

This processing is executed by the elevator transport capacity calculation unit 5 illustrated in Fig. 1.

Subsequently, the evaluation of the operation state of the elevator for the predicted demand is performed (S5). This evaluation is performed by comparing the predicted number of users and the transport capacity, and is executed by the elevator operation state evaluation unit 8 for the demand of Fig. 1.

[0089]

As a result of this evaluation, it is predicted and determined whether or not the operation efficiency of the

elevator decreases under the unsteady situation (S6). When the decrease in the operation efficiency is not predicted, the processing proceeds to the end, and the processing ends.

[0090]

Meanwhile, when the decrease in the operation efficiency is predicted, the output condition of the guidance information for the decrease in the operation efficiency of the elevator is set (S7). This processing is executed by the guidance information output condition setting unit 101 of Fig. 1. The occurrence of the operation efficiency decrease event is predicted in advance, and when the occurrence is predicted, the processing for setting the output condition is performed.

[0091]

Processing subsequent to this processing is processing to be executed in real time every day. First, the conditions of the current "date" and "time" are checked, and it is determined whether or not the current date and time satisfy the output condition for the guidance information (S8). This processing is performed by the guidance information output condition determination unit 102 of Fig. 1. When the current date and time do not satisfy the output condition for the guidance information, the processing proceeds to the end, and the processing

ends.

[0092]

Meanwhile, when the current date and time satisfy the output condition for the guidance information, the content of the guidance information is subsequently created (S9). This processing is executed by the guidance information content creation unit 103 of Fig. 1. The data of the guidance information created last is output (S10). This processing is the processing of the guidance information output unit 11 of Fig. 1.

[0093]

As described above, according to the functional blocks in the embodiment described with reference to Figs. 1 and 2, it is possible to acquire actions and effects such as (1) it is possible to predict the temporary increase in the number of users and the decrease in the operation efficiency of the elevator due to the decrease in the effective number of operated elevators which are caused under the unsteady situation which are not usually caused, (2) it is possible to set the output conditions of an appropriate provision date, provision time, and provision location at which the guidance information indicating the decrease in the operation efficiency is output for the users estimated to be influenced in the occurrence date and time when the decrease in the operation efficiency is

predicted, (3) it is possible to create the information content indicated by comparing a degree of influence of the decrease in the operation efficiency with a degree of influence in the normal state, and (4) it is possible to provide the guidance information to the users influenced by the decrease in the operation efficiency in the appropriate provision date and time and the provision location based on the comparison result.

[0094]

As a result, the users of the elevators can grasp the occurrence of the operation efficiency decrease event of the elevator in advance, can avoid the use of the elevator at the corresponding time of the day, and can avoid the increase in waste time and the increase in psychological stress of the user.

[0095]

<<Configuration of elevator system>>

Next, a configuration of the elevator system to which the present embodiment is applied will be described with reference to Figs. 3 and 4. The description of an overall configuration of a hardware system in which the functional blocks described in Figs. 1 and 2 are implemented and processing from a macro viewpoint corresponds to this description.

[0096]

First, Fig. 3 is a diagram illustrating a configuration of the entire system according to the embodiment of the present invention. When the entire system is classified from the macro viewpoint, the system can be divided into an "elevator remote management system", a "group management elevator system", and a "building management system".

[0097]

First, the "elevator remote management system" includes an elevator remote management system 15 which remotely manages and controls a plurality of elevators and group management devices operating in many buildings via a dedicated communication network. The elevator remote management system plays a role of a management system in the correspondence of higher-level control of the elevator group management devices that control a plurality of elevators as a group. The functional blocks described in Figs. 1 and 2 are mainly mounted in the elevator remote management system 15, and the processing is executed in the elevator remote management system.

[0098]

Next, the "group management elevator system" includes the elevators managed as a group and a device group of the hall. First, an elevator group management device 16 that integrally controls a plurality of elevators

as a group is provided. A control device 171, a car 181, a destination floor call registration device 1811, a load sensor 1812, and an in-car information output device 121 described in Fig. 1 are provided for a first elevator managed as the group. A control device 172, a car 182, a destination floor call registration device 1821, a load sensor 1822, and an in-car information output device 122 are similarly provided for an M-th elevator.

[0099]

On the hall side, a hall call registration device 1911 and an in-hall information output device 131 described in Fig. 1 are provided at a hall 191 on the first floor, and a hall call registration device 1921 and an in-hall information output device 132 are similarly provided at a hall 192 on an N-th floor.

[0100]

Here, the functional blocks described in Figs. 1 and 2 may be mounted on the elevator group management device 16 instead of the elevator remote management system 15, and the processing may be executed in the elevator group management device.

[0101]

The destination floor call registration devices 1811 and 1821 of the cars are used for causing passengers to register destination floors, and the load sensors 1812 and

1822 are used for estimating the number of passengers within the cars.

[0102]

In the present embodiment, the in-car information output devices 121 and 122 play an important role of providing information to users in the cars. The users in the cars often look at the in-car information output devices 121 and 122 while moving in the cars, and thus, the guidance information indicating that the operation efficiency decreases is directly provided to the users who are influenced by the decrease in the operation efficiency.

[0103]

It is possible to more appropriately provide the guidance information in accordance with the presence or absence of the user and the destination floor information by combining determination of whether the call states of the destination floor call registration devices 1811 and 1821 are registered and determination of whether or not there is the passenger in the car by the load sensors 1812 and 1822 in the car.

[0104]

The same applies to the hall side. The in-hall information output devices 131 and 132 play an important role of providing the guidance information indicating that operation efficiency decreases to the users of the hall.

It is possible to more accurately provide the guidance information to the user according to a time when and a direction in which the user is at the elevator hall in combination with information indicating whether or not the elevator hall calls of the elevator hall call registration devices 1911 and 1921 are registered and information of a direction of the elevator hall call.

[0105]

“Finally, the building management system” includes a schedule management server 20 for the entire building, a schedule server 21 for the tenant A in the building, and a building facility management server 22, and these servers are connected to the elevator remote management system 15 via a wide-area communication network 23 such as the Internet.

[0106]

The user information terminal 14 described in Fig. 1 is also connected to the elevator remote management system 15 via the communication network 23. Here, regarding the correspondence with the functional blocks of Fig. 1, the schedule management server 20 of the entire building and the schedule server 21 of the tenant A in the building correspond to the building tenant and building user schedule database unit 4 of Fig. 1, and the elevator group management device 16 and the building facility management

server 22 correspond to the building and elevator specification database unit 6 and the elevator operation schedule database unit 7 of Fig. 1.

[0107]

The schedule management server 20 of the entire building manages event schedules for the entire building such as large meetings and large events in which many persons gather. The schedule server 21 of the tenant A in the building manages an event schedule in which a plurality of persons for each tenant company occupying the building moves. The building facility management server 22 manages scheduled information of maintenance and inspection of building facilities including the elevators.

[0108]

The elevator remote management system 15 can predict the temporary increase in the number of users and the decrease in the effective number of operated elevators under the unsteady situation in the building by using the schedule information.

[0109]

The operation of the overall system according to the system configuration illustrated in Fig. 3 is as follows. First, information on a large event in which a plurality of persons moves in the building or a plurality of persons gathers in the building is transmitted to the elevator

remote management system 15 from the schedule management server 20 of the entire building of the building management system and the schedule server 21 of the tenant A in the building. Similarly, information such as the maintenance and inspection operation and the VIP dedicated operation is transmitted from the building facility management server 22 to the elevator remote management system 15.

[0110]

The elevator remote management system 15 predicts the occurrence of the operation efficiency decrease event of the elevator under the unsteady situation and the "occurrence date" and "occurrence time" thereof based on such information. The output conditions of "provision date", "provision time", and "provision location" at which the guidance information indicating that the operation efficiency decreases is provided to the user of the elevator based on the "occurrence date" and "occurrence time".

[0111]

At the "provision date" and "provision time" at which the guidance information is output, the guidance information indicating that the operation efficiency decreases is provided to the information output devices 121 and 122 in the car of each elevator and the information output devices 131 and 132 of the elevator hall on each

floor from the elevator remote management system 15 via the elevator group management device 16 or directly without using the elevator group management device 16.

[0112]

Here, since the user used the elevator at the date and time when the occurrence of the operation efficiency decrease event is predicted, a warning can be given in advance by providing the guidance information indicating that the operation efficiency decreases to the user thereof in advance at any "provision date" and "provision time".

[0113]

With such a mechanism, it is possible to avoid the influence of the decrease in the operation efficiency caused under the unsteady situation as much as possible by providing appropriate information to an appropriate user.

[0114]

Finally, when the user information terminal 14 is supplemented, the details of the information provision to the user using the user information terminal 14 will be described in detail as a second embodiment with reference to Fig. 17. In this method, the user information terminal 14 can individually provide the guidance information related to the decrease in the operation efficiency by using an email by taking advantage capable of coping with each individual.

[0115]

Next, a control flow of information provision determination processing will be described with reference to Fig. 4. This control flow is a control flow to which processing for inquiring the building manager about whether or not to provide the guidance information to the user of the elevator is added when the decrease in the operation efficiency of the elevator is predicted under the unsteady situation.

[0116]

First, the control flow of Fig. 4 is started at a predetermined start timing. Processing for predicting and evaluating the operation state of the elevator is executed (S13). Subsequently, it is determined whether or not the decrease in the operation efficiency of the elevator is predicted under the unsteady situation (S14). When the decrease in the operation efficiency is not predicted, the processing proceeds to the end, and the processing ends.

[0117]

Meanwhile, when the decrease in the operation efficiency is predicted, the guidance information indicating that the operation efficiency of the elevator decreases under the unsteady situation is provided to the building manager (S15). Whether or not to provide the guidance information indicating that the operation

efficiency of the elevator decreases under the unsteady situation to the user is inquired (S16).

[0118]

When the guidance information is not provided to the user, the processing proceeds to the end, and the processing ends. Meanwhile, when the guidance information is provided to the user, processing for providing the guidance information indicating that the operation efficiency of the elevator decreases to the user is executed (S17).

[0119]

By such processing, first, the building manager can grasp in advance that there is a possibility that the operation efficiency decrease event occurs in the building, and can further select whether or not to provide the guidance information to the user as necessary.

[0120]

For example, when one of the elevators is operated exclusively for an important visitor of the building and the operation efficiency decreases due to the unavoidable unsteady situation, the information may not be disclosed to the user. Since the large event in the building or the special operation of the elevator may be a special circumstance on the building side, the elevator system cannot determine whether or not to provide the guidance

information without permission. In such a case, the control flow as illustrated in Fig. 4 is effective.

[0121]

<<Information output control of elevator system>>

Next, information output control of the elevator system will be described. This information output control is particularly important control in the present embodiment, and details thereof will be described with reference to Figs. 5 to 10B.

[0122]

Fig. 5 is a detailed functional block diagram of the guidance information output condition setting unit 101 illustrated in Fig. 1. The data input to the guidance information output condition setting unit 101 is data of an evaluation result of the operation state and an "occurrence date D" and an "occurrence time T" when the occurrence of the operation efficiency decrease event is predicted. These input data are used in the following setting units. Hereinafter, the processing of the functional unit block will be described.

[0123]

First, the "provision date" at which the guidance information is output is set by a "provision date" condition setting unit 1011, and a "provision date" as a condition to be output is set based on the "occurrence date

D" when the occurrence of the operation efficiency decrease event is predicted. The "provision date" to be output is set as a "provided date" divided into a plurality of dates such that the guidance information is not provided very early and is not provided immediately before the guidance information is provided to the user.

[0124]

For example, the provision date is set to be divided into three times, that is, one week ago (D-7), the previous day (D-1), and the day (D) of the "occurrence date" at which the occurrence of the operation efficiency decrease event is predicted. When the previous day is a holiday such as Saturday and Sunday, the date is set to the previous day on business day (D-3).

[0125]

Subsequently, a "provision time" condition setting unit 1012 that outputs the guidance information sets a "provision time" as a condition to be output based on the "occurrence time T" when the occurrence of the operation efficiency decrease event is predicted. This "provision time" is set to a time obtained by estimating the time used by the user who is directly influenced by the decrease in the operation efficiency by using the elevator on the day.

[0126]

For example, since the time zone before and after

the same time as the "occurrence time T" when the decrease in the operation efficiency is predicted is considered to be a time when the user normally uses, the time zone when the user normally uses is set as the "provision time" to be output.

[0127]

Subsequently, a "provision location" condition setting unit 1013 at which the guidance information is output sets the condition of "provision location" at which the guidance information is output at the "provision date" and "provision time" described above. Since the guidance information is provided to the users who use the elevator, the "provision location" is the elevator hall of the elevator and the inside of the car. Other appropriate locations include the user information terminal (a smartphone, a tablet, a personal computer, and an information device), an entrance on a lobby floor, and a dining hall. Here, the guidance information related to the predicted decrease in the operation efficiency is provided to a display device such as a display device or a digital signage device.

[0128]

A start condition setting unit 1014 for outputting the guidance information sets a condition for starting to provide the guidance information. A start condition is

obtained by detecting that the user is present at the "provision location" described above. For example, it is possible to detect that the hall call is registered in the case of the elevator hall and the destination floor call is registered and the user is present in the car from load data of the load sensor in the case of the inside of the car.

[0129]

Finally, an output condition table creation unit 1015 for the guidance information creates an output condition table that summarizes the output conditions set in each processing.

An example of this table is a table indicated by a reference numeral 1016.

Results of items of "provision date", "provision time", "provision location", and "output start condition" at which the guidance information already described is provided are registered in this table. For example, the output condition determination unit 102 for the next guidance information determines whether or not the output condition of the guidance information is satisfied based on these output conditions, and when the output condition is satisfied, the information output devices 121 and 122 in the car provide the guidance information related to the decrease in the operation efficiency to the user.

[0130]

Fig. 6 illustrates an example of the output condition related to the guidance information. This output condition is defined by contents such as an output condition table T1 (same as reference numeral 1016 in Fig. 5) for the guidance information, and items of a "provision date" T4 and a "provision time" T5 when the guidance information which is a setting condition T3 of the information output is provided and a "provision location" T6 at which the guidance information is provided are defined for each item number T2.

[0131]

It is assumed that the "provision time" T5 represents a time zone of a predetermined time length. Therefore, the guidance information may be provided over the entire time zone having the predetermined time length, or may be a time zone near the beginning or the center of the time zone.

[0132]

Next, the details of the setting conditions for the "occurrence date" and the "occurrence time" at which the occurrence of the operation efficiency decrease event is predicted will be described with reference to Fig. 6.

[0133]

First, when the "provision date" at which the

guidance information is one week ago (D-7) and the “provision time” at which the guidance information is provided is twice the time zone including a working hour time zone (08:00 - 09: 00) in the morning and the “occurrence time” at which the decrease in the operation efficiency is predicted. The “provision location” at which each piece of guidance information is provided is the elevator hall of the lobby floor, the inside of the car that departs from the lobby floor, the elevator halls of all the floors, and the inside of the car in which the user is getting on the elevator.

[0134]

That is, in the case of the working hour time zone (08:00 - 09:00) in the morning, since the user gets on the elevator from the lobby floor, when the guidance information is provided to the elevator hall of the lobby floor and the inside of the car that departs from the lobby floor, the user can easily grasp the guidance information. Meanwhile, in the same time zone as the “occurrence time” at which the occurrence of the operation efficiency decrease event is predicted, the guidance information is provided to all the users of the elevator halls or the cars who use the elevators in this time zone, and thus, the users can grasp the guidance information.

[0135]

When the operation efficiency decreases, the wait time increases on all the floors and all the cars of the elevators. Thus, such guidance information is provided to all the users in this time zone.

[0136]

When the "provision date" at which the guidance information is provided is the previous day (D-1 or D-3), the same guidance information is provided to the same "provision time" and "provision location" as those in one week ago.

[0137]

When the "provision date" at which the guidance information is provided is the day (D), the "provision time" at which the guidance information is provided is three times of a time zone including the working hour time zone (08:00 - 09:00) in the morning, a time zone (for example, (T-15) minutes) earlier than the "occurrence time" at which the decrease in the operation efficiency decreases, and the "occurrence time" at which the decrease in operation efficiency is predicted. The "provision location" at which each piece of guidance information is provided is the elevator hall of the lobby floor, the inside of the car that departs from the lobby floor, the elevator halls of all the floors, and the inside of the car in which the user is getting on the elevator.

[0138]

That is, in the case of the working hour time zone (08:00 - 09:00) in the morning, the reason is the same as the reason described above. In the time zone earlier than the "occurrence time" at which the decrease in the operation efficiency is predicted, it is considered that the user who uses the elevator earlier than the "occurrence time" uses the elevator again after a while (for example, 15 minutes later) the user completes the business on the very day. Therefore, the reason is that the guidance information is provided to the user.

[0139]

The time zone including the "occurrence time" at which the decrease in the operation efficiency is predicted is a situation in which the operation efficiency decrease event already occurs, and this case will be described below. However, the guidance information is provided in order to explain the situation description and the reason of the decrease in the operation efficiency to the user.

[0140]

Finally, the start conditions of the information provision for providing the guidance information can be output conditions in which the passengers get on the elevator from the fact that the elevator hall call is registered in the case of the elevator hall and the

destination floor call of the load sensor or the inside of the car is registered in the case of the inside of the car in order to provide the information to the users to which the guidance information is provided.

[0141]

The concept of the output condition for the guidance information illustrated in Fig. 6 is to provide the guidance information to the user in three temporal stages. (1) First guidance information is provided to the user and the user grasp this guide information at an early state one week ago, (2) second guidance information is provided on the previous day and the user is encouraged to change a behavior on the next day, and (3) the user is finally encouraged to take a behavior for reliably avoiding the operation efficiency decrease event by providing the guidance information immediately before the operation efficiency decrease event occurs in the morning on the very day.

[0142]

An effect capable of providing the guidance information to the user who uses the elevator in the time zone in which the operation efficiency decrease event occurs can be expected by dividing the concept of the output condition into three stages.

[0143]

In the working hour time zone in the morning, it is possible to provide warning information to many users influenced by the decrease in the operation efficiency on the very day by providing the guidance information is provided to the elevator hall of the lobby floor on which most of the users in the building gather and the inside of the car and providing the guidance information to the elevator halls of all the floors and the inside of the car for the users in this time zone.

[0144]

Next, output conditions different from the output conditions of Fig. 6 will be described with reference to Fig. 7. In Fig. 7, in an output condition table T7 (same as reference numeral 1016 in Fig. 5) related to the guidance information, items of an operation efficiency decrease level T10 which is a setting condition T9 for providing the guidance information and a provision date T11 and a provision time T12 at which the guidance information is provided are defined for each item number T8. The provision location at which the guidance information is provided is omitted due to space limitations.

[0145]

A difference from the output condition table T1 for the guidance information described with reference to Fig. 6 is that the operation efficiency decrease level T10 is

newly added. Hereinafter, this item will be described in detail. Other information is the same as the content described in Fig. 6, and thus, the description is omitted.

[0146]

The items of the operation efficiency decrease level T10 are classified into three levels of "high", "medium", and "low" in descending order of the decrease in the operation efficiency, and the guidance information is output according to the decrease level. The classification of the decrease level is, for example, performed two weeks ago as a determination starting point. The determination starting point is arbitrary.

[0147]

For example, a case where the guidance information is provided one week ago (D-7) is only a case where the decrease level is high. In the case of the previous day (D-1 or D-3), when the decrease level is medium or higher, the guidance information is provided in the working hour time zone (08:00 - 09:00) in the morning.

[0148]

Meanwhile, the condition for providing the guidance information even when the decrease level of the operation efficiency is low is a time zone including the "occurrence time" on the previous day (D-1 or D-3) at which the decrease in the operation efficiency decrease is predicted,

the working hour time zone (08:00 - 09:00) on the very day (D), and a time zone (for example, (T-15) minutes) earlier than the "occurrence time" at which the decrease in the operation efficiency is predicted.

[0149]

As described above, the user can more accurately receive the guidance information by changing the provision condition of the guidance information (changing the number of times the guidance information is provided) according to the decrease level of the operation efficiency.

[0150]

For example, when the influence of the decrease in the operation efficiency is large, the guidance information is repeatedly notified, and thus, the user can avoid the operation efficiency decrease event without forgetting. Meanwhile, when the influence of the decrease in the operation efficiency is small, the number of times of guidance is small, and thus, it is possible to suppress occurrence of discomfort caused by persistently providing the guidance information.

[0151]

The decrease level of the operation efficiency can be appropriately evaluated based on a value of a difference between the number of users and the transport capacity, a value of the number of users itself, a value of the

transport capacity or the effective number of operated elevators.

[0152]

Next, a control flow of the output condition determination unit related to the guidance information will be described with reference to Fig. 8. The point of this control flow is to search a situation in which it is predicted that the user influenced by the decrease in the operation efficiency uses the elevator and provide the guidance information by checking the "provision date", "provision time", "provision location", and the output start condition at which the guidance information is provided in real-time processing according to the set output conditions.

[0153]

First, the control flow of Fig. 8 is started at a predetermined start timing. It is determined whether or not a current point in time (the day on which this processing is executed) is the "provision date" at which the guidance information is provided (S20). When it is determined that the current point in time is not the "provision date", the processing proceeds to the end, and the processing ends. Meanwhile, when it is determined that the current point in time is the "provision date", it is further determined whether or not the current point in time

(the time at which this processing is being executed) is the "provision time" at which the guidance information is output (S21). The "provision time" is a time zone given a predetermined time length as described above.

[0154]

In this control step, when it is determined that the current point in time is not the "provision time", the processing proceeds to the end, and the processing ends. Meanwhile, when it is determined that the current point in time is the "provision time", first, as the determination of the elevator hall side, it is determined whether or not a current floor is the elevator hall of the floor on which the guidance information is output (S22). Here, when the current floor is not the elevator hall, that is, in the case of "No", all other floors are searched, and in the case of still "No", the processing proceeds to the end, and the processing ends.

[0155]

When it is determined that the elevator floor is the floor on which the guidance information is output, it is determined whether or not the elevator hall call is registered at the elevator hall (S23). This determination condition corresponds to a guidance information output start condition (item in the table indicated by a reference numeral 1016) described with reference to Fig. 5.

[0156]

Here, when it is not determined that the guidance information output start condition is satisfied, the processing proceeds to control step S25, and when it is determined that the guidance information output start condition is satisfied, the guidance information indicating the decrease in the operation efficiency is provided to the information output device (display device or digital signage device) of the elevator hall (S24). In this case, character information and image information are displayed on the information output device, and are further notified by voice.

[0157]

Next, as a determination on the car side, it is determined whether or not the designated car is a car of an elevator at which the guidance information is output (S25). Here, when the car is not the car at which guidance information is output, that is, in the case of "No", all other cars are searched, and in the case of still "No", the processing proceeds to the end, and the processing ends.

[0158]

When it is determined that the car at which the guidance information is output, it is determined whether or not the passenger gets on the car (S26). This determination can be performed by determining whether or

not the destination floor call in the car is registered or determining whether or not the passenger gets on the car from the load sensor in the car. This determination also corresponds to the guidance information output start condition (item in the table indicated by a reference numeral 1016) described in Fig. 5.

[0159]

Here, when the passenger does not get on the car, the processing proceeds to the end, and the processing ends. When the passenger gets on the car, the guidance information indicating the decrease in the operation efficiency is provided to the information output device (display device or digital signage device) of the car of the elevator (S27). In this case, character information and image information are displayed on the information output device, and are further notified by voice.

[0160]

According to the control flow in the guidance information output condition determination unit 102 as described above, the guidance information indicating the decrease in the operation efficiency in real time under appropriate output conditions can be provided to the user of the elevator influenced by the decrease in the operation efficiency. As a result, the user can grasp in advance that the operation efficiency decrease event occurs, and

can avoid the use of the elevator when the operation efficiency decrease event occurs.

[0161]

Next, a display example of specific guidance information will be described. Fig. 9 illustrates a table of a format in which the contents of the guidance information indicating the decrease in the operation efficiency are classified according to the output conditions, and is indicated by a reference numeral A1.

[0162]

Table A1 illustrated in Fig. 9 is characterized in that the information contents to be output according to the output conditions and a degree of decrease in the operation efficiency are expressed in a visually easy-to-understand manner. Hereinafter, the contents of Table A1 (hereinafter, referred to as sorting table A1) according to the output conditions will be described.

[0163]

First, for sorting table A1, an item of a "provision date" A2 is classified into two items of a "previous day or one week ago" A3 and a "very day" A4, and are classified into a case where the guidance information is output (provided) before the very day and a case where the guidance information is output (provided) on the very day. These two items are sorted as items of a "provision time"

A5, a "provision location (target)" A6, and an "information provision content" A7 in a row direction. Since the "provision time" A5 and the "provision location (target)" A6 are already described, the "information provision content" A7 will be described in detail here.

[0164]

An "information provision content" A8 in the case of the "previous day or one week ago" A3, and an "information provision content" A9 in the case of the "very day" A4 are illustrated in the item of the "information provision content" A7. Any provision information is displayed as "forecast of operation situation of elevator" from the information output devices (reference numerals 13 and 12 of Fig. 1) in the elevator hall and the car. The "forecast of operation situation of elevator" is one of the guidance information. The characteristics of this information provision content are as follows.

[0165]

(a) A guide message indicating the decrease in the operation efficiency which is a set of time information at which the operation efficiency decrease event occurs: specifically, displays of "... at the same time tomorrow" and "... after 10 minutes from now" are examples of the time information at which the operation efficiency decrease event occurs.

[0166]

(b) Quantitative comparison between the normal time and the occurrence of the operation efficiency decrease event using an index related to the operation state: specifically, the number of users in the normal time and the increase in the occurrence of the operation efficiency decrease event are shown as different colors or display patterns by using the predicted number of elevator users as the index. By this display form, the user can grasp the degree of influence of the decrease in the operation efficiency in an easier-to-understand manner by comparing the degree of influence with the current situation.

[0167]

(c) Situation of time transition of quantitative comparison illustrated in (b): a user situation for 30 minutes including the occurrence time of the event under the operation efficiency decrease event is illustrated every 5 minutes. It is characterized by including the same time as the current time. According to this display form, the user can grasp which time zone has a large influence of the decrease in the operation efficiency in the entire time zone, and can more accurately avoid this time.

[0168]

(d) Specification of positions at the current time in the time transition of (c): a specific example is the

display with arrow markers of reference numerals A10 and A11. Accordingly, it is possible to accurately grasp a time at which the degree of decrease in the operation efficiency becomes relatively large with the current time as a reference, and it is possible to obtain a prospect for taking a more accurate avoidance behavior.

[0169]

Next, an example of setting a "provision date" at which the guidance information is provided will be described with reference to Figs. 10A and 10B. Each of Figs. 10A and 10B is based on calendar-based schedules (B1a and B1b) for each day of the week.

[0170]

Fig. 10A illustrates the example of setting the provision date at which the day on which the decrease in the operation efficiency is predicted is a weekday other than Monday. In the schedule B1a arranged by day of the week, there is an "occurrence date" B2a at which the decrease in the operation efficiency is predicted, and a time zone including the "occurrence date" B2a, a previous day B3a, and a day B4a one week ago with the "occurrence date" B2a as the reference are set to the day on which the guidance information indicating the decrease in the operation efficiency is provided.

[0171]

First, the reason why one week ago B4a is set to the day when the guidance information is provided is that a high possibility that the users who use the elevators at the "occurrence date" and "occurrence time" at which the operation efficiency decrease event occurs use the elevator at the same time on the same day of the week is estimated.

[0172]

The reason why the previous day is set to the day on which the guidance information is provided is that when the guidance information is provided to the users who are usually using the elevator at the time before and after the "occurrence time" on the very day, since the guidance information is not useful for the user on the very day, the guidance information is provided on the previous day of the "occurrence date" and the user is encouraged to avoid the use of the elevator on the very day.

[0173]

Meanwhile, Fig. 10B illustrates the example of setting the provision date at which the day on which the decrease in the operation efficiency is predicted is Monday (the previous day is a holiday). In the schedule B1b arranged by day of the week, the "occurrence date" B2b at which the decrease in the operation efficiency is predicted, the day B3b three days before the "occurrence date" (the previous day on the business day), and the day

B4b one week ago are dates at which the guidance information indicating the decrease in the operation efficiency is provided. The reason why the day B4b one week ago is the same as the reason in Fig. 10A, but when the previous day is a holiday, since there is no user of the target elevator, the previous day B3b on the business day is set.

[0174]

It is possible to provide the guidance information to the user of the elevator before the "occurrence date" of the operation efficiency decrease event by setting the "provision date" at which the guidance information is provided as described in Figs. 10A and 10B, and as a result, it is possible to provide the guidance information related to the operation efficiency decrease event in advance to many users who are influenced by the decrease in the operation efficiency on the very day of the "occurrence date". Therefore, it is possible to decrease the number of users influenced by the decrease in the operation efficiency by increasing the number of users who avoid the use of the elevator at the "occurrence time" of the "occurrence date" of the operation efficiency decrease event.

[0175]

<<Display form of guidance information of elevator system>>

Next, a display form of the guidance information of the elevator system will be described. Figs. 11A and 11B are contents in which the situation of the decrease in the operation efficiency is provided to the user by illustrating the predicted number of elevator users with time. Figs. 11A and 11B illustrate states displayed on a display screen.

[0176]

Fig. 11A illustrates an example in which the predicted number of elevator users is used as an index, and Fig. 11B illustrates an example in which a ratio of the predicted number of elevator users is used as an index. Although the predicted number of elevator users is not an index directly indicating the decrease in the operation efficiency, the predicted number of elevator users is an important cause of the decrease in the operation efficiency. The degree of decrease in the operation efficiency can be indirectly informed by showing an increase in the number of users.

[0177]

In particular, the increase in the number of users is equivalent to a congestion index. Since the user can easily grasp the congestion state and can understand the influence on the operation situation of the elevator, the guidance information using the number of users is more

effective to inform the user of the congestion situation. The guidance information illustrated in Figs. 11A and 11B is displayed on an information display device or a personal information terminal at the elevator hall or the car.

[0178]

First, a display example of the guidance information illustrated in Fig. 11A is a graph illustrating a change in the predicted number of elevator users with the passage of time in which a horizontal axis represents a time and a vertical axis represents the predicted number of elevator users. Here, the change in the predicted number of elevator users under the steady situation is indicated by a reference numeral C3a, whereas an increase in the predicted number of users before and after the "occurrence time" at which the predicted operation efficiency decrease event occurs is indicated by a hatched region C4a in the graph. The hatched region C4a is displayed with an emphasis color or an emphasis pattern.

[0179]

Fig. 11A illustrates the guidance information of the time zone including the "occurrence time" of the previous day when the operation efficiency decrease event occurs, and time marker information C5a indicating the "occurrence time" of the "occurrence date" of tomorrow is displayed.

[0180]

This display example is characterized in that the normal time and the occurrence of the operation efficiency decrease event are represented in a display form in which the increase in the predicted number of elevator users is emphasized in different display formats (colors or fill patterns) so as to be compared.

[0181]

Accordingly, the user who sees this guidance information can easily know the degree of the temporary increase in the number of users compared to the normal time, and can grasp the time zone in which the user is strongly influenced by the decrease in the operation efficiency from the passage of time. It is possible to specifically grasp a relative increase state in the number of users with the passage of time by checking the time marker information C5a indicating the "occurrence time".

[0182]

As a result, in the display example of Fig. 11A, in the same time zone as tomorrow (occurrence date), since the number of users is the largest and the operation efficiency greatly decreases, it is possible to determine that the user uses the elevator 10 minutes later tomorrow, and it is possible to take an appropriate avoidance behavior.

[0183]

Accordingly, many users affected by the increase in

wait time can avoid the increase in wait time and can smoothly move to the target floor by using the elevator at the date and time at which the operation efficiency event occurs. In particular, since the operation efficiency decrease event that occurs under the unsteady situation cannot be predicted by general users, the above-described effects can be expected by providing such guidance information.

[0184]

Next, the display example illustrated in Fig. 11B is a graph illustrating a change in this ratio with the passage of time in which a horizontal axis represents a time and a vertical axis represents a ratio of the predicted number of elevator users to the number of persons in the steady state.

[0185]

Here, the ratio of the predicted number of elevator users under the steady situation is indicated by a reference numeral C3b, whereas an increase in the ratio of the predicted number of users before and after the "occurrence time" at which the predicted operation efficiency decrease event occurs is indicated by a hatched region C4b in the graph. The hatched region C4a is displayed with an emphasis color or an emphasis pattern. It is possible to specifically grasp the relative increase

state of the number of users with the passage of time by checking the time marker information C5b indicating the "occurrence time".

[0186]

Fig. 11B is different from Fig. 11A in that the index on the vertical axis represents a ratio of the predicted number of elevator users to that in the steady state, and only the characteristics based on this point will be described below. In Fig. 11B, since the ratio of the predicted number of elevator users to that in the steady state is used as the index, the reference numeral C3b indicating the situation in the steady state is 100%, and the increase when the operation efficiency decrease event occurs is the region C4b indicating the ratio exceeding 100%. Thus, an effect of more easily understanding the increase can be expected.

[0187]

Next, a display form of the guidance information of the elevator system, which is different from Figs. 11A and 11B will be described. In Figs. 12A and 12B, the wait time of the elevator is used as the index indicating the decrease in the operation efficiency, and the influence of the decrease in the operation efficiency is represented according to the degree of increase in the wait time.

[0188]

Here, the wait time is an average elevator hall call wait time for the elevator hall call. Another wait time, for example, an average wait time from when the user arrives at the elevator hall may be used. Hereinafter, the wait time will be simply described as the average wait time.

[0189]

The guidance information indicating the decrease in the operation efficiency illustrated in Figs. 12A and 12B is basically the same as that of Figs. 11A and 11B. A difference is that the average wait time is used as the index, and a special effect using this difference is described below.

[0190]

First, a display example of the guidance information illustrated in Fig. 12A is a graph illustrating a change in the average wait time of the elevator with the passage of time in which a horizontal axis represents a time and a vertical axis represents the average wait time of the elevator. Here, the average wait time of the elevator in the steady situation is indicated by a reference numeral D3a, whereas the increase in the average wait time before and after the "occurrence time" at which the predicted operation efficiency decrease event occurs is indicated by a hatched region D4a in the graph. The hatched region D4a

is displayed with an emphasis color or an emphasis pattern. Time marker information D5a indicating the "occurrence time" of the "occurrence date" of tomorrow is displayed.

[0191]

Here, the wait time of the elevator is the index that the user places the most importance on the elevator, and the influence of the decrease in the operation efficiency can be more directly and strongly informed to the user by using this wait time as the index. In particular, since the increase in the wait time caused by the temporary decrease in the operation efficiency is highlighted separately from the steady state, it is possible to easily and visually grasp the influence of the decrease in the operation efficiency.

[0192]

Fig. 12B illustrates a case where the average wait time of the elevator is represented as a ratio to the steady state as the index of the decrease in the operation efficiency. Fig. 12B is a graph representing a change in a ratio with the passage of time in which a horizontal axis represents a time and a vertical axis represents the ratio of the average wait time of the elevator to the steady state.

[0193]

A steady wait time is used as a reference, and is

indicated by a reference numeral D3b as 100%. A display form in which an increase in the average wait time at which the operation efficiency decreases is emphasized in a different display format (color or fill pattern) is used. It is possible to specifically grasp the increase state of the average wait time with the passage of time by checking the marker information D5a indicating the "occurrence time".

[0194]

The display example illustrated in Fig. 12B is characterized in that the average wait time is represented not by an absolute value but by a ratio. Accordingly, the user can intuitively understand the increase in the wait time with respect to the current wait time by the ratio (equivalent to the magnification) when the operation efficiency decrease event occurs.

[0195]

Since the accuracy can be slightly lower than the wait time represented by the absolute value, the operator of the elevator has the advantage of being easy to implement, and thus, benefits are given to the users.

[0196]

That is, when the provision of the guidance information is postponed due to the requirement of high accuracy by displaying the absolute value of the wait time,

since the guidance information is not provided to the user at all, the user is influenced by the long wait of the elevator.

[0197]

For example, when the guidance information is displayed based on this ratio, it is possible to start providing the guidance information after the user's understanding that the accuracy is low is obtained in advance.

[0198]

Next, a display form of the guidance information of the elevator system which is different from Figs. 12A and 12B will be described. Fig. 13 is a display example in which the average wait time (left side) E1a under the steady situation and the average wait time (right side) E2 when the operation efficiency decrease event under the unsteady situation occurs can be compared by using the average wait time of the elevator as the index indicating the decrease in the operation efficiency.

[0199]

Here, as the average wait time E2a when the operation efficiency decrease event occurs, the average wait time of the operation efficiency decrease event closest to the currently predicted operation efficiency decrease event among the plurality of past operation

efficiency decrease events is used. Two graphs on the left and right illustrated in Fig. 13 are displayed on the information display device as a set as a pair.

[0200]

Both the left and right graphs of Fig. 13 have the same display form, and are graphs illustrating the change in the average wait time of the elevator with the passage of time in which a horizontal axis represents a time and a vertical axis represents the average wait time of the elevator. A reference numeral E4a represents the average wait time in the steady state, and a reference numeral E4b represents the average wait time when the operation efficiency decrease event occurs. Reference numerals E5a and E5b represent marker information indicating the "occurrence time" of the operation efficiency decrease event.

[0201]

Here, as described above, in the graph representing the average wait time E4b when the operation efficiency decrease event occurs, the average wait time closest to the current operation efficiency decrease event is selected from the past average wait times when the operation efficiency decrease event occurs, and the selected average wait time is displayed as the past average wait time of the operation efficiency decrease event.

[0202]

Since a target operation efficiency decrease event is the operation efficiency decrease event under the unsteady situation, for example, when the number of users increases due to the holding of the event, it is difficult to predict the accurate number of users.

[0203]

Therefore, an effect of easily informing the user of the degree of influence of the decrease in the operation efficiency is obtained by displaying the average wait time closest to the current operation efficiency decrease event among the past average wait times as reference data by taking into account such a case.

[0204]

Actually, when a large meeting is held, the number of users may greatly fluctuate depending on conditions such as the theme of the meeting at this time, and it is difficult to perform accurate prediction in such a case. As an alternative, since the average wait time closest to the current operation efficiency decrease event is displayed among the past average wait times, the user can refer to the average wait time. Since the past data is displayed, there is an advantage that it is easy for the elevator operation side to explain to the user.

[0205]

In the case of such a display form, the comparison of the two graphs can be grasp in an easier-to-understand manner by displaying a message of "decrease in operation efficiency is expected at this time tomorrow" indicated by a reference numeral E6 of Fig. 13.

[0206]

Next, a display form of the guidance information of the elevator system which is different from Fig. 13 will be described.

[0207]

Fig. 14 illustrates a case where the average wait time closest to the current operation efficiency decrease event from the past average wait times as in Fig. 13 and this average wait time is provided as reference information to the user. In Fig. 14, a graph at the steady state and a graph of a current increase are displayed in one graph object F1 with different colors or display patterns.

[0208]

In the display example of Fig. 14, a horizontal axis represents a time, a vertical axis represents the ratio of the average wait time of the elevator, and this ratio is an index of the ratio based on the steady state as a reference (100%). A reference numeral F4 is a graph of the ratio of the average wait time in the steady state (a value of 100%), and a reference numeral F5 is a graph of the ratio

of the average wait time when the operation efficiency decrease event occurs. It is possible to specifically grasp the increase state of the average wait time with the passage of time by checking the time marker information F6 indicating the "occurrence time".

[0209]

This display example is characterized in that the ratio based on the average wait time in the steady state is set as the wait time ratio as the index indicating that the operation efficiency decreases and the reference example is displayed by using the past average wait time of the operation efficiency decrease event closest to the operation efficiency decrease event currently predicted.

[0210]

By grasping this guidance information, the user can grasp the ratio at which the wait time increases at the date and time when the operation efficiency decrease event occurs in a visually easy-to-understand manner compared to the steady situation (basically the current situation).

[0211]

The occurrence of the operation efficiency decrease event and the guidance information for the operation efficiency decrease event easily understood by the user and the fact that the guidance information is the past reference data can be transmitted by simultaneously

displaying a message F7 of "this is a past example in the same situation" that clarifies the meaning indicating the display form of Fig. 14.

[0212]

Next, a display form of the guidance information of the elevator system which is different from Figs. 11A to 14 will be described.

[0213]

The display example of Fig. 15 is characterized in that an operation state index of the elevator corresponding to the transport capacity such as the effective number of operated elevators is used as the index indicating the decrease in the operation efficiency. For example, one or a plurality of elevators may be separated from the operation for general users by performing the special operation such as the VIP operation or the maintenance and inspection operation as described above.

[0214]

In this case, since the effective number of operated elevators for general users decreases, the value of the operation state index decreases according to the decrease in the effective number of operated elevators. Therefore, it is possible to inform the user of the influence of the decrease in the operation efficiency of the elevator by indicating the degree of decrease in the operation state

index. It is effective to use, as the elevator operation state index, an index value proportional to the transport capacity representing the number of transported persons per hour or an index value in proportional to the effective number of operated elevators.

[0215]

In the display example of Fig. 15, a horizontal axis represents a time, and a vertical axis represents an operation state index representing the transport capacity of the elevator (number of transported persons per hour). The operation state information is the index of the ratio based on the steady state (100%). 100% of the vertical axis is the operation state index in the steady state, and a reference numeral G3 is a graph representing the operation state index when the operation efficiency decrease event occurs. Time marker information G4 indicating the "occurrence time" of the "occurrence date" of tomorrow is displayed.

[0216]

In the display example of Fig. 15, the operation state index decreases to 50% or less from the steady state in the vicinity of the time marker information G4, and the influence of increasing the wait time is informed to the user. This case is, for example, a situation in which the effective number of operated elevators decreases to less

than half by the special operation under the unsteady situation.

[0217]

The operation efficiency decreases under the unsteady situation (for example, fluctuations in the number of operated elevators) of the operation state of the elevator as well as the aforementioned event such as a large meeting in which the number of elevator users temporarily increases. The display example illustrated in Fig. 15 is effective for accurately informing the user of such a decrease in the operation efficiency.

[0218]

The user can change the use time at the predicted occurrence date of the operation efficiency decrease event in advance by grasping the change in the operation state index G3 tomorrow (the predicted occurrence date of the operation efficiency decrease event) and recognizing a time zone in which the decrease in the operation state index G3 is large from the change of the operation state index G3 with the passage of time. Thus, the user can grasp in advance that the operation efficiency decrease event occurs, and can avoid the use of the elevator when the operation efficiency decrease event occurs.

[0219]

Next, a display form of the guidance information of

the elevator system which is different from Figs. 11A to 15 will be described. In the display example of Fig. 16, the "occurrence date", "occurrence time", and "degree of decrease in operation efficiency" of the operation efficiency decrease event are provided to the user not by the graph but by characters and numerical values.

[0220]

This display form is effective, for example, when a screen size of the information display device in the elevator hall or the car is small or when the information is provided to the user information terminal by an e-mail or a pop-up message.

[0221]

In the display example illustrated in Fig. 16A, the display form includes a display content section H1a, a message H2a indicating the character information related to the decrease in the operation efficiency and the information of the "occurrence date", an "occurrence time" H3a, and character information H4a indicating the degree of decrease in the operation efficiency which are displayed on the display screen of the information display device.

[0222]

In this display example, the operation efficiency decrease event such as the temporary increase in the number of elevator users occurs tomorrow (the occurrence date of

the operation efficiency decrease event), and the guidance information indicating that the time is the time zone between 10:10 and 0:30 and an increase rate in the number of users is 180 to 250% is informed to the user.

[0223]

The user can specifically grasp in advance the time zone in which the number of users increases and the degree of decrease in the operation efficiency from this guidance information. Here, the degree of decrease in the operation efficiency is expressed as the increase rate in the number of users based on the normal state (100%), and the user can quantitatively grasp the degree of influence compared with the steady state (equivalent to the current situation except on the very day of occurrence).

[0224]

Next, in the display example illustrated in Fig. 16B, the display form includes a display content section H1b, a message H2b indicating the character information related to the decrease in the operation efficiency and the information of the "occurrence date", an "occurrence time" H3b, and character information H4b indicating the degree of decrease in the operation efficiency, which are displayed on the display screen of the information display device.

[0225]

In this display example, an event in which the

operation efficiency decreases due to the increase in the wait time of the elevator occurs tomorrow (the occurrence date of the operation efficiency decrease event), and the guidance information indicating that the time is the time zone between 10:10 and 0:30 and the increase rate in the wait time is at most about twice is informed to the user.

[0226]

The user can specifically grasp in advance the time zone in which the wait time increases and the degree of decrease in the operation efficiency from this guidance information. Here, the degree of decrease in the operation efficiency is expressed as a multiple of the wait time based on the normal state, and the user can quantitatively grasp the degree of influence compared with the steady state (equivalent to the current situation in a case where the occurrent date is not the day of occurrence).

[0227]

In the display example of Fig. 16B, the index of the decrease in the operation efficiency is set as the wait time of the elevator. The wait time is an index that the user places the most important on the operation of the elevator, and the guidance information that is easy for the user to understand can be provided to the user by indicating the wait time.

[0228]

It is possible to recognize the index of the wait time as a relative influence in comparison with the steady state (magnification). The operation side that provides the guidance information can cope with a case where a fluctuation width of the actual time is large such as the wait time by indicating the maximum value such as at most twice. The wait time mentioned herein is an average elevator hall call wait time or an average wait time at which the user arrives and waits at the elevator hall.

[0229]

<<Second embodiment of present invention>>

Next, a second embodiment different from the first embodiment will be described.

[0230]

Fig. 17 is a control flow illustrating a provision example of the guidance information to the user in the second embodiment of the present invention. This provision example is characterized in that the guidance information of the operation efficiency decrease event is directly provided to a portable information terminal such as a smartphone of the user in advance.

[0231]

For example, the second embodiment is characterized in that the guidance information is provided in advance by an e-mail, SNS, or a pop-up message to the user who uses

the elevator at the "occurrence time" from the predicted "occurrence date" and "occurrence time" of the operation efficiency decrease event. Hereinafter, the control flow of Fig. 17 will be described.

[0232]

First, it is determined whether or not the decrease in the operation efficiency of the elevator is predicted under the unsteady situation at the current time (on the day at which the processing is performed at a current point in time) (S30). When the decrease in the operation efficiency is not predicted, the processing proceeds to the end, and the processing ends. Meanwhile, when the decrease in the operation efficiency is predicted, the user who uses the elevator at the predicted "occurrence time" is selected (S31).

[0233]

The user selection condition at this time is to select the user who satisfies any of the following conditions from the past use history data of the elevator of the user. The user who satisfies such a condition can be estimated as the user who has a high possibility of using the elevator in the time zone in which the operation efficiency decrease event occurs.

[0234]

(1) User who frequently uses elevator at "occurrence

time"

(2) User who belongs to a tenant that frequently uses elevator at "occurrence time"

(3) User on a floor on which elevator is frequently used at "occurrence time"

Subsequently, it is determined whether or not the current time (the time at which the present processing is being executed) is a predetermined time before a predetermined time (for example, 20 minutes before) from the "occurrence time" (S32). Here, in the case of "No", the wait state is continued until a predetermined time comes.

[0235]

When the predetermined time comes, the guidance information related to the decrease in the operation efficiency of the elevator caused under the unsteady situation is delivered to the user selected in control step S31 by the registered e-mail address or Web site (portal site of tenant company) (S33), and the processing ends.

[0236]

In the embodiment of Fig. 17, the user having the high possibility of using the elevator at the "occurrence time" of the "occurrence date" at which the operation efficiency decrease event occurs is selected from the use history data of the elevator of the user and the guidance

information is directly provided to the portable information terminal of the user before the operation efficiency decrease event occurs for the user. The provision date and time are as described above.

[0237]

As a result, the guidance information can be reliably provided to the user who is likely to be influenced by the decrease in the operation efficiency, and the user can take an avoidance behavior such as changing the use time of the elevator in advance.

[0238]

The present invention is not limited to the aforementioned embodiments, and includes various modification examples. For example, the aforementioned embodiments are described in detail in order to facilitate easy understanding of the present invention, and are not limited to necessarily include all the described components. Some of the components of a certain embodiment can be substituted into the components of another embodiment, and the components of another embodiment can be added to the component of a certain embodiment. In addition, the components of another embodiment can be added, removed, and substituted to, from, and into some of the components of the aforementioned embodiments.

What is claimed is:

1. An elevator operation information notification system including control means for notifying an outside of operation information of a plurality of elevators arranged in a building,

wherein the control means predicts a decrease in operation efficiency of the elevator under an unsteady situation from a schedule related to a behavior of a user of the building, and/or data of a schedule related to an operation of the elevator, and/or data of a past use state of the elevator, and provides operation information related to the decrease in the operation efficiency to a display device in a hall or a car of the elevator before an event in which the operation efficiency decreases occurs.

2. The elevator operation information notification system according to claim 1, further comprising:

means for setting a predetermined "provision date" and a predetermined "provision time" earlier than an "occurrence date" and an "occurrence time" at which the operation efficiency decreases when it is determined that the operation efficiency decreases,

wherein the operation information related to the decrease in the operation efficiency is provided to the display device in the hall or the car of the elevator at

the "provision time" of the "provision date".

3. The elevator operation information notification system according to claim 2, wherein

the data of the use state of the elevator includes data of the number of users of the elevator,

the control means includes

means for predicting the number of users of the elevator based on data of an event schedule of the user of the building, and/or data of the past number of users of the elevator, and

means for determining whether or not the operation efficiency decreases in the unsteady situation of the elevator based on the predicted number of users, and

the operation information related to the decrease in the operation efficiency includes at least information on the number of users of the elevator related to the decrease in the operation efficiency.

4. The elevator operation information notification system according to claim 2, wherein

the control means includes

means for predicting a transport capacity of the elevator based on an operation schedule of the elevator of the building, and

means for determining whether or not the operation efficiency decreases under the unsteady situation of the

elevator based on a predicted operation state, and

the operation information related to the decrease in the operation efficiency includes at least operation state information of the elevator related to the decrease in the operation efficiency.

5. The elevator operation information notification system according to claim 2, wherein

the "provision date" is a previous day of the "occurrence date" at which the operation efficiency decreases, and

the "provision time" is a time zone before and after the "occurrence time" at which the operation efficiency decreases.

6. The elevator operation information notification system according to claim 2, wherein

the "provision date" is a day one week ago of the "occurrence date" at which the operation efficiency decreases, and

the "provision time" is a time zone before and after the "occurrence time" at which the operation efficiency decreases.

7. The elevator operation information notification system according to claim 2, wherein

the "provision time" includes a working hour time zone in the morning of the "occurrence date".

8. The elevator operation information notification system according to claim 2, wherein

the "provision date" is the very day at which the operation efficiency decreases, and

the "provision time" is a time immediately before the "occurrence time" at which the operation efficiency decreases.

9. The elevator operation information notification system according to claim 2, wherein

the "provision date" and the "provision time" are set according to a degree of decrease in the operation efficiency.

10. The elevator operation information notification system according to claim 3, wherein

the means for predicting the number of users of the elevator predicts a change in the number of users under the unsteady situation, and

the change in the number of users under the unsteady situation is a change in the number of users caused by a participant of an event held in the building.

11. The elevator operation information notification system according to claim 4, wherein

the means for predicting the operation state of the elevator predicts the change in the operation state of the elevator under the unsteady situation, and

the change in the operation state of the elevator under the unsteady situation is at least a change in the operation state of the elevator caused by a decrease in the effective number of operated elevators due to a VIP dedicated operation and/or a maintenance and inspection operation.

12. The elevator operation information notification system according to claim 3, wherein

the means for determining whether or not the operation efficiency decreases in the unsteady situation of the elevator determines that the operation efficiency decreases by comparing the number of users with the transport capacity of the elevator.

13. The elevator operation information notification system according to claim 4, wherein

the means for determining whether or not the operation efficiency decreases in the unsteady situation of the elevator determines that the operation efficiency decreases by comparing the number of users with the transport capacity of the elevator calculated based on at least the operation state information of the elevator related to the decrease in the operation efficiency.

14. An operation information provision method of an elevator system including control means for notifying an outside of operation information of a plurality of

elevators arranged in a building, the method comprising:

by the control means,

predicting a decrease in operation efficiency of the elevator under an unsteady situation from a schedule related to a behavior of a user of the building, and/or data of a schedule related to an operation of the elevator, and/or data of a past use state of the elevator, and

providing operation information related to the decrease in the operation efficiency to a display device in a hall or a car of the elevator before an event in which the operation efficiency decreases occurs.

15. An elevator including control means for notifying an outside of operation information of a plurality of elevators arranged in a building,

wherein the control means includes

means for predicting a decrease in operation efficiency of the elevator under an unsteady situation from a schedule related to a behavior of a user of the building, and/or data of a schedule related to an operation of the elevator, and/or data of a past use state of the elevator, and

means for providing operation information related to the decrease in the operation efficiency to a display device in a hall or a car of the elevator before an event in which the operation efficiency decreases occurs.