above-mentioned two techniques using the same camera. In other words, for example, a habitual offender who displays problematic behaviors is hard to be automatically found by simply combining the above-mentioned two techniques.

[0009]

In view of this, an exemplary object of the present invention is to provide an object monitoring system, a monitoring target extraction device, an object monitoring method, a monitoring target extraction method, and a monitoring target extraction program with which an object that is presumed to be a cause of a specific state can be automatically collected from images captured by installed cameras.

Solution to Problem

[0010]

An object monitoring system according to an exemplary aspect of the present invention includes: first imaging means for creating a state image by capturing a state occurring in a first range; second imaging means for creating a monitoring target image by capturing a monitoring target present in a second range; specific state detection means for detecting a specific state from the state image; ~~monitoring target analysis means for analyzing a status of a monitoring target, using the state image from which the specific state is detected; and~~ monitoring target feature extraction means for extracting, from the monitoring target image created after the specific state is detected, a feature used for specifying the monitoring target, based on ~~the~~ a status of the monitoring target~~.~~; and object specification means for specifying, for each type of specific state, as an object, a monitoring target which appears with a high frequency in a plurality of monitoring target images.

[0011]

A monitoring target extraction device according to an exemplary aspect of the present invention includes: specific state detection means for detecting a specific

state from a state image captured by first imaging means for capturing a state occurring in a first range; ~~monitoring target analysis means for analyzing a status of a monitoring target, using the state image from which the specific state is detected; and~~ monitoring target feature extraction means for extracting, from a monitoring target image created after the specific state is detected and that is captured by second imaging means for capturing a monitoring target present in a second range, a feature used for specifying the monitoring target, based on ~~the~~ a status of the monitoring target~~.~~; and object specification means for specifying, for each type of specific state, as an object, a monitoring target which appears with a high frequency in a plurality of monitoring target images.

[0012]

An object monitoring method according to an exemplary aspect of the present invention includes: creating a state image by capturing a state occurring in a first range; detecting a specific state from the state image; ~~analyzing a status of a monitoring target, using the state image from which the specific state is detected;~~ creating a monitoring target image by capturing a monitoring target present in a second range, based on ~~the~~ a status of the monitoring target; and extracting, from the monitoring target image, a feature used for specifying the monitoring target~~.~~; and specifying, for each type of specific state, as an object, a monitoring target which appears with a high frequency in a plurality of monitoring target images.

[0013]

A monitoring target extraction method according to an exemplary aspect of the present invention includes: detecting a specific state from a state image captured by first imaging means for capturing a state occurring in a first range; ~~analyzing a status of a monitoring target, using the state image from which the specific state is detected; and~~ extracting, from a monitoring target image captured by second imaging means for capturing a monitoring target present in a second range, a feature used for specifying the monitoring target, based on ~~the~~ a status of the monitoring target~~.~~; and specifying, for each type of specific state, as an object, a monitoring target which appears with a high frequency in a plurality of monitoring target images.

[0014]

A monitoring target extraction program according to an exemplary aspect of the present invention causes a computer to execute: a specific state detection process of detecting a specific state from a state image captured by first imaging means for capturing a state occurring in a first range; ~~a monitoring target analysis process of analyzing a status of a monitoring target, using the state image from which the specific state is detected; and~~ a monitoring target feature extraction process of extracting, from a monitoring target image captured by second imaging means for capturing a monitoring target present in a second range, a feature used for specifying the monitoring target, based on ~~the~~ a status of the monitoring target~~.~~; and an object specification process of specifying, for each type of specific state, as an object, a monitoring target which appears with a high frequency in a plurality of monitoring target images.

Advantageous Effect of Invention

[0015]

According to embodiments of the present invention, an object that is presumed to be a cause of a specific state can be automatically collected from images captured by installed cameras.

Brief Description of Drawings

[0016]

[Fig. 1] It is a block diagram depicting an exemplary embodiment of an object monitoring system according to the present invention.

[Fig. 2] It is an explanatory diagram depicting an example of the case where state images are captured by different cameras.

[Fig. 3] It is a flowchart depicting an example of operations of the object monitoring system.

[Fig. 4] It is an explanatory diagram depicting a specific example of the object monitoring system.

[Fig. 5] It is a block diagram depicting a schematic

Claims

[Claim 1] An object monitoring system comprising:

first imaging means for creating a state image by capturing a state occurring in a first range;

second imaging means for creating a monitoring target image by capturing a monitoring target present in a second range;

specific state detection means for detecting a specific state from the state image;

~~monitoring target analysis means for analyzing a status of a monitoring target, using the state image from which the specific state is detected; and~~

monitoring target feature extraction means for extracting, from the monitoring target image created after the specific state is detected, a feature used for specifying the monitoring target, based on ~~the~~ a status of the monitoring target~~.~~; and

object specification means for specifying, for each type of specific state, as an object, a monitoring target which appears with a high frequency in a plurality of monitoring target images.

[Claim 2] The object monitoring system according to claim 1, comprising

time prediction means for predicting a time at which the monitoring target appears in the second range, from the status of the monitoring target,

wherein the second imaging means creates the monitoring target image in a period determined based on the time predicted by the time prediction means, and

wherein the monitoring target feature extraction means extracts the feature used for specifying the monitoring target, from the monitoring target image.

[Claim 3] The object monitoring system according to claim 2, wherein the monitoring target analysis means analyzes a movement status of the monitoring target, and

wherein the time prediction means predicts the time at which the monitoring target appears in the second range,

based on the movement status.

[Claim 4] The object monitoring system according to claim 3, comprising

past state image storage means for storing a past state image created in the past,

wherein the monitoring target analysis means analyzes the movement status of the monitoring target, using the state image from which the specific state is detected and the past state image captured within a predetermined period before the state image is captured.

[Claim 5] The object monitoring system according to any one of claims 1 to 4, wherein the monitoring target analysis means analyzes an appearance of the monitoring target, and

wherein the monitoring target feature extraction means narrows down the monitoring target whose feature is to be extracted, based on the analyzed appearance.

[Claim 6] The object monitoring system according to any one of claims 1 to 5, wherein the second imaging means creates the monitoring target image by capturing a person as the monitoring target, and

wherein the monitoring target feature extraction means extracts a face feature of the person from the monitoring target image.

[Claim 7] The object monitoring system according to any one of claims 1 to 6, ~~comprising~~ wherein the object specification means ~~for~~ compare~~sing~~, for each type of specific state, features of monitoring targets extracted from ~~a~~ the plurality of monitoring target images by the monitoring target feature extraction means~~, and~~

~~specifying, as an object, a monitoring target estimated to appear with a high frequency.~~

[Claim 8] The object monitoring system according to claim 7, wherein the object specification means specifies the monitoring target for which a feature estimated to be identical is extracted at least a predetermined number of times, as the object.

[Claim 9] The object monitoring system according to claim 7 or 8, wherein the monitoring target feature extraction means calculates a likelihood indicating a degree of probability of the monitoring target, together with the feature of the monitoring target, and

wherein the object specification means specifies the monitoring target using the likelihood.

[Claim 10] A monitoring target extraction device comprising:

specific state detection means for detecting a specific state from a state image captured by first imaging means for capturing a state occurring in a first range;

~~monitoring target analysis means for analyzing a status of a monitoring target, using the state image from which the specific state is detected; and~~

monitoring target feature extraction means for extracting, from a monitoring target image created after the specific state is detected and that is captured by second imaging means for capturing a monitoring target present in a second range, a feature used for specifying the monitoring target, based on ~~the~~ a status of the monitoring target~~.~~; and

object specification means for specifying, for each type of specific state, as an object, a monitoring target which appears with a high frequency in a plurality of monitoring target images.

[Claim 11] The monitoring target extraction device according to claim 10, comprising

time prediction means for predicting a time at which the monitoring target appears in the second range captured by the second imaging means, from the status of the monitoring target,

wherein the monitoring target feature extraction means extracts the feature used for specifying the monitoring target, from the monitoring target image captured by the second imaging means in a period determined based on the time predicted by the time prediction means.

[Claim 12] An object monitoring method comprising:

creating a state image by capturing a state occurring in a first range;

detecting a specific state from the state image;

~~analyzing a status of a monitoring target, using the state image from which the specific state is detected;~~

creating a monitoring target image by capturing a monitoring target present in a second range, based on ~~the~~ a status of the monitoring target; and

extracting, from the monitoring target image, a feature used for specifying the monitoring target~~.~~; and

specifying, for each type of specific state, as an object, a monitoring target which appears with a high frequency in a plurality of monitoring target images.

[Claim 13] The object monitoring method according to claim 12, comprising:

predicting a time at which the monitoring target appears in the second range, from the status of the monitoring target;

creating the monitoring target image by capturing the monitoring target present in the second range in a period determined based on the predicted time; and

extracting the feature used for specifying the monitoring target, from the monitoring target image.

[Claim 14] A monitoring target extraction method

comprising:

detecting a specific state from a state image captured by first imaging means for capturing a state occurring in a first range;

~~analyzing a status of a monitoring target, using the state image from which the specific state is detected; and~~

extracting, from a monitoring target image captured by second imaging means for capturing a monitoring target present in a second range, a feature used for specifying the monitoring target, based on ~~the~~ a status of the monitoring target~~.~~; and

specifying, for each type of specific state, as an object, a monitoring target which appears with a high frequency in a plurality of monitoring target images.

[Claim 15] The monitoring target extraction method according to claim 14, comprising:

predicting a time at which the monitoring target appears in the second range captured by the second imaging means, from the status of the monitoring target; and

extracting the feature used for specifying the monitoring target, from the monitoring target image captured by the second imaging means in a period determined based on the predicted time.

[Claim 16] A monitoring target extraction program for causing a computer to execute:

a specific state detection process of detecting a specific state from a state image captured by first imaging means for capturing a state occurring in a first range;

~~a monitoring target analysis process of analyzing a status of a monitoring target, using the state image from which the specific state is detected; and~~

a monitoring target feature extraction process of extracting, from a monitoring target image captured by second imaging means for capturing a monitoring target present in a second range, a feature used for specifying

the monitoring target, based on ~~the~~ a status of the monitoring target~~.~~; and

an object specification process of specifying, for each type of specific state, as an object, a monitoring target which appears with a high frequency in a plurality of monitoring target images.

[Claim 17] The monitoring target extraction program according to claim 16, causing the computer to execute

a time prediction process of predicting a time at which the monitoring target appears in the second range captured by the second imaging means, from the status of the monitoring target,

wherein the monitoring target extraction program causes the computer to, in the monitoring target feature extraction process, extract the feature used for specifying the monitoring target, from the monitoring target image captured by the second imaging means in a period determined based on the predicted time.