

Title of Invention

BUILDING INFORMATION VISUALIZATION DEVICE

Technical Field

The present invention relates to a building information visualization device that visualizes building usage information.

Background Art

JP-A No. 2002-68610 discloses a technique to run an operation simulation of an elevating machine based on a use application of a building, a count of floors, a capacity, a speed, a count of machines, a building specification, and the like to answer an elevating machine facility specification required for construction of a building based on a result of the operation simulation.

As the operation simulation result in JP-A No. 2002-68610, a usage situation for each floor of a building is effective not only when a building is newly designed but also when an existing building is renewed (for example, reshuffle of tenants, change in installation floor of a smoking area, a cafeteria, and the like). In such intention decision, not only an operation situation of the elevating machine but also various kinds of numerical value information aggregated for each floor, such as an entrance and exit situation, a usage situation of facilities (for example, air conditioning and illumination), a consumption situation of electric power, are required.

However, it is not easy to precisely understand the usage situation of the building from the numerical value information aggregated as described above. Especially, there is a problem that the higher the building is, the larger a count of elevators is, and the larger a count of settled tenants is, the more difficult the

understanding of the usage situation of the building is.

The present invention has been made in consideration of the above-described situation, and an object of this invention is to provide a building information visualization device that allows a user to intuitively understand a time change of a usage situation for each floor of a building.

Summary

The present invention is a building information visualization device that visualizes information for each floor of a building. The building information visualization device includes a storage device, a matrix generating unit, and a visualization processing unit. The storage device stores building usage information, a floor identifier, and date and time information associated with one another. The building usage information is a numerical value indicating a usage situation of each floor. The floor identifier identifies the floor. The date and time information indicates a collection date and time of the building usage information. The matrix generating unit generates matrix data, in a two-dimensional matrix that defines a first axis as a floor and a second axis perpendicular to the first axis as a time, by differentiating a display format of each cell positioned at an intersection point between the floor and the time depending on a magnitude of the building usage information associated with the floor identifier indicating the floor and the date and time information indicating the time. The visualization processing unit visualizes the matrix data generated by the matrix generating unit.

Advantageous Effects of Invention

The present invention allows the user to intuitively understand the time change of the usage situation for each floor of the building. Problems, configurations, and effects other than ones described above will be made apparent from the following description of embodiments.

Brief Description of Drawings

Fig. 1 is a schematic configuration diagram of an elevator 1 according to an embodiment;

Fig. 2 is a block diagram of a building information visualization system according to the embodiment;

Fig. 3 is a diagram illustrating exemplary data configurations of a user DB and a building usage information DB;

Fig. 4 is a flowchart of a process executed between a visualization device and a customer operation terminal;

Fig. 5 is a display example of a building information screen according to the embodiment;

Fig. 6 is a display example of a building information screen where a plurality of banks are merged; and

Fig. 7 is a display example of a building information screen where a plurality of pieces of matrix data having different aggregate target periods are displayed in parallel.

Description of Embodiments

The following describes an embodiment of the present invention by referring to the drawings. Hereinafter, in this description, identical reference numerals designate ones having identical functions unless otherwise stated, and

the following omits the repeated description.

Fig. 1 is a schematic configuration diagram of an elevator 1 according to the embodiment of the present invention. The elevator 1 in this embodiment mainly includes a riding car 2, a tail cord 3, and an elevator control device 10. The elevator 1 has a mechanical configuration similar to that of the previous one, thus omitting its detailed description.

The riding car 2 has an internal space where a user enters, and includes a car door 4 for the user to come in and out of this internal space. The riding car 2 is coupled to a balance weight (not illustrated) via a main rope (not illustrated) inside a hoistway 5 extending in a vertical direction in a building. The riding car 2 vertically runs inside the hoistway 5 such that the main rope is hoisted or paid out by a hoist (not illustrated).

The elevator control device 10 is installed in, for example, a machine room 6 disposed on an upper portion of the hoistway 5. The elevator control device 10 is coupled to the riding car 2 via the tail cord 3. The elevator control device 10 transmits a control signal that operates the riding car 2 through the tail cord 3 and receives operation information of the riding car 2 through the tail cord 3.

Riding spots 7a, 7b are disposed at positions adjacent to the hoistway 5 on respective floors of the building. The riding car 2 stops at the positions facing the riding spots 7a, 7b, and the car door 4 opens to allow a person at the riding spots 7a, 7b to ride in the riding car 2 and a person in the riding car 2 to step out of the elevator 1.

Operation panels 8a, 8b are installed at the respective riding spots 7a, 7b.

The operation panels 8a, 8b include at least one of an up call button to call the riding car 2 for moving up from the present floor or a down call button to call the riding car 2 for moving down from the present floor. More specifically, the operation panel 8a on the lowest floor includes only the up call button, the operation panel 8b on the highest floor includes only the down call button, and an operation panel (not illustrated) on a halfway floor includes both of the up call button and the down call button. The elevator control device 10 receives information indicating that the operation panels 8a, 8b are pressed through a signal line (not illustrated).

The following describes a building information visualization system 100 according to the embodiment with reference to Fig. 2. Fig. 2 is a diagram illustrating a configuration of the building information visualization system 100 according to the embodiment of the present invention. The building information visualization system 100 is configured from a customer building 20, a visualization device (building information visualization device) 30, and a customer operation terminal 40, which are coupled through communication networks 13 and 14. The communication networks 13 and 14 may be, for example, the Internet, mobile communication networks, wired LANs, wireless LANs, leased lines, or these combinations. The communication networks 13 and 14 may be one communication network (for example, the Internet). Counts of the customer building 20 and the customer operation terminal 40, which are coupled to the building information visualization system 100, are not limited to one and may be plural.

The customer building 20 has a plurality of floors (for example, 15 floors

of B2 to 13F). One or more elevators 1 are installed in the customer building 20. In the customer building 20 (building A) illustrated in Fig. 2, six elevators 1 (Fig. 2 illustrates respective elevator control devices 10a, 10b, 10c, 10d, 10e, and 10f of the six elevators) are installed.

The six elevators 1 that operate in the customer building (building A) 20 belong to any of a bank A for upper floors and a bank B for lower floors. The bank A is an elevator group whose stopping floor is in ranges of B2, 1F, and 8F to 13F. Meanwhile, the bank B is an elevator group whose stopping floor is in a range of B1 to 7F. The elevator control devices 10a to 10c are coupled to a bank management device 11. The elevator control devices 10d to 10f are coupled to a bank management device 12.

Operation of the three elevators 1 belonging to the bank A is controlled by the bank management device 11. Operation of the three elevators 1 belonging to the bank B is controlled by the bank management device 12. The bank management devices 11 and 12 collect operation information (for example, a count of staying persons, an elevator waiting time, and a count of elevator call registration on each floor) of the elevators 1 controlled by themselves, through the elevator control devices 10a to 10f.

The count of staying persons is, for example, an accumulation value of a value obtained by dividing a difference of detected values by a weight sensor (not illustrated) included in the elevator 1 when the elevator 1 stops at the riding spot 7a, 7b by a preliminarily determined average weight (for example, 50 kg). That is, it is assumed that, when the detected value of the weight sensor decreases by 200 kg from open to close of the car door 4, four persons step out of the elevator 1

(the count of staying persons on the floor increases by four). Meanwhile, it is assumed that, when the detected value of the weight sensor increases by 150 kg from open to close of the car door 4, three persons ride in the elevator 1 (the count of staying persons on the floor decreases by three).

The elevator waiting time is an elapsed time from when the up call button or the down call button of the operation panel 8a, 8b is pressed until when the elevator 1 arrives at the corresponding riding spot 7a, 7b. The elevator waiting time is, for example, a difference between a time at which the operation panel 8a, 8b is operated and a time at which the elevator 1 stops at the corresponding riding spot 7a, 7b. The count of elevator call registration is a count of times that the up call button or the down call button of the operation panel 8a, 8b is pressed. The elevator waiting time and the count of elevator call registration on the halfway floor may be aggregated separately in a case where the up call button is pressed and a case where the down call button is pressed.

For example, the elevator control devices 10a to 10f collect information (for example, the difference in the detected value by the weight sensor, the time at which the operation panel 8a, 8b is operated, and the time at which the elevator 1 stops) to calculate the operation information from the corresponding elevator 1 per second. Then, the elevator control devices 10a to 10f calculate an accumulation value of the count of staying persons, an average value of the elevator waiting time, and an accumulation value of the count of elevator call registration every 15 minutes based on the collected information, and transmit the calculated result to the corresponding bank management device 11, 12.

The bank management devices 11 and 12 store the operation information

for every 15 minutes obtained from the elevator control devices 10a to 10f in a storage device (not illustrated). Then, the bank management devices 11 and 12 add the corresponding building ID, bank ID, elevator ID, date and time information, and floor name to the operation information collected in a predetermined period (for example, one day) to transmit it to the visualization device 30 through the communication network 13.

The building ID is a building identifier that identifies a building where the elevator 1 as a collection source of the operation information is installed. The bank ID is a bank identifier that identifies a bank to which the elevator 1 as the collection source of the operation information belongs. The elevator ID is an elevator identifier that identifies the elevator 1 as the collection source of the operation information. The date and time information indicates a range (a starting time to a finishing time) of a collection date and time of the operation information. The floor name is a floor identifier that identifies a floor as a collection target of the operation information.

An aggregate method, a collection method, and a transmission timing of the operation information are not limited to the aforementioned examples. As one example, the information collected by the elevator control devices 10a to 10f may be transmitted to the visualization device 30 in real-time through the bank management devices 11 and 12 to be aggregated in the visualization device 30. As another example, the information stored in the storage devices of the bank management devices 11 and 12 may be copied to a maintenance terminal by a maintenance personnel to be registered in the visualization device 30.

The visualization device 30 mainly includes a storage device 31, an

aggregate processing unit 32, a matrix generating unit 33, and a visualization processing unit 34. The visualization device 30 includes, for example, a Central Processing Unit (CPU), a Read Only Memory (ROM), a Random Access Memory (RAM), and a communication interface. A program code stored in the ROM is read out and executed by the CPU to cause software and hardware to collaborate to function as the aggregate processing unit 32, the matrix generating unit 33, and the visualization processing unit 34, thus executing other various processes. That is, the aggregate processing unit 32, the matrix generating unit 33, and the visualization processing unit 34 correspond to algorithm executed by a controller.

The storage device 31 is configured from a ROM, a RAM, or a Hard Disk Drive (HDD). As illustrated in Fig. 3, the storage device 31 stores a user DB 31A and a building usage information DB 31B. Fig. 3 is a diagram illustrating data structures of the user DB 31A and the building usage information DB 31B.

The user DB 31A stores, for example, a user ID, a password, attribute information, and the building ID associated with one another. The user ID and the password are user identifiers that identify a user having an accessibility to the visualization device 30. The attribute information is information indicative of an attribution of the user, and a value such as "BUILDING MANAGEMENT COMPANY" that manages a plurality of buildings and "BUILDING OWNER" that owns the building is set. The building ID identifies a building corresponding to the user. That is, the building IDs "BUILDING A" and "BUILDING B" corresponding to the attribute information "BUILDING MANAGEMENT COMPANY" identify the buildings controlled by the user.

The building ID "BUILDING C" corresponding to the attribute information "BUILDING OWNER" identifies the building owned by the user.

The building usage information DB 31B stores, for example, the building ID, bank ID, elevator ID, date and time information, floor name, count of staying persons, elevator waiting time, and count of elevator call registration associated with one another. Such information is the information obtained from the bank management devices 11 and 12. The building usage information DB 31B may include operating information of the elevator (for example, a count of open and close of the car door 4, a reverse count of the car door 4, and a count of activation of the elevator 1), an operation situation of an escalator, an entrance and exit situation, a usage situation of facilities (for example, air conditioning and illumination), and information indicative of a consumption situation of electric power, which are obtained from the elevator control devices 10a to 10f, in an item "OTHER." Such information is collected by a collection device (not illustrated) installed in the building.

The count of staying persons, the elevator waiting time, the count of elevator call registration, any other operating information of the elevator, the operation situation of the escalator, the entrance and exit situation, the usage situation of facilities (for example, air conditioning and illumination), and the consumption situation of electric power are one example of the building usage information of the customer building 20. However, the concrete example of the building usage information is not limited to these, and every numerical value information indicating the usage situation of the floor corresponds to the building usage information.

The aggregate processing unit 32 aggregates the building usage information included in the building usage information DB 31B in accordance with a specification condition specified by the user. As one example, the aggregate processing unit 32 aggregates a plurality of pieces of building usage information associated with an identical floor name for each aggregate cycle (for example, one hour, one day, and one month) specified by the user. As another example, the aggregate processing unit 32 aggregates (for example, accumulates or averages) a plurality of pieces of building usage information associated with an identical bank ID. The detail of the aggregate processing unit 32 will be described later with reference to Fig. 4.

The matrix generating unit 33 generates, for example, matrix data 3016, 3026, and 3036 illustrated in Fig. 5 to Fig. 7. The matrix data is data indicating a two-dimensional matrix that takes a first axis as the floor and a second axis perpendicular to the first axis as the time. Each cell positioned at an intersection point between the floor and the time in the two-dimensional matrix differs in a display format depending on a magnitude of the building usage information corresponding to the floor name indicating the floor and the date and time information indicating the time.

The display format of the cell means at least one of, for example, a kind of color (for example, blue, green, yellow, and red), shading in color, and a pattern (for example, a line width in hatching and a density of dots). As one example, it may be possible that the smaller the value of the building usage information is, the closer to blue the color is, and the larger the value of the building usage information is, the closer to red the color is. As another example,

it may be possible that the smaller the value of the building usage information is, the thinner the color is, and the larger the value of the building usage information is, the darker the color is.

In this embodiment, when the value of the building usage information is positive, the dot pattern is added to the corresponding cell. The smaller an absolute value is, the lower the density of dots is, and the larger the absolute value is, the higher the density of dots is. When the value of the building usage information is negative, the hatching pattern is added to the corresponding cell. The smaller the absolute value is, the thinner a line width is, and the larger the absolute value is, the thicker the line width is. However, the relationship between the value of the building usage information and the display format may be changeable depending on a preference of the user of the customer operation terminal 40.

In this embodiment, the first axis is the vertical axis, and the second axis is the horizontal axis. The vertical axis means an axis extending along a vertical direction of characters (numerals). Meanwhile, the horizontal axis means an axis perpendicular to the vertical axis. However, a method of the first axis and the second axis is not limited to the aforementioned example. The first axis may be the horizontal axis and the second axis may be the vertical axis.

The visualization processing unit 34 executes a process to visualize the matrix data generated by the matrix generating unit 33. The visualizing process is, for example, displaying the matrix data on a display (not illustrated) of the visualization device 30, causing a printer coupled to the visualization device 30 to print out the matrix data, and transmitting the matrix data to the customer

operation terminal 40 to display it on a display of the customer operation terminal 40. A data format of the matrix data is not specifically limited, but, for example, an image format, an HTML format, an XML format, and a CSV format can be employed.

The customer operation terminal 40, which is an information processing terminal carried by a customer, includes the display, an operating device (for example, a keyboard, a computer mouse, and a touchscreen), and a communication interface. The concrete example of the customer operation terminal 40 is not specifically limited, but, for example, a PC, a tablet, and a smart phone correspond to the customer operation terminal 40.

The following describes a process between the visualization device 30 and the customer operation terminal 40 with reference to Fig. 4 and Fig. 5. Fig. 4 is a flowchart of the process executed between the visualization device 30 and the customer operation terminal 40. Fig. 5 is a diagram illustrating a building information screen 301 containing the matrix data 3016.

In this embodiment, the following description will be given assuming that the visualization device 30 functions as a Web server and a web browser is installed in the customer operation terminal 40. However, the visualization device 30 and the customer operation terminal 40 may constitute a client and server system, and a specialized program may be installed in the customer operation terminal 40.

First, the user of the customer operation terminal 40 inputs the user ID and the password assigned to him/herself to a login page (not illustrated) through the operating device. Then, the customer operation terminal 40 transmits the

user ID and the password input by the user to the visualization device 30 through the communication network 14 to request login (S11). Here, it is assumed that the user ID "001" and the password "abc" are input.

The visualization device 30, responding to reception of the user ID and the password from the customer operation terminal 40, reads out the building IDs "BUILDING A" and "BUILDING B" associated with these user ID and password from the user DB 31A. Then, the visualization device 30 generates the building information screen based on the read building IDs (S12), and transmits the generated building information screen to the customer operation terminal 40 through the communication network 14 (S13).

The customer operation terminal 40, responding to reception of the building information screen from the visualization device 30, displays this building information screen on the display (S14). The building information screen displayed here has, for example, a state where a column of "MAXIMUM COUNT OF STAYING PERSONS" in a bank selection area 3012, a display method specification area 3013, and a setting contents display area 3014 are blank and the matrix data 3016 is hidden in the building information screen 301 illustrated in Fig. 5.

As illustrated in Fig. 5, the building information screen 301 includes a building usage information selection area 3011, the bank selection area 3012, the display method specification area 3013, the setting contents display area 3014, and a [DISPLAY] button 3015.

The building usage information selection area 3011 includes a pull-down menu to cause the user to select a type of the building usage information to

display it in the cell of the matrix data. The bank selection area 3012 includes a checkbox to cause the user to select the building and the bank as a visualization target, a region showing a count of elevators 1 belonging to the corresponding bank, and a region showing the maximum count of staying persons in the corresponding bank. In the bank selection area 3012, all the banks associated with the building ID read out by the visualization device 30 in S12 are selectable.

The display method specification area 3013 includes a unit time specification column and a comparative display column. The unit time specification column includes a radio button to specify an aggregate unit (aggregate cycle) of the building usage information, and a text box to input an aggregate target period of the building usage information. The comparative display column includes a checkbox for a comparative display of the matrix data in different aggregate target periods, and a text box to input the aggregate target period as a comparative target. The setting contents display area 3014 displays contents specified in the unit time specification column in the display method specification area 3013.

The [DISPLAY] button 3015 is a button to cause the visualization device 30 to generate the matrix data in accordance with the specification condition specified by the user through the building usage information selection area 3011, the bank selection area 3012, and the display method specification area 3013 to display the generated matrix data on the building information screen 301.

As one example, as illustrated in Fig. 5, the following case will be described. In this case, "COUNT OF STAYING PERSONS" is selected in the building usage information selection area 3011, the building ID "BUILDING A"

and the bank ID "BANK B" are selected in the bank selection area 3012, the radio button of "UNIT TIME" is checked in the unit time specification column in the display method specification area 3013, the aggregate target period "30 June 2018" is input, and the [DISPLAY] button 3015 is clicked.

The customer operation terminal 40, responding to the click of the [DISPLAY] button 3015 (S15), transmits the specification condition specified in the building usage information selection area 3011, the bank selection area 3012, and the display method specification area 3013 to the visualization device 30 through the communication network 14 to request transmission of the matrix data (S16).

The aggregate processing unit 32 in the visualization device 30, responding to reception of the specification condition from the customer operation terminal 40, aggregates the building usage information registered in the building usage information DB 31B (S17). More specifically, the aggregate processing unit 32 reads out all records associated with the building ID "BUILDING A" and the bank ID "BANK B" and having the date and time information matching the aggregate target period "30 June 2018" from the building usage information DB 31B. Next, the aggregate processing unit 32 accumulates (aggregates) the counts of staying persons of the read records by the hour. That is, the counts of staying persons on 30 June 2018 are accumulated for each aggregate cycle: 0:00 to 1:00, 1:00 to 2:00, ..., and 23:00 to 24:00.

Next, the matrix generating unit 33 in the visualization device 30 generates the matrix data 3016 using the specification condition received from the customer operation terminal 40 and the building usage information aggregated by

the aggregate processing unit 32 (S18). More specifically, the matrix generating unit 33 generates a two-dimensional matrix configured from the vertical axis of eight cells corresponding to the stopping floors (B1 to 7F) of the bank B of the building A and the horizontal axis of 24 cells obtained by dividing the aggregate target period into the aggregate cycles. Then, the matrix generating unit 33 determines the display format of each cell at the intersection point between the stopping floor and the aggregate cycle depending on the magnitude of the count of staying persons aggregated by the aggregate processing unit 32.

That is, as illustrated in Fig. 5, the matrix generating unit 33 adds the hatching having a thinner line width as the absolute value becomes small and adds the hatching having a thicker line width as the absolute value becomes large to the respective cells of the stopping floor "1F" where the count of staying persons is negative. The matrix generating unit 33 adds the dot having a lower density as the absolute value becomes small and adds the dot having a higher density as the absolute value becomes large to the respective cells of the stopping floor where the count of staying persons is positive. Furthermore, the matrix generating unit 33 whitens the respective cells where the count of staying persons is 0.

Furthermore, the controller of the visualization device 30 identifies an aggregate cycle 3017 having the largest count of staying persons in this building from the matrix data 3016 generated by the matrix generating unit 33. Then, the controller calculates the maximum count of staying persons by summing up only the positive values among the counts of staying persons of the respective floors in the identified aggregate cycle 3017. Then, the visualization processing unit 34 in the visualization device 30 transmits the matrix data 3016 generated by the matrix

generating unit 33 and the maximum count of staying persons calculated by the controller to the customer operation terminal 40 through the communication network 14 (S19).

Next, the customer operation terminal 40 displays the matrix data 3016 received from the visualization device 30 on the building information screen 301 (S20). The customer operation terminal 40 displays the received maximum count of staying persons in the column of "MAXIMUM COUNT OF STAYING PERSONS" in the bank selection area 3012. As illustrated in Fig. 5, the visualization device 30 may calculate not only the maximum count of staying persons of the bank whose checkbox is checked but also the maximum count of staying persons of all the banks displayed in the bank selection area 3012 to display them on the building information screen 301.

The above-described embodiment has, for example, the following operational advantage.

As the above-described embodiment, differentiating the display formats of the respective cells in the matrix of the floor and the time depending on the magnitude of the corresponding building usage information ensures instant and intuitive understanding of, for example, a distribution in the building usage information of the respective floors at an identical time and the time change of the building usage information on an identical floor. This results in simple and precise recognition of the current usage situation of the building when the existing building is renewed. Especially, vertically arranging the floors can identify the image of the actual building with the matrix data, thus ensuring more intuitive understanding of the usage situation of the building.

The above-described embodiment allows the user to specify the aggregate cycle (for example, one hour, one day, and one month) of the building usage information through the unit time specification column in the display method specification area 3013. This ensures analysis of the usage situation of the building from various angles from a short-term flow of people to a long-term flow of people inside the building. Aggregating and displaying the building usage information of a plurality of elevators 1 belonging to an identical bank ensures more intuitive understanding of the flow of people inside the building. However, the matrix data may be generated for each elevator 1 without aggregating the building usage information for each bank.

In the above-described embodiment, in the bank selection area 3012, when the user who requests the visualization is a building owner, only the building and the bank owned by this user are selectable. Meanwhile, in the bank selection area 3012, when the user who requests the visualization is a building management company, only the building managed by this user and the bank of this building are selectable. That is, the visualization device 30 is configured to visualize only the building usage information of the building ID and the bank ID associated with the user ID of the user who operates the customer operation terminal 40. Thus, isolating visualizable information depending on the user ID (in other words, the attribution of the user) can present information effective for each user.

Furthermore, the above-described embodiment has described the example that the visualization device 30 collects the building usage information collected by the bank management devices 11 and 12 in batch processing to cause the

customer operation terminal 40 to display the matrix data 3016 indicating past building usage information. However, the visualization device 30 may collect the building usage information from the respective elevator control devices 10a to 10f in real-time to visualize the matrix data indicating current building usage information. On the building information screen 301 in this case, the matrix data 3016 may be automatically updated per predetermined time like moving image playback.

Modification

The following describes a modification of the above-described embodiment. The description in common with that of the above-described embodiment will be omitted, and the difference will be mainly described.

Fig. 6 is a display example of the matrix data 3026 when both of the checkbox corresponding to the building ID "BUILDING A" and the bank ID "BANK A" and the checkbox corresponding to the building ID "BUILDING A" and the bank ID "BANK B" are checked in a bank selection area 3022.

First, it is different from the process in Fig. 5 in that, in addition to the record containing the building ID "BUILDING A" and the bank ID "BANK B," the record containing the building ID "BUILDING A" and the bank ID "BANK A" is further read out in S17. Additionally, it is different from the process in Fig. 5 in that the two-dimensional matrix configured from the vertical axis of 15 cells corresponding to the stopping floors (B2 to 13F) of the banks A and B of the building A and the horizontal axis of 24 cells obtained by dividing the aggregate target period into the aggregate cycles is generated in S18. Other processes share similarity with those of the case in Fig. 5.

Thereby, the matrix data 3026 illustrated in Fig. 6 is generated to be displayed on the display of the customer operation terminal 40. The matrix data 3026 is different from the matrix data 3016 illustrated in Fig. 5 in that the stopping floors (B2, 1F, 8F to 13F) shown in the bank A (a first bank identifier) and the stopping floors (B1 to 7F) shown in the bank B (a second bank identifier) are merged into the vertical axis.

With a building information screen 302 illustrated in Fig. 6, the flow of people in the whole building A can be instantly and intuitively understood. For example, with reference to Fig. 6, a difference between a time slot 3027 when a count of users of the elevator 1 belonging to the bank A becomes maximum and a time slot 3028 when the count of users of the elevator 1 belonging to the bank B becomes maximum can be instantly and intuitively understood.

Fig. 7 is a display example of matrix data 3036 and 3037 when the checkbox in the comparative display column is checked and the aggregate target period "30 June 2015" as the comparative target is input in a display method specification area 3033.

First, it is different from the process in Fig. 5 in that, in addition to the record whose date and time information matches the aggregate target period "30 June 2018," the record whose date and time information matches the aggregate target period "30 June 2015" as the comparative target is further read out in S17. Additionally, it is different from the process in Fig. 5 in that, in addition to the matrix data 3036 corresponding to the aggregate target period "30 June 2018," the matrix data 3037 corresponding to the aggregate target period "30 June 2015" as the comparative target is further generated in S18. Other processes share

similarity with those of the case in Fig. 5.

Thereby, the matrix data 3036 and 3037 illustrated in Fig. 7 are generated to be displayed in parallel on the display of the customer operation terminal 40. Setting contents display areas 3034A and 3034B are displayed associated with the matrix data 3036 and 3037 respectively. With a building information screen 303 illustrated in Fig. 7, a change in the flow of people in the building A in past (30 June 2015) and at present (30 June 2018) (for example, a change in the time slot when the count of staying persons becomes maximum, and increase and decrease in the maximum count of staying persons for each floor) can be instantly and intuitively understood.

In the example in Fig. 7, the example that the matrix data 3036 and 3037 are generated for each range (aggregate target period) of a plurality of collection dates and times specified by the user has been described. However, the selection method of the matrix data displayed in parallel is not limited to this.

As one example, the user may specify one aggregate target period and a plurality of buildings through the customer operation terminal 40. Then, the visualization device 30 may aggregate the building usage information in the aggregate target period by the plurality of buildings specified by the user to generate the matrix data. This can compare the usage situations of the different buildings in an identical period. As another example, the matrix data by banks of one building may be displayed in parallel, or the matrix data of two or more buildings may be displayed in parallel. Thus, comparison of the matrix data from various viewpoints can be utilized to examine a method for improving an income and a value of the real estate and a satisfaction level of the user.

The present invention is not limited to the above-described embodiment illustrated in the drawings, and various modifications are allowed in a range without departing from the gist of the present invention disclosed in claims. For example, the above-described embodiment and the subsequent modification can be combined in any combination in the range without departing from the gist of the present invention.

We claim:

1. A building information visualization device that visualizes information for each floor of a building, comprising:

a storage device that stores building usage information, a floor identifier, and date and time information associated with one another, the building usage information being a numerical value indicating a usage situation of each floor, the floor identifier identifying the floor, and the date and time information indicating a collection date and time of the building usage information;

a matrix generating unit that generates matrix data, in a two-dimensional matrix that defines a first axis as a floor and a second axis perpendicular to the first axis as a time, by differentiating a display format of each cell positioned at an intersection point between the floor and the time depending on a magnitude of the building usage information associated with the floor identifier indicating the floor and the date and time information indicating the time; and

a visualization processing unit that visualizes the matrix data generated by the matrix generating unit.

2. The building information visualization device as claimed in claim 1, wherein the visualization processing unit defines the first axis as a vertical axis and the second axis as a horizontal axis to visualize the matrix data.

3. The building information visualization device as claimed in claim 1, further comprising
an aggregate processing unit that aggregates a plurality of pieces of the

building usage information associated with the identical floor identifier for each aggregate cycle specified by a user,

wherein the matrix generating unit differentiates the display format of each cell depending on a magnitude of the building usage information aggregated by the aggregate processing unit.

4. The building information visualization device as claimed in any one of claims 1 to 3,

wherein the storage device stores information collected by an elevator control device that controls an elevator installed in a building, the information including at least one of a count of staying persons on each floor at each collection date and time, an elevator waiting time on each floor at each collection date and time, and a count of elevator call registration on each floor at each collection date and time as the building usage information.

5. The building information visualization device as claimed in claim 4,

wherein the storage device stores a bank identifier associated with the building usage information, the bank identifier identifying a bank of elevators having a common stopping floor range,

the building information visualization device further comprising

an aggregate processing unit that aggregates a plurality of pieces of the building usage information associated with the identical bank identifier, and

the matrix generating unit differentiates the display format of each cell depending on a magnitude of the building usage information aggregated by the

aggregate processing unit.

6. The building information visualization device as claimed in claim 5, wherein the matrix generating unit merges a stopping floor indicated by a first bank identifier and a stopping floor indicated by a second bank identifier different from the first bank identifier into the first axis to generate the matrix data.

7. The building information visualization device as claimed in claim 1, wherein the matrix generating unit generates the matrix data for each range of a plurality of collection dates and times specified by a user or for each building as a collection source of the building usage information specified by a user, and

the visualization processing unit visualizes a plurality of pieces of the matrix data generated by the matrix generating unit in parallel.

8. The building information visualization device as claimed in claim 1 or 2, wherein the matrix generating unit differentiates at least one of a color, a shading, and a pattern of each cell depending on a magnitude of the building usage information.

9. The building information visualization device as claimed in claim 1, wherein, when a user who requests visualization of the matrix data is a building owner, the visualization processing unit visualizes only the matrix data of

a building owned by the user, and

when a user who requests visualization of the matrix data is a building management company, the visualization processing unit visualizes only the matrix data of a building managed by the user.