Description

Title of Invention: IRIS RECOGNITION SYSTEM, IRIS RECOGNITION METHOD, AND STORAGE MEDIUM

Technical Field

[0001] The present invention relates to an iris recognition system, an iris recognition method, and a storage medium.

Background Art

[0002] Patent Literature 1 discloses an individual authentication method using an iris image. In such an individual authentication method, a mask region is set under an upper eyelid, an image of an iris region excluding the mask region is used for authentication, and thereby eyelashes less affect the authentication accuracy.

Citation List

Patent Literature

[0003] [PTL 1] Japanese Patent Application Laid-Open No. 2004-206444

Summary

[0004] In recent years, colored contact lenses in which a colored region is provided to a part of the contact lens have been commercially available. A colored contact lens on an eye provides a decorative effect that changes the color of an iris or makes an iris appear larger, and thus colored contact lenses have spread through the market.

[0005] In recognition of an iris as disclosed in Patent Literature 1, when the recognition subject wears colored contact lenses, appearance of a part of an iris changes, and this may reduce the matching accuracy of the iris.

[0006] The present invention has been made in view of the above problem and intends to provide an iris recognition system, an iris recognition method, and a storage medium that can reduce influence on matching accuracy when a recognition subject wears colored contact lenses.

[0007] In a first aspect, the present disclosure provides an iris recognition system comprising: a determination means for, based on an image including an eye of a recognition subject, determining whether or not a colored contact lens is worn; and a processing means for, when it is determined by the determination unit that the colored contact lens is worn, performing a process of ~~improving accuracy of iris matching on the recognition subject~~instructing the recognition subject to rotate the colored contact lens; and a matching means for separating a pattern of the colored contact lens from a pattern of an iris of the eye of the recognition subject by calculating a difference between two images

acquired before and after performing a process of instructing the recognition subject to rotate the colored contact lens and performing matching.

[0008] In a second aspect, the present disclosure provides an iris

recognition method comprising: based on an image including an eye of a recognition subject, determining whether or not a colored contact lens is worn; ~~and~~ when it is determined that the colored contact lens is worn, performing a process of ~~improving accuracy of iris matching on the recognition subject~~instructing the recognition subject to rotate the colored contact lens; and separating a pattern of the colored contact lens from a pattern of an iris of the eye of the recognition subject by calculating a difference between two images acquired before and after performing a process of instructing the recognition subject to rotate the colored contact lens to perform matching.

[0009] In a third aspect, the present disclosure provides a storage medium in which a program is stored, the program causing a computer to execute: based on an image including an eye of a recognition subject, determining whether or not a colored contact lens is worn; ~~and~~ when it is determined that the colored contact lens is worn, performing a process of ~~improving accuracy of iris matching on the recognition subject~~instructing the recognition subject to rotate the colored contact lens; and separating a pattern of the colored contact lens from a pattern of an iris of the eye of the recognition subject by calculating a difference between two images acquired before and after performing a process of instructing the recognition subject to rotate the colored contact lens to perform matching .

[0010] According to the present disclosure, an iris recognition system, an iris recognition method, and a storage medium that can reduce influence on matching accuracy when a recognition subject wears colored contact lenses can be provided.

Brief Description of Drawings

[0011] [fig.1]Fig. 1 is a block diagram illustrating a hardware configuration example of an iris recognition system according to a first example embodiment.

[fig.2]Fig. 2 is a function block diagram of the iris recognition system according to the first example embodiment.

[fig.3]Fig. 3 is a flowchart illustrating a summary of a process performed by the iris recognition system according to the first example embodiment.

[fig.4]Fig. 4 is a flowchart illustrating a colored contact lens-wearing determination process according to the first example embodiment.

[fig.5]Fig. 5 is a diagram schematically illustrating extraction of determination object images according to the first example embodiment.

[fig.6]Fig. 6 is a diagram schematically illustrating change of the size of a determination object image according to the first example embodiment.

[fig.7]Fig. 7 is a diagram schematically illustrating a determination process according to the first example embodiment.

[fig.8]Fig. 8 is a flowchart illustrating a first example of a matching accuracy improvement process according to the first example embodiment.
[fig.9]Fig. 9 is a flowchart illustrating a second example of a matching accuracy improvement process according to the first example embodiment.
[fig.10]Fig. 10 is a flowchart illustrating a third example of a matching accuracy improvement process according to the first example embodiment.
[fig.11]Fig. 11 is a flowchart illustrating a modified example of a third example of a matching accuracy improvement process according to the first example embodiment.

[CLAIMS]

[Claim 1]

An iris recognition system comprising:

a determination means for, based on an image including an eye of a recognition subject, determining whether or not a colored contact lens is worn; ~~and~~

a processing means for, when it is determined by the determination means that the colored contact lens is worn, performing a process of instructing the recognition subject to rotate the colored contact lens; and~~improving accuracy of iris matching on the recognition subject~~

a matching means for separating a pattern of the colored contact lens from a pattern of an iris of the eye of the recognition subject by calculating a difference between two images acquired before and after performing a process of instructing the recognition subject to rotate the colored contact lens and performing matching.

~~[Claim 2]~~

~~The iris recognition system according to claim 1, wherein, when it is determined by the determination means that the colored contact lens is worn, the processing means performs a process for causing contraction of a pupil due to a pupillary light reflex on the recognition subject.~~

~~[Claim 3]~~

~~The iris recognition system according to claim 2, wherein the processing means includes a visible light irradiation means for irradiating an eye of the recognition subject with a visible light when it is determined by the determination means that the colored contact lens is worn.~~

~~[Claim 4]~~

~~The iris recognition system according to claim 2, wherein, when it is determined by the determination means that the colored contact lens is worn, the processing means~~

~~performs a process of notification of a message that prompts the recognition subject to look at a bright object.~~

~~[Claim 5]~~

~~The iris recognition system according to claim 1, wherein, when it is determined by the determination means that the colored contact lens is worn, the processing means performs a process of instructing the recognition subject to rotate the colored contact lens.~~

[Claim ~~6~~2]

The iris recognition system according to claim ~~5~~1, wherein, when it is determined by the determination means that the colored contact lens is worn, the processing means performs a process of notification of a message that prompts the recognition subject to blink.

[Claim ~~7~~3]

The iris recognition system according to claim ~~5~~1, wherein, when it is determined by the determination means that the colored contact lens is worn, the processing means performs a process of notification of a message that prompts the recognition subject to move the eye.

~~[Claim 8]~~

~~The iris recognition system according to any one of claims 5 to 7 further comprising a matching means for separating a pattern of the colored contact lens from a pattern of an iris of the eye of the recognition subject by calculating a difference between two images acquired before and after performing a process of instructing the recognition subject to rotate the colored contact lens and performing matching.~~

[Claim ~~9~~4]

The iris recognition system according to any one of claims 1 to ~~8~~3, wherein, when it is determined by the determination means that the colored contact lens is worn, the processing means performs a process of notification of a message that prompts the recognition subject to put off the colored contact lens.

[Claim ~~10~~5]

The iris recognition system according to any one of claims 1 to ~~9~~4, wherein, when it is determined by the determination means that the colored contact lens is worn, the processing means performs a process of notifying the recognition subject that a process is failed.

[Claim ~~11~~6]

The iris recognition system according to any one of claims 1 to ~~10~~5, wherein, when it is determined by the determination means that the colored contact lens is worn, the processing means performs a process for acquiring the image including the eye of the recognition subject for multiple times.

[Claim ~~12~~7]

An iris recognition method comprising:

based on an image including an eye of a recognition subject, determining whether or not a colored contact lens is worn; ~~and~~

when it is determined that the colored contact lens is worn, performing a process of instructing the recognition subject to rotate the colored contact lens~~improving accuracy of iris matching on the recognition subject~~; and

separating a pattern of the colored contact lens from a pattern of an iris of the eye of the recognition subject by calculating a difference between two images acquired before and after performing a process of instructing the

recognition subject to rotate the colored contact lens to perform matching.

[Claim ~~13~~8]

A storage medium in which a program is stored, the program causing a computer to execute:

based on an image including an eye of a recognition subject, determining whether or not a colored contact lens is worn; ~~and~~

when it is determined that the colored contact lens is worn, performing a process of instructing the recognition subject to rotate the colored contact lens~~improving accuracy of iris matching on the recognition subject~~; and

separating a pattern of the colored contact lens from a pattern of an iris of the eye of the recognition subject by calculating a difference between two images acquired before and after performing a process of instructing the recognition subject to rotate the colored contact lens to perform matching.