

DESCRIPTION

INFORMATION SHARING SUPPORT APPARATUS, SYSTEM, METHOD, AND PROGRAM

5

TECHNICAL FIELD

[0001]

[Description of related applications]

10 The present invention is based on a priority claim of Japanese Patent Application No. 2021-085605 (filed on May 20, 2021), and the entire contents of the present application shall be incorporated and stated in the present application by reference.

15 The present invention relates to an information sharing support apparatus, system, method and program, and more particularly to an information sharing support apparatus, system, method and program for three-dimensional point group data.

BACKGROUND ART

[0002]

20 As a method of sharing information such as maps, images, photographs, virtual spaces, etc., there is a method (for example, a method like tagging) of relating (linking, pasting) additional information that is not enough for information only such as maps, images, photographs, virtual spaces, etc. to a predetermined position(s) of maps, images, photographs, virtual spaces, etc.

25 [0003]

For example, in Google Map, additional information related to a predetermined position(s) on the map is related to a pin put up at the predetermined position(s). Also, in an apparatus of Patent Literature (PTL) 1, each data for design, operation, maintenance, and inspection
30 necessary for maintenance management of equipment and instrumentation used in a plant is input in a form of image data such as building layout diagrams, equipment layout diagrams, electrical single-line diagrams, etc.; graphic data such as equipment photos,

specifications, parts configuration diagrams, lists, etc.; or attribute data such as inspection cycle of equipment/instrumentation, parts replacement timing, past data of equipment/instrumentation, normality/abnormality judgment criteria, etc.

5 [0004]

Also, in a system of PTL 2, various types of information related to a three-dimensional model placed in a virtual space are related to positions in a polar coordinate system defined in the virtual space. Further, in a system of PTL 3, an inspection result of an inspection
10 object of a structure at a current position is related to a position of an inspection object in a three-dimensional model generated when the structure was designed. Furthermore, in a system of PTL 4, information related to an existing object is superimposed on a live view video and corresponded to a mark image corresponding to the object.

15 PATENT LITERATURE

[0005]

[PTL 1] JPH4-90099A

[PTL 2] JP2018-88065A

[PTL 3] JP2019-28595A

20 [PTL 4] JP2020-98568A

[PTL 5] JP2021-21671A

[PTL 6] JP2021-56765A

SUMMARY

TECHNICAL PROBLEM

25 [0006]

The following analysis is given by the inventors of the present application.

[0007]

Here, since a three-dimensional point group data is an aggregate
30 of points having coordinate information and has sparse information, when displaying the three-dimensional point group on a display apparatus, it is often difficult to distinguish or identify an imaging object in the three-dimensional point group only by viewing from one

direction, and even if the imaging object is rotated, it is still difficult to distinguish or identify the imaging object. Therefore, it is difficult even for a skilled person to grasp the imaging object from the three-dimensional point group data displayed on a screen of a personal computer, a tablet terminal, or the like. Also, even if it is a matter of course for a person staying at a site, a state of surroundings (surroundings of the imaging object) that is easy to break off near edge(s) when the three-dimensional point group data is displayed on the screen is often unknown for a person staying at a location (remote location) far away from the site. That is, there is a possibility that additional information requested by a person who has never been at the site is unknown for a person who is at the site (or a person who was at the site), and the additional information is not input in advance at a predetermined position in the three-dimensional point group data. Therefore, construction of a system that enables sharing of information of the surroundings of the imaging object in three-dimensional point group data in real time between a person who has never been at a site and a person who is at the site (or who was at the site) is desired.

[0008]

In this regard, in Google Map, the apparatus of PTL 1, and the systems of PTLs 2 and 3, although additional information is associated in advance to maps, figures, virtual spaces, three-dimensional models, etc., and in three-dimensional point group data, they are not configured to be capable of sharing information of surroundings of an imaging object in the three-dimensional point group data in real time. Also, in the system of PTL 4, the position of the object in a predetermined space is specified, a mark image corresponding to the object is superimposed on and added to a live view image, and information related to the object is corresponded to the mark image. However, even if the position of the object can be identified, it is not possible to identify the state in various forms of surroundings (surroundings of the object) that is easy to break off near edge(s) of the live view image and it is not possible to share the information of the surroundings of the imaging object in real time.

[0009]

It is a main object of the present invention to provide an information sharing support apparatus, system, method, and program that can contribute to sharing information of surroundings of an imaging
5 object in three-dimensional point group data in real time.

SOLUTION TO PROBLEM

[0010]

An information sharing support apparatus according to a first aspect is an information sharing support apparatus that is communicably
10 connected to a plurality of terminals and supports information sharing between the terminals, wherein the information sharing support apparatus comprises: an information addition part configured to perform an add-processing of tag information to a designated position(s) in three-dimensional point group data, based on additional information
15 including a designated position(s) and tag information acquired from any one of terminals connected to the information sharing support apparatus; and a data provision part configured to synchronously provide the three-dimensional point group data add-processed by the information addition part to all of the terminals connected to the
20 information sharing support apparatus.

[0011]

An information sharing support system according to a second aspect comprises: the information sharing support apparatus according to the first aspect; and a plurality of terminals communicably connected
25 to the information sharing support apparatus.

[0012]

An information sharing support method according to a third aspect comprises: adding tag information to a designated position(s) in three-dimensional point group data, based on additional information
30 including a designated position(s) and tag information acquired from any one of terminals connected to hardware resources; and synchronously providing the add-processed three-dimensional point group data to all of the terminals connected to the hardware resources.

[0013]

A program according to a fourth aspect is a program causing hardware resources to execute processings that support information sharing, wherein the program causes the hardware resources to execute the processings comprising: adding tag information to a designated position(s) in three-dimensional point group data, based on additional information including a designated position(s) and tag information acquired from any one of terminals connected to the hardware resources; and synchronously providing the add-processed three-dimensional point group data to all of the terminals connected to the hardware resources.

[0014]

The program can be recorded on a computer-readable storage medium. The storage medium can be non-transitory such as semiconductor memory, hard disk, magnetic recording medium, optical recording medium, or the like. Also, the present disclosure can also be realized as a computer program product. The program is input from an input apparatus or outside to a computer apparatus via a communication interface, is stored in a storage device, drives a processor in accordance with predetermined steps or processings, can cause to display results of processing including intermediate states as necessary in stage by stage via a display apparatus, or can cause to communicate with the outside via a communication interface. A computer apparatus for this purpose, as an example, typically comprises a processor, a storage device, an input apparatus, a communication interface, and a display apparatus as necessary, which are connectable to each other by a bus.

EFFECTS OF INVENTION

[0015]

According to the first to fourth aspects, it is possible to contribute to sharing information of surroundings of an imaging object in three-dimensional point group data in real time.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016]

[FIG. 1] FIG. 1 is a block diagram schematically showing an example

of a configuration of an information sharing support system according to a first example embodiment.

[FIG. 2] FIG. 2 is a block diagram schematically showing an example of a configuration of a field terminal in the information sharing support system according to the first example embodiment.

[FIG. 3] FIG. 3 is an image diagram in case an eyeglass type display is used as an output part of the field terminal in the information sharing support system according to the first example embodiment.

[FIG. 4] FIG. 4 is a block diagram schematically showing an example of a configuration of an information sharing support apparatus in the information sharing support system according to the first example embodiment.

[FIG. 5] FIG. 5 is a block diagram schematically showing an example of a configuration of a remote terminal in the information sharing support system according to the first example embodiment.

[FIG. 6] FIG. 6 is an image diagram in case a three-dimensional display is used as an output part of the remote terminal and a non-contact UI device is used as an input part in the information sharing support system according to the first example embodiment.

[FIG. 7] FIG. 7 is a flow chart schematically showing operations of the information sharing support system according to the first example embodiment.

[FIG. 8] FIG. 8 is an image diagram schematically showing a mode of use of the information sharing support system according to the first example embodiment.

[FIG. 9] FIG. 9 is an image diagram schematically showing an example of visibility improvement processing in the information sharing support system according to the first example embodiment.

[FIG. 10] FIG. 10 is an image diagram schematically showing an example of add-processing in the information sharing support system according to the first example embodiment.

[FIG. 11] FIG. 11 is an image diagram schematically showing an example of operations when the information sharing support system

according to the first example embodiment is applied to load amount management in a logistics industry.

[FIG. 12] FIG. 12 is an image diagram schematically showing an example of the operation in case the information sharing support system according to the first example embodiment is applied to retail inventory management.

[FIG. 13] FIG. 13 is a block diagram schematically showing a configuration of an information sharing support apparatus according to a second example embodiment.

[FIG. 14] FIG. 14 is a block diagram schematically showing a configuration of hardware resources.

EXAMPLE EMBODIMENTS

[0017]

Hereinafter, example embodiments will be described with reference to drawings. It should be noted that when reference numerals are attached to the drawings in the present application, they are solely for a purpose of helping understanding, and are not intended to limit the modes shown in the drawings. Also, the following example embodiments are only examples, and do not limit the present invention.

Further, connection lines between blocks in the drawings and the like referred to in the following description include both bidirectional and unidirectional connections. The unidirectional arrows schematically show flows of main signals (data) and do not exclude bidirectionality. Furthermore, in circuit diagrams, block diagrams, internal configuration diagrams, connection diagrams, etc. disclosed in the present application, an input port and an output port exist at the input end and the output end of each connection line, respectively, although not explicitly shown. The same is applied to input/output interface. The program is executed via a computer apparatus, and the computer apparatus comprises, for example, a processor, a storage device, an input apparatus, a communication interface, and a display apparatus as necessary. The computer apparatus is configured to be able to communicate with an internal or external apparatus (including computer) via the

communication interface, regardless of wired or wireless.

[0018]

[FIRST EXAMPLE EMBODIMENT]

An information sharing support system according to a first example
5 embodiment will be described with reference to drawings. FIG. 1 is a
block diagram schematically showing an example of a configuration of
the information sharing support system according to the first example
embodiment. FIG. 2 is a block diagram schematically showing an
example of a configuration of a field terminal in the information sharing
10 support system according to the first example embodiment; FIG. 3 is an
image diagram in case an eyeglass type display is used as an output part
of the field terminal in the information sharing support system
according to the first example embodiment. FIG. 4 is a block diagram
schematically showing an example of a configuration of an information
15 sharing support apparatus in the information sharing support system
according to the first example embodiment. FIG. 5 is a block diagram
schematically showing an example of a configuration of a remote
terminal in the information sharing support system according to the first
example embodiment. FIG. 6 is an image diagram in case a three-
20 dimensional display is used as an output part of the remote terminal and
a non-contact UI device is used as an input part in the information
sharing support system according to the first example embodiment.

[0019]

The information sharing support system 1 is a system that
25 supports sharing of information including additional information and
three-dimensional point group data of surroundings of an imaging object
imaged by a sensor 500 in any one of between a field (or site) terminal
200 and the other field terminals 200; between the field terminal 200
and a remote terminal 400; and between the remote terminal 400 and the
30 other remote terminals 400 via an information sharing support apparatus
300 (see FIG. 1). The information sharing support system 1 uses imaging
data (100 in FIG. 2) as it is if the imaging data 100 related to the
imaging object acquired by the sensor 500 is three-dimensional point

group data, and use the imaging data 100 by converting the imaging data 100 into three-dimensional point group data in the field terminal 200 or the information sharing support apparatus if the imaging data 100 is not three-dimensional point group data. The information sharing support
5 system 1 includes the field terminals 200, the information sharing support apparatus 300, the remote terminals 400, the sensors 500, and a network 600 as main configurations.

[0020]

Here, the imaging data 100 is data created by imaging in the
10 sensor 500. As the imaging data 100, three-dimensional point group data, which is an aggregate of points having coordinate information, may be used, and in case the imaging data 100 is data (for example, image data, depth information, and other sensing information) other than the three-dimensional point group data, data that can be converted into three-
15 dimensional point group data may be used. In case of converting the imaging data 100 into three-dimensional point group data, the conversion may be performed by the field terminal(s) 200 or the information sharing support apparatus 300.

[0021]

20 The field terminal 200 is an information communication terminal used by a person (or a person who was at an imaging field) being at the imaging field of an imaging object (for example, a utility pole) (see FIG. 1). The field terminal 200 is communicably connected to the network 600 (by wireless or wired). The field terminal 200 is communicably
25 connected to the sensor 500 (wireless or wired). Although there are a plurality of field terminals 200 in FIG. 1, there may be only one. Also, although the field terminal 200 is configured to be connected to the sensor 500 outside the field terminal 200 in FIG. 1, the field terminal 200 may be configured to include the sensor 500 therein. As the field
30 terminal 200, a personal computer, a tablet, a smart phone, an eyeglass type device that realize XR (Extended Reality, Cross Reality) including VR (Virtual Reality), AR (Augmented Reality) and MR (Mixed Reality), or the like may be used. The field terminal 200 includes, as main

function parts, a communication part 210, an output part 220, an input part 230, a storage part 240, and a control part 250 (see FIG. 2).

[0022]

5 The communication part 210 is a function part that performs information communication (by wired or wireless) (see FIG. 2). The communication part 210 is communicably connected to the network (600 in FIG. 1). The communication part 210 is communicably connected to the sensor (500 in FIG. 1). The communication part 210 communicates under control of the control part 250. As the communication part 210, 10 for example, a wireless communication interface may be used, or a wired communication interface may be used. The communication part 210 can acquire the imaging data 100 related to the imaging object imaged by the sensor 500. The communication part 210 can transmit additional information and the imaging data 100 to the information sharing support 15 apparatus 300. The communication part 210 can collect data stored in the storage part (320 in FIG. 4) of the information sharing support apparatus (300 in FIG. 4).

[0023]

20 The output part 220 is a function part that outputs information (display, audio output, etc.) (see FIG. 2). The output part 220 outputs information under control of the control part 250. As the output part 220, for example, a display device such as a liquid crystal display and an organic EL (Electro Luminescence) display, an eyeglass type display communicably connected to the communication part 210, a speaker, 25 earphones, a headphone, a headset, a vibrator, etc. communicably connected to the communication part 210 can be used. The output part 220 can display data acquired by the communication part 210. In case a eyeglass type display is used as the output part 220, as shown in FIG. 3, information written by a supervisor from the remote terminal 400 may 30 be reflected in a world of a real image together with three-dimensional point group data displayed on the eyeglass-type display (output part 220) of a field worker.

[0024]

The input part 230 is a function part that inputs information (operation input, voice input, etc.) (see FIG. 2). The input part 230 is controlled by the control part 250 to input information obtained by operation or voice recognition. As the input part 230, for example, a touch panel, keyboard, mouse, non-contact UI (User Interface), gesture sensor, microphone, headset, camera, etc. can be used. The input part 230 can input additional information including a designated position and tag information by user's operation. As inputting additional information, tag information (comments, measurement results, etc.) in a tag type display form, or tag information representing an intention and a purpose, such as a pointer or an icon resembling a hand by inputting a designated position that designates an arbitrary position (point group, object) in three-dimensional point group data or data with improved visibility may be input. Here, the object may be an imaging object (for example, entire utility pole), its configuration parts (for example, a transformer (voltage transformer), an arm (cross arm), an electric wire, a branch wire, etc.), or anything (for example, cars, houses, packages, shelves, etc.) other than the imaging object may be treated as an object. The input part 230 can input operation information such as enlargement/reduction/rotation/viewpoint-movement of a screen operated by a user. As a result, operations such as enlargement, reduction, rotation, and viewpoint-movement of the screen can be shared among different terminals in synchronization with the operation information.

[0025]

The storage part 240 is a function part that stores various types of information (data, programs, etc.) (see FIG. 2). As the storage part 240, for example, a storage apparatus such as a RAM (Random Access Memory), SSD (Solid State Drive), HDD (Hard Disk Drive), or the like can be used. The storage part 240 writes and reads information under control of the control part 250.

[0026]

The control part 250 is a function part that controls the

communication part 210, the output part 220, the input part 230, and the storage part 240 (see FIG. 2). As the control part 250, for example, a processor such as a CPU (Central Processing part) or an MPU (Micro Processor Unit) can be used. The control part 250, by executing a predetermined program stored in the storage part 240, can perform predetermined processings (information processing, voice recognition processing, character recognition processing, etc.) described in the program. Details of operations of the control part 250 will be described later.

[0027]

The information sharing support apparatus 300 is an apparatus that assists in sharing information including additional information of surroundings of the imaging object imaged by the sensor 500 and three-dimensional point group data between the field terminal 200 and the other field terminals 200, between the field terminal 200 and the remote terminal 400, and between the remote terminal 400 and the other remote terminals 400 (see FIG. 1). The information sharing support apparatus 300 is communicably connected to network 600 (by wireless or wired). As the information sharing support apparatus 300, for example, a physical server, a virtual server, a cloud server, or the like may be used. The information sharing support apparatus 300 includes, as main function parts, a communication part 310, a storage part 320, and a control part 330 (see FIG. 4).

[0028]

The communication part 310 is a function part that performs information communication (wired communication or wireless communication) (see FIG. 4). The communication part 310 is communicably connected to the network (600 in FIG. 1). The communication part 310 communicates under control of the control part 330. As the communication part 310, for example, a wireless communication interface may be used, or a wired communication interface may be used. The communication part 310 can collect data (for example, additional information) from the field terminal 200 and the

remote terminal 400.

[0029]

The storage part 320 is a function part that stores various information (data, programs, etc.) (see FIG. 4). As the storage part 320, for example, a storage apparatus such as a RAM, SSD, or HDD can be used. The storage part 320 writes and reads information under control of the control part 330. The storage part 320 can store data from the field terminal 200 and the remote terminal 400. The storage part 320 can store data processed by the control part 330. Data stored in the storage part 320 can be transmitted from the communication part 310 to the field terminal 200 or the remote terminal 400.

[0030]

The control part 330 is a function part that controls the communication part 310 and the storage part 320 (see FIG. 4). As the control part 330, for example, a processor such as a CPU or MPU can be used. The control part 330, by executing a predetermined program stored in the storage part 320, can perform predetermined information processings described in the program. The control part 330 performs information processing related to the three-dimensional point group data. In case the imaging data 100 is not three-dimensional point group data, the control part 330 performs conversion processings to three-dimensional point group data based on the imaging data 100. Details of operations of the control part 330 will be described later.

[0031]

The control part 330, by executing a program, can be configured to virtually include a data provision part 331, a visibility improvement part 332, an information addition part 333, an operation processing part 334, and a chat processing part 335. The data provision part 331 is a function part that synchronizes and provides data to the terminals (field terminal 200, remote terminal 400) connected to the information sharing support apparatus 300. As the provided data, for example, imaging data 100 from the field terminal 200, three-dimensional point group data converted based on the imaging data 100 in case the imaging data 100

is not three-dimensional point group data, processing data visibility-improvement-processed, processing data operation-processed, and the like can be mentioned. The control part 330 causes the storage part 320 to store (save) the data to be provided. The visibility improvement part 332 is a function part that performs a processing to improve a visibility of the imaging data 100 (here, three-dimensional point group data). Here, improving the visibility means performing objectification, etc. of three-dimensional point group data being visually difficult to recognize. As a method for improving the visibility of three-dimensional point group data, for example, modeling such as objectification, meshing, and voxelization can be mentioned. The information addition part 333 is a function part that performs a processing to add (associate) tag information including additional information to a designated position including the additional information in the data (three-dimensional point group data is also possible) visibility-improvement-processed by the visibility improvement part 332 based on the additional information (including designated position and tag information) acquired from the field terminal 200 or the remote terminal 400 via the communication part 310. The operation processing part 334 is a functional part that performs an operation processing of data (three-dimensional point group data is also possible) visibility-improvement -processed by the visibility improvement part 332 based on operation information acquired from the field terminal 200 or the remote terminal 400 via the communication part 310. The chat processing part 335 is a functional part that performs information processing related to voice conversation and text conversation in any one of between the field terminal 200 and the other field terminals 200, between the field terminal 200 and the remote terminal 400, or between the remote terminal 400 and the other remote terminals 400.

[0032]

The remote terminal 400 is an information communication terminal used by a person who is remote from the imaging field (see FIG. 1). The remote terminal 400 is communicably connected (wirelessly

or by wire) to network 600 . Although there are a plurality of remote terminals 400 in FIG. 1, the remote terminal 400 may be one. As the remote terminal 400, a personal computer, a tablet, a smart phone, a glasses-type device that realizes XR including VR, AR, and MR, or the like can be used. Although the field terminal 200 and the remote terminal 400 are distinguished in FIG. 1, the field terminal 200 and the remote terminal 400 may be commonized. The remote terminal 400 includes, as main function parts, a communication part 410, an output part 420, an input part 430, a storage part 440, and a control part 450 (see FIG. 5).

[0033]

The communication part 410 is a function part that performs information communication (wired communication or wireless communication) (see FIG. 5). The communication part 410 is communicably connected to the network (600 in FIG. 1). The communication part 410 communicates under control of the control part 450. As the communication part 410, for example, a wireless communication interface may be used, or a wired communication interface may be used. The communication part 410 can transmit additional information to information sharing support apparatus 300. The communication part 410 can collect data stored in the storage part (320 in FIG. 4) of the information sharing support apparatus (300 in FIG. 4).

[0034]

The output part 420 is a function part that outputs information (display, audio output, etc.) (see FIG. 5). The output part 420 outputs information under control of the control part 450. As the output part 420, for example, a display device such as a liquid crystal display, an organic EL display, and a three-dimensional display, an eyeglass type display communicably connected to the communication part 410, a speaker, and an earphone communicably connected to the communication part 410, headphones, headsets, vibrators, etc. can be used. The output part 420 can display data acquired by the communication part 410.

[0035]

The input part 430 is a function part that inputs information (operation input, voice input, etc.) (see FIG. 5). The input part 430 inputs information obtained by operation or voice recognition under control of the control part 450. As the input part 430, for example, a touch panel, keyboard, mouse, non-contact UI, gesture sensor, microphone, headset, camera, etc. can be used. The input part 430 can input additional information including a designated position and tag information by user's operation. The input part 430 can input operation information. As handling of three-dimensional point group data and input of additional information, as shown in FIG. 6 may be realized by using a three-dimensional display that can be stereoscopically viewed with the naked eye as the output part 420 and using a non-contact UI (User Interface) device as the input part 430.

[0036]

The storage part 440 is a function part that stores various information (data, programs, etc.) (see FIG. 5). As the storage part 440, for example, a storage apparatus such as a RAM, SSD, or HDD can be used. The storage part 440 writes and reads information under control of the control part 450.

[0037]

The control part 450 is a function part that controls the communication part 410, the output part 420, the input part 430, and the storage part 440 (see FIG. 5). As the control part 450, for example, a processor such as a CPU or MPU can be used. By executing a predetermined program stored in the storage part 440, the control part 450 can perform predetermined processing (information processing, voice recognition processing, character recognition processing, etc.) described in the program. Details of operations of the control part 450 will be described later.

[0038]

The sensor 500 is a sensor that senses a surface of an imaging object (for example, a utility pole) and images (photographs) it (see FIG.

1). The sensor 500 is communicably connected to the field terminal 200 (by wired or wireless). The sensor 500 may be built in the field terminal 200. A sensor 500 images an imaging object and creates imaging data (100 in FIG. 2). The sensor 500 outputs the created imaging data 100 to the field terminal 200. The sensor 500 can be selected according to imaging conditions such as an imaging distance, angle of view, and size of the imaging object necessary for detecting the imaging object, and customer requests. Also, as the sensor 500, products sold by various manufacturers can be used. As the sensor 500, for example, a three-dimensional sensor, three-dimensional camera, stereo camera, ToF (Time of Flight) camera, 3D-lidar (Three Dimensions - light detection and ranging), LIDAR (Laser Imaging Detection And Ranging) depth sensor, 2D-lidar (Two Dimensions-light detection and ranging), an RGB (Red-Green-Blue) camera, or the like can be used. A plurality of sensors 500 may be used in case s imaging range is wide and it is difficult to image with one sensor. One sensor 500 may be provided in one field terminal 200, but a plurality of sensors may be provided. In case there are a plurality of sensors 500, the types and manufacturers may be different. Further, in case there are a plurality of sensors 500, the information sharing support apparatus 300 may synthesize each imaging data imaged by each sensor 500.

[0039]

The network 600 is a wired or wireless communication network that communicably connects the field terminal 200, the information sharing support apparatus 300, and the remote terminal 400. As the network 600, for example, a communication network such as a PAN (Personal Area Network), a LAN (Local Area Network), a MAN (Metropolitan Area Network), a WAN (Wide Area Network), or a GAN (Global Area Network) can be used.

[0040]

Next, operations of the information sharing support system according to the first example embodiment will be explained using drawings. FIG. 7 is a flowchart schematically showing operations of the

information sharing support system according to the first example embodiment, FIG. 8 is an image diagram schematically showing an example of operations in case the information sharing support system according to the first example embodiment is applied to infrastructure facility management. FIG. 9 is an image diagram schematically showing an example of visibility-improvement-processing in the information sharing support system according to the first example embodiment. FIG. 10 is an image diagram schematically showing an example of add-processing in the information sharing support system according to the first example embodiment. FIG. 11 is an image diagram schematically showing an example of operations in case the information sharing support system according to the first example embodiment is applied to a load amount management in a logistics industry. FIG. 12 is an image diagram schematically showing an example of operations in case the information sharing support system according to the first example embodiment is applied to an inventory management in a retail business. Here, an example in which the information sharing support system is applied to a distance measurement system for managing infrastructure facilities (for managing utility poles) (see, for example, PTL 5) will be described. As to the configuration of the information sharing support system, please see FIGS. 1, 2, 4 and 5.

[0041]

First, the field terminal 200 and the remote terminal 400 access the information sharing support apparatus 300 and start a chat function (step A1 in FIG. 7). As a result, as shown in FIG. 8, voice chat and character chat can be performed between a user of the field terminal 200 and a user of the remote terminal 400. In step A1, it is sufficient to become a state that the field terminal 200 and the remote terminal 400 are connected to the information sharing support apparatus 300 (a state that the field terminal 200 and the remote terminal 400 participate in the information sharing site provided by the information sharing support apparatus 300), or it is sufficient to start a function other than the chat function.

[0042]

Next, the control part 250 of the field terminal 200 acquires the imaging data 100 (here, three-dimensional point group data) created by imaging the imaging object (utility pole in FIG. 8) using the sensor 500 by an imaging person. (Step A2 in FIG. 7). In case the imaging data 100 is not three-dimensional point group data, the control part 330 of the information sharing support apparatus 300 may convert the imaging data 100 into three-dimensional point group data.

[0043]

Next, the control part 250 of the field terminal 200 transmits the acquired imaging data 100 to the information sharing support apparatus 300 (step A3 in FIG. 7). Here, all of the imaging data 100 may be transmitted, or a part of the imaging data 100, or the worked, converted, or processed imaging data 100 may be transmitted for data reduction or quality improvement, and additional information of the sensor 500 may be added. Alternatively, it may be processed using additional information and then transmitted.

[0044]

Next, the control part 330 of the information sharing support apparatus 300 acquires the imaging data 100 from the field terminal 200 and stores (saves) the acquired imaging data 100 in the storage part 320 (step A4 in FIG. 7).

[0045]

Next, the data provision part 331 of the control part 330 of the information sharing support apparatus 300 synchronizes and transmits the stored image data 100 to the field terminals 200 and remote terminals 400 participating in the chat (step A5 in FIG. 7).

[0046]

Next, the control part 250 of the field terminal 200 and the control part 450 of the remote terminal 400 acquire the imaging data 100 from the information sharing support apparatus 300 and cause the output parts 220, 420 to display the acquired imaging data 100 (step A6 and step A7 in FIG. 7).

[0047]

Next, the visibility improvement part 332 of the control part 330 of the information sharing support apparatus 300 performs visibility-improvement-processing (for example, see FIG. 9) of the stored imaging data 100 (step A8 in FIG. 7). Here, the visibility-improvement-processing means performing objectification, meshing, voxelization, noise reduction (removal), correction, synthesis with other sensor information, changing an expression method such as size and color of point group, etc., by processing the imaging data 100 which is difficult to recognize as three-dimensional point group data. The visibility-improvement-processing may be omitted. The visibility-improvement-processing may be performed by the field terminal 200 or the remote terminal 400.

[0048]

Next, the control part 330 of the information sharing support apparatus 300 causes the storage part 320 to store the processing data visibility-improvement-processed (step A9 in FIG. 7).

[0049]

Next, the data provision part 331 of the control part 330 of the information sharing support apparatus 300 transmits the stored processing data (here, processing data visibility-improvement-processed) synchronously to the field terminals 200 and remote terminals 400 participating in the chat (step A10 in FIG. 7).

[0050]

Next, the control part 250 of the field terminal 200 and the control part 450 of the remote terminal 400 acquire the processing data (here, processing data visibility-improvement-processed) from the information sharing support apparatus 300 and cause the output parts 220, 420 to display the acquired processing data (steps A11 and A12 in FIG. 7). Thereby, the processing data visibility-improvement-processed can be shared with the field terminal 200 and the remote terminal 400.

[0051]

Next, the control part 250 of the field terminal 200 activates the

additional information function (tag function) according to the user's operation and inputs additional information including a designated position which designates an arbitrary position of the processing data visibility-improvement-processed and tag information (step A13 in FIG. 7). Although, an example of inputting the additional information in the field terminal 200 is described here, the additional information may be input in the remote terminal 400. As the tag information, for example, information of surroundings of the imaging object in the imaging data 100, character information input by an imaging person, a photograph image imaged by a camera (different from the sensor 500), and other sensor information (position information, azimuth information, etc.), a measured/calculated/processed result, a supervisor's inquiry, an instruction, information indicating intentions, and the like can be used. [0052]

Next, the control part 250 of the field terminal 200 transmits the input additional data (information) to the information sharing support apparatus 300 (step A14 in FIG. 7). [0053]

Next, the information addition part 333 of the control part 330 of the information sharing support apparatus 300 acquires the additional information from the field terminal 200, and performs a processing (add-processing; see, for example, FIG. 10) to add the tag information included in the additional information to the designated position included in the additional information in the processing data (processing data visibility-improvement-processed) based on the acquired additional information (step A15 in FIG. 7). [0054]

Next, the control part 330 of the information sharing support apparatus 300 causes the storage part 320 to save (store) the processing data add-processed (step A16 in FIG. 7). [0055]

Next, the data provision part 331 of the control part 330 of the information sharing support apparatus 300 transmits the stored

processing data (here, processing data add-processed) synchronously to the field terminals 200 and remote terminals 400 participating in the chat (step A17 in FIG. 7).

[0056]

5 Next, the control part 250 of the field terminal 200 and the control part 450 of the remote terminal 400 acquire the processing data (here, processing data add-processed) from the information sharing support apparatus 300 and cause the output parts 220, 420 to display the acquired processing data (steps A18 and A19 in FIG. 7). As a result, the
10 processing data add-processed can be shared by the field terminal 200 and the remote terminal 400, and detailed information on the imaging data 100 can be obtained.

[0057]

 Next, the control part 450 of the remote terminal 400 inputs
15 operation information by a user's operation (step A20 in FIG. 7). Although an example of inputting the operation information in the remote terminal 400 is described here, the operation information may be input in the field terminal 200. As the operation information, for example, information related to operations such as
20 enlarging/reducing/rotating/viewpoint-moving of a screen can be used.

[0058]

 Next, the control part 450 of the remote terminal 400 transmits the input operation information to the information sharing support apparatus 300 (step A21 in FIG. 7).

25 [0059]

 Next, the operation processing part 334 of the control part 330 of the information sharing support apparatus 300 acquires the operation information from the remote terminal 400 and performs a processing (operation-processing) of operating the processing data (processing data
30 visibility-improvement-processed and/or add-processed) based on the acquired operation information (step A22 in FIG. 7).

[0060]

 Next, the control part 330 of the information sharing support

apparatus 300 causes the storage part 320 to store the processing data operation-processed (step A23 in FIG. 7).

[0061]

Next, the data provision part 331 of the control part 330 of the information sharing support apparatus 300 transmits the stored processing data (here, the processing data operation-processed) synchronously to the field terminals 200 and the remote terminals 400 participating in the chat (step A24 in FIG. 7).

[0062]

Next, the control part 250 of the field terminal 200 and the control part 450 of the remote terminal 400 acquire the processing data (here, the processing data operation-processed) from the information sharing support apparatus 300 and cause the output parts 220, 420 to display the acquired processing data (steps A25 and A26 in FIG. 7), and then end. As a result, the field terminal 200 and the remote terminal 400 can share the processing data operation-processed and the imaging data 100 can be referred to from various angles.

[0063]

Although FIG. 7 shows an example in which one field terminal 200 and one remote terminal 400 participate in the chat, at least one of the field terminal 200 and the remote terminal 400 may participate in the chat, or even 3 or more may participate in the chat. Also, although FIG. 7 shows an example in which the field terminal 200 and the remote terminal 400 participate in the chat from the beginning, either the other field terminal 200 or the other remote terminal 400 may participate in the chat from an intermediate timing and the latest processing data may be provided to a terminal that participates in the chat in the intermediate. Further, although FIG. 7 shows an example in which one add-processing and one operation-processing are performed, any one of the add-processing and the operation-processing may be performed at least once, and may be performed three times or more.

[0064]

In the distance measurement system for infrastructure facility

management used in the example of FIG. 8, a large object such as an utility pole is imaged by a sensor in large premises (or site), and a distance measurement is performed using the imaged data (three-dimensional point group data). Since the three-dimensional point group data in virtual space (also called virtual space, cyber space, digital space, etc.) reflects only part of information of the real space and an actual condition of the object, if checking data away from a field, surrounding information cannot be recognized. Therefore, it is difficult to grasp a condition of a measurement object and its surroundings. Also, it is also difficult to share information with a person who is not on the field. Therefore, in the first example embodiment, an information addition function is provided for associating (relating, tying, pasting) insufficient information (additional information) to an arbitrary position in the virtual space.

[0065]

The information sharing support system according to the first example embodiment is applicable not only to infrastructure facility management as shown in FIG. 8 but also to load amount management in the logistics industry as shown in FIG. 11. As shown in FIG. 11, in visualizing a loading amount of cargo in a logistics using a sensor, additional information can be grasped even at a remote location by recording it in a space.

[0066]

Also, the information sharing support system according to the first example embodiment can also be applied to inventory management in the retail industry as shown in FIG. 12. Further, as shown in FIG. 12, when visualizing the inventory of products, additional information can be recorded in a space and grasped at a remote location.

[0067]

Further, the information sharing support system according to the first example embodiment can be used in situations such as recording and displaying ever-changing situations in a vast area, work support applications, situations in which the same thing is reviewed remotely,

or the like and can also be applied in the following situations.

[0068]

In building maintenance, the information sharing support system according to the first example embodiment can be used in situations where facilities in a building such as an equipment, air conditioner and firefighting equipment are maintained, inspected, and monitored on a 24-hour basis. Also, the information sharing support system according to the first example embodiment can be used in situations such as cleaning, reading of water and electric meters. Further, the information sharing support system according to the first example embodiment can be used in situations of inspection/monitoring of factories and plants, checking a condition of consumables (hoses, springs, gears, etc.) of factory equipment, and detecting signs of failure. In infrastructure inspections, the information sharing support system according to the first example embodiment can be used in situations of grasping a current situation, discovering and treating damages, carrying out efficient maintenance and management, accumulating basic information for making repair plans, and identifying problems and improvements in maintenance and management. In real estate management, the information sharing support system according to the first example embodiment can be used in situations such as aged deterioration of buildings, disaster prevention measures, and crime prevention measures. In commercial facilities, the information sharing support system according to the first example embodiment can be used in situations of displaying campaigns for consumers. At event sites, the information sharing support system according to the first example embodiment can be used in situations of recording the number of visitors, displaying a program, displaying a guide map, and the like. In offices, the information sharing support system according to the first example embodiment can be used to display contents and schedules of meetings. In data centers, the information sharing support system according to the first example embodiment can be used in situations of managing installation location of information equipment such as servers, air

conditioning for information equipment, fire detection system for preventing system-stoppage due to disasters, earthquake-resistant structure, server room entry/exit, etc. In delivery status management, the information sharing support system according to the first example
5 embodiment can be used in situations of managing cargo statuses such as "shipment", "relay/acceptance", and "delivery completed". In assembly design, the information sharing support system according to the first example embodiment can be used in situations of recording review results of a three-dimensional object (such as a car) that are
10 difficult to share remotely. In educational tools, the information sharing support system according to the first example embodiment can be used in situations of displaying necessary information and instructions when a young person maintains a three-dimensional object. By using the information sharing support system according to the first example
15 embodiment, location information becomes easier to recognize than information recorded on paper or the like.

[0069]

In inspecting and monitoring of infrastructure facilities and management of logistics, it is still common for person to visit a field to
20 inspect facilities and confirm things, and to record them on paper media such as reports. Even if the reports are digitized, the actual equipment, things and the recorded data are independent and not linked. Therefore, inspection monitoring and maintenance management using a three-dimensional sensor is generally considered. By using three-dimensional
25 point group data obtained by a three-dimensional sensor, it is easy to measure and inspect a distance of large objects such as utility poles and it is possible to visualize cargo load amounts in logistics. Therefore, by digitizing situations of an object and its surroundings using a three-dimensional sensor, it is possible to share data with a remote person,
30 and to remotely process information such as inspection and management. However, since the three-dimensional point group data is an aggregate of points and it is difficult to identify which building be which, it is necessary to add information to the three-dimensional point group data

to make it easier to recognize.

[0070]

As an additional function that relates (associates) additional information to a predetermined position, for example, there is a function
5 that relates additional information to a predetermined position on a two-dimensional map, such as Google Map (Trade Name). The function of relating the additional information to the predetermined position is simply to set a pin on the latitude and longitude information on an earth and relate the additional information to the position related to the pin.
10 For example, it is thought to be possible to image three-dimensional point group data, set a pin at an imaging position, and relate the imaged three-dimensional point group data to the imaging position. However, in this method, it is not possible to identify information such as in which direction of north, south, east or west, the three-dimensional point
15 group data was taken from the shooting position, or at what angle of elevation and depression. Also, if a wide-area data that imaged surroundings can be confirmed in a wide range is linked to a map position, such as Google Earth and wide-area 3D scanner synthetic data, there might be no problem. However, it is wasteful in case only narrow
20 area data including a measurement object is required. Therefore, in the first example embodiment, a function of pasting information such as position information and building name to objects themselves such as buildings and utility poles in the three-dimensional data becomes effective instead of adding additional information to position
25 information.

[0071]

According to the first example embodiment, since information is synchronized using the information addition function, it is possible to contribute to sharing information of surroundings of an imaging object
30 in three-dimensional point group data in real time. In particular, by pasting the additional information in case the imaging object is in a large wide area, it is possible to record time-to-time-(ever)-changing situations.

[0072]

Also, according to the first example embodiment, by adding incidental additional information to the three-dimensional point group data, it is possible also to communicate with a person(s) staying at remote locations who does not know local situations. In addition, it is possible to prevent the details of the three-dimensional point group data from being unclear (or lost) when the three-dimensional point group data is taken at the site and brought back to a company. Further, information that has been recorded on paper media such as reports can be put in order, and it is easy to share and report the same. Furthermore, since information that could not be obtained without visiting a field can be obtained remotely, and it is possible to reduce worker burden and help to solve labor shortages.

[0073]

Also, according to the first example embodiment, by improving the visibility of the three-dimensional point group data, it becomes easier to grasp the three-dimensional point group data.

[0074]

Further, according to the first example embodiment, by using a three-dimensional display capable of stereoscopic viewing and a non-contact UI device, it becomes easier to grasp three-dimensional point group data.

[0075]

Furthermore, according to the first example embodiment, since images displayed on the terminal are synchronized by the operation process, it becomes easier for a person to grasp the three-dimensional point group data even if he is remote from a field.

[0076]

[Second example embodiment]

An information sharing support apparatus according to a second example embodiment will be described with reference to drawings. FIG. 13 is a block diagram schematically showing a configuration of the information sharing support apparatus according to the second example embodiment.

[0077]

The information sharing support apparatus 300 is an apparatus that is communicably connected to a plurality of terminals 700 and supporting information sharing between/among the terminals 700. The information sharing support apparatus 300 includes an information addition part 333 and a data provision part 331. The information addition part 333 is configured to perform an add-processing of tag information to a designated position(s) in three-dimensional point group data, based on additional information including a designated position(s) and tag information acquired from any one of the terminals 300 connected to the information sharing support apparatus 300. The data provision part 331 is configured to synchronously provide the three-dimensional point group data add-processed by the information addition part 333 to all of the terminals 700 connected to the information sharing support apparatus 300.

[0078]

According to the second example embodiment, since information is synchronized using the information addition function, it is possible to contribute to sharing information of surroundings of an imaging object in three-dimensional point group data in real time.

[0079]

It should be noted that the loading space recognition apparatus, the field terminal, the remote terminal and the terminal according to the first and second example embodiments can be configured by so-called hardware resources (information processing apparatus, computer), and can use one including a configuration exemplarily shown in FIG. 14. For example, hardware resources 1000 include a processor 1001, a memory 1002, a network interface 1003, etc., which are interconnected by an internal bus 1004.

[0080]

It should be noted that the configuration shown in FIG. 14 is not intended to limit the hardware configuration of the hardware resources 1000. The hardware resources 1000 may comprise a hardware not shown

(for example, an input/output interface). Alternatively, it is not intended to limit the number of units such as the processors 1001 included in the apparatus to the example shown in FIG. 14 as well. For example, multiple processors 1001 may be included in the hardware resources 1000. As the processor 1001, for example, a CPU (Central Processing unit), MPU (Micro Processor Unit), GPU (Graphics Processing unit), or the like can be used.

[0081]

As the memory 1002, for example, RAM (Random Access Memory), ROM (Read Only Memory), HDD (Hard Disk Drive), SSD (Solid State Drive), etc. can be used.

[0082]

As the network interface 1003, for example, a LAN (Local Area Network) card, network adapter, network interface card, etc. can be used.

[0083]

The functions of the hardware resources 1000 are realized by the above processing modules. The processing module is realized by the processor 1001 executing a program stored in the memory 1002, for example. Also, the program can be downloaded via a network or updated using a storage medium storing the program. Further, the above processing module may be realized by a semiconductor chip(s). In other words, the functions performed by the above processing module may be realized by executing software in some kind of hardware.

[0084]

Part or all of the above example embodiments can be described as the following MODES but are not limited to the following.

[0085]

[MODE 1]

An information sharing support apparatus, that is communicably connected to a plurality of terminals and supports information sharing between/among the terminals,

wherein the information sharing support apparatus comprises:

an information addition part configured to perform an addition-

processing of tag information to a designated position(s) in three-dimensional point group data, based on additional information including a designated position(s) and tag information acquired from any one of terminals connected to the information sharing support apparatus; and
5 a data provision part configured to synchronously provide the three-dimensional point group data add-processed by the information addition part to all of the terminals connected to the information sharing support apparatus.

[MODE 2]

10 The information sharing support apparatus according to MODE 1, further comprising a visibility improvement part configured to perform a visibility-improvement-processing of the three-dimensional point group data,

wherein the information addition part is configured to add-process the
15 tag information to the designated position(s) in the processing data visibility-improve-processed by the visibility improvement part, based on the additional information; and

the data provision part is configured to synchronously provide the processing data add-processed by the information addition part to all of
20 the terminals connected to the information sharing support apparatus.

[MODE 3]

The information sharing support apparatus according to MODE 1, further comprising an operation processing part configured to operate-process the three-dimensional point group data, based on operation
25 information acquired from any one of terminals connected to the information sharing support apparatus,

wherein the information addition part is configured to add the tag information to the designated position(s) in the processing data operate-processed by the operation processing part, based on the additional
30 information; and

the data provision part is configured to synchronously provide the processing data add-processed by the information addition part to all of the terminals connected to the information sharing support apparatus.

[MODE 4]

The information sharing support apparatus according to MODE 2, further comprising an operation processing part configured to operate-process the processing data visibility-improve-processed by the visibility improvement part, based on operation information acquired from any one of the terminals connected to the information sharing support apparatus,

wherein the information addition part is configured to add-process the tag information to the designated position(s) in the processing data operate-processed by the operation processing part, based on the additional information; and

the data provision part is configured to synchronously provide the processing data add-processed by the information addition part to all of the terminals connected to the information sharing support apparatus.

[MODE 5]

The information sharing support apparatus according to any one of MODES 1 to 4, further comprising a chat processing part configured to chat-process between/among the terminals connected to the information sharing support apparatus.

[MODE 6]

An information sharing support system, comprising:

the information sharing support apparatus according to any one of MODES 1 to 5; and

a plurality of terminals communicably connected to the information sharing support apparatus.

[MODE 7]

The information sharing support system according to MODE 6, comprising an eyeglass type display on any one of the terminals.

[MODE 8]

The information sharing support system according to MODE 6 or 7, comprising a three-dimensional display and a non-contact UI device on any one of the terminals.

[MODE 9]

An information sharing support method of supporting information sharing using hardware resources, the method comprising:

adding tag information to a designated position(s) in three-dimensional point group data, based on additional information including a designated position(s) and tag information acquired from any one of terminals connected to the hardware resources; and
synchronously providing the add-processed three-dimensional point group data to all of the terminals connected to the hardware resources.

[MODE 10]

A program causing hardware resources to execute processings that support information sharing, wherein the program causes the hardware resources to execute processings comprising:

adding tag information to a designated position(s) in three-dimensional point group data, based on additional information including a designated position(s) and tag information acquired from any one of terminals connected to the hardware resources; and
synchronously providing the add-processed three-dimensional point group data to all of the terminals connected to the hardware resources.

[0086]

It should be noted that each disclosure of the above PTLs is incorporated herein by reference and can be used as the basis or part of the present invention as necessary. Within the framework of the entire disclosure of the present invention (including claims and drawings), modifications and adjustments of the example embodiments or examples are possible based on the basic technical concept thereof further. Also, within the framework of the entire disclosure of the present invention, various combinations or selections (if necessary not selection) of various disclosure elements (including each element of each claim, each element of each example embodiment or example, each element of each drawing, etc.) is possible. That is, the present invention naturally includes various variations and modifications that can be made by one skilled in the art according to the entire disclosure including the claims and drawings, and the technical idea. Further, with regard to numerical

values and numerical ranges described in the present application, it is assumed that any intermediate values, sub-numerical values and sub-ranges thereof are described even if not explicitly mentioned. Furthermore, it is assumed that each disclosure matter of the above-cited document(s) is included in (belong to) the disclosure matter of the present application as a part of the disclosure of the present invention in accordance with the meaning of the present invention if necessary and a part or all of each disclosure matter of the above-cited document can be used in combination with the matters described in the present document.

REFERENCE SIGNS LIST

[0087]

1 Information sharing support system

100 Imaging data

200 Field terminal

210 Communication part

220 Output part

230 Input part

240 Storage part

250 Control part

300 Information sharing support apparatus

310 Communication part

320 Storage part

330 Control part

331 Data provision part

332 Visibility improvement part

333 Information addition part

334 Operation processing part

335 Chat processing part

400 Remote terminal

410 Communication part

420 Output part

430 Input part

	440	Storage part
	450	Control part
	500	Sensor
	600	Network
5	700	Terminals
	1000	Hardware resources
	1001	Processor
	1002	Memory
	1003	Network interface
10	1004	Internal bus

CLAIMS:

[Claim 1]

An information sharing support apparatus, that is communicably connected to a plurality of terminals and supports information sharing
5 between/among the terminals,

wherein the information sharing support apparatus comprises:

an information addition part configured to perform an add-
processing of tag information to a designated position(s) in three-
dimensional point group data, based on additional information including
10 a designated position(s) and tag information acquired from any one of
terminals connected to the information sharing support apparatus; and

a data provision part configured to synchronously provide the
three-dimensional point group data add-processed by the information
addition part to all of the terminals connected to the information sharing
15 support apparatus.

[Claim 2]

The information sharing support apparatus according to claim 1,
further comprising a visibility improvement part configured to perform
a visibility-improvement-processing of the three-dimensional point
20 group data,

wherein the information addition part is configured to add-
process the tag information to the designated position(s) in the
processing data visibility-improve-processed by the visibility
improvement part, based on the additional information; and

25 the data provision part is configured to synchronously provide
the processing data add-processed by the information addition part to
all of the terminals connected to the information sharing support
apparatus.

[Claim 3]

30 The information sharing support apparatus according to claim 1,
further comprising an operation processing part configured to operate-
process the three-dimensional point group data, based on operation
information acquired from any one of terminals connected to the

information sharing support apparatus,

wherein the information addition part is configured to add the tag information to the designated position(s) in the processing data operate-processed by the operation processing part, based on the additional
5 information; and

the data provision part is configured to synchronously provide the processing data add-processed by the information addition part to all of the terminals connected to the information sharing support apparatus.

10 [Claim 4]

The information sharing support apparatus according to claim 2, further comprising an operation processing part configured to operate-process the processing data visibility-improve-processed by the visibility improvement part, based on operation information acquired
15 from any one of the terminals connected to the information sharing support apparatus,

wherein the information addition part is configured to add-process the tag information to the designated position(s) in the processing data operate-processed by the operation processing part,
20 based on the additional information; and

the data provision part is configured to synchronously provide the processing data add-processed by the information addition part to all of the terminals connected to the information sharing support apparatus.

25 [Claim 5]

The information sharing support apparatus according to any one of claims 1 to 4, further comprising a chat processing part configured to chat-process between/among the terminals connected to the information sharing support apparatus.

30 [Claim 6]

An information sharing support system, comprising:

the information sharing support apparatus according to any one of claims 1 to 5; and

a plurality of terminals communicably connected to the information sharing support apparatus.

[Claim 7]

5 The information sharing support system according to claim 6, comprising an eyeglass type display on any one of the terminals.

[Claim 8]

The information sharing support system according to claim 6 or 7, comprising a three-dimensional display and a non-contact UI device on any one of the terminals.

10 [Claim 9]

An information sharing support method of supporting information sharing using hardware resources, the method comprising:

15 adding tag information to a designated position(s) in three-dimensional point group data, based on additional information including a designated position(s) and tag information acquired from any one of terminals connected to the hardware resources; and

synchronously providing the add-processed three-dimensional point group data to all of the terminals connected to the hardware resources.

20 [Claim 10]

A program causing hardware resources to execute processings that support information sharing, wherein the program causes the hardware resources to execute processings comprising:

25 adding tag information to a designated position(s) in three-dimensional point group data, based on additional information including a designated position(s) and tag information acquired from any one of terminals connected to the hardware resources; and

30 synchronously providing the add-processed three-dimensional point group data to all of the terminals connected to the hardware resources.