SUMMARY OF INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0005] In the system described in Patent Document 1, depending on the installation location of the MFP, the imaging environment may differ depending on the time of day, even at the same imaging location. For example, if the MFP is installed in a location where the light shines differently during the day and at night, the obtained captured image varies depending on the influence of the light shining on the user's face or the shadows on the user's face. In this case, even if the face image (feature point information) for face authentication is registered, the face authentication may not succeed.

[0006] Embodiments of the present invention seek to provide a face authentication apparatus, a face authentication method, and a computer-readable recording medium that improve the accuracy of face authentication while reducing the burden on an administrator.

MEANS FOR SOLVING THE PROBLEMS

[0007] According to a first aspect of the present invention, there is provided a face authentication apparatus comprising:

an acquisition means for acquiring face image data of a person from an image capturing apparatus,

a determination means for determining whether registration data, having degree of matching with the face image data that is equal to or more than a threshold value, is registered in a storage device,

a prompting means for prompting the person to input identifying information when the determination means determines that the registration data is not registered in the storage device,

a reception means for receiving the identifying information input,

a registration after input reception means for registering the face image data as registration data in the storage device when the reception means successfully receives the identifying information,

a setting means for setting the threshold value, to be used by the determination means, in association with the registration data registered by the registration after input reception means, and

an additional registration means for registering the face image data as registration data in the storage device when the determination means determines that the registration data, having degree of matching with the face image data that is equal to or more than the threshold value, is registered in the storage device,

a classification means for classifying the image capturing apparatuses into one or more groups based on an installation environment of each of the image capturing apparatuses,

wherein, the acquisition means acquires the face image data from different 5 image capturing apparatuses,

the additional registration means registers the face image data as registration data in association with the image capturing apparatus from which the face image data is acquired

the setting means sets the threshold value, being determined from the degree of matching between the face image data and the registration data used for determination by the determination means, in association with the registration data registered by the additional registration means,

when a number of times the threshold value is set for the registration data registered in association with the image capturing apparatus in the group classified by the classification means is P (P = 1), the setting means sets a predetermined threshold value, and

when a number of times the threshold value is set for the registration data registered in association with the image capturing apparatus in the group classified by the classification means is P (P ≥ 2), the setting means sets a value obtained by ((M × (P - 1) + N) / P), which is represented by the threshold value M set immediately before and the degree of matching N between the face image data and the registration data used by the determination means for determination, as the threshold value.

[0008] According to a second aspect of the present invention, there is provided a face authentication method comprising:

acquiring face image data of a person from an image capturing apparatus,

determining whether registration data, having degree of matching with the face

image data that is equal to or more than a threshold value, is registered in a storage device,

prompting the person to input identifying information when it is determined that the registration data is not registered in the storage device,

receiving the identifying information input,

registering the face image data as registration data in the storage device when the identifying information is successfully received, and

setting the threshold value, to be used to determine whether registration data having the degree of matching equal to or more than a threshold value is registered, in association with the registration data registered, and

registering the face image data as registration data in the storage device when the determination means determines that the registration data, having degree of matching with the face image data that is equal to or more than the threshold value, is registered in the storage device,

classifying the image capturing apparatuses into one or more groups based on an installation environment of each of the image capturing apparatuses,

wherein, in the acquisition, acquiring the face image data from different 5 image capturing apparatuses,

in the registration, registering the face image data as registration data in association with the image capturing apparatus from which the face image data is acquired

in the setting, setting the threshold value, being determined from the degree of matching between the face image data and the registration data used for determination by the determination means, in association with the registration data registered by the additional registration means,

when a number of times the threshold value is set for the registration data registered in association with the image capturing apparatus in the group classified by the classification means is P (P = 1), setting a predetermined threshold value, and

when a number of times the threshold value is set for the registration data registered in association with the image capturing apparatus in the group classified by the classification means is P (P ≥ 2), setting a value obtained by ((M × (P - 1) + N) / P), which is represented by the threshold value M set immediately before and the degree of matching N between the face image data and the registration data used by the determination means for determination, as the threshold value.

[0009] According to a third aspect of the present invention, there is provided a computer-readable recording medium that includes recorded thereon, a program including instructions that cause a computer to execute:

determining whether registration data, having degree of matching with the face image data of a person acquired from an image capturing apparatus that is equal to or more than a threshold value, is registered in a storage device,

prompting the person to input identifying information when it is determined that the registration data is not registered in the storage device,

receiving the identifying information input,

registering the face image data as registration data in the storage device when an input of the identifying information is successfully received, and

setting the threshold value, to be used to determine whether registration data having the degree of matching equal to or more than a threshold value is registered, in association with the registration data registered, and

registering the face image data as registration data in the storage device when the determination means determines that the registration data, having degree of matching with the face image data that is equal to or more than the threshold value, is registered in the storage device,

classifying the image capturing apparatuses into one or more groups based on an installation environment of each of the image capturing apparatuses,

wherein, in the acquisition, acquiring the face image data from different 5 image capturing apparatuses,

in the registration, registering the face image data as registration data in association with the image capturing apparatus from which the face image data is acquired

in the setting, setting the threshold value, being determined from the degree of matching between the face image data and the registration data used for determination by the determination means, in association with the registration data registered by the additional registration means,

when a number of times the threshold value is set for the registration data registered in association with the image capturing apparatus in the group classified by the classification means is P (P = 1), setting a predetermined threshold value, and

when a number of times the threshold value is set for the registration data registered in association with the image capturing apparatus in the group classified by the classification means is P ($P \geq 2$), setting a value obtained by $((M \times (P - 1) + N) / P)$, which is represented by the threshold

value M set immediately before and the degree of matching N between the face image data and the registration data used by the determination means for determination, as the threshold value.

ADVANTAGEOUS EFFECTS OF THE INVENTION

[0010] As described above, according to the present invention, it is possible to improve the accuracy of the face authentication by registering the registration data for face authentication and setting the threshold value in association with the registration data, without requiring the administrator to take time and effort.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 is a diagram showing a configuration of a face authentication apparatus according to the example embodiment 1.

FIG. 2 is a block diagram specifically showing a configuration of the face authentication apparatus according to the example embodiment 1.

FIG. 3 is a diagram showing a database referred to at the time of face authentication.

CLAIMS

1. A face authentication apparatus comprising:

an acquisition means for acquiring face image data of a person from an image capturing apparatus,

a determination means for determining whether registration data, having degree of matching with the face image data that is equal to or more than a threshold value, is registered in a storage device,

a prompting means for prompting the person to input identifying information when the determination means determines that the registration data is not registered in the storage device,

a reception means for receiving the identifying information input,

a registration after input reception means for registering the face image data as registration data in the storage device when the reception means successfully receives the identifying information,

a setting means for setting the threshold value, to be used by the determination means, in association with the registration data registered by the registration after input reception means, and

an additional registration means for registering the face image data as registration data in the storage device when the determination means determines that the registration data, having degree of matching with the face image data that is equal to or more than the threshold value, is registered in the storage device,

a classification means for classifying the image capturing apparatuses into one or more groups based on an installation environment of each of the image capturing apparatuses,

wherein, the acquisition means acquires the face image data from different 5 image capturing apparatuses,

the additional registration means registers the face image data as registration data in association with the image capturing apparatus from which the face image data is acquired

the setting means sets the threshold value, being determined from the degree of matching between the face image data and the registration data used for determination by the determination means, in association with the registration data registered by the additional registration means,

when a number of times the threshold value is set for the registration data registered in association with the image capturing apparatus in the group classified by the classification means is P (P = 1), the setting means sets a predetermined threshold value, and

when a number of times the threshold value is set for the registration data registered in association with the image capturing apparatus in the group classified by the classification means

is P ($P \geq 2$), the setting means sets a value obtained by $((M \times (P - 1) + N) / P)$, which is represented by the threshold value M set immediately before and the degree of matching N between the face image data and the registration data used by the determination means for determination, as the threshold value.

2. The face authentication apparatus according to claim 1, wherein

the acquisition means acquires the face image data from different image capturing apparatuses,

the registration after input reception means registers the face image data as registration data in association with the image capturing apparatus from which the face image data is acquired.

3. The face authentication apparatus according to claim 1 or 2, wherein

the registration after input reception means registers registration data in a storage area, being different from a storage area that registration data is registered in advance, in the storage device.

4. The face authentication apparatus according to claim 1, wherein

the additional registration means registers registration data in a storage area, being different from a storage area that registration data is registered in advance, in the storage device.

5. The face authentication apparatus according to claim 1, further comprising:

an identification means for verifying an identity of the person, wherein

the additional registration means registers registration data in the storage device when the identification means successfully verifies the identity of the person.

6. A face authentication method comprising:

acquiring face image data of a person from an image capturing apparatus,

determining whether registration data, having degree of matching with the face image data that is equal to or more than a threshold value, is registered in a storage device,

prompting the person to input identifying information when it is determined that the registration data is not registered in the storage device,

receiving the identifying information input,

registering the face image data as registration data in the storage device when the identifying information is successfully received, and

setting the threshold value, to be used to determine whether registration data having the degree of matching equal to or more than a threshold value is registered, in association with the registration data registered, and

registering the face image data as registration data in the storage device when the determination means determines that the registration data, having degree of matching with the face image data that is equal to or more than the threshold value, is registered in the storage device,

classifying the image capturing apparatuses into one or more groups based on an installation environment of each of the image capturing apparatuses,

wherein, in the acquisition, acquiring the face image data from different 5 image capturing apparatuses,

in the registration, registering the face image data as registration data in association with the image capturing apparatus from which the face image data is acquired

in the setting, setting the threshold value, being determined from the degree of matching between the face image data and the registration data used for determination by the determination means, in association with the registration data registered by the additional registration means,

when a number of times the threshold value is set for the registration data registered in association with the image capturing apparatus in the group classified by the classification means is P (P = 1), setting a predetermined threshold value, and

when a number of times the threshold value is set for the registration data registered in association with the image capturing apparatus in the group classified by the classification means is P ($P \geq 2$), setting a value obtained by $((M \times (P - 1) + N) / P)$, which is represented by the threshold value M set immediately before and the degree of matching N between the face image data and the registration data used by the determination means for determination, as the threshold value.

7. A computer-readable recording medium that includes recorded thereon, a program including instructions that cause a computer to execute:

determining whether registration data, having degree of matching with the face image data of a person acquired from an image capturing apparatus that is equal to or more than a threshold value, is registered in a storage device,

prompting the person to input identifying information when it is determined that the registration data is not registered in the storage device,

receiving the identifying information input,

registering the face image data as registration data in the storage device when an input of the identifying information is successfully received, and

setting the threshold value, to be used to determine whether registration data having the degree of matching equal to or more than a threshold value is registered, in association with the registration data registered, and

registering the face image data as registration data in the storage device when the determination means determines that the registration data, having degree of matching with the face image data that is equal to or more than the threshold value, is registered in the storage device,

classifying the image capturing apparatuses into one or more groups based on an installation environment of each of the image capturing apparatuses,

wherein, in the acquisition, acquiring the face image data from different 5 image capturing apparatuses,

in the registration, registering the face image data as registration data in association with the image capturing apparatus from which the face image data is acquired

in the setting, setting the threshold value, being determined from the degree of matching between the face image data and the registration data used for determination by the determination means, in association with the registration data registered by the additional registration means,

when a number of times the threshold value is set for the registration data registered in association with the image capturing apparatus in the group classified by the classification means is P (P = 1), setting a predetermined threshold value, and

when a number of times the threshold value is set for the registration data registered in association with the image capturing apparatus in the group classified by the classification means is P ($P \geq 2$), setting a value obtained by $((M \times (P - 1) + N) / P)$, which is represented by the threshold value M set immediately before and the degree of matching N between the face image data and the registration data used by the determination means for determination, as the threshold value.