

METHOD AND APPARATUS FOR DETERMINING IDENTITY OF PERSON

BACKGROUND OF THE INVENTION

[0001] Technical Field

[0002] The invention relates to the technical field of computers and computer software, in particular to a method and apparatus for determining the identity of a person.

[0003] 2. Description of Related Art

[0004] In today's social activities, it is required to authenticate the identity of a person in many occasions, one of the most common authentication methods is facial recognition for people. For example, when a bank user makes a transaction at a transaction terminal, in some cases it is necessary to confirm that the operation is done by the user himself or herself, and the transaction terminal needs to perform facial recognition in such cases. For example, some access control systems need to perform facial recognition on a visitor to determine whether or not the visitor has permission to enter. In the above-mentioned transaction terminal and access control systems, they each have an image collecting device, commonly referred to as a camera, capable of collecting images of a person, including face images, and they each have a computer processing device or are connected with a computer processing device to process the images or other information.

[0005] For the existing facial recognition system, an illegal approach appearing currently to cheat during the facial recognition is authentication based on a photo with a human face, this approach is mainly used to replace a real face with a photo to participate in authentication, for example, a paper photo or a photo displayed on an electronic device is placed in front of the lens of the above-mentioned image collecting device to replace a real face, so as to achieve the purpose of counterfeiting a legitimate person.

[0006] There is therefore a need for a technical solution to determine the identity of a person so as to prevent the illegal approach using a photo to participate in identity authentication.

BRIEF SUMMARY OF THE INVENTION

[0007] In view of this, the invention provides a method and apparatus for determining the identity of a person, capable of distinguishing a picture from a real person during facial recognition to improve the reliability of the identity authentication of a person.

[0008] In order to achieve the above purpose, according to one aspect of the invention, a method for determining the identity of a person is provided.

[0009] The method for determining the identity of a person according to the invention comprises: acquiring a first image that is collected by an image collecting device and contains the face of a person, wherein the ratio of the face area in the first image is greater than a first preset value; changing the focal length of the image collecting device and then acquiring a second image that is collected by the image collecting device and contains the face of the person, wherein the ratio of the face area in the second image is less than the first preset value; searching the outside of a boundary rectangle of a face region in the second image by means of edge detection to determine whether or not there are four boundary lines defining a quadrangle and whether the values of the four vertex angles of the quadrangle fall into the same preset angle interval; if there are four boundary lines defining a quadrangle and the values of the four vertex angles of the quadrangle fall into the same preset angle interval, outputting a prompt message; or otherwise, determining the identity of the person based on the first image.

[0010] Alternatively, the step of acquiring the first image that is collected by the

image collecting device and contains the face of the person comprises: step A: receiving a current image that is collected by the image collecting device and contains the face of the person; and

[0011] step B: determining whether or not the ratio of the face area in the current image reaches the first preset value; if the ratio reaches the first preset value, taking the current image as the first image; or otherwise, outputting a prompt message so that the person adjusts a body position and then performing step A and step B again.

[0012] Alternatively, the first preset value is 70%.

[0013] Alternatively, the step of searching by means of edge detection comprises: moving outwards from the four edges of the boundary rectangle and detecting the edges of the image, wherein the linear edges are regarded as the boundary lines.

[0014] Alternatively, the interval of the ratio of the face area in the second image is (48%, 52%) or (28%, 32%).

[0015] Alternatively, the step of determining the identity of the person according to the first image comprises: determining the similarity of the first image to a face image on an identity certificate of the person and then determining the identity of the person according to the similarity.

[0016] According to another aspect of the invention, an apparatus for determining the identity of a person is provided.

[0017] The apparatus for determining the identity of a person according to the invention comprises: a first acquiring module, configured to acquire a first image that is collected by an image collecting device and contains the face of a person, wherein the ratio of the face area in the first image is greater than a first preset value; a second acquiring module, configured to change the focal length of the image collecting device and then acquire a second image that is collected by the image collecting device and

contains the face of the person, wherein the ratio of the face area in the second image is less than the first preset value; a detecting module, configured to search the outside of a boundary rectangle of a face region in the second image by means of edge detection to determine whether or not there are four boundary lines defining a quadrangle and whether the values of the four vertex angles of the quadrangle fall into the same preset angle interval; a prompt module, configured to output a prompt message when the determination result of the detecting module is “Y”; and a determining module, configured to determine the identity of the person according to the first image when the determination result of the detecting module is “N”.

[0018] Alternatively, the first acquiring module is further configured to acquire, according to the following steps, the first image that is collected by the image collecting device and contains the face of the person: step A: receiving a current image that is collected by the image collecting device and contains the face of the person; and step B: determining whether or not the ratio of the face area in the current image reaches the first preset value; if the ratio reaches the first preset value, taking the current image as the first image; or otherwise, outputting a prompt message so that the person adjusts a body position and then performing step A and step B again.

[0019] Alternatively, the detecting module is further configured to perform searching by means of edge detection in the following way: moving outwards from the four edges of the boundary rectangle and detecting the edges of the image, wherein the linear edges are regarded as the boundary lines.

[0020] Alternatively, the determining module is further configured to determine the identity of the person in the following way: determining the similarity of the first image to a face image on an identity certificate of the person and then determining the identity of the person according to the similarity.

[0021] According to yet another aspect of the invention, a computer readable storage medium is provided. The computer readable storage medium is stored with a computer instruction, wherein the computer instruction can be operated by a computer or a computer system so that the computer or the computer system can perform the method of the invention.

[0022] According to the technical solution of the invention, in view of the approach in which a photo is used to replace a real face for authentication, considering that a photo has a border, the face region is appropriately reduced in order to capture the border that possibly exists when an image is acquired, and then whether the image has a border or not is determined, and thus the situation where a photo, instead of a real face, is used for authentication can be found, which helps to improve the reliability of authentication.

BRIEF DESCRIPTION OF SEVERAL VIEWS OF THE DRAWINGS

[0023] The accompanying drawings are for better understanding of the invention and are not to be construed as improperly limiting the invention, where

[0024] Fig. 1 is a schematic diagram showing the main steps of a method for determining the identity of a person according to an embodiment of the invention;

[0025] Fig. 2A is a schematic diagram showing a case where an image collected by an image collecting device does not contain a border according to an embodiment of the invention;

[0026] Fig. 2B is a schematic diagram showing a case where an image collected by the image collecting device contains a type of border according to an embodiment of the invention;

[0027] Fig. 2C is a schematic diagram showing a case where an image collected by the image collecting device contains another type of border according to an

embodiment of the invention;

[0028] Fig. 3 is a schematic diagram showing basic components of an apparatus for determining the identity of a person according to an embodiment of the invention;

[0029] Fig. 4 is a schematic diagram showing a basic structure of an application system according to an embodiment of the invention; and

[0030] Fig. 5 is a schematic diagram showing a processing flow of a transaction terminal according to an embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0031] The exemplary embodiments of the invention will be described below with reference to the accompanying drawings in which various details of the embodiments of the invention are included to facilitate understanding and should be construed as merely exemplary. It will therefore be appreciated by those of ordinary skill in the art that various changes and modifications may be made to the embodiments described herein without departing from the scope and spirit of the invention. Similarly, for the sake of clarity and conciseness, the description of known functions and structures is omitted from the following description.

[0032] Fig. 1 is a schematic diagram showing the main steps of a method for determining the identity of a person according to an embodiment of the invention. The method may be performed by a computer processing device and the computer processing device may be applied to a facial recognition-based identity authentication system. A self-service transaction terminal of a bank (e.g., an ATM) is described below as an example for illustration.

[0033] Step 11 is to acquire a first image that is collected by the image collecting device and contains the face of a person. When the person makes a transaction on a

self-service transaction terminal device (hereinafter referred to as a “terminal device”), the computer processing device begins operating from Step 11 and controls the terminal device to give a voice or text prompt to instruct the person to stand in front of an image camera of the terminal device. Then, the camera takes a shot to obtain an image containing a human face.

[0034] In order to make the human face in the obtained image clear enough for the subsequent processing, it is preferred to determine, after a photo is taken, whether the face area in the photo accounts for 70% of the whole photo or other percentages, set as required. If the determination result is positive, the photo is saved; if it is otherwise, the terminal device is controlled to give another prompt to instruct the person to adjust the body position. And then another shot will be taken until the face area in a photo meets the above requirement.

[0035] Step 12 is to change the focal length of the image collecting device and then acquire a second image that is collected by the image collecting device and contains the face of the person. When this step is preformed, in the case where the person does not move, the camera changes the focal length to take another photo, i.e., the second image herein. In this photo, the ratio of the face area is reduced, for example, the face area accounts for 48%-52% or 28%-32% of the total area of the photo. The face area herein may be the area of the face region (i.e., the area of all pixels recognized as belonging to the human face) or the area of a boundary rectangle of the face region.

[0036] Step 13 is to search the outside of the boundary rectangle of the face region in the second image by means of edge detection to determine whether or not there are four boundary lines defining a quadrangle and whether the values of the four vertex angles of the quadrangle fall into the same preset angle interval.

[0037] In an embodiment of the invention, in order to prevent the situation where a

photo, instead of a real face, is used for identity authentication, an image collected by the image collecting device is searched to determine whether there is a border in the image. This is because there must be a border at the periphery of a photo if the photo is used to replace a real face; and in Step 12, reducing the ratio of the face area in another photo is to capture the border.

[0038] A reference may be made to Fig. 2A and Fig. 2B, Fig. 2A is a schematic diagram showing a case where an image collected by an image collecting device does not contain a border according to an embodiment of the invention; Fig. 2B is a schematic diagram showing a case where an image collected by the image collecting device contains a type of border according to an embodiment of the invention; and Fig. 2C is a schematic diagram showing a case where an image collected by the image collecting device contains another type of border according to an embodiment of the invention. If a real face is in front of the camera, the photo obtained is similar to the photo 21 in Fig. 2A, where a face 22 is the image of the real face; and if a paper photo is placed in front of the camera, the photo obtained is similar to photo 23 in Fig. 2B, where a face 24 is located within a border 25 which is the border formed by the edges of the paper photo. In addition, if a photo displayed on a screen is placed in front of the camera, the photo obtained is similar to photo 26 in Fig. 2C, where a device 27 having the screen is also shot, and it is clear that the device also forms a border in the photo.

[0039] In the case where the above-mentioned border is included in the image acquired by the image capturing device, it is easy to find the border in the image by the edge detection method. Considering that this embodiment is applied to a terminal device with limited computing capability and low processing speed, it may affect the user experience. Therefore, in this embodiment, a relatively simple manner is adopted, that is, moving outwards from the four edges of the boundary rectangle of the face region in the

second image and carrying out a Hough transform and the like to find the linear edges of the boundary lines. The linear edges here refer to lines presented as straight lines as whole.

[0040] If the result of Step 13 is “Y”, it means that a photo has been used to replace a real face and in this case, the processing goes to step 14 to output a prompt message which may be a text message or a voice message to prompt a user to participate in identity authentication with a real face; or other prompt methods may be used according to the actual conditions.

[0041] If the result of Step 13 is “N”, it means that a person is participating in the identity authentication with their own real face and in this case, the processing goes to Step 15 to further determine the identity of the person according to the first image acquired in Step 11. For example, the face image on an identity certificate of the person can be read, and then the face image can be compared with the first image to obtain similarity and the identity of the person can be determined based on the similarity between the two.

[0042] Fig. 3 is a schematic diagram showing the basic components of an apparatus for determining the identity of a person according to an embodiment of the invention. The apparatus can be set in the foregoing computer processing device as software. As shown in Fig. 3, the apparatus 30 for determining the identity of a person mainly comprises a first acquiring module, a second acquiring module, a detecting module, a prompt module and a determining module, wherein

[0043] the first acquiring module is configured to acquire a first image that is collected by an image collecting device and that contains the face of a person, wherein the ratio of the face area in the first image is greater than a first preset value; the second acquiring module is configured to change the focal length of the image collecting device and then acquire a second image that is collected by the image collecting device and

contains the face of the person, wherein the ratio of the face area in the second image is less than the first preset value; the detecting module is configured to search the outside of a boundary rectangle of a face region in the second image by means of edge detection to determine whether or not there are four boundary lines defining a quadrangle and whether the values of the four vertex angles of the quadrangle fall into the same preset angle interval; the prompt module is configured to output a prompt message when the determination result of the detecting module is “Y”; and the determining module is configured to determine the identity of the person according to the first image when the determination result of the detecting module is “N”.

[0044] The first acquiring module is further configured to acquire, according to the following steps, the first image that is collected by the image collecting device and contains the face of the person: step A: receiving a current image that is collected by the image collecting device and contains the face of the person; and step B: determining whether or not the ratio of the face area in the current image reaches the first preset value; if the ratio reaches the first preset value, taking the current image as the first image; or otherwise, outputting a prompt message so that the person adjusts a body position and then performing step A and step B again.

[0045] The detecting module is further configured to perform searching by means of edge detection in the following way: moving outwards from the four edges of the boundary rectangle and detecting the edges of the image, wherein the linear edges are regarded as the boundary lines.

[0046] The determining module is further configured to determine the identity of the person in the following way: determining the similarity of the first image to a face image on an identity certificate of the person and then determining the identity of the person according to the similarity.

[0047] Fig. 4 is a schematic diagram showing a basic structure of an application system according to an embodiment of the invention. As shown in Fig. 4, the technical solution in the embodiment of the invention may be applied to a transaction terminal of a bank, and the foregoing computer processing device may be arranged in an identity discriminating service system and is connected to the transaction terminal via a transaction behavior monitoring system and a banking system.

[0048] In Fig. 4, the main functions of the transaction terminal include: collecting identity information and transaction information of a card holder and receiving and executing transaction processing instructions. The main functions of the banking system include forwarding information and instructions. The transaction behavior monitoring system is mainly used to analyze transaction data in real time and determine transaction operation instructions. The identity discriminating service system is mainly used to check the identity information.

[0049] Fig. 5 is a schematic diagram showing a processing flow of a transaction terminal according to an embodiment of the invention. As shown in Fig. 5, a password check is performed after a user inserts a bank card, and then whether the bank card is a domestic bank card is determined; if the bank card is a domestic bank card, the information of a 2nd generation identity card is read, a face photo is collected and whether a real person is participating is determined, that is, the identity discriminating service system is called to perform processing; if the determination result is "Y", an identity information check and face matching are performed to determine whether the currently collected face is consistent with the photo on the identity card; and if the currently collected face is consistent with the photo on the identity card, whether the number of transaction times and transaction amount exceed the limits are further determined.

[0050] According to the technical solution of the embodiment of the invention, in

view of the approach in which a photo is used to replace a real face for authentication, considering that a photo has borders, face region is appropriately reduced in order to capture borders that possibly exist when an image is acquired, and then whether the image has borders or not is determined, and thus the situation where a photo, instead of a real face, is used for authentication can be found, which helps to improve the reliability of authentication.

[0051] The above-described specific embodiments are not to be construed as limiting the scope of the invention. It will be understood by those skilled in the art that various modifications, combinations, sub-combinations and substitutions may occur, depending on design requirements and other factors. Any modifications, equivalent substitutions and improvements within the spirit and principle of the invention are intended to be included within the scope of the invention.

What is claimed is:

1. A method for determining the identity of a person, comprising:

acquiring a first image that is collected by an image collecting device and contains the face of a person, wherein the ratio of the face area in the first image is greater than a first preset value;

changing the focal length of the image collecting device and then acquiring a second image that is collected by the image collecting device and contains the face of the person, wherein the ratio of the face area in the second image is less than the first preset value;

searching the outside of a boundary rectangle of a face region in the second image by means of edge detection to determine whether or not there are four boundary lines defining a quadrangle and whether the values of the four vertex angles of the quadrangle fall into the same preset angle interval;

if there are four boundary lines defining a quadrangle and the values of the four vertex angles of the quadrangle fall into the same preset angle interval, outputting a prompt message; or otherwise,

determining the identity of the person according to the first image.

2. The method according to Claim 1, wherein the step of acquiring the first image that is collected by the image collecting device and contains the face of the person comprises:

step A: receiving a current image that is collected by the image collecting device and contains the face of the person; and

step B: determining whether or not the ratio of the face area in the current image reaches the first preset value; if the ratio reaches the first preset value, taking the current image as the first image; or otherwise, outputting a prompt message so that the person adjusts a body position and then performing the step A and step B again.

3. The method according to Claim 1 or 2, wherein the first preset value is 70%.

4. The method according to Claim 1, wherein the step of searching by means of edge detection comprises: moving outwards from the four edges of the boundary rectangle and detecting the edges of the image, wherein the linear edges are regarded as the boundary lines.

5. The method according to Claim 1 or 4, wherein the interval of the ratio of the face area in the second image is (48%, 52%) or (28%, 32%).

6. The method according to Claim 1, 2 or 4, wherein the step of determining the identity of the person according to the first image comprises:

determining the similarity of the first image to a face image on an identity certificate of the person and then determining the identity of the person according to the similarity.

7. An apparatus for determining the identity of a person, comprising:

a first acquiring module, configured to acquire a first image that is collected by an image collecting device and contains the face of a person, wherein the ratio of the face area in the first image is greater than a first preset value;

a second acquiring module, configured to change the focal length of the image collecting device and then acquiring a second image that is collected by the image collecting device and contains the face of the person, wherein the ratio of the face area in the second image is less than the first preset value;

a detecting module, configured to search the outside of a boundary rectangle of a face region in the second image by means of edge detection to determine whether or not there are four boundary lines defining a quadrangle and whether the values of the four vertex angles of the quadrangle fall into the same preset angle interval;

a prompt module, configured to output a prompt message when the determination result of the detecting module is “Y”; and

a determining module, configured to determine the identity of the person according to the first image when the determination result of the detecting module is “N”.

8. The apparatus according to Claim 7, wherein the first acquiring module is further configured to acquire, according to the following steps, the first image that is collected by the image collecting device and contains the face of the person:

step A: receiving a current image that is collected by the image collecting device and contains the face of the person; and

step B: determining whether or not the ratio of the face area in the current image reaches the first preset value; if the ratio reaches the first preset value, taking the current image as the first image; or otherwise, outputting a prompt message so that the person adjusts a body position and then performing step A and step B again.

9. The apparatus according to Claim 7, wherein the detecting module is further configured to perform searching by means of edge detection in the following way: moving outwards from the four edges of the boundary rectangle and detecting the edges of the image, wherein the linear edges are regarded as the boundary lines.

10. The apparatus according to Claim 7, 8 or 9, wherein the determining module is further configured to determine the identity of the person in the following way: determining the similarity of the first image to a face image on an identity certificate of the person and then determining the identity of the person according to the similarity.

11. A computer readable storage medium, stored with a computer instruction, wherein the computer instruction can be operated by a computer or a computer system so that the computer or the computer system can perform the method of any of Claims 1-6.