

model for facilitating personal authentication or re-identification based on the extracted body features over a period of time in addition to face authentication".

US2018/0307899A1 describes that, by extracting the features of the body parts (arms, legs, and torso) of a person who appears in the video, and by training a machine learning system using the features, the classification model for specifying the person is constructed. According to the invention described in US2018/0307899A1, for example, even in a case of a video in which the face of a person is not reflected, the identity of the person can be accurately specified.

Meanwhile, from the viewpoint of protection of personal information, it is also required to appropriately protect information that has accurately specified the identity, from unauthorized access.

However, although US2018/0307899A1 describes that an individual is specified based on the body parts of a human, it is not considered to appropriately manage information on the analyzed image data and provide an appropriate access right holder with appropriate range of information.

SUMMARY OF THE INVENTION

Here, an object of the invention is to provide an appropriate access right holder with an appropriate range of information by appropriately changing information amount

[Expression 1]

$$d(f(A), f(P)) < t$$

In Expression 1, it is guaranteed that the distance $d(f(A), f(P))$ between the sample A210 of the anchor class and the positive sample P220 is less than a predetermined threshold value t . The predetermined threshold value t may be determined based on, for example, the dimension of the feature f .

[Expression 2]

$$d(f(A), f(N)) > t$$

In Expression 2, it is guaranteed that the distance $d(f(A), f(N))$ between the sample A210 of the anchor class and the negative sample N230 is greater than the predetermined threshold value t .

[Equation 3]

$$d(f(A), f(N)) < t + k * s(A, N)$$

In Expression 3, it is guaranteed that the distance $d(f(A), f(N))$ between the sample A210 of the anchor class and the negative sample N230 is less than the sum of the predetermined threshold value t and the semantic similarity $s(A, N)$ of the sample A210 of the anchor class and the negative sample N230. Here, " k " is a scaling coefficient based on the dimension of a vector space of the feature f .

[Expression 4]

$$d(f(A), f(N)) > t + l * s(A, N)$$

In Expression 4, it is guaranteed that the distance $d(f(A),$

inferences related to the meaning indicated by the image.

The attributes may be represented as numerical values. In the specification, a digitized attribute is called an "attribute value". One or more attribute values that represent the attributes of a region or an object in a certain image are referred to as "feature vectors". The feature vector is defined by the number of included attribute values. For example, the dimension of a feature vector 380 illustrated in FIG. 3 is "5", and the dimension of a feature vector 390 is "3".

The inference that can be derived differs depending on the dimension of the feature vector. In principle, the higher the dimension of the feature vector is, the easier the derivation of the inferences related to finer elements of the image is. For example, with a feature vector 380 having a high dimension, which includes an attribute related to the face of a person who appears in an image, there is a high possibility that it is possible to derive an inference related to specifying the identity of the person who appears in the image. Meanwhile, with the feature vector 390 having a lower dimension, which does not include an attribute related to the face of a person who appears in an image, there is a low possibility that it is possible to derive an inference related to specifying the identity of the person who appears in the image. Therefore, by appropriately adjusting the dimension of the feature vector by the neural network according to the invention, it is possible

instead of one or more attribute values of the feature vector. For example, as illustrated in FIG. 9, by replacing the lower two attribute values 915 in the feature vector 910 having five attribute values with random values, a feature vector 914 in which a specific attribute is set to a random state can be obtained.

For example, in a case where the color of the outfit of the person who appears in the target image is red, by making the attribute value that corresponds to the color of the outfit is set to a random value, the feature vector having an attribute value indicating that the color of the outfit of the person who appears is a random color (for example, green) is obtained.

As one of the means for changing the attribute value of the feature vector, one or more attribute values of the feature vector can be deleted. For example, as illustrated in FIG. 9, by deleting the lower two attribute values 915 in the feature vector 910 having five attribute values, the feature vector 916 in which a specific attribute is deleted can be obtained. For example, when a person who appears in the target image has luggage, by deleting the attribute value that corresponds to the luggage, a feature vector including an attribute value indicating a state where the person who appears does not have luggage can be obtained.

As described above, the inference derived for the feature vector having the reduced dimension in this manner is different

that represents the object such as a male having no first attribute such as a suit jacket. Then, the feature calculation unit receives the second image that represents the first attribute. The images may be designated by the user, for example, or may be acquired from a sensor such as a surveillance camera.

Then, the feature calculation unit calculates a first attribute value set that corresponds to the object (for example, a male who is not wearing a jacket) of the first image, and a second attribute value set that corresponds to the attribute (for example, jacket) of the second image. Thereafter, the feature calculation unit calculates a third attribute value set by adding the second attribute value set that corresponds to the attributes of the second image to the first attribute value set that corresponds to the object of the first image. The third attribute value set is a feature vector obtained by adding the second attribute value set to the first attribute value set.

Then, the image generation unit generates an image of the object having a first attribute as a final image based on the calculated third attribute value set. For example, an image of a male who is wearing the jacket is obtained by adding the second attribute value set that corresponds to the jacket to the first attribute value set that corresponds to a male who is not wearing the jacket.

What is claimed is:

1. An image access management device for managing access to an image, the device comprising:

a feature calculation unit;

an access management unit; and

an image generation unit,

wherein when the image access management device receives an access request to a target image, the access management unit determines a browsing level which defines a range in which an access requester can access the target image according to an access authority or purpose included in the access request to the target image, and

the image generation unit generates a final image that corresponds to the access authority, and provides the generated final image as a response to the access request,

wherein the feature calculation unit extracts a feature vector related to a predetermined region in the target image,

the image generation unit includes a dimension adjusting unit to perform processing of reducing an information amount of the feature vector according to the browsing level, and generates the final image that corresponds to the access authority based on the feature vector having the reduced information amount according to the browsing level.

2. The image access management device according to claim

1, wherein

the image generation unit further includes an inference unit,

the inference unit derives inference related to the feature vector based on the feature vector having the reduced information amount, and

the image generation unit generates the final image based on the feature vector having the reduced information amount and the inference.

3. The image access management device according to claim 2, wherein

the image access management device is connected to a client terminal via a communication network,

the dimension adjusting unit uses a constraint that depends on the communication network for the feature vector, and performs processing of reducing the information amount of the feature vector, and

the client terminal

generates a partial image based on the feature vector by receiving the feature vector having the reduced information amount and by performing processing by a neural network, and

generates the final image by inserting the partial image into a predetermined background image.

4. The image access management device according to claim 2, wherein

a predetermined region of the target image includes at least a first patch and a second patch,

the feature calculation unit extracts a first feature vector related to the first patch, and extracts a second feature vector related to the second patch, and

the dimension adjusting unit calculates a semantic average of the first feature vector and the second feature vector to generate a third feature vector having the reduced information amount by comparing the first feature vector and the second feature vector with each other.

5. The image access management device according to claim 2, wherein

the feature vector includes one or more attribute values that represent attributes of an object in the target image, and

the dimension adjusting unit performs processing of reducing the information amount of the feature vector by changing the attribute values.

6. The image access management device according to claim 5, wherein

the feature calculation unit

receives a first image that represents an object having a first attribute, and a second image that represents the first attribute,

calculates a first attribute value set that corresponds to the object based on the first image,

calculates a second attribute value set that corresponds to the first attribute based on the second image, and

changes the attribute values of the first image by calculating a third attribute value set by subtracting the second attribute value set from the first attribute value set, and

the image generation unit generates an image of the object having no first attribute based on the third attribute value set.

7. The image access management device according to claim 5, wherein

the feature calculation unit

receives a first image that represents an object having no first attribute, and a second image that represents the first attribute,

calculates a first attribute value set that corresponds to the object based on the first image,

calculates a second attribute value set that

corresponds to the first attribute based on the second image,
and

changes the attribute values of the first image by
calculating a third attribute value set by adding the second
attribute value set to the first attribute value set, and

the image generation unit generates an image of the object
having the first attribute based on the third attribute value
set.

8. An image access management method executed by an image
access management device for managing access to an image,
wherein

the image access management device includes a feature
calculation unit, an access management unit, and an image
generation unit, and

the image access management method comprises:

a step of extracting a feature vector related to
a predetermined region in a target image, by the feature
calculation unit;

a step of determining a browsing level which
defines a range in which an access requester can access the
target image according to an access authority or purpose
included in the access request to the target image, in a case
where the image access management device receives an access
request to the target image, by the access management device;

a step of generating a final image that corresponds to the access authority by processing the feature vector according to the browsing level, by the image generation unit, wherein the step of generating a final image includes: a step of performing processing for reducing an information amount of the feature vector according to the browsing level, by a dimension adjusting unit included in the image generation unit, and a step of generating the final image based on the feature vector having the reduced information amount, by the image generation unit; and

a step of providing the final image as a response to the access request.

9. The image access management method according to claim 8, wherein

the image generation unit further includes an inference unit, and

the step of generating the final image includes

a step of deriving inference related to the feature vector based on the feature vector having the reduced information amount, by the inference unit, and

a step of generating the final image based on the feature vector having the reduced information amount and the inference, by the image generation unit.

10. The image access management method according to claim 9, wherein

the image access management device is connected to a client terminal via a communication network, and

the step of generating the final image includes

a step of using a constraint that depends on the communication network for the feature vector, and performs processing of reducing the information amount of the feature vector, by the dimension adjusting unit,

a step of generating a partial image based on the feature vector by receiving the feature vector having the reduced information amount and by performing processing by a neural network, by the client terminal, and

a step of generating the final image by inserting the partial image into a predetermined background image.

11. The image access management method according to claim 9, wherein

a predetermined region of the target image includes at least a first patch and a second patch,

the image access management method further comprises:

a step of extracting a first feature vector related to the first patch, and a step of extracting a second feature vector related to the second patch, by the feature calculation unit; and

a step of calculating a semantic average of the first feature vector and the second feature vector to generate a third feature vector having the reduced information amount by comparing the first feature vector and the second feature vector with each other, by the dimension adjusting unit.

12. The image access management device according to claim 9, wherein

the feature vector includes one or more attribute values that represent attributes of an object in the target image, and

the image access management method further comprises: a step of performing processing for reducing the information amount of the feature vector by changing the attribute values, by the dimension adjusting unit.

13. The image access management method according to claim 12, further comprising:

a step of receiving a first image that represents an object having a first attribute, and a second image that represents the first attribute, a step of calculating a first attribute value set that corresponds to the object based on the first image, a step of calculating a second attribute value set that corresponds to the first attribute based on the second image, and a step of changing the attribute values of the first image by calculating a third attribute value set by subtracting

the second attribute value set from the first attribute value set, by the feature calculation unit; and

a step of generating an image of the object having no first attribute based on the third attribute value set, by the image generation unit.

14. The image access management method according to claim 12, further comprising:

a step of receiving a first image that represents an object having no first attribute, and a second image that represents the first attribute, a step of calculating a first attribute value set that corresponds to the object based on the first image, a step of calculating a second attribute value set that corresponds to the first attribute based on the second image, and a step of changing the attribute values of the first image by calculating a third attribute value set by adding the second attribute value set to the first attribute value set, by the feature calculation unit; and

a step of generating an image of the object having the first attribute based on the third attribute value set, by the image generation unit.

15. An image access management system for managing access to an image, the system comprising:

an image access management device including a feature

calculation unit, an access management unit, and an image generation unit;

a sensor device that acquires a target image; and

a client terminal that creates and sends an access request to the target image, wherein

the image access management device, the sensor device, and the client terminal are connected to each other via a network,

the feature calculation unit acquires the target image from the sensor device,

when the image access management device receives the access request to the target image from the client terminal, the access management unit determines a browsing level which defines a range in which an access requester can access the target image according to an access authority or purpose included in the access request to the target image, and

the image generation unit generates a final image that corresponds to the access authority, and provides the generated final image as a response to the access request from the client terminal,

wherein the feature calculation unit extracts a feature vector related to a predetermined region in the target image,

the image generation unit includes a dimension adjusting unit to perform processing of reducing an information amount of the feature vector according to the browsing level, and

generates the final image that corresponds to the access authority based on the feature vector having the reduced information amount according to the browsing level.