[Document Name] DESCRIPTION

[Title] AUTHENTICATION DEVICE, AUTHENTICATION METHOD, AUTHENTICATION PROGRAM, AND RECORDING MEDIUM

[Technical Field]

[0001]

The example embodiments relates to an authentication device or the like that authenticates a target.

[Background Art]

[0002]

Personal authentication based on an individual difference of a living body (Biometrics-based authentication) has a lower risk of leakage and theft than a password or the like created by a user. For this reason, there are increasing examples of introducing the personal authentication based on the individual difference of the living body to identify the individual and confirm the right or for security protection. A personal authentication technique based on the individual difference of the living body has been known that uses fingerprints (Fingerprint), veins (Vein), faces (Face), irises (Iris), voices (Voice), or the like as biometric information.

[0003]

Among these, in face authentication and iris authentication, positions (face and eyes) of authentication targets are almost the same, and multi-modal authentication in which the face authentication and the iris authentication are combined has been developed (refer to cited documents 1 and 2).

[Citation List]

[Patent Literature]

[0004]

[PTL 1] JP 2000-102524 A

[PTL 2] JP 2005-242677 A

[Summary]

[0005]

There is a need for companies and organizations that operate commercial facilities and large event venues to utilize walkthrough authentication for an entrance and exit management system in order to enhance security measures and enhance convenience of the user side in entrance and exit management of a large number of users. In the walkthrough authentication, a living body (user) to be authenticated only walks through a predetermined section without stopping in front of an authentication camera. As a result, authentication processing can be executed at high speed even if the number of users to be authenticated is large and without making the user side conscious of the authentication processing. When the face authentication and the iris authentication are applied to the walkthrough authentication in combination as the multi-modal authentication, it is preferable because authentication data can be collected only by performing imaging using a camera without having contact with the users.

[0006]

However, because the user moves in the walkthrough authentication, a time period spent on the authentication is limited. Specifically, a time period from a time when the user enters an authentication gate entrance and images an image to be used for authentication (authentication start time) to a time when the user ends the authentication and passes through an authentication gate exit (authentication completion time) is limited to about several seconds. Therefore, if the positions of the authentication regions are close to each other as in the combination of the face authentication and the iris

authentication, it is necessary to execute two types of authentication processing at high speed at almost the same timings, and a plurality of cameras and a large number of hardware resources are required.

[0007]

The disclosure has been made in view of the above problems, and one of objects of the disclosure is to provide an authentication device or the like that can execute authentication with high accuracy on an authentication target who is moving with less hardware resources and within a predetermined time period.

[0008]

In a first aspect, the present disclosure provides an authentication device comprising:

detection means for detecting an authentication target who is moving in a predetermined direction in a video of a predetermined area;

first image input means for inputting a first image in which an entire body of the detected target is imaged;

first storage means for storing characteristic information of entire bodies of one or more targets to be authenticated;

first authentication means for calculating characteristic information from the image of the entire body of the target imaged in the first image, comparing the calculated characteristic information with the characteristic information of the entire body stored in the first storage means, and extracting candidate information of the one or more targets from the first storage means based on a comparison result;

second image input means for inputting a second image in which an iris of at least one of a right eye and a left eye of the target who is detected by the detection means and is moving in the predetermined direction is imaged;

second storage means for storing characteristic information of irises of the right eyes and the left eyes of the one or more targets to be authenticated; and

second authentication means for comparing characteristic information of iris calculated from the second image with the characteristic information of the one or more irises stored in the second storage means, calculating a verification score for each target included in the candidate information, authenticating the target imaged in the second image based on the calculated verification score, and outputting an authentication result.

[0009]

In a second aspect, the present disclosure provides an authentication method comprising:

detecting an authentication target who is moving in a predetermined direction in a video of a predetermined area;

inputting a first image in which an entire body of the detected target is imaged;

calculating characteristic information from the image of the entire body of the target imaged in the first image, comparing the calculated characteristic information with characteristic information of the entire body stored in first storage means that stores characteristic information of entire bodies of one or more targets to be authenticated to execute first authentication, and extracting candidate information of the one or more targets from the first storage means based on a result of the first authentication;

inputting a second image in which an iris of at least one of a right eye and a left eye of the target who is detected and is moving in the predetermined direction is imaged; and

comparing characteristic information of one or more irises stored

in second storage means that stores characteristic information of the irises of the right eyes and the left eyes of the one or more targets to be authenticated with characteristic information of the iris calculated from the second image for each target included in the candidate information, calculating a verification score, executing second authentication on the target imaged in the second image based on the calculated verification score, and outputting an authentication result.

[0010]

In a third aspect, the present disclosure provides an authentication program for causing a computer to achieve processing comprising:

detecting an authentication target who is moving in a predetermined direction in a video of a predetermined area;

inputting a first image in which an entire body of the detected target is imaged;

calculating characteristic information from an image of the entire body of the target imaged in the first image, comparing the calculated characteristic information with characteristic information of the entire body stored in first storage means that stores characteristic information of entire bodies of one or more targets to be authenticated to execute first authentication, and extracting candidate information of the one or more targets from the first storage means based on a result of the first authentication;

inputting a second image in which an iris of at least one of a right eye and a left eye of the target who is detected and is moving in the predetermined direction is imaged; and

comparing characteristic information of one or more irises stored in second storage means that stores characteristic information of the irises of the right eyes and the left eyes of the one or more targets to be

authenticated with characteristic information of an iris calculated from

the second image for each target included in the candidate information, calculating a verification score, executing second authentication on the target imaged in the second image based on the calculated verification score, and outputting an authentication result.

[0010a]

In a fourth aspect, the present disclosure provides a recording medium recorded with an authentication program according to the third aspect.

[0011]

The authentication program may be stored in a storage medium.

[Brief Description of Drawings]

[0013]

Fig. 1 is a diagram of a configuration of a biometric authentication device according to a first example embodiment of the disclosure.

Fig. 2 is a diagram of an image of a target user who moves in a specific direction.

Fig. 3 is a diagram of a first image acquired from the image of the target user who moves in the specific direction.

Fig. 4 is a diagram of a second image acquired from the image of the target user who moves in the specific direction.

Fig. 5 is a flowchart illustrating an operation example of the biometric authentication device according to the first example embodiment of the disclosure.

Fig. 6 is a diagram of a configuration of a biometric authentication device according to a second example embodiment of the disclosure.

Fig. 7 is a diagram illustrating an exemplary configuration of data stored in a second storage unit.

[Document Name] CLAIMS

[Claim 1]

An authentication device comprising:

detection means for detecting an authentication target who is moving in a predetermined direction in a video of a predetermined area;

first image input means for inputting a first image in which an entire body of the detected target is imaged;

first storage means for storing characteristic information of entire bodies of one or more targets to be authenticated;

first authentication means for calculating characteristic information from an image of the entire body of the target imaged in the first image, comparing the calculated characteristic information with the characteristic information of the entire body stored in the first storage means, and extracting candidate information of the one or more targets from the first storage means based on a comparison result;

second image input means for inputting a second image in which an iris of at least one of a right eye and a left eye of the target who is detected by the detection means and is moving in the predetermined direction is imaged;

second storage means for storing characteristic information of irises of the right eyes and the left eyes of the one or more targets to be authenticated; and

second authentication means for comparing characteristic information of the iris calculated from the second image with the characteristic information of the one or more irises stored in the second storage means, calculating a verification score for each target included in the candidate information, authenticating the target imaged in the second image based on the calculated verification score, and outputting an authentication result.

[Claim 2]

The authentication device according to claim 1, wherein

when the detection means detects a movement of the target in a direction other than the predetermined direction, the first image input means and the second image input means stop input of an image of the target.

[Claim 3]

The authentication device according to claim 1 or 2, further comprising:

determination means for determining whether the second image is of the left eye or the right eye of the target based on information including the first image and outputting a determination result in association with the second image as left/right information, wherein

the second authentication means compares characteristic information of an iris calculated from the second image associated with the left/right information with one or more pieces of characteristic information stored in the second storage means related to the left/right information and calculates the verification score.

[Claim 4]

The authentication device according to claim 1, wherein

the second storage means stores the characteristic information of the irises of the right eyes and the left eyes of the one or more targets to be authenticated and reliability scores of the right eyes and the left eyes of the one or more targets to be authenticated, and

the second authentication means specifies the target based on the verification score, acquires the reliability score related to the target from the second storage means, and calculates a weighted verification score obtained by weighting the reliability score to the verification score.

[Claim 5]

The authentication device according to claim 4, wherein

the second authentication means prioritizes an eye having a higher value indicating the reliability score and calculates the weighted verification score.

[Claim 6]

The authentication device according to claim 3, wherein

the determination means applies a predetermined template to a face region of the target in the first image and determines whether the second image is relevant to the left eye or the right eye of the target.

[Claim 7]

The authentication device according to claim 1, further comprising:

adjustment means for performing adjustment in such a way that the second authentication means executes second authentication after first authentication by the first authentication means and the first authentication and the second authentication are completed within a time period in which the detection means is able to detect the target who is moving in the predetermined direction in the video of the predetermined area.

[Claim 8]

The authentication device according to claim 1, further comprising:

third image input means for inputting a third image in which a face of the target who is moving in the predetermined direction and is detected by the detection means is imaged between input of an image by the first image input means and input of an image by the second image input means;

third storage means for storing characteristic information of faces

of the one or more targets to be authenticated; and

third authentication means for comparing characteristic information of the face calculated from the third image with the characteristic information of the one or more faces stored in the third storage means for each target included in the candidate information output by the first authentication means and extracting candidate information of the one or more targets from the third storage means based on a comparison result.

[Claim 9]

The authentication device according to claim 8, further comprising:

adjustment means for performing adjustment in such a way that the third authentication means executes third authentication after the first authentication by the first authentication means, the second authentication means executes the second authentication after the third authentication, and the first authentication, the third authentication, and the second authentication are completed within a time period in which the detection means is able to detect the target who is moving in the predetermined direction in the video of the predetermined area.

[Claim 10]

An authentication method comprising:

detecting an authentication target who is moving in a predetermined direction in a video of a predetermined area;

inputting a first image in which an entire body of the detected target is imaged;

calculating characteristic information from an image of the entire body of the target imaged in the first image, comparing the calculated characteristic information with characteristic information of the entire body stored in first storage means that stores characteristic information of

entire bodies of one or more targets to be authenticated to execute first

authentication, and extracting candidate information of the one or more targets from the first storage means based on a result of the first authentication;

inputting a second image in which an iris of at least one of a right eye and a left eye of the target who is detected and is moving in the predetermined direction is imaged; and

comparing characteristic information of one or more irises stored in second storage means that stores characteristic information of irises of the right eyes and the left eyes of the one or more targets to be authenticated with characteristic information of an iris calculated from the second image for each target included in the candidate information, calculating a verification score, executing second authentication on the target imaged in the second image based on the calculated verification score, and outputting an authentication result.

[Claim 11]

An authentication program for causing a computer to achieve processing comprising:

detecting an authentication target who is moving in a

predetermined direction in a video of a predetermined area;

inputting a first image in which an entire body of the detected target is imaged;

calculating characteristic information from an image of the entire body of the target imaged in the first image, comparing the calculated characteristic information with characteristic information of the entire body stored in first storage means that stores characteristic information of entire bodies of one or more targets to be authenticated to execute first authentication, and extracting candidate information of the one or more targets from the first storage means based on a result of the first authentication;

inputting a second image in which an iris of at least one of a right eye and a left eye of the target who is detected and is moving in the predetermined direction is imaged; and

comparing characteristic information of one or more irises stored in second storage means that stores the characteristic information of the irises of the right eyes and the left eyes of the one or more targets to be authenticated with characteristic information of an iris calculated from the second image for each target included in the candidate information, calculating a verification score, executing second authentication on the target imaged in the second image based on the calculated verification score, and outputting an authentication result.

[Claim 12]

A recording medium recorded with an authentication program according to claim 11.