

[DESCRIPTION]

[TITLE OF INVENTION]

MONITORING SYSTEM, MONITORING METHOD, AND PROGRAM

[Technical Field]

5 [0001]

An embodiment of the present invention relates to a monitoring system, a monitoring method, and a program.

[Background Art]

[0002]

10 Conventionally, when an inconvenient object is shown in a monitoring image captured by a monitoring camera, it is known to mask the inconvenient part in the monitoring image and to insert character information such as “it cannot be displayed because it is a public prohibited part” into a mask area. However, it is not possible to even indirectly acquire information that should have been displayed in the masked part in
15 a conventional technology, which is inconvenient in some cases.

[Citation List]

[Patent Literature]

[0003]

[Patent Literature 1]

20 Japanese Unexamined Patent Application, First Publication No.2003-153252

[Patent Literature 2]

Japanese Unexamined Patent Application, First Publication No.2004-62560

[Patent Literature 3]

Japanese Unexamined Patent Application, First Publication No.2011-193115

25 [Patent Literature 4]

Japanese Unexamined Patent Application, First Publication No.2005-323007

[Patent Literature 5]

Republished Japanese Translation No.WO 2006/115156 of the PCT

International Publication for Patent Applications

5 [Patent Literature 6]

Japanese Unexamined Patent Application, First Publication No.2001-69494

[Patent Literature 7]

Japanese Unexamined Patent Application, First Publication No.2010-62699

[Summary of Invention]

10 [Technical Problem]

[0004]

A problem to be solved of the present invention is to provide a monitoring system, a monitoring method, and a program that can improve a convenience in a system that masks part of a monitoring camera.

15 [Solution to Problem]

[0005]

A monitoring system of an embodiment includes an acquirer, an extractor, an encryption processor, and a generator. The acquirer is configured to acquire, from one or more monitoring cameras that capture an image of a work area in which presented
20 information to be input is input to an input terminal, a captured image captured by the one or more monitoring cameras. The extractor is configured to extract the information to be input from the captured image acquired by the acquirer. The encryption processor is configured to encrypt the information to be input extracted by the extractor. The generator is configured to generate a replaced image in which the information to be input
25 is made invisible, the replaced image comprising a partial image that displays

information encrypted by the encryption processor at a position of the information to be input in the captured image acquired by the acquirer.

[Brief Description of Drawings]

[0006]

5 FIG. 1 is a diagram which shows an example of a configuration of a monitoring system 1 according to an embodiment.

FIG. 2 is a diagram which shows an example of a sheet C.

FIG. 3 is a diagram which shows an example of a configuration of a monitoring device 100.

10 FIG. 4 is a diagram which shows an example of a captured image.

FIG. 5 is a diagram which shows an example of a replaced image.

FIG. 6 is a flowchart which shows an example of processing performed by the monitoring device 100.

[Description of Embodiments]

15 [0007]

Hereinafter, a monitoring system, a monitoring method, and a program of an embodiment will be described with reference to the drawings.

[0008]

[Overall configuration]

20 FIG. 1 is a diagram which shows an example of a configuration of a monitoring system 1 of an embodiment. The monitoring system 1 includes, for example, an input terminal 10, one or more monitoring cameras 50, and a monitoring device 100. The monitoring cameras 50 and the monitoring device 100 are connected to each other by a network NW, and communicate with each other via the network NW. The network NW
25 includes, for example, some or all of a wide area network (WAN), a local area network

(LAN), the Internet, a dedicated line, a wireless base station, a provider, and the like.

[0009]

The input terminal 10 is installed in a work area A and operated by an inputter B.

The inputter B prepares a sheet C on which information to be input is described at hand.

- 5 The inputter B inputs the information to be input described on the sheet C to the input terminal 10 by operating, for example, a keyboard. Note that the input terminal 10 has a voice recognition function, and the information to be input may be input thereto on the basis of information collected by a microphone. The input terminal 10 is, for example, a tablet terminal or a personal computer.

10 [0010]

FIG. 2 is a diagram which shows an example of the sheet C. Information to be input C1 is described on the sheet C. The information to be input C1 has, for example, 16 characters or numbers, and is described in a frame. Additional information such as identification information, a type, or a date of the information to be input C1 may also be

15 described on the sheet C.

[0011]

The monitoring cameras 50 capture an image of the work area A and generate captured image data. The captured image data may be still image data, and may also be moving image data. Hereinafter, the captured image data may be referred to as a

- 20 captured image. The monitoring cameras 50 transmit the generated captured image to the monitoring device 100 via the network NW. A plurality of monitoring cameras 50 are installed in, for example, the work area A, and include a monitoring camera 51 that captures a state of work from a side behind the inputter B, a monitoring camera 52 that captures a face of the inputter B from a side in front of the inputter B, and the like. The
- 25 work area A is not limited to one area, and may be plural areas. In addition, a plurality

of work areas A may be prepared in the same room or may be prepared in different rooms.

[0012]

A monitoring person monitors a state in the work area A while viewing an image that is processed by the monitoring device 100 for a captured image captured by the monitoring camera 50.

[0013]

[Monitoring device]

FIG. 3 is a diagram which shows an example of a configuration of the monitoring device 100. The monitoring device 100 includes, for example, a communication device 110, an input device 120, a display device 130, a first storage 140, a second storage 150, an image processor 160, and a system controller 170.

[0014]

The communication device 110 includes hardware for connecting to the network NW using a cellular network, a Wi-Fi network, or the like. For example, the communication device 110 includes an antenna, a transmitter/receiver, and the like. The input device 120 includes, for example, some or all of various keys, buttons, dial switches, a mouse, a microphone, a touch panel formed integrally with the display device 130, and the like. The display device 130 may include, for example, a liquid crystal display (LCD) or an organic electroluminescence (EL) display device. The display device 130 may include a speaker, a lamp, and the like.

[0015]

The first storage 140 and the second storage 150 are realized by, for example, a random access memory (RAM), a flash memory, an SD card, a register, and the like. The first storage 140 temporarily stores a captured image generated by the monitoring

cameras 50 as captured image data 141. In addition, the first storage 140 stores history data 142. The history data 142 is information in which the information to be input is associated with an image generated on the basis of the information to be input. The second storage 150 may be an external storage device such as a network attached storage (NAS) which can be accessed by the monitoring device 100 via the network. The second storage 150 stores replaced image data 151 generated by the image processor 160 and a history.

[0016]

The image processor 160 includes, for example, an acquirer 161, an extractor 162, an encryption processor 163, a generator 164, a determiner 165, and a deleter 166. Some or all of these components are realized by, for example, a processor such as a central processing unit (CPU) executing a program (software) stored in the first storage 140. In addition, some or all of functions of these components may be realized by hardware (circuit unit: including circuitry) such as a large scale integration (LSI), an application specific integrated circuit (ASIC), a field-programmable gate array (FPGA), or a graphics processing unit (GPU), and may also be realized by cooperation of software and hardware. The program may be stored in advance in a storage device such as a hard disk drive (HDD) or a flash memory, or may also be stored in a detachable storage medium such as a DVD or a CD-ROM and installed by the storage medium being mounted in a drive device.

[0017]

When the captured image is moving image data, the image processor 160 executes the following processing for each frame included in the moving image data.

[0018]

The acquirer 161 acquires captured images from the monitoring cameras 50

using the communication device 110.

The acquirer 161 temporarily stores the acquired captured image in the first storage 140. An example of the captured image is shown in FIG. 4. A captured image D10 shown in FIG. 4 is an image captured from behind the inputter B by the monitoring camera 51.

[0019]

The extractor 162 extracts the information to be input from the captured image acquired by the acquirer 161. For example, the extractor 162 recognizes the information to be input on the basis of a predetermined format of information to be input and extracts a target image including the recognized information to be input by performing an image analysis on the captured image using a character recognition technology. The character recognition technology is a technology that recognizes characters or numbers contained in an image.

[0020]

The “predetermined format of information to be input” includes, for example, a character string composed of a predetermined number of characters, a format composed of a predetermined number of numbers, a format that is a combination of characters and numbers and in which positions of the characters and positions of the numbers are predetermined, and the like. In addition, the predetermined format of information to be input may include an arrangement of characters or numbers, an arrangement of characters or numbers horizontally in a row, an arrangement of characters or numbers vertically in two columns, and the like.

[0021]

The extractor 162 extracts information to be input on the basis of, for example, an input area associated with the “predetermined format of information to be input.”

The input area includes, for example, a frame printed on the sheet C as shown in FIG. 2, an input field displayed on the monitor of the input terminal 10, and the like. Thereby, the extractor 162 can extract information to be input even when part of the information to be input is displayed on the monitor while being input. In addition, the extractor 162

5 may recognize all the characters or numbers included in a captured image, and extract characters or numbers that match the predetermined format of information to be input among the recognized characters or numbers as information to be input.

[0022]

The extractor 162 determines an image area (hereinafter, described as a target

10 area) that includes the extracted information to be input and cuts out an image of the target area (hereinafter, described as a target image). For example, the extractor 162 may determine a target area in accordance with the input area. The extractor 162, not limited thereto, may determine a target area in accordance with a circumscribed minimum rectangle of the recognized characters or numbers. The circumscribed

15 minimum rectangle is a rectangular figure that is set such that a string of characters or numbers (which may be one character or number) recognized as information to be input does not protrude therefrom, and has the smallest area. The extractor 162 may determine the target area by providing a predetermined margin outside the input area or the circumscribed minimum rectangle.

20 [0023]

For example, the extractor 162 extracts a target image D11 including information to be input that has been displayed on the sheet C and a target image D12 including information to be input that has been displayed on the monitor of the input terminal 10 from the captured image D10 shown in FIG. 4.

25 [0024]

The encryption processor 163 encrypts the information to be input that has been extracted by the extractor 162 and generates encrypted information. The encrypted information includes characters (hiragana, katakana, alphabet, and the like), numbers, and the like. For example, the encryption processor 163 encrypts information to be
5 input using a predetermined encryption algorithm.

[0025]

Various algorithms can be used for encryption processing. For example, the encryption processor 163 may perform encryption using key information and may also perform encryption according to a predetermined rule. Moreover, the encryption
10 processor 163 may generate key information for performing decryption in the encryption processing.

[0026]

The generator 164 generates a partial image on the basis of information encrypted by the encryption processor 163. The partial image is, for example, an image
15 in which the information to be input is made invisible and is an image that displays information for acquiring encrypted information generated by the encryption processor 163.

[0027]

The generator 164 generates a partial image in which the encrypted information
20 is superimposed on a filled image (a mask image). In addition, the generator 164 may generate a partial image that displays a code obtained by encoding encrypted information (including a one-dimensional code, a two-dimensional code, and the like), or may also generate a mosaic image in which the encrypted information is embedded as a partial image.

25 [0028]

The partial image, not limited thereto, may be an image in which the information to be input is made invisible, and may also be an image that displays information for acquiring key information for decrypting information that has been encrypted by the encryption processor 163. For example, the generator 164 may generate a partial image in which the key information is superimposed on the filled image. In addition, the generator 164 may also generate a partial image that displays a code obtained by encoding the key information, and may also generate a mosaic image in which the key information is embedded as a partial image.

[0029]

The generator 164 generates a replaced image in which the information to be input is made invisible by displaying the partial image in the target area (a position of the information to be input) instead of the target image in the captured image acquired by the acquirer 161. The generator 164 outputs the generated replaced image to the system controller 170.

[0030]

FIG. 5 is a diagram which shows an example of a replaced image. A replaced image data D20 includes a partial image D21 which is replaced with the target image D11, and a partial image D22 which is replaced with the target image D12.

[0031]

The partial image D21 and the partial image D22 are the same in the example shown in FIG. 5, but the present invention is not limited thereto. For example, the partial image D21 and the partial image D22 may include different encrypted information if information to be input is being input. Specifically, information to be input that has been extracted at a time when three characters are input and information to be input that has been extracted at a time when ten characters are input are different. For this reason,

the encrypted information may change during an input and a different image may be displayed in a replaced image, and encrypted information displayed in a target area included in the monitor may switch each time a character is input.

[0032]

5 The generator 164 stores information to be input that has been extracted by the extractor 162 and a partial image generated on the basis of the information to be input in the history data 142 in association with each other.

[0033]

 The determiner 165 determines whether the information to be input that has
10 been extracted by the extractor 162 matches the information to be input that has been already encrypted by the encryption processor 163. For example, the determiner 165 refers to the history data 142 and determines whether the information to be input that has been extracted by the extractor 162 is registered. When the determiner 165 determines that the extracted information to be input matches information to be input that has been
15 already encrypted, the generator 164 generates a replaced image on the basis of a partial image read from the history data 142 without performing processing of generating a partial image.

[0034]

 The deleter 166 deletes an associated captured image from the first storage 140
20 when a replaced image is generated by the generator 164. In addition, the deleter 166 may also delete a captured image whose storage period has exceeded a threshold value.

[0035]

 When it is instructed to decrypt the encrypted information included in the replaced image using the input device 120, the decryption processor 167 decrypts the
25 encrypted information on the basis of the replaced image to be input by the system

controller 170. The decryption processor 167 outputs the decrypted information to the system controller 170 and causes the display device 130 to display it.

[0036]

The system controller 170 includes, for example, a data manager 171 and a display controller 172. Some or all of these components are realized by, for example, a processor such as a CPU executing a program (software) stored in the second storage 150. Moreover, some or all of functions of these components may be realized by hardware such as a LSI, an ASIC, a FPGA, or a GPU, or may also be realized by cooperation between software and hardware.

10 [0037]

The data manager 171 stores the replaced image generated by the generator 164 in the second storage 150, instead of the captured image captured by the monitoring camera 50.

[0038]

15 The display controller 172 causes the display device 130 to display the replaced image generated by the generator 164, instead of the captured image captured by the monitoring camera 50. The display controller 172 may cause the display device 130 to display the replaced image on the basis of a replaced image input from the image processor 160, or may read a replaced image stored in the second storage 150 by the data management unit 171 and cause the display device 130 to display it.

20 [0039]

In addition, when it is instructed to view a past image, the display controller 172 reads the instructed replaced image from the second storage 150 and causes the display device 130 to display it. When it is instructed to decrypt the encrypted information using the input device 120, the display controller 172 causes the display device 130 to

25

display information to be input decrypted by the decryption processor 167.

[0040]

[Flowchart]

FIG. 6 is a flowchart which shows an example of processing performed by the
5 monitoring device 100. The monitoring device 100 executes the following processing
for each captured image. When a captured image is part of a moving image, the
monitoring device 100 executes the following processing for each frame included in an
operation.

[0041]

10 First, the acquirer 161 acquires a captured image from the monitoring cameras
50 using the communication device 110 (step S101). The extractor 162 extracts
information to be input from the captured image acquired by the acquirer 161 (step
S102). The determiner 165 refers to the history data 142 and determines whether the
information to be input that has been extracted by the extractor 162 matches information
15 to be input that has been already encrypted by the encryption processor 163 (step S103).

[0042]

When the information to be input that has been extracted by the extractor 162
does not match the information to be input that has been already encrypted by the
encryption processor 163, the extractor 162 determines a target area (step S104) and cuts
20 off the determined target area (step S105). The encryption processor 163 encrypts the
information to be input that has been extracted by the extractor 162 (step S106). The
generator 164 generates a partial image on the basis of information encrypted by the
encryption processor 163 (step S107). Next, the generator 164 generates a replaced
image that displays the partial image in the target area in which a target image is cut out
25 in step S105 (step S108). Then, the generator 164 outputs the replaced image to the

system controller 170.

[0043]

The data manager 171 stores the replaced image output from the generator 164 in the second storage 150 (step S109). The display controller 172 causes the display device 130 to display the replaced image generated by the generator 164 (step S110).

[0044]

On the other hand, when the information to be input that has been extracted by the extractor 162 matches the information to be input that has been already encrypted by the encryption processor 163 in step S103, the generator 164 reads a partial image associated with the information to be input that has been extracted by the extractor 162 from the first storage 140, and generates a replaced image on the basis of the read partial image (step S111). For example, step S111 is executed at a timing at which the same information to be input as the information to be input that has been already encrypted is extracted from the captured image. Since the information to be input that has been displayed on the sheet C on an image does not change during input work, the generator 164 uses a partial image that has been first generated when information to be input is captured by the monitoring camera 50, and causes it to be displayed in a target area associated with information to be input that has been extracted from a captured image thereafter.

[0045]

In this manner, the monitoring device 100 can cause the display device 130 to display the replaced image in which the information to be input is not displayed.

Accordingly, it is possible to keep the information to be input secret from a monitoring person who monitors a work area A while viewing the display device 130.

Confidentiality obligation is often imposed on the inputter B, but there are some cases

where the confidentiality obligation is not imposed on the monitoring person. It is especially beneficial in this case.

[0046]

In addition, the monitoring device 100 can cause the display device 130 to
5 display a replaced image including encrypted information and the like or transmit the replaced image to an external device having a monitor at the time of monitoring almost in real time by a monitoring person or at the time of viewing a past image. Thereby, information to be input can be acquired by decrypting the information to be input that is made invisible using encrypted information and the like displayed in the replaced image.
10 Therefore, the information to be input can be easily acquired even when there is a situation in which associating of the information to be input with the captured image captured by the monitoring camera 50 later and checking of it are required. On the other hand, when a captured image is an image which is obtained by merely replacing a target area with a mask image, since it is impossible to associate the information to be
15 input with the captured image thereafter and to check it even when there is a situation in which the associating and the checking are required later, which is inconvenient.

[0047]

According to at least one embodiment described above, it is possible to check information to be input when checking of the information to be input is required while
20 making the information to be input invisible on the replaced screen by including an acquirer configured to acquire, from one or more monitoring cameras that capture an image of a work area in which presented information to be input is input to an input terminal, a captured image captured by the one or more monitoring cameras, an extractor configured to extract the information to be input from the captured image acquired by the
25 acquirer, an encryption processor configured to encrypt the information to be input

extracted by the extractor, and a generator configured to generate a replaced image in which the information to be input is made invisible, the replaced image including a partial image that displays information encrypted by the encryption processor at a position of the information to be input in the captured image acquired by the acquirer.

- 5 Therefore, it is possible to improve a convenience in a system that masks part of the monitoring camera.

[0048]

- Although some embodiments of the present invention have been described, these embodiments are presented as examples and are not intended to limit the scope of the invention. These embodiments can be implemented in various other forms, and various omission, replacements, and changes can be made in a range not departing from the spirit of the invention. These embodiments and modifications thereof are included in the scope and spirit of the invention, as well as in the scope of the invention described in the claims and the equivalent scope thereof.

15 [0049]

- For example, the image processor 160 may execute different processing in accordance with a subject including a target area in a captured image. For example, the different processing may also be executed when the subject including a target area is the sheet C, and when the subject including a target area is the monitor of the input terminal 10. This is because information to be input in the monitor changes according to input work although information to be input on the sheet C of an image does not change. A specific example thereof will be described below.

[0050]

- The image processor 160 generates a partial image in the sheet C on an image on the basis of encrypted information obtained by encrypting information to be input that

has been extracted from the sheet C on the image. On the other hand, the image processor 160 generates a partial image in the monitor on an image on the basis of the encrypted information obtained by encrypting the information to be input that has been extracted from the sheet C on an image instead of information to be input that has been extracted from the monitor on the image. Thereby, a processing load of the encryption processing can be reduced. In addition, the information to be input that is extracted from the monitor changes during an input, but, even in such a situation, partial images including the same encrypted information can be displayed and a replaced screen can be made easier to view.

10 [0051]

In addition, the encryption processor 163 may also change an algorithm of encrypting a captured image when a predetermined switching timing is reached. The predetermined switching timing includes a case in which a predetermined time has been elapsed, a case in which extracted information to be input is different from information to be input that has been previously extracted, a case in which a predetermined format of information to be input is different from a previous format, and the like. Moreover, the encryption processor 163 may also change an algorithm of encrypting a captured image in accordance with the predetermined format of information to be input.

[Reference Signs List]

20 [0052]

1 Monitoring system

10 Input terminal

50 Monitoring camera

100 Monitoring device

25 110 Communication device

	120 Input device
	130 Display device
	140 First storage
	150 Second storage
5	160 Image processor
	161 Acquirer
	162 Extractor
	163 Encryption processor
	164 Generator
10	165 Determiner
	166 Deleter
	170 System controller
	171 Data manager
	172 Display controller
15	

[CLAIMS]

[Claim 1]

A monitoring system comprising:

an acquirer configured to acquire, from one or more monitoring cameras that
5 capture an image of a work area in which presented information to be input is input to an
input terminal, a captured image captured by the one or more monitoring cameras;

an extractor configured to extract the information to be input from the captured
image acquired by the acquirer;

an encryption processor configured to encrypt the information to be input
10 extracted by the extractor; and

a generator configured to generate a replaced image in which the information to
be input is made invisible, the replaced image comprising a partial image that displays
information encrypted by the encryption processor at a position of the information to be
input in the captured image acquired by the acquirer.

15 [Claim 2]

A monitoring system comprising:

an acquirer configured to acquire, from one or more monitoring cameras that
capture an image of a work area in which presented information to be input is input to an
input terminal, a captured image captured by the one or more monitoring cameras;

20 an extractor configured to extract the information to be input from the captured
image acquired by the acquirer;

an encryption processor configured to encrypt the information to be input
extracted by the extractor; and

a generator configured to generate a replaced image in which the information to
25 be input is made invisible, the replaced image comprising a partial image that displays

key information for decrypting information encrypted by the encryption processor at a position of the information to be input in the captured image acquired by the acquirer.

[Claim 3]

The monitoring system according to claim 1 or 2, further comprising:

5 a data manager configured to cause a storage to store the captured image captured by the one or more monitoring cameras, and, in a case where the replaced image is generated by the generator, to cause the storage to store the replaced image instead of the captured image.

[Claim 4]

10 The monitoring system according to any one of claims 1 to 3, further comprising:

 a display controller configured to cause a display device to display the captured image captured by the one or more monitoring cameras, and, in a case where the replaced image is generated by the generator, to cause the display device to display the replaced
15 image instead of the captured image.

[Claim 5]

The monitoring system according to any one of claims 1 to 4, further comprising:

 a determiner configured to determine whether the information to be input
20 extracted by the extractor matches the information to be input that has been encrypted by the encryption processor,

 wherein, in a case where the determiner determines that the information to be input extracted by the extractor matches the information to be input that has been encrypted by the encryption processor, the generator generates the replaced image on the
25 basis of the invisible image already converted by the encryption processor.

[Claim 6]

The monitoring system according to any one of claims 1 to 5,
wherein, in a case where a predetermined switching timing is reached, the
encryption processor changes an algorithm for encrypting the captured image.

5 [Claim 7]

A monitoring method comprising:

by a computer,

acquiring, from one or more monitoring cameras that capture an image of a
work area in which presented information to be input is input to an input terminal, a

10 captured image captured by the one or more monitoring cameras;

extracting the information to be input from the acquired captured image;

encrypting the extracted information to be input; and

generating a replaced image in which the information to be input is made
invisible, the replaced image comprising a partial image that displays encrypted

15 information at a position of the information to be input in the captured image.

[Claim 8]

A program that causes a computer to execute:

acquiring, from one or more monitoring cameras that capture an image of a
work area in which presented information to be input is input to an input terminal, a

20 captured image captured by the one or more monitoring cameras;

extracting the information to be input from the acquired captured image;

encrypting the extracted information to be input; and

generating a replaced image in which the information to be input is made
invisible, the replaced image comprising a partial image that displays encrypted

25 information at a position of the information to be input in the captured image.