DESCRIPTION

REMOTE WORK SUPPORT SYSTEM

TECHNICAL FIELD

The present disclosure relates to a remote work support system for allowing a support operator located in a remote location to support a worker at a work site.

BACKGROUND ART

A remote work support system is known in which a worker is equipped with a camera terminal and a support operator in a remote location operates the camera terminal to support the worker. PTL 1 (Japanese Unexamined Patent Publication No. 2018-207420) discloses a work support system that enables a worker to check an object to work via voice communication without using a display device.

SUMMARY OF INVENTION

<Technical Problem>

Various types of wearable devices have also been devised. An eyeglass-type device is capable of displaying information in or near portions corresponding to lenses of eyeglasses. In a case where an eyeglass-type device is used to support a worker, display of an image or the like transmitted from a support operator on eyeglass lenses reduces the field of vision of the worker, which may reduce work efficiency and cause danger. However, conversely, a worker terminal (wearable device) without a display faces a dilemma in that the worker is not allowed to check the image transmitted from the support operator.

<Solution to Problem>

According to a first aspect, there is provided a remote work support system including: a wearable device that is to be worn by a site worker, wherein the wearable device includes an image capturing unit, a voice input unit, a voice output unit, and a communication unit, which is connected to a network via a first communication line, the wearable device being configured to transmit the image captured by the image capturing unit, and transmit and receive voice, and wherein the wearable device has no display which displays an image; a mobile terminal that is to be carried by the site worker separately from the wearable device and wherein the mobile terminal

includes an image reception unit, which is connected to a network via a second communication line, which is different from the first communication line and receives an image, and a display unit that displays the received image; and a support operator terminal that is to be used by a support operator who remotely supports the site worker, wherein the support operator terminal includes a voice input unit, a voice output unit, and a display unit, the support operator terminal being configured to transmit and receive voice to and from the wearable device via the first communication line, receive an image from the wearable device, and transmit an image to the mobile terminal via the second communication line, wherein the first communication line is continuously used while the site worker works, and the second communication line is connected, as necessary, while the site worker works.

In the above aspect, the wearable device includes no display, and the site worker is able to secure a sufficient field of view and perform work safely. On the other hand, an image can be displayed on the mobile terminal when necessary. This enables the site worker to view the content of an instruction from the remote support operator on a screen of the display unit.

In an embodiment of the remote work support system, the wearable device is a neck-mounted device.

In the above embodiment, the wearable device is a neck-mounted device, which enables the site worker to work with both hands free and to also perform work efficiently without interference with the field of view.

In an embodiment of the remote work support system, the display unit of the support operator terminal displays a moving image and a still image that are captured with the image capturing unit of the wearable device.

In an embodiment of the remote work support system, an image captured with the image capturing unit of the wearable device is selected, processed, or additionally provided with information using the support operator terminal, is transmitted to the mobile terminal, and is displayed on the display unit of the mobile terminal.

The above embodiment enables the site worker to receive support by using an image of the site that is processed and additionally provided with information, without capturing an image with particular consciousness. Thus, work efficiency is increased.

In an embodiment of the remote work support system, an utterance of the site worker and an utterance of the support operator are subjected to voice recognition and are displayed on the

display unit of the support operator terminal as text information.

In the above embodiment, the support operator is able to perform support while checking a telephone conversation with the site worker by using text information. Thus, the support operator can work efficiently without having to take a note.

In an embodiment of the remote work support system, the text information is further displayed on the display unit of the mobile terminal.

In the above embodiment, the site worker is able to check a telephone conversation with the support operator by text.

An embodiment of the remote work support system includes a first line and a second line. The first line connects the support operator terminal and the wearable device. The second line connects the support operator terminal and the mobile terminal. The first line is continuously used while the site worker works. The second line is connected, as necessary, while the site worker works.

In the above embodiment, the first line and the second line are selectively used, and the second line is used only when necessary, which eliminates the need for the site worker to operate the mobile terminal more than necessary because the second line can be used only when necessary.

In an embodiment of the remote work support system, progress of work performed by the site worker is automatically extracted from an image captured with the image capturing unit and/or from an utterance of the site worker and an utterance of the support operator. A state of progress of the work or an end time of the work is estimated from the automatically extracted image or voice. The estimated state of progress or end time is displayed on the display unit of the support operator terminal.

The above embodiment allows the support operator to monitor the state of progress of the work.

In an embodiment of the remote work support system, the support operator terminal accesses a database that stores site work support information, extracts and processes the site work support information, and transmits the extracted and processed site work support information to the mobile terminal.

The above embodiment allows the site worker to receive extracted and processed site work support information and to thus efficiently proceed with the work.

In an embodiment of the remote work support system, support for the site worker through

the support operator terminal includes any one or a combination of support by voice, support with a processed image, support by text input from the support operator terminal, and support by characters obtained by converting an utterance of the support operator into text.

An embodiment of the remote work support system includes a plurality of devices connectable to an identical server. The plurality of devices include the wearable device, the mobile terminal, and the support operator terminal. The server designates at least one or more devices among the plurality of devices in accordance with a predetermined condition, and calls a connection target device in accordance with the designation.

In an embodiment of the remote work support system, the server acquires environment information of a work site of the site worker. The server calls at least one or more devices among the plurality of devices on the basis of the environment information.

In an embodiment of the remote work support system, the server manages progress of work performed by the site worker. The server calls at least one or more devices among the plurality of devices on the basis of the progress of the work.

In an embodiment of the remote work support system, the server performs voice recognition of an utterance of the site worker and an utterance of the support operator. The server calls at least one or more devices among the plurality of devices on the basis of a keyword acquired through the voice recognition.

In an embodiment of the remote work support system, the server further accepts, from the support operator terminal, designation of at least one or more devices among the plurality of devices that are used by the site worker.

In an embodiment of the remote work support system, the plurality of devices are capable of communicating with each other.

According to a second aspect, there is provided a support operator terminal to be used by a support operator who remotely supports a site worker, the support operator terminal including a voice input unit, a voice output unit, and a display unit, wherein the support operator terminal transmits and receives voice to and from a wearable device to be worn by the site worker and including an image capturing unit, a voice input unit, and a voice output unit, and a communication unit, which is connected to a network via a first communication line, wherein the wearable device is configured to transmit the image captured by the image capturing unit, and transmit and receive voice, and wherein the wearable device has no display which displays an

image, and the support operator terminal transmits an image to a mobile terminal to be carried by the site worker separately from the wearable device and including an image reception unit, which is connected to a network via a second communication line, which is different from the first communication line and receives an image, and a display unit that displays the received image, wherein the first communication line is continuously used while the site worker works, and the second communication line is connected, as necessary, while the site worker works.

According to a third aspect, there is provided a server to be connected to a plurality of devices including: a wearable device that is to be worn by a site worker, wherein wearable device includes an image capturing unit, a voice input unit, and a voice output unit, and a communication unit, which is connected to a network via a first communication line, wherein the wearable device is configured to transmit the image captured by the image capturing unit, and transmit and receive voice, and wherein the wearable device has no display which displays an image; a mobile terminal that is to be carried by the site worker separately from the wearable device and includes an image reception unit, which is connected to a network via a second communication line, which is different from the first communication line and receives an image, and a display unit that displays the image received by the image reception unit; and a support operator terminal that is to be used by a support operator who remotely supports the site worker, the support operator terminal includes a voice input unit, a voice output unit, and a display unit, wherein the support operator terminal is configured to transmit and receive voice to and from the wearable device via the first communication line, receive an image from the wearable device, and transmit an image to the mobile terminal via the second communication line, wherein the server designates at least one or more devices among the plurality of devices in accordance with a predetermined condition, and calls a communication target device in accordance with the designation, wherein the first communication line is continuously used while the site worker works, and the second communication line is connected, as necessary, while the site worker works.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of a wearable device 10 according to a first embodiment.

Fig. 2 is an overall schematic diagram of a remote work support system 1 according to the first embodiment.

Fig. 3 is a diagram illustrating an example of a display screen on a display unit 43 of a

CLAIMS

[Claim 1]

A remote work support system including:

a wearable device that is to be worn by a site worker, wherein the wearable device includes an image capturing unit, a voice input unit, a voice output unit, and a communication unit, which is connected to a network via a first communication line, the wearable device being configured to transmit the image captured by the image capturing unit, and transmit and receive voice, and wherein the wearable device has no display which displays an image;

a mobile terminal that is to be carried by the site worker separately from the wearable device and wherein the mobile terminal includes an image reception unit, which is connected to a network via a second communication line, which is different from the first communication line and receives an image, and a display unit that displays the received image; and

a support operator terminal that is to be used by a support operator who remotely supports the site worker, wherein the support operator terminal includes a voice input unit, a voice output unit, and a display unit, the support operator terminal being configured to transmit and receive voice to and from the wearable device via the first communication line, receive an image from the wearable device, and transmit an image to the mobile terminal via the second communication line, wherein the first communication line is continuously used while the site worker works, and the second communication line is connected, as necessary, while the site worker works.

[Claim 2]

The remote work support system according to Claim 1, wherein

the wearable device further includes a control unit that controls the communication unit which transmits images including moving pictures captured by the image capturing unit to the support operator terminal.

[Claim 3]

The remote work support system according to Claim 1 or 2, wherein

the wearable device is a neck-mounted device.

[Claim 4]

The remote work support system according to Claim 1 to 3, wherein

the display unit of the support operator terminal displays a moving image and a still image that are captured with the image capturing unit of the wearable device.

[Claim 5]

The remote work support system according to any one of Claims 1 to 4, wherein

an image captured with the image capturing unit of the wearable device is selected, processed, or additionally provided with information using the support operator terminal, is transmitted to the mobile terminal, and is displayed on the display unit of the mobile terminal.

[Claim 6]

The remote work support system according to any one of Claims 1 to 5, wherein

an utterance of the site worker and an utterance of the support operator are subjected to voice recognition and are displayed on the display unit of the support operator terminal as text information.

[Claim 7]

The remote work support system according to Claim 6, wherein

the text information is further displayed on the display unit of the mobile terminal.

[Claim 8]

The remote work support system according to any one of Claims 1 to 7, including:

a first line that connects the support operator terminal and the wearable device; and

a second line that connects the support operator terminal and the mobile terminal, wherein

the first line is continuously used while the site worker works, and

the second line is connected, as necessary, while the site worker works.

[Claim 9]

The remote work support system according to any one of Claims 1 to 8, wherein

progress of work performed by the site worker is automatically extracted from an image captured with the image capturing unit and/or from an utterance of the site worker and an utterance of the support operator, a state of progress of the work or an end time of the work is estimated, and the state of progress or the end time is displayed on the display unit of the support operator terminal.

[Claim 10]

The remote work support system according to any one of Claims 1 to 9, wherein

the support operator terminal accesses a database that stores site work support information, extracts and processes the site work support information, and transmits the extracted and processed site work support information to the mobile terminal.

[Claim 11]

The remote work support system according to any one of Claims 1 to 10, wherein

support for the site worker through the support operator terminal includes any one or a combination of support by voice, support with a processed image, support by characters input from the support operator terminal, and support by characters obtained by converting an utterance of the support operator into text.

[Claim 12]

The remote work support system according to any one of Claims 1 to 11, wherein

the remote work support system includes a plurality of devices connectable to an identical server,

the plurality of devices include the wearable device, the mobile terminal, and the support

operator terminal, and

the server designates at least one or more devices among the plurality of devices in accordance with a predetermined condition, and calls a connection target device in accordance with the designation.

[Claim 13]

The remote work support system according to Claim 12, wherein

the server acquires environment information of a work site of the site worker, and

the server calls at least one or more devices among the plurality of devices on the basis of the environment information.

[Claim 14]

The remote work support system according to Claim 12, wherein

the server manages progress of work performed by the site worker, and

the server calls at least one or more devices among the plurality of devices on the basis of the progress of the work.

[Claim 15]

The remote work support system according to Claim 12, wherein

the server performs voice recognition of an utterance of the site worker and an utterance of the support operator, and

the server calls at least one or more devices among the plurality of devices on the basis of a keyword acquired through the voice recognition.

[Claim 16]

The remote work support system according to any one of Claims 12 to 15, wherein

the server further accepts, from the support operator terminal, designation of at least one or more devices among the plurality of devices that are used by the site worker.

[Claim 17]

The remote work support system according to any one of Claims 1 to 16, wherein the plurality of devices are capable of communicating with each other.

[Claim 18]

A support operator terminal to be used by a support operator who remotely supports a site worker, the support operator terminal including a voice input unit, a voice output unit, and a display unit, wherein

the support operator terminal transmits and receives voice to and from a wearable device to be worn by the site worker and including an image capturing unit, a voice input unit, and a voice output unit, and a communication unit, which is connected to a network via a first communication line, wherein the wearable device is configured to transmit the image captured by the image capturing unit, and transmit and receive voice, and wherein the wearable device has no display which displays an image, and

the support operator terminal transmits an image to a mobile terminal to be carried by the site worker separately from the wearable device and including an image reception unit, which is connected to a network via a second communication line, which is different from the first communication line and receives an image, and a display unit that displays the received image, wherein the first communication line is continuously used while the site worker works, and the second communication line is connected, as necessary, while the site worker works.

[Claim 19]

The support operator terminal according to Claim 18, wherein

the wearable device further includes a control unit, that controls the communication unit which transmits images including moving pictures captured by the image capturing unit to the support operator terminal.

[Claim 20]

A server to be connected to a plurality of devices including:

a wearable device that is to be worn by a site worker, wherein wearable device includes an image capturing unit, a voice input unit, and a voice output unit, and a communication unit, which is connected to a network via a first communication line, wherein the wearable device is configured to transmit the image captured by the image capturing unit, and transmit and receive voice, and wherein the wearable device has no display which displays an image;

a mobile terminal that is to be carried by the site worker separately from the wearable device and includes an image reception unit, which is connected to a network via a second communication line, which is different from the first communication line and receives an image, and a display unit that displays the image received by the image reception unit; and

a support operator terminal that is to be used by a support operator who remotely supports the site worker, the support operator terminal includes a voice input unit, a voice output unit, and a display unit, wherein the support operator terminal is configured to transmit and receive voice to and from the wearable device via the first communication line, receive an image from the wearable device, and transmit an image to the mobile terminal via the second communication line, wherein

the server designates at least one or more devices among the plurality of devices in accordance with a predetermined condition, and calls a communication target device in accordance with the designation, wherein the first communication line is continuously used while the site worker works, and the second communication line is connected, as necessary, while the site worker works.

[Claim 21]

The server according to Claim 20, wherein

the wearable device further includes a control unit, that controls the communication unit which transmits images including moving pictures captured by the image capturing unit to the support operator terminal.