

TITLE OF THE INVENTION

CONGESTION DEGREE PREDICTION DISPLAY SYSTEM, CONGESTION
DEGREE PREDICTION DISPLAY METHOD, AND PROGRAM

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001]

The present invention relates to a congestion degree prediction display system, a congestion degree prediction display method, and a program.

2. Description of the Related Art

[0002]

For an elevating machine such as an elevator, it is necessary to repeatedly perform work such as appropriate maintenance inspection and repair. During those work periods, it is necessary to stop operation of the elevating machine for the whole day or for several hours to half a day, and the corresponding elevating machine cannot be used while the operation is stopped. Therefore, when maintenance inspection work or renewal of an elevating machine such as an elevator is performed, a time zone and a day of the week are selected so that there is no problem even if operation is stopped due to work in an installed building.

[0003]

When work including an elevator operation stop is planned, it is necessary to make a work plan by grasping information on the number of people and a flow of people in a building based on a building use and tenant information on each floor and selecting a time and a day of the week that have less impact on operation of other elevators in the same building.

[0004]

For example, when a case of renewal construction in an office building is considered, there are generally many elevator users during daytime on weekdays and few users at night and on Saturdays and Sundays, so that the renewal construction is usually carried out at night and on Saturdays and Sundays. Also, since an elevator subjected to construction is disconnected from group management control during a renewal construction period, the number of elevators that can be used decreases, thereby causing congestion during a time zone when the number of users increases, such as at a time of going to work or during a lunch break.

[0005]

Therefore, even during an elevator operation stop period, a building management company and a maintenance company that performs elevator maintenance monitor an operation status and confirm that there is no problem in a

congestion status caused by the work. Then, depending on the congestion status acquired by the monitoring, adjustment including collecting elevator operation information, analyzing data, and changing settings such as elevator operation control at appropriate times is performed so as to allow reduction of congestion at a landing of each floor and optimum operation.

[0006]

JP 2019-108189 A discloses a technique in which the number of users on each floor is calculated for each time zone from information of landing buttons, sensors, and the like, the number of users is estimated by performing statistical processing for each day of the week, and after it is determined whether or not the estimated number of users exceeds the maximum number of passengers to be transported, guidance for avoiding congestion is displayed if exceeded.

SUMMARY OF THE INVENTION

[0008]

In order to reduce elevator congestion during work, it is necessary to collect operation data on site for a certain period of time, analyze a cause based on that data, and change settings of elevator operation control to have an optimum state. In addition, as described in JP 2019-

108189 A, congestion reducing measures are taken by shifting an elevator usage time of users of multiple tenants backward (time shifting) or the like during busy hours such as office-going hours and lunch breaks. However, these conventional analysis and measures such as time shift are basically carried out at a stage when a work date and a time are fixed, and are not suitable for consideration at a planning stage such as in which time zone the work itself should be performed.

[0009]

A purpose of the present invention is to provide a congestion degree prediction display system, a congestion degree prediction display method, and a program capable of appropriately considering an operation status prediction during a work period including an operation stop of an elevating machine such as an elevator and an effect prediction of a congestion countermeasure.

[0010]

In order to solve the above problems, for example, configurations described in the claims are adopted.

The present application includes a plurality of means for solving the above problems, but if one example is given, it is a congestion degree prediction display system that predicts and displays a congestion degree when work on a plurality of installed elevating machines is performed,

the system including: a master information storage unit that stores information about the elevating machines; a work plan information storage unit that stores a plurality of pieces of plan information on the work; a collected data storage unit that stores data on the number of users of the elevating machines; an operation simulation unit that predicts a congestion degree of the elevating machines for each of the plan information by simulation when at least a part of the elevating machines indicated by the information stored in the master information storage unit is stopped due to work in the plurality of pieces of plan information stored in the work plan information storage unit; and an operation status screen generation unit that generates a display screen for presenting the congestion degrees for the plurality of pieces of plan information predicted by the operation simulation unit.

[0011]

According to the present invention, it is possible to predict by simulation the number of users of an elevator machine and a congestion status during a period of work such as maintenance inspection and renewal construction including an operation stop of the elevating machine in various forms by changing conditions, and it is possible to set an appropriate work period.

Problems, configurations, and effects other than

those described above will be clarified by the following description of the embodiment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

Fig. 1 is a block diagram showing a configuration example of a data center according to an embodiment of the present invention;

Fig. 2 is a block diagram showing a configuration example of a building side according to the embodiment of the present invention;

Fig. 3 is a block diagram showing a hardware configuration example of the data center according to the embodiment of the present invention;

Fig. 4 is a flowchart showing a flow of display processing according to the embodiment of the present invention;

Fig. 5 is a diagram showing an example of a display screen (construction plan selection screen) according to the embodiment of the present invention;

Fig. 6 is a diagram showing an example of a display screen (overall congestion degree prediction screen) according to the embodiment of the present invention;

Fig. 7 is a diagram showing an example of a display screen (detailed congestion degree prediction screen)

according to the embodiment of the present invention;

Fig. 8 is a diagram showing an example of a display screen (congestion degree prediction screen when some users are shifted) according to the embodiment of the present invention;

Fig. 9 is a diagram showing an example of a display screen (construction estimated amount comparison screen) according to the embodiment of the present invention; and

Fig. 10 is a diagram showing an example of a display screen (maintenance plan retrieval screen) according to a modification of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0013]

Hereinafter, an embodiment of the present invention (hereinafter referred to as "this example") will be described with reference to the accompanying drawings.

[Configuration of data center]

Fig. 1 shows a configuration of a data center 4 included in a congestion degree prediction display system of this example.

The data center 4 performs processing for collecting information from a group management elevator 5 installed in a building and a pedestrian flow monitoring device 6 that measures the number of users of the group management

elevator 5, for predicting a congestion degree during various work, and for sending a prediction result to a mobile terminal 3. The group management elevator 5 is composed of a plurality of elevators. The work to predict the congestion degree here includes various work performed with the elevator stopped, such as renewal work that updates part or all of the elevator and maintenance inspection work performed regularly or irregularly. The following example describes a case of renewal work.

[0014]

The mobile terminal 3 is a terminal carried by a worker 1 such as a salesperson or a technician for an elevator. A tablet terminal, a smartphone, a notebook personal computer, or the like can be applied to this mobile terminal 3, and the mobile terminal 3 has a function of communicating with the data center 4, and includes a display unit that displays information received from the data center 4. In Fig. 1, a configuration of the mobile terminal 3 is omitted. Based on the information displayed on the mobile terminal 3, the worker 1 such as a salesperson or a technician has a meeting with a customer 2 who is a manager of the building where the group management elevator 5 is installed about the renewal work.

[0015]

The data center 4 includes a server processing unit

10, an elevator operation simulation unit 20, a collected data storage unit 30, a building master information storage unit 40, an elevator work plan information storage unit 50, a renewal construction estimate information storage unit 60, a communication unit 70, and an operating pedestrian flow data collection unit 80.

[0016]

The server processing unit 10 includes an elevator operation status screen generation unit 11 and an information retrieval unit 12.

The elevator operation status screen generation unit 11 generates information on a congestion status display screen based on a result of simulation by the elevator operation simulation unit 20 (operation status screen generation processing). Then, the information on the display screen generated by the elevator operation status screen generation unit 11 is transmitted to the mobile terminal 3. An example of the display screen of the result of the simulation performed by the elevator operation simulation unit 20 will be described with reference to Fig. 5 and subsequent drawings.

Information is transmitted from the server processing unit 10 to the mobile terminal 3 using, for example, a wireless telephone line.

[0017]

The information retrieval unit 12 retrieves and acquires information necessary for simulating by the elevator operation simulation unit 20 from each of the storage units 30, 40, 50, 60.

The elevator operation simulation unit 20 performs operation simulation processing for simulating elevator operation based on the information retrieved and obtained by the information retrieval unit 12, and estimates a congestion degree from the number of users obtained by the simulation.

[0018]

The collected data storage unit 30 includes an elevator operation information storage unit 31 and a pedestrian flow monitoring information storage unit 32, and performs collected data storage processing.

In other words, the elevator operation information storage unit 31 stores information on an operation status of the group management elevator 5 collected by the communication unit 70 via the operating pedestrian flow data collection unit 80.

Further, the pedestrian flow monitoring information storage unit 32 stores pedestrian flow information, which is information on the number of elevator users collected by the communication unit 70, acquired through the operating pedestrian flow data collection unit 80.

[0019]

The building master information storage unit 40 stores master information such as a type, a format, the number of floors, and the number of units of each elevator that constitutes the group management elevator 5 (master information storage processing).

The elevator work plan information storage unit 50 stores a plurality of work plans when work (renewal work) of the group management elevator 5 is performed (work plan information storage processing). The work plan information stored in this elevator work plan information storage unit 50 is created by a construction information creation terminal 7, and indicates the plurality of work plans in which at least one of a day (day of the week) on which the work is performed, a time zone in which the work is performed, and the number of units on which the work is simultaneously performed is different.

[0020]

The renewal construction estimate information storage unit 60 stores an estimated amount of money required for the work for each of the work plan information stored in the elevator work plan information storage unit 50. The estimated amount stored in this renewal construction estimate information storage unit 60 is acquired from, for example, the construction information

creation terminal 7.

[0021]

[Configuration of building side]

Fig. 2 shows configurations of the group management elevator 5 and the pedestrian flow monitoring device 6, which are configurations of a building side where the operating pedestrian flow data collection unit 80 of the data center 4 collects information.

The group management elevator 5 includes a plurality of (a plurality of units of) elevators 101a to 101n (n is an integer corresponding to the number), and operation of the plurality of elevators 101a to 101n is controlled by a group management elevator control unit 102. Operation control of the plurality of elevators 101a to 101n by the group management elevator control unit 102 may be performed either collectively controlling the plurality of elevators as one or a plurality of groups or individually controlling the plurality of elevators. In addition, when renewal work or maintenance work is performed on any one or a plurality of the plurality of elevators 101a to 101n, the group management elevator control unit 102 performs control to stop operation of a corresponding unit.

[0022]

Operation statuses of the units of the elevators 101a to 101n controlled by the group management elevator

control unit 102 are stored in an operation data storage unit 104.

Operation data stored in the operation data storage unit 104 is transmitted to the data center 4 via a communication unit 103.

[0023]

The pedestrian flow monitoring device 6 serves as a sensor for monitoring a pedestrian flow of the elevator, and includes a landing camera 201 installed at an elevator landing on each floor, an in-car camera 202 installed in a car of each unit, and a pedestrian flow monitoring device 203. The landing camera 201 and the in-car camera 202 acquire the number of persons at each shooting location by analyzing shot images. The pedestrian flow monitoring device 203 is a device such as a security gate that directly counts the number of people passing by.

[0024]

The pedestrian flow monitoring data storage unit 211 stores pedestrian flow monitoring data, which is information on the number of persons obtained by the landing camera 201, the in-car camera 202, and the pedestrian flow monitoring device 203. A date (day of the week), a time zone, and the like when the data has been acquired are added to the pedestrian flow monitoring data stored in the pedestrian flow monitoring data storage unit

211 and stored.

Further, the pedestrian flow monitoring data stored in the pedestrian flow monitoring data storage unit 211 is transmitted to the data center 4 via a communication unit 212.

[0025]

Note that the elevator operation data stored in the operation data storage unit 104 and the pedestrian flow monitoring data stored in the pedestrian flow monitoring data storage unit 211 do not need to be transmitted to the data center 4 in real time. For example, operation data and pedestrian flow monitoring data for a certain period such as one month or several months may be collectively transmitted to the data center 4. In this case, the operation data and the pedestrian flow monitoring data may be recorded in a recording medium such as a memory card and the recording medium may be sent to the data center 4.

[0026]

[Hardware configuration of data center]

Fig. 3 shows a hardware configuration example of the data center 4.

The data center 4 is composed of a computer that processes information.

The data center (computer) 4 shown in Fig. 3 includes a CPU (Central Processing Unit) 301, a ROM (Read

Only Memory) 302, and a RAM (Random Access Memory) 303 that are connected to a bus. Furthermore, the data center 4 includes a non-volatile storage 304, a network interface 305, an input unit 306, and a display unit 307.

[0027]

The CPU 301 is an arithmetic processing unit that reads out a program code of software that executes prediction processing and screen generation processing in the data center 4 from the ROM 302 and executes it, and functions as a control unit.

Variables, parameters, etc. generated during the arithmetic processing are temporarily written in the RAM 303.

[0028]

As the non-volatile storage 304, for example, a large-capacity information storage unit such as a HDD (Hard Disk Drive) or SSD (Solid State Drive) is used. The non-volatile storage 304 stores a program for executing the prediction function executed by the data center 4 and data stored in the storage units 30 to 60.

[0029]

As the network interface 305, for example, a NIC (Network Interface Card) or the like is used. The network interface 305 transmits/receives various information to/from the outside (the mobile terminal 3, the group

management elevator 5, the pedestrian flow monitoring device 6, etc.).

[0030]

The input unit 306 performs input processing of various information necessary for setting the data center 4 and the like.

An operation status of the data center 4 and the like are displayed on the display unit 307. Further, a screen generated by the elevator operation status screen generation unit 11 may be displayed on the display unit 307.

Note that the data center 4 includes the input unit 306 and the display unit 307 as an example, and the data center 4 may not include the input unit 306 and the display unit 307.

[0031]

Further, the data center 4 is composed of the computer shown in Fig. 3 as an example, and may be configured by a device that performs other arithmetic processing other than the computer. For example, some or all of the functions performed by the data center 4 may be realized by hardware such as FPGA (Field Programmable Gate Array) and ASIC (Application Specific Integrated Circuit).

[0032]

[Flow of processing for creating display screen in data

center]

Fig. 4 is a flowchart showing a flow of processing performed by the data center 4 in this example.

The flow of processing shown in Fig. 4 is a flow of processing when the worker 1 (salesperson or technician) who owns the mobile terminal 3 checks a congestion degree for each work plan when elevator renewal construction is performed on the mobile terminal 3, and has a meeting with the customer 2.

[0033]

First, the worker 1 selects a target elevator for renewal construction on a screen of the mobile terminal 3 (step S1). The target elevator for this renewal construction is selected on an elevator renewal construction plan selection screen 400 in Fig. 5. In other words, on the elevator renewal construction plan selection screen 400 shown in Fig. 5, a renewal construction target elevator selection field 401 is displayed, and all elevators in a target building are listed in this renewal construction target elevator selection field 401.

[0034]

Here, the worker 1 selects an elevator unit to which the renewal construction is executed from among the elevators shown in the renewal construction target elevator selection field 401. Here, in selecting the elevator unit,

a plurality of units can be selected at the same time. When the plurality of units is selected at the same time, congestion degree prediction processing is performed when a plurality of renewal constructions is executed.

[0035]

Next, the worker 1 selects a renewal construction type desired by the customer 2 on the screen of the mobile terminal 3. For example, the worker 1 selects any one of control renewal, semi-removal renewal, and all-removal renewal displayed in a renewal construction type selection field 402 of the elevator renewal construction plan selection screen 400. The control renewal is a work to renew a control device and the like of the elevator. The semi-removal renewal is a work to renew some of a rope, the control device, and the like of the elevator. The all-removal renewal is a work to remove and renew the entire elevator except for some structures such as guide rails.

Thereafter, the worker 1 presses a retrieval button 403 on the elevator renewal construction plan selection screen 400 to execute retrieval in the data center 4 (step S2).

[0036]

When a retrieval instruction for the elevator renewal construction plan is on the screen, in the data center 4, a construction plan for the unit and the

construction type selected on the screen is retrieved from information registered in advance in the elevator work plan information storage unit 50. The retrieval in the data center 4 is performed by, for example, the information retrieval unit 12 of the server processing unit 10. Then, a list of renewal construction plans retrieved in the data center 4 is displayed on the screen of the mobile terminal 3 (step S3).

For example, a list of retrieved renewal construction plans is displayed in a renewal construction plan selection field 404 of the elevator renewal construction plan selection screen 400 shown in Fig. 5. This display screen is created by the elevator operation status screen generation unit 11 of the server processing unit 10, for example.

[0037]

In the example of Fig. 5, a list of a plan name, a construction period, construction days, and plan contents are displayed as the renewal construction plan selection field 404. As the plan contents, details such as that all-day construction is performed, construction is performed at weekday nights and on Saturdays and Sundays, construction is performed in weekday daytime, construction is performed on Saturdays and Sundays, etc. are displayed. Note that although the plans displayed in the renewal construction

plan selection field 404 are based on the information registered in the elevator work plan information storage unit 50, the worker 1 may change (input) a work start date and a work end date in (to) a construction period display field 405 while listening to a request from the customer 2.

[0038]

Then, the worker 1 selects one or a plurality of plans for predicting an operation status from the renewal construction plan selection field 404 and presses an operation status prediction button 406.

Note that the elevator renewal construction plan selection screen 400 also displays an approximate estimate calculation button 407 for calculating an approximate estimate of the selected plan and an end button 408.

[0039]

When the operation status prediction button 406 is pressed, the elevator operation simulation unit 20 of the data center 4 performs processing of predicting a congestion degree when designated construction is executed and an elevator of a corresponding unit is stopped during construction. When the elevator operation simulation unit 20 predicts the congestion degree, past operation information stored in the elevator operation information storage unit 31 of the collected data storage unit 30 and past pedestrian flow information stored in the pedestrian

flow monitoring information storage unit 32 are used.

[0040]

For example, the elevator operation simulation unit 20 acquires, from the collected data storage unit 30, average pedestrian flow information for the same day of the week and for each time zone within a certain past period, and estimates the number of users for all the units operating during the work period when the construction of each plan is executed. Then, the elevator operation simulation unit 20 calculates a congestion degree for each time zone in the entire group management elevator from the estimated number of users. Then, results of the predicted number of users and the congestion degree are displayed on the screen of the mobile terminal 3 (step S4).

[0041]

For example, an elevator renewal construction period operation status prediction screen 500 shown in Fig. 6 is displayed on the screen of the mobile terminal 3. This display screen is created by the elevator operation status screen generation unit 11 of the server processing unit 10, for example.

On the elevator renewal construction period operation status prediction screen 500 shown in Fig. 6, a construction execution time zone display field 501, a display field 502 of the number of elevator users, a

congestion degree prediction graph 503, a congestion degree threshold value 504, a date selection field 505, and a construction plan selection field 506 are displayed. Also, on the elevator renewal construction period operation status prediction screen 500, an operation status button 507 for each time zone and a return button 508 are displayed. Here, the congestion degree threshold value 504 is a threshold value for determining a very congested state in which the number of passengers in an elevator car reaches a fixed number. In other words, it is not preferable that a congestion degree exceed the congestion degree threshold value 504.

[0042]

As shown in Fig. 6, in the congestion degree prediction graph 503, all the construction plans selected in the renewal construction plan selection field 404 of the renewal construction plan selection screen 400 in Fig. 5 are displayed so that they can be distinguished. Specifically, three congestion degree predictions of a plan A, a plan B, and a plan C are displayed overlaid on one congestion degree prediction graph 503.

In addition, the congestion degree prediction graph 503 also displays a congestion degree when no construction (work) is performed, that is, when all the units are operated, for reference. As a result, on the renewal

construction period operation status prediction screen 500, it is possible to compare the congestion degrees for the renewal construction plans and compare them with the congestion degree at normal time (before the construction is performed).

[0043]

Note that, in the example shown in Fig. 6, the congestion degree predictions of the plurality of plans (plan A, plan B, plan C) are displayed by being superimposed on one congestion degree prediction graph 503, but graphs for the plans may be displayed side by side on the screen.

[0044]

Again, returning to Fig. 4, the explanation will be continued. The worker 1 who has seen the renewal construction period operation status prediction screen 500 in Fig. 6 judges whether or not there is a plan that exceeds the congestion degree threshold value 504 and elevator operation during the construction period is affected (step S5).

In this step S5, if there is no plan that exceeds the congestion degree threshold value 504 (No in step S5), the worker 1 judges whether or not to confirm yet another plan (step S10). In step S10, if the other plan is also confirmed (Yes in step S10), the process returns to the

elevator selection in step S1, and prediction and display of the other plan are executed.

[0045]

Further, in step S5, if there is a plan that exceeds the congestion degree threshold value 504 (Yes in step S5), the worker 1 presses the operation status button 507 for each time zone of the renewal construction period operation status prediction screen 500 to make the screen displayed by the mobile terminal 3 transit to a display of an operation status prediction display screen for each construction time zone (step S6).

[0046]

Fig. 7 shows an operation status prediction screen 600 for each elevator renewal construction time zone.

The operation status prediction screen 600 for each elevator renewal construction time zone displays a transition 601 of the number of users for each time zone, a congestion degree display field 602, a congestion degree prediction graph 603, a congestion degree threshold value 604, and graphs 606, 607 of the number of users. The graphs 606, 607 of the number of users are a graph 606 of the number of users in a time zone from 12:00 to 13:00 and a graph 607 of the number of users in a time zone from 13:00 to 14:00. In addition, the operation status prediction screen 600 for each elevator renewal

construction time zone displays a shift target time zone selection field 608, a shift time width selection field 609, an input field 610 of the number of people shifted, a time shift operation prediction button 611, and a return button 612.

[0047]

In an example of Fig. 7, it is shown that a congestion degree deterioration time zone 605 exceeds the congestion degree threshold value 604.

Here, the worker 1 who has viewed the operation status prediction screen 600 for each time zone presses the time shift operation prediction button 611, so that the elevator operation simulation unit 20 of the data center 4 executes a prediction for shifting usage time zones of some users of the building (step S7).

Here, the worker 1 first sees the transition 601 of the number of users for each time zone in Fig. 7, and selects the graph 606 of the number of users in the crowded time zone in the shift target time zone selection field 608.

[0048]

Next, the worker 1 selects a time width to be shifted from the shift time width selection field 609, inputs the number of people to be shifted in the input field 610 of the number of people shifted, and then selects

the time shift operation prediction button 611. In the example of Fig. 7, four of 15 minutes, 30 minutes, 45 minutes, and 60 minutes can be selected in the shift time width selection field 609, and an arbitrary number of people can be input to the input field 610 of the number of people shifted.

[0049]

Note that, as for the users to be shifted, the elevator operation simulation unit 20 may randomly extract users in a target time zone, or may also shift users in a specific floor or users in a specific area on a specific floor. Alternatively, floors where the group management elevator stops are divided into upper floors and lower floors, and either one of the users may be subjected to time shift, the number of people per floor can be set, or the number of occupied tenants can be set. It is considered that the shift here is, for example, shifting a lunch break time of an office on a specific floor by a designated time.

[0050]

Fig. 8 shows an example of an operation status prediction screen 700 for each elevator renewal construction time zone when usage time zones of some users are shifted.

Display contents of the operation status prediction

screen 700 for each elevator renewal construction time zone shown in Fig. 8 are basically the same as the operation status prediction screen 600 for each time zone shown in Fig. 7, and a graph 701 of the number of users in a time zone from 12:00 to 13:00 indicates a period in which the number of users is reduced by the shift, and a graph 702 of the number of users in a time zone from 13:00 to 14:00 indicates a period in which the number of users is increased by the shift.

[0051]

Further, a congestion degree prediction graph 703 before the time shift and a congestion degree prediction graph 704 after the time shift are displayed in an overlapping manner. In the example of Fig. 8, it can be seen that the congestion degree prediction graph 704 after the time shift is below the congestion degree threshold value 707. In other words, it is expected that users will be dispersed by shifting the time.

In this way, according to this example, it is possible to perform operation simulation in which a crowded time zone such as office-going hours or lunch break time is designated and the number of elevator users designated in the corresponding time zone is shifted backward (or forward).

[0052]

It should be noted that, on the operation status prediction screen 600 for each time zone of Fig. 7, it is preferable to input a value to the input field 610 of the number of people shifted so that the number of users in the graph 606 of the number of users and the number of users in the graph 607 of the number of users are leveled. However, depending on the time width set in the shift time width selection field 609, the leveling may not be performed properly. In such a case, a time width in the shift time width selection field 609 is changed to another value on the operation status prediction screen 600 for each time zone of Fig. 7, the operation simulation is re-executed, and an optimum time width is set. In addition, the time set in the shift time width selection field 609 may be such that a time width (minutes) can be directly input as a numerical value.

[0053]

The operation status prediction screen 700 for each elevator renewal construction time zone in Fig. 8 indicates that a shift is in progress, and thus a time shift operation prediction button 705 is grayed out. Then, a return button 706 on the operation status prediction screen 700 for each elevator renewal construction time zone is pressed to return to the display of Fig. 7, etc.

[0054]

Returning to Fig. 4 again, the explanation will be continued. The worker 1 who has confirmed an effect of the shift on the operation status prediction screen 700 for each elevator renewal construction time zone in Fig. 8 judges whether or not congestion is reduced by the shift and elevator operation is affected (step S8).

In this step S8, if it is affected even after the shift (No in step S8), the worker 1 reviews the construction plan and the plan at a meeting with the customer 2 (step S9). The process returns to the elevator selection in step S1, and prediction and display of the reviewed plans are executed.

[0055]

Further, in step S8, if the shift has eliminated the influence (Yes in step S8), the worker 1 judges whether or not to confirm yet another plan (step S10). In step S10, if the other plan is also confirmed (Yes in step S10), the process returns to the elevator selection in step S1, and prediction and display of the other plan are executed.

Then, in step S10, if the other plan is not confirmed (No in step S10), the worker 1 instructs to display an approximate estimate and confirms a cost comparison result for each construction plan (step S11). The process is finished.

[0056]

Fig. 9 shows an example of an elevator renewal construction estimated amount comparison screen 800 displayed in step S11. This renewal construction estimated amount comparison screen 800 is created by the elevator operation status screen generation unit 11 based on renewal construction estimate information stored in the renewal construction estimate information storage unit 60. However, if conditions such as a renewal construction period are changed in the flow from step S1 to step S10, an approximate estimate under the changed conditions is displayed.

[0057]

As shown in Fig. 9, the elevator renewal construction estimated amount comparison screen 800 has a construction plan estimated amount comparison table 801 and a return button 802. A field of the construction plan estimated amount comparison table 801 displays an estimated amount of construction (work) cost for each plan. This elevator renewal construction estimated amount comparison screen 800 is displayed and presented to the customer 2 when, for example, the customer 2 requests presentation of an approximate estimate.

[0058]

As explained above, according to the system of this example, when renewal construction of an elevator installed

in a building managed by a customer such as a building management company or a building owner is performed, it is possible to predict congestion of the elevator during the work in advance and present it to the customer. Further, when it is necessary to take congestion reducing measures based on the prediction, an effect of congestion reduction can also be confirmed by setting the number of people shifted and a time shift width after designating a crowded time zone and changing operation by the time shift of users in the corresponding time zone by operation simulation.

Furthermore, it is possible to calculate and display an estimated amount when the elevator renewal construction is performed in each plan, and to appropriately present a construction plan to the customer.

[0059]

[Modifications]

It should be noted that the present invention is not limited to the above-described embodiment and includes various modifications. For example, in the examples of Figs. 5 to 8, the congestion degree based on the work plan when the elevator renewal construction is performed is estimated. On the other hand, the data center 4 may similarly estimate a congestion degree at the time of work performed by stopping an elevator other than the renewal construction.

[0060]

For example, the data center 4 may create an elevator maintenance work plan retrieval screen 900 shown in Fig. 10 instead of the renewal construction plan selection screen 400 shown in Fig. 5 and execute an elevator maintenance work plan in a similar procedure.

The elevator maintenance work plan retrieval screen 900 shown in Fig. 10 includes a work start date/time selection field 901, a work end date/time selection field 902, a retrieval button 903, a maintenance work plan list display field 904, an operation status prediction button 905, and an end button 906.

[0061]

Then, the worker 1 specifies a range in the work start date/time selection field 901 and the work end date/time selection field 902 on this maintenance work plan retrieval screen 900, and then presses the retrieval button 903. As a result, the maintenance work plan list display field 904 displays a list of maintenance works scheduled within the specified range. This maintenance work is performed by temporarily stopping operation of the elevator.

By pressing the operation status prediction button 905 with the list displayed in the maintenance work plan list display field 904, the screen changes to a congestion

degree display screen when each work displayed in the list is performed. The congestion degree display screen is similar to the screen at the time of the renewal construction. Further, when the date (day of the week) or the time zone for executing the maintenance work is selected, the estimated amount required for the maintenance work for each of those selections may be displayed.

In this way, in addition to the renewal construction, it becomes possible to predict and display congestion degrees at various works such as maintenance work in which the elevator is stopped. It should be noted that when the maintenance work plan is processed, maintenance plan information is stored in the elevator work plan information storage unit 50 of the data center 4.

[0062]

Further, in the above-described embodiment and modification, the congestion degrees at the elevator renewal construction and maintenance work can be compared, but the congestion degrees at the renewal construction and maintenance work may be compared in similar processing even for an elevating machine other than the elevator. For example, it may be applied to an elevating machine such as an escalator.

[0063]

Further, in the above-described embodiment, the

server processing unit 10 or the elevator operation simulation unit 20 installed in the data center 4 generates an operation status screen, sends information to display the screen on the mobile terminal 3 owned by the salesperson or technician to display the result on the mobile terminal 3. On the other hand, a display device included in the data center 4 may display the created screen.

Alternatively, a program (software) for executing the processing of this example may be installed in the mobile terminal 3 owned by the salesperson or technician, the mobile terminal 3 may acquire each information necessary for estimating a congestion degree from the data center 4 side, and the mobile terminal 3 at the time of work may perform congestion degree estimation processing and display screen creation processing.

[0064]

Further, the examples of the screens shown in Figs. 5 to 10 are examples, and display screens of other forms may be used. For example, the display field 502 of the number of elevator users is provided on the elevator renewal construction period operation status prediction screen 500 shown in Fig. 6, but this display field 502 of the number of elevator users may be omitted, and only the congestion degree prediction graph 503 may be displayed on

the screen. Also regarding a display form of the congestion degree prediction, the graph showing the congestion degree for each time zone is an example, and the congestion degree for each time zone may be shown by characters or figures indicating states such as large, medium, and small. Alternatively, the congestion degree may be indicated by a numerical value such as a percentage.

[0065]

Further, the above-described embodiment has been described as an example for easily understanding the present invention, and the present invention is not necessarily limited to those including all the configurations described.

Furthermore, in the above-described embodiment, the device or system configuration may be changed, or some processing procedures may be omitted or replaced without departing from the spirit of the present invention.

In addition, information such as a program for performing operation mode switching processing can be stored in a memory, a recording device such as a hard disk or SSD (Solid State Drive), or a recording medium such as an IC card, an SD card, or an optical disk.

[0066]

Furthermore, in the block diagrams of Figs. 1 and 2, only the control lines and information lines that are

considered necessary for explanation are shown, and not all the control lines and information lines for the product are shown. In fact, it can be considered that almost all the configurations are connected to each other. Further, in the flowchart shown in Fig. 4, the plurality of processing may be simultaneously executed or a processing order may be changed within a range that does not affect the processing result.

What is claimed is:

1. A congestion degree prediction display system that predicts and displays a congestion degree when work on a plurality of installed elevating machines is performed, the system comprising:

a master information storage unit that stores information about the elevating machines;

a work plan information storage unit that stores a plurality of pieces of plan information on the work;

a collected data storage unit that collects and stores data on the number of users of the elevating machines;

an operation simulation unit that predicts a congestion degree of the elevating machines for each of the plan information by simulation when at least a part of the elevating machines indicated by the information stored in the master information storage unit is stopped due to work in the plurality of pieces of plan information stored in the work plan information storage unit; and

an operation status screen generation unit that generates a display screen for presenting the congestion degrees for the plurality of pieces of plan information predicted by the operation simulation unit.

2. The congestion degree prediction display system

according to claim 1, wherein

the plurality of pieces of plan information are pieces of information in which at least one of a day on which the work is performed, a time zone in which the work is performed, and the number of elevating machines on which the work is simultaneously performed is different, and

the operation status screen generation unit generates a display screen in which the congestion degrees for the plurality of pieces of simulated plan information can be compared on one screen.

3. The congestion degree prediction display system according to claim 2, wherein

the display screen of the congestion degrees for the plurality of pieces of plan information obtained by the operation simulation unit is transmitted to a terminal held by a worker in the work, and

the congestion degrees for the plurality of pieces of simulated plan information are displayed on a screen of a display unit included in the terminal.

4. The congestion degree prediction display system according to claim 3, wherein

the operation simulation unit also predicts by simulation a congestion degree of the elevating machine at normal time when the elevating machine is not stopped, and also presents the predicted congestion degree at the normal

time in the display screen generated by the operation status screen generation unit.

5. The congestion degree prediction display system according to claim 3, wherein

of the plurality of pieces of plan information stored in the work plan information storage unit, the plan information simulated by the operation simulation unit is plan information selected by an instruction from the terminal.

6. The congestion degree prediction display system according to claim 3, further comprising:

an estimate information storage unit that stores an estimated amount required for the work for each of the plan information stored in the work plan information storage unit, wherein

based on information about the estimated amounts stored in the estimate information storage unit, an estimated amount for each work plan is displayed on the screen of the display unit included in the terminal.

7. The congestion degree prediction display system according to claim 1, wherein

the operation simulation unit predicts and presents a congestion degree of the elevating machine when a usage time zone of users on some floors or some areas, in the data on the number of users stored in the collected data

storage unit, are shifted.

8. The congestion degree prediction display system according to claim 1, wherein

the plan information on the work stored in the work plan information storage unit is plan information on renewal construction work of the elevating machine or plan information on maintenance work of the elevating machine.

9. A congestion degree prediction display method that predicts and displays a congestion degree when work on a plurality of installed elevating machine is performed, comprising:

master information storage processing of storing information about the elevating machines;

work plan information storage processing of storing a plurality of pieces of plan information on the work;

collected data storage processing of collecting and storing data on the number of users of the elevating machines;

operation simulation processing of predicting a congestion degree of the elevating machines for each of the plan information by simulation when at least a part of the elevating machines indicated by the information stored in the master information storage processing is stopped due to work in the plurality of pieces of plan information stored in the work plan information storage processing; and

operation status screen generation processing of generating a display screen for presenting the congestion degrees for the plurality of pieces of plan information predicted by the operation simulation processing.

10. A program that causes a computer to execute processing of predicting a congestion degree when work on a plurality of installed elevating machines is performed, comprising:

a master information storage procedure for storing information about the elevating machines;

a work plan information storage procedure for storing a plurality of pieces of plan information on the work;

a collected data storage procedure for collecting and storing data on the number of users of the elevating machines;

an operation simulation procedure for predicting a congestion degree of the elevating machines for each of the plan information by simulation when at least a part of the elevating machines indicated by the information stored in the master information storage procedure is stopped due to work in the plurality of pieces of plan information stored in the work plan information storage procedure; and

an operation status screen generation procedure for generating a display screen for presenting the congestion

degrees for the plurality of pieces of plan information predicted by the operation simulation procedure.