

DESCRIPTION

BUILDING INFORMATION MANAGEMENT SYSTEM, IMAGE GENERATION METHOD, AND BUILDING INFORMATION MANAGEMENT PROGRAM

Technical Field

[0001]

The present invention relates to a building information management system, an image generation method, and a building information management program.

Background Art

[0002]

In inspecting structural elements such as piping installed in a building, the inspection has been performed by marking inspection points based on drawings or paper plans for inspection targets, such as points in poor condition and whether all inspection target elements were installed correctly. In addition, inspection results have been stored by printing to 2D files and paper as reports. On the other hand, in recent years, drawing creation using three-dimensional information such as building information modeling (BIM) data has become mainstream, and an example of such technique is proposed in Patent Literature 1, for example.

[0003]

Patent Literature 1 discloses a technique for executing: a

data creation process of acquiring first BIM data containing drawing data related to construction, a plurality of pieces of area data, and a plurality of pieces of component data, creating second data in which the plurality of pieces of component data is grouped together based on the acquired first BIM data, and iconizing the created second data; and a data arrangement process of generating layer data to be arranged by being superimposed on the drawing data based on the acquired first BIM data, arranging the second data on the generated layer data, and outputting the drawing data in which the layer data with the second data arranged is superimposed.

Citation List

Patent Literature

[0004]

Patent Literature 1: JP 7129586 B1

Summary of Invention

Technical Problem

[0005]

However, the technique as in Patent Literature 1 has a problem when showing an inspection result of a structural element of a building, that it is difficult to grasp a position from the whole building and a detailed position.

[0006]

In view of the above circumstances, a purpose of the present invention is to provide a novel technique for generating an image with which a structural element of a building can be easily grasped.

Solution to Problem

[0007]

In order to solve the above problem, the present invention relates to a building information management system that generates an image related to a structural element of a building, the building information management system including an acceptance unit that accepts, for drawing information to which base line information is added, designation information designating a target to be contained in the image, and an image generation unit that determines an enlarged part based on the designation information, and generates an enlarged image to which the enlarged part and base line information sectioning the enlarged part are added based on the base line information.

[0008]

In addition, the present invention relates to an image generation method for generating an image related to a structural element of a building, the image generation method including an acceptance step of accepting, for

drawing information to which base line information is added, designation information designating a target to be contained in the image, an enlarged part determination step of determining an enlarged part based on the designation information, and an image generation step of generating an enlarged image to which the enlarged part and base line information sectioning the enlarged part are added based on the base line information.

[0009]

In addition, the present invention relates to a building information management program for generating an image related to a structural element of a building, the building information management program causing a computer to execute an acceptance step of accepting, for drawing information to which base line information is added, designation information designating a target to be contained in the image, an enlarged part determination step of determining an enlarged part based on the designation information, and an image generation step of generating an enlarged image to which the enlarged part and base line information sectioning the enlarged part are added based on the base line information.

[0010]

With such a configuration, it is possible to add the base line information to the enlarged image and display the

enlarged image. As a result, it is possible to display a common reference in the enlarged image, and to easily grasp the structural element of the building.

[0011]

In a preferred mode of the present invention, a file generation unit that generates a file containing the enlarged image is further included.

[0012]

With such a configuration, it is possible to generate a file containing the generated enlarged image.

[0013]

In a preferred mode of the present invention, the drawing information is BIM data containing a three-dimensional structural element model, the acceptance unit accepts designation of the structural element model as the designation information, and the image generation unit generates the enlarged image by making an undesignated structural element model transparent.

[0014]

With such a configuration, it is possible to generate the enlarged image in which the designated structural element model is emphasized. As a result, it is possible to easily visually recognize the designated structural element model.

[0015]

In a preferred mode of the present invention, the drawing information is BIM data containing a three-dimensional structural element model, the acceptance unit accepts designation of a position and viewpoint direction of the structural element model in the enlarged part as the designation information, and the image generation unit determines the enlarged part based on the position and the viewpoint direction.

[0016]

With such a configuration, it is possible to arbitrarily change the position and viewpoint direction of the structural element model. As a result, it is possible to generate the enlarged image in which the structural element model is arranged in a direction or position desired by a user.

[0017]

In a preferred mode of the present invention, the image generation unit generates an enlarged image in which the base line information is added to a plan view and an elevation view of the structural element model based on the designation information.

[0018]

With such a configuration, it is possible to generate the enlarged image containing the plan view and the elevation view of the structural element model. As a

result, it is possible to generate the enlarged image containing a three-dimensional drawing of the structural element model.

[0019]

In a preferred mode of the present invention, the image generation unit further determines the enlarged part based on the base line information.

[0020]

With such a configuration, it is possible to determine the enlarged part using the base line information. As a result, it is possible to clarify a criterion for determining the enlarged part.

[0021]

In a preferred mode of the present invention, the image generation unit determines the enlarged part by a pair of base lines sandwiching all the designation information in at least one axial direction.

[0022]

With such a configuration, it is possible to determine the enlarged part so as to contain all the designation information by using the pair of base lines. As a result, it is possible to determine the enlarged part of all the designation information, and to grasp the position of the enlarged part by using the base line information.

[0023]

In a preferred mode of the present invention, the acceptance unit is configured to be able to accept designation of a plurality of structural element models as the designation information, and the image generation unit uses, as one group, one or a plurality of the structural element models surrounded by two pairs of continuous base lines in respective axial directions, or one or a plurality of the structural element models sandwiched between a pair of continuous base lines in one axial direction and positioned closer to an outside than an outermost base line in another axial direction, determines the enlarged part for each of the groups, and generates a plurality of the enlarged images.

[0024]

With such a configuration, it is possible to use one or a plurality of structural element models as a group to determine the enlarged part for each group, and to generate a plurality of enlarged images. As a result, it is possible to visually recognize the designation information on a drawing even when there is a large amount of designation information.

[0025]

In a preferred mode of the present invention, the image generation unit generates a plurality of the enlarged

images, and also generates a drawing image in a range containing the designation information on at least all groups, the drawing image being sectioned by the base line information and having an annotation number added to a section corresponding to each of the enlarged images to refer to the enlarged image.

[0026]

With such a configuration, it is possible to section the drawing image by the base line information, and to attach a number in the drawing image to refer to a section corresponding to the enlarged image.

[0027]

In a preferred mode of the present invention, the image generation unit determines the enlarged part by adding a margin to a range sectioned by the base line information.

[0028]

With such a configuration, it is possible to add a margin to the range sectioned by the base line information. As a result, it is possible to reflect the drawing information in the margin.

Advantageous Effects of Invention

[0029]

The present invention can provide a novel technique

for generating an image with which a structural element of a building can be easily grasped.

Brief Description of Drawings

[0030]

Fig. 1 is a block diagram illustrating a configuration of a system according to an embodiment.

Fig. 2 is a hardware configuration diagram illustrating a system according to an embodiment.

Fig. 3 is a functional block diagram illustrating a system according to an embodiment.

Fig. 4 is a diagram illustrating an example of a processing procedure in a system according to an embodiment.

Fig. 5 is a diagram illustrating an example of a screen for registering designation information in a system according to an embodiment.

Fig. 6 is a diagram illustrating an example of an image to be contained in report information in a system according to an embodiment.

Fig. 7 is a diagram illustrating an example of report information in a system according to an embodiment.

Fig. 8 is a diagram illustrating an example of a processing procedure in a system according to an embodiment.

Fig. 9 is a diagram illustrating an example of a screen for registering designation information in a system according to an embodiment.

Fig. 10 is a diagram illustrating an example of an image to be contained in report information in a system according to an embodiment.

Fig. 11 is a diagram illustrating an example of report information in a system according to an embodiment.

Description of Embodiments

[0031]

Hereinafter, the present invention will be described in more detail with reference to the accompanying drawings. Preferred embodiments are illustrated in the drawings. However, the present invention can be implemented in many different embodiments and is not limited to the embodiments described in this specification.

[0032]

For example, the configuration, operation, and the like of a building information management system are described in the present embodiment, but similar functions and effects can be achieved by a method, a device, a computer program, and the like to be performed. In the present embodiment, a so-called server-client type building information management system is described, in which the

program is activated in an external computer in order to achieve the functions on a client terminal. The program may be provided as a non-transitory computer-readable recording medium or in a downloadable form from an external server.

[0033]

<1. System configuration>

Fig. 1 is a block diagram illustrating a configuration of a system according to an embodiment. As illustrated in Fig. 1, a building information management system 0 includes an information management device 1 (server) and a user terminal device 3 (client), which are configured to be communicable via a network NW.

[0034]

As the information management device 1, a computer for a general-purpose server, a personal computer, or the like can be used. As the user terminal device 3, a personal computer, a smartphone, a tablet terminal, a wearable device, or the like can be used. The user terminal device 3 includes an information management device use program for making a request to the information management device 1 and accepting a response.

[0035]

The network NW is an Internet Protocol (IP) network in the present embodiment, but the type of communication

protocol is not limited, and the type and size of the network are also not limited.

[0036]

<1.1. Hardware configuration>

Fig. 2 is a hardware configuration diagram. As illustrated in Fig. 2(a), the information management device 1 includes a processing unit 101, a memory unit 102, and a communication unit 103.

[0037]

The processing unit 101 includes a processor, such as a CPU, capable of executing a command set, and controls the entire operation processing of the information management device 1 by executing an image generation program related to the present invention, an OS, and other applications.

The memory unit 102 includes a volatile memory, such as a RAM, capable of storing a command set, and a nonvolatile recording medium, such as an HDD or an SSD, capable of recording the OS, a building information management program, and the like.

The communication unit 103 includes a communication interface device for connecting to a network, and performs communication control with the network NW to input and output information.

[0038]

As illustrated in Fig. 2(b), a terminal device 90 (user terminal device 3) includes a processing unit 901, a memory unit 902, a communication unit 903, an input unit 904, and a display unit 905.

[0039]

The processing unit 901 includes a processor, such as a CPU, capable of executing a command set, and controls the entire operation processing of the information management device 1 by executing an information management device use program for using the information management device 1, an OS, and other applications.

The memory unit 902 includes a volatile memory, such as a RAM, capable of storing a command set, and a nonvolatile recording medium, such as an HDD or an SSD, capable of recording the OS, the information management device use program, and the like.

The communication unit 903 includes a communication interface device for connecting to a network, and executes communication control with the network NW to input and output information.

The input unit 904 includes an input device, such as a keyboard or a touch panel, capable of performing input processing.

The display unit 905 includes a display device, such as a display, capable of performing display processing.

[0040]

<1.2. Functional configuration of Information management device>

Fig. 3 is a functional block diagram illustrating the building information management system 0. As illustrated in Fig. 3, the information management device 1 includes a distribution unit 11, an acceptance unit 12, a file generation unit 13, an image generation unit 14, and a database 2. In addition, the user terminal device 3 includes a display processing unit 31 and a data storage unit 32. This shows that information processing by software (stored in the memory unit 102/the memory unit 902) is concretely achieved by hardware (the processing unit 101/901 or the like).

[0041]

Note that some or all of the functional component elements (units) included in the information management device 1 may be included in the user terminal device 3, which is a client. For example, the user terminal device 3 may include the acceptance unit 12, the file generation unit 13, the image generation unit 14, and the like, and the information management device 1 may be a cloud storage that records and manages various types of data such as drawing information. The building information management system 0 is used via the user terminal device 3 executing

the information management device use program in the present embodiment, but a building information management device may be configured by installing the building information management program in the user terminal device 3. Note that the device may be configured by a plurality of computers capable of transmitting and accepting information via the network NW or another network.

[0042]

<1.3. Database 2>

The database 2 stores drawing information 21, measurement/inspection information 22, a worker master 23, a measurement/inspection master 24, and report information 25.

[0043]

The distribution unit 11 distributes the various types of information stored in the database 2 to the user terminal device 3, and the data storage unit 32 stores the distributed various types of information in the memory unit 902. The display processing unit 31 performs display processing on the distributed various types of information and transmits a display processing result to the display unit 905, thereby displaying various screens on the user terminal device 3.

[0044]

<1.4. Drawing information 21>

The distribution unit 11 distributes the drawing information 21 to the user terminal device 3, and the display unit 905 of the user terminal device 3 displays the drawing information 21 on a drawing display screen. The drawing information 21 is a two-dimensional or three-dimensional drawing for illustrating a structural element of a building, and contains base line information on base lines arranged in two or three axis directions intersecting each other. The base line information contains information on positions (coordinates and the like) at which the base lines are arranged in the drawing and signs attached to the base lines. The coordinate system in the drawing plane or the drawing space may not necessarily coincide with the arrangement direction of the base lines. In addition, the base lines arranged in the same arrangement direction may intersect each other. In the present embodiment, it is assumed that the drawing information 21 is three-dimensional BIM data, structural elements in a building are represented by structural element models that can be independently distinguished, and attribute information on the structural elements, such as a wall surface, a floor, a pipe (piping), a sleeve, a reinforcing bar, or a steel material, is assigned to each structural element model.

[0045]

Note that the information management device 1 may

perform display processing on the various types of information stored in the database 2, and the user terminal device 3 may accept the transmitted display processing result to cause the display unit 905 to display various screens. In the following, in order to simplify the description, the intervention of the distribution unit 11, the display processing unit 31, and the data storage unit 32 will be omitted to the extent that it is not unclear.

[0046]

<1.5. Registration of Measurement/inspection information 22>

The acceptance unit 12 of the user terminal device 3 registers the measurement/inspection information 22 in association with the drawing information 21 by a predetermined operation performed on the drawing display screen or the like. The measurement/inspection information 22 is information related to measurement or inspection of a structural element, and contains identification information on the measurement/inspection information 22, identification information on a drawing (directory, file name, and the like), information related to a measurement/inspection name, a schedule, a worker, and a measurement/inspection type. The worker may be selected from those registered in the worker master 23. The measurement/inspection type may be selected from those

registered in the measurement/inspection master 24.

[0047]

For each measurement/inspection type, initial values for measurement or inspection requirements, such as measurement items or reference values, and/or format information on the report information 25 may be attached to the measurement/inspection master 24.

[0048]

<1.6. Registration of Report information 25>

The acceptance unit 12 of the user terminal device 3 registers the report information 25 in association with the measurement/inspection information 22 by a predetermined operation performed on the drawing display screen or the like. The report information 25 is information indicating a report of measurement or inspection, and contains identification information on the report information 25, and the measurement/inspection name, the worker, and the drawing information 21 contained in the measurement/inspection information 22. Note that, in the present embodiment, the report information 25 is information for confirming measurement/inspection details before measurement or inspection. Meanwhile, the report information 25 may be information for marking a point where measurement/inspection has been completed during the measurement/inspection. In addition, in the present

embodiment, the display processing unit 31 performs display processing on the report information 25 to cause the display unit 905 to display a report input screen, and the acceptance unit 12 accepts an input to a report via the report input screen.

[0049]

<1.7. Acceptance unit 12>

The acceptance unit 12 accepts designation information designating a target to be contained in the image. The drawing display screen is configured to be able to designate a range or a structural element model in the drawing by a predetermined operation, and accepts the designated range or structural element model as the designation information. The designation information contains a range or a structural element model in the drawing or information on a position and viewpoint direction of a structural element model. As a result, it is possible to designate a range or a structural element model in the drawing, which is a measurement/inspection target, or a position and viewpoint direction of a structural element model.

[0050]

<1.8. File generation unit 13>

The file generation unit 13 generates a file containing an enlarged image. In the present embodiment,

the file generation unit 13 generates the report information 25 as the file containing the enlarged image. Specifically, the file generation unit 13 generates, based on the measurement/inspection information 22 and the designation information designating the measurement/inspection target that have been input on the drawing display screen, the report information 25 containing the enlarged image corresponding to the designation information and the measurement/inspection information 22. Details of the enlarged image will be described later. As a result, it is possible to secondarily use the generated image.

[0051]

<1.9. Image generation unit 14>

The image generation unit 14 determines an enlarged part based on the designation information, and generates the enlarged image to which the enlarged part and base line information sectioning the enlarged part are added based on the base line information. In the present embodiment, the image generation unit 14 determines the enlarged part so as to contain the range or the structural element model designated as the designation information.

[0052]

The image generation unit 14 further determines the enlarged part based on the base line information in

addition to the designation information. In the present embodiment, the image generation unit 14 determines the enlarged part by a pair of base lines sandwiching all the designation information in at least one axial direction.

[0053]

Note that, in the present embodiment, when the range or the position and viewpoint direction of the structural element model is not designated, the image generation unit 14 determines the enlarged part so as to arrange the range or the structural element model designated by the designation information in the center of the drawing, and generates the enlarged image. On the other hand, when the position and/or viewpoint direction of the structural element model is designated by the designation information, the image generation unit 14 determines, based on the position and/or viewpoint direction, the enlarged part of the range or the structural element model, and generates the enlarged image.

[0054]

<2. Processing flow (Measurement/inspection of piping)>

The management of building information is described below with reference to Figs. 4 to 9. Fig. 4 is a diagram illustrating a processing flowchart up to the registration of the report information 25 when measurement/inspection

related to piping is selected and input as a measurement/inspection type. Here, examples of the measurement/inspection related to piping include a pipe pressure inspection and a pipe drainage inspection.

[0055]

First, in step S10 (hereinafter, simply referred to as SXX), the display processing unit 31 accepts a selection input from a user for the drawing information 21 for which generation of the report information 25 is desired, and causes the display unit 905 to display the drawing display screen for displaying the drawing information 21. Fig. 5 is a diagram illustrating an example of the drawing display screen. Fig. 5(a) is a screen displayed when the drawing information 21 is selected, and includes a scene creation section W11, a group setting section W12, a target setting section W13A, an isometric drawing confirmation updating section W14, a measurement/inspection information list W15, and a drawing display section W16.

[0056]

In the present embodiment, when accepting the selection input for the scene creation section W11 from the user, the display processing unit 31 causes the display unit 905 to display a screen for accepting registration of the measurement/inspection information 22 (not illustrated). A scene indicates a type of measurement or

inspection of a building, and includes, for example, a pipe pressure inspection, a pipe drainage inspection, a section penetration treatment record (fire prevention), a sleeve inspection, and the like. Note that, depending on the scene, measurement or inspection may be performed a plurality of times for each phase, which will be described later. Then, the acceptance unit 12 accepts a measurement/inspection type (pipe inspection), a scheduled work time, a worker, a test date, a water pressure, an air pressure (high pressure), and an air pressure (low pressure) as the measurement/inspection information 22 on the screen, and registers them in association with the drawing information 21 (S11). Then, the registered measurement/inspection information 22 is displayed in the measurement/inspection information list W15.

[0057]

Next, the acceptance unit 12 accepts information (target group information) related to a group of measurement/inspection targets (targets to be contained in the image), and registers the information in association with the measurement/inspection information 22 (S12). In the present embodiment, the display processing unit 31 accepts a selection input for the group setting section W12 and causes the display unit 905 to display a screen for registering the target group information (not illustrated).

Then, the acceptance unit 12 accepts and registers an input of a measurement/inspection method, a group name, and a structural element model selection color as the target group information. Then, the registered target group information is displayed in the lower part of the measurement/inspection information list W15.

[0058]

Next, the acceptance unit 12 accepts designation information designating the measurement/inspection targets, and registers the designation information in association with the target group information (S13). In the present embodiment, when accepting from the user a selection input of the target group information for which designation of the measurement/inspection targets is desired from the measurement/inspection information 22 displayed in the measurement/inspection information list W15 and further accepting a selection input for the target setting section W13A, the display processing unit 31 causes the display unit 905 to display a screen for accepting the designation information (Fig. 5(b)).

[0059]

Fig. 5(b) is a display example of a screen (pipe designation screen) on which the drawing of the drawing information 21 selected and input in S10 is displayed in such a manner that a pipe, which is the

measurement/inspection target, can be accepted as the designation information in the drawing display section W16. In the present embodiment, pipes colored with one or a plurality of predetermined colors are displayed on the piping designation screen. Then, the acceptance unit 12 accepts designation of a range or a pipe in the drawing and registers the designation as the designation information. Here, the range in the drawing is any region in the drawing that contains a part of the structural element model or the like. Note that, in the present embodiment, one or a plurality of pipes can be designated, and may be individually designated by a click operation, or a plurality of pipes may be simultaneously designated by a drag operation.

[0060]

Note that the structural element model for which the designation is accepted is colored and displayed with the color specified by the structural element model selection color in the target group information in the present embodiment, but may be colored and displayed with a predetermined color to be distinguishable from other structural element models.

[0061]

Then, the image generation unit 14 generates an enlarged image to be contained in the report information 25

based on the accepted designation information (S14). In the present embodiment, the image generation unit 14 determines the enlarged part so as to arrange the range or the pipe accepted as the designation information in the center of the drawing, and generates the enlarged image in which the base line information is added to the three-dimensional view of the designated pipe. In addition, the image generation unit 14 generates the enlarged image in which the base line information is added to the plan view of the designated pipe viewed from a certain axial direction.

[0062]

For example, Fig. 6(a) is an isometric drawing (so-called isometric projection diagram) of the designated pipe. Figs. 6(b) and 6(c) are enlarged images in which the enlarged part is determined by a pair of base lines sandwiching all the designation information in at least one axial direction. Fig. 6(b) is an enlarged image (plan view) containing a pair of base lines sandwiching one designated pipe in one axial direction (x axis or y axis) in a plane perpendicular to the vertical axis (z axis). Fig. 6(c) is an enlarged image (elevation view) containing a pair of base lines (floor level) sandwiching one designated pipe in one axial direction (z axis) in a plane parallel to the vertical axis (z axis).

[0063]

In addition, in the present embodiment, the image generation unit 14 further determines the enlarged part by adding a margin to a range sectioned by the base line information. In the present embodiment, the image generation unit 14 determines the enlarged part by adding a margin to a plan view sectioned by the base line information. For example, in Figs. 6(b) and 6(c), a margin is added outside the base lines, and the drawing of the drawing information 21 is displayed in the range included in the margin.

[0064]

Note that the image generation unit 14 generates the enlarged image by making an undesignated structural element model transparent in the present embodiment, but may generate the enlarged image by coloring an undesignated structural element model in an inconspicuous color such as light black.

[0065]

Next, the position, size, and viewpoint direction of the structural element model in the isometric drawing can be changed at any timing after S14. When accepting a change in the isometric drawing (YES in S15), the acceptance unit 12 changes the isometric drawing and registers the isometric drawing (S16). In the present

embodiment, when there is an isometric drawing for which confirmation and/or change is desired, the display processing unit 31 accepts a selection input of the target group information corresponding to the isometric drawing, and further accepts a selection input for the isometric drawing confirmation updating section W14. Then, the display processing unit 31 causes the display unit 905 to display a screen for confirming and/or changing the isometric drawing (not illustrated). Then, the acceptance unit 12 accepts the position and viewpoint direction of the pipe as the designation information, and registers the isometric drawing updated based on the designation information.

[0066]

Next, in S17, the acceptance unit 12 accepts an input of the measurement/inspection result of the designated pipe, and registers the input as the measurement/inspection information 22. Then, an instruction to generate the report information 25 containing the updated drawing is accepted, and the processing proceeds to the next step. Note that, when a change in the isometric drawing is not accepted, the processing directly proceeds to the next step without changing the isometric drawing. Note that the input of the measurement/inspection result is accepted after the

enlarged image is generated in the present embodiment, but the enlarged image may be generated after the input of the measurement/inspection result is accepted. In this case, the image generation unit 14 may generate the enlarged image containing the measurement/inspection result.

[0067]

In S18, the file generation unit 13 accepts a selection input of the target group information for which generation of a report is desired, and generates the report information 25. The file generation unit 13 generates the report information 25 containing the measurement/inspection information 22 and the drawing generated in S14 or S16 based on the measurement/inspection information 22 and the designation information that are associated with the selected and input target group. Fig. 7 is a diagram illustrating an example of the generated report information 25.

[0068]

Then, in S19, the designation of the generated report information 25 is accepted from the user, and a registration instruction is accepted, whereby the report information 25 is stored in the memory unit 902. In the present embodiment, the designation of the desired report information 25 is accepted from the list of the report information 25, and the report information 25 is registered

in the user terminal device 3 by dragging and dropping.

[0069]

As described above, the report information 25 containing the enlarged image of the pipe that is the measurement/inspection target can be generated through S10 to S19. As a result, the distribution unit 11 can distribute the generated report information 25 via the network NW and causes the display unit 905 of the user terminal device 3 to display the report information 25. In addition, the data storage unit 32 accepts the generated report information 25 from the distribution unit 11 and stores the report information 25 in the memory unit 902, and the display processing unit 31 can thereby cause the display unit 905 of the user terminal device 3 to display the report information 25 even when communication with the information management device 1 via the network NW cannot be performed.

[0070]

<3. Processing flow (Measurement/inspection related to Sleeve)>

Fig. 8 is a flowchart illustrating a processing flowchart up to the registration of the report information 25 when measurement/inspection related to a sleeve is selected and input as a measurement/inspection type. Fig. 9 is a diagram illustrating an example of a display screen

when measurement/inspection related to a sleeve is performed. Note that the sleeve is an example of an inspection target, and may be another structural element model.

[0071]

S21 to S22 are the same processing procedure as the measurement/inspection for a pipe, and are therefore omitted. Note that the acceptance unit 12 accepts and registers a measurement/inspection type (sleeve inspection), a measurement/inspection name, a scheduled work time, and an inspection type (floor sleeve, wall sleeve, or the like) as the measurement/inspection information 22.

[0072]

Then, in S23, the acceptance unit 12 accepts designation information and registers the designation information in association with the measurement/inspection information 22. In the present embodiment, when accepting from the user a selection input of the measurement/inspection information 22 for which designation of a measurement/inspection target is desired from the measurement/inspection information 22 displayed in the measurement/inspection information list W15 and further accepting a selection input for a target setting section W13B, the display processing unit 31 causes the display

unit 905 to display a screen for accepting the designation information (Fig. 9(b)).

[0073]

Fig. 9(b) is a display example of a screen (sleeve designation screen) on which the drawing of the drawing information 21 selected and input in S21 is displayed while the sleeve, which is the measurement/inspection target, can be accepted as the designation information in the drawing display section 16. In the present embodiment, on the sleeve designation screen, base line information (in the illustrated example, straight lines with Arabic numerals or alphabet) on a plane perpendicular to the vertical direction and the structural element model in the drawing information 21 are displayed. Then, the acceptance unit 12 accepts one or a plurality of sleeves, and registers the designation as designation information. Note that one or a plurality of sleeves may be individually designated by a click operation, or a plurality of sleeves may be simultaneously designated by a drag operation.

[0074]

Here, when the structural element model that is the measurement/inspection target is a "sleeve", an inspection phase is accepted because a sleeve inspection is performed at several timings (inspection phases) such as before and after concrete placement.

[0075]

In S24, the acceptance unit 12 accepts an input of the inspection phase of the measurement/inspection of the target sleeve, and registers the inspection phase in association with the measurement/inspection information 22. In the present embodiment, when the sleeve designation screen is displayed and a selection input for the target setting section W13B is accepted, the display processing unit 31 causes the display unit 905 to display a screen for accepting the input of the inspection phase. Then, the acceptance unit 12 accepts a selection input of the inspection phase. Then, when the designation information and the inspection phase are registered, the registered inspection phase and the designation information are displayed in association with each other in the lower part of the measurement/inspection information list W15. In addition, the display processing unit 31 accepts a selection input of the inspection phase to be displayed in the lower part of the measurement/inspection information list W15, thereby performing display processing of displaying all the registered designation information on the drawing display section W16 and performing display processing of highlighting the designation information associated with the inspection phase.

[0076]

Note that the registered designation information is displayed for each group in the present embodiment, but may be displayed for each designation information. Note that the inspection phase is registered after the designation information is registered in the present embodiment, but the designation information may be registered after the inspection phase is registered.

[0077]

Here, in the present embodiment, a group is one or a plurality of structural element models surrounded by two pairs of continuous base lines in each axial direction, or one or a plurality of structural element models sandwiched between a pair of continuous base lines in one axial direction and positioned closer to the outside than the outermost base line in another axial direction.

[0078]

Next, in S25, the acceptance unit 12 accepts an input of the measurement/inspection result of the designated sleeve, and registers the input as the measurement/inspection information 22. Then, in S26, the image generation unit 14 generates an enlarged image to be contained in the report information 25 based on the accepted designation information. In the present embodiment, the image generation unit 14 determines the enlarged part for each group and generates a plurality of

enlarged images. In addition, the image generation unit 14 generates a plurality of the enlarged images, and also generates a drawing image in a range containing the designation information on at least all groups, and the drawing image is sectioned by the base line information and has an annotation number added to a section corresponding to each of the enlarged images to refer to the enlarged image. In addition, the image generation unit 14 generates a plurality of enlarged images displaying a measurement/inspection status as the measurement/inspection result for each designated designation information.

[0079]

Note that, in the present embodiment, the measurement/inspection status is input in the generated report information 25, thereby being stored in association with the measurement/inspection information 22 and the designation information. On the other hand, by selecting and inputting the created measurement/inspection information 22 displayed in the measurement/inspection information list W15, a screen on which the measurement/inspection status can be input may be displayed to store the input measurement/inspection status in association with the measurement/inspection information 22 and the designation information.

[0080]

For example, Fig. 10(a) is an enlarged image in which, of the designated sleeves, a plurality of sleeves surrounded by two pairs of base lines "2" and "3" and base lines "B" and "C" that are continuous in the x and y axis directions in a plane perpendicular to the z axis is designated as the enlarged part. Fig. 10(b) is an enlarged image in which, of the designated sleeves, a sleeve sandwiched between a pair of base lines "B" and "C" that are continuous in the y axis (axis in the vertical direction in the drawing) in a plane perpendicular to the z axis and positioned closer to the outside than the outermost base line in the drawing in the x axis is designated as the enlarged part. In the enlarged images of Figs. 10(a) and 10(b), the measurement/inspection statuses of "passed", "not inspected", "under inspection", and "failed" are displayed in the balloon portions for each designated designation information. Fig. 10(c) is a drawing of the drawing information 21 in a range containing all the designated sleeves, and is sectioned by the base lines "1" to "5" and "A" to "G" in a lattice pattern, and annotation numbers (1) to (4) are added to the sections containing the designated sleeves (section determined as the enlarged part) to refer to the enlarged image.

[0081]

In addition, in the present embodiment, the image

generation unit 14 further determines the enlarged part by adding a margin to a range sectioned by the base line information. For example, in Figs. 10(a) and 10(c), a margin is added outside the base lines, and the drawing of the drawing information 21 is displayed in a range included in the margin.

[0082]

Then, in S27, the file generation unit 13 accepts a selection input of the measurement/inspection information 22, the inspection phase, and the measurement/inspection status for which generation of a report is desired, and generates the report information 25. Based on the selected and input inspection phase, the designation information associated with the measurement/inspection information 22, and the measurement/inspection status, the file generation unit 13 generates the report information 25 containing the drawing generated in S26 and associated with the inspection phase, the measurement/inspection information 22, and the selected and input measurement/inspection status.

[0083]

Then, in S28, the designation of the generated report information 25 is accepted from the user, and a registration instruction is accepted, whereby the report information 25 is stored in the memory unit 902. In the present embodiment, the desired report information 25 is

designated from the list of the report information 25, and the report information 25 is registered in the user terminal device 3 by dragging and dropping. Fig. 11 is a diagram illustrating an example of the generated report information 25.

[0084]

As described above, through S21 to S28, it is possible to generate a report in which an overall drawing, a diagram divided in certain sections (Fig. 10(c)), and a diagram showing the measurement/inspection points on the enlarged drawing for each section (Figs. 10(a) and 10(b)) are combined. As a result, it is possible to solve the problem that it is difficult to visually recognize, on the drawing, a large number of measurement/inspection points on one floor.

[0085]

Note that the drawing information 21 is BIM data containing the base line information in the present embodiment, but may not be BIM data (for example, two-dimensional Computer Aided Design (CAD) or three-dimensional CAD). In this case, the enlarged part may be determined by manually designating the section position. Note that the building information management system 0 may further include a base line setting unit that sets the base line information in the drawing information without the

base line information, and may generate an enlarged image based on the base line information set by the base line setting unit.

Reference Signs List

[0086]

0	Building information management system
1	Information management device
2	Database
3	User terminal device
101	Processing unit
102	Memory unit
103	Communication unit
90	Terminal device
901	Processing unit
902	Memory unit
903	Communication unit
904	Input unit
905	Display unit
11	Distribution unit
12	Acceptance unit
13	File generation unit
14	Image generation unit
21	Drawing information
22	Measurement/inspection information

23	Worker master
24	Measurement/inspection master
25	Report information
31	Display processing unit
32	Data storage unit
NW	Network
W1	Drawing display screen
W11	Scene creation section
W12	Group setting section
W13A	Target setting section
W13B	Target setting section
W14	Isometric drawing confirmation updating section
W15	Measurement/inspection information list
W16	Drawing display section
SEM	Structural element model

CLAIMS

1. A building information management system configured to generate an image related to a structural element of a building, the building information management system comprising:

an acceptance unit configured to accept, for drawing information to which base line information is added, designation information designating a target to be contained in the image; and

an image generation unit configured to determine an enlarged part based on the designation information, and generate an enlarged image to which the enlarged part and base line information sectioning the enlarged part are added based on the base line information.

2. The building information management system according to claim 1, wherein

the image generation unit further determines the enlarged part based on base line information on a pair of base lines sandwiching all the structural element in at least one axial direction.

3. The building information management system according to claim 1, wherein

the drawing information contains a three-dimensional structural element capable of being individually designated, and

the image generation unit generates a plurality of the enlarged images containing an isometric drawing.

4. The building information management system according to claim 1, further comprising a file generation unit configured to generate a file containing the enlarged image.

5. The building information management system according to claim 1, wherein

the drawing information is BIM data containing a three-dimensional structural element model,

the acceptance unit accepts designation of the structural element model as the designation information, and

the image generation unit generates the enlarged image by making an undesignated structural element model transparent.

6. The building information management system according to claim 1, wherein

the drawing information is BIM data containing a three-dimensional structural element model,

the acceptance unit accepts designation of a position and viewpoint direction of the structural element model in the enlarged part as the designation information, and

the image generation unit determines the enlarged

part based on the position and viewpoint direction.

7. The building information management system according to claim 5 or 6, wherein

the image generation unit generates an enlarged image in which the base line information is added to a plan view and an elevation view of the structural element model based on the designation information.

8. The building information management system according to claim 1, wherein

the acceptance unit is configured to be able to accept designation of a plurality of structural element models as the designation information, and

the image generation unit uses, as one group, one or a plurality of the structural element models surrounded by two pairs of continuous base lines in respective axial directions, or

one or a plurality of the structural element models sandwiched between a pair of continuous base lines in one axial direction and positioned closer to an outside than an outermost base line in another axial direction,

determines the enlarged part for each of the groups, and generates a plurality of the enlarged images.

9. The building information management system according to claim 8, wherein

the image generation unit generates a plurality of

the enlarged images, and also generates a drawing image in a range containing the designation information on at least all groups, the drawing image being sectioned by the base line information and having an annotation number added to a section corresponding to each of the enlarged images to refer to the enlarged image.

10. The building information management system according to claim 1, wherein

the image generation unit determines the enlarged part by adding a margin to a range sectioned by the base line information.

11. An image generation method for generating an image related to a structural element of a building, the image generation method comprising:

an acceptance step of accepting, for drawing information to which base line information is added, designation information designating a target to be contained in the image;

an enlarged part determination step of determining an enlarged part based on the designation information; and

an image generation step of generating an enlarged image to which the enlarged part and base line information sectioning the enlarged part are added based on the base line information.

12. A building information management program for

generating an image related to a structural element of a building, the building information management program causing a computer to execute:

an acceptance step of accepting, for drawing information to which base line information is added, designation information designating a target to be contained in the image;

an enlarged part determination step of determining an enlarged part based on the designation information; and

an image generation step of generating an enlarged image to which the enlarged part and base line information sectioning the enlarged part are added based on the base line information.