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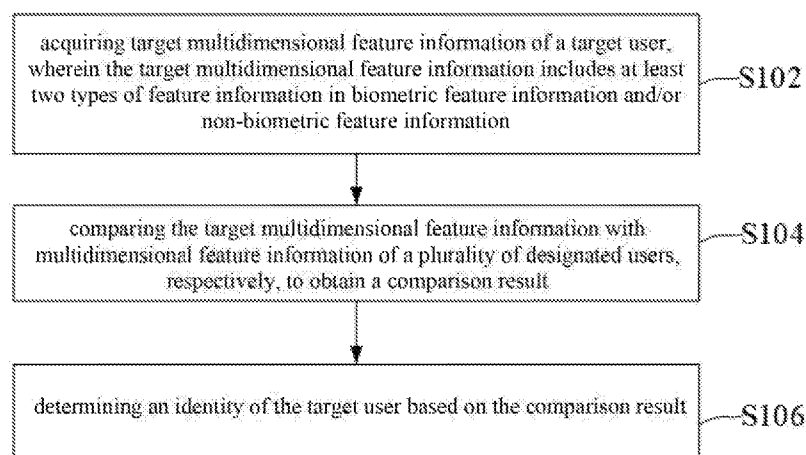


FIG. 1

(57) Abstract: The present invention discloses a user identity determining: method, apparatus and electronic device. The method includes: acquiring; target multidimensional feature information of a target user, wherein the target multidimensional feature information includes at least two types of feature information in biometric feature information and/or non-biometric feature information; comparing the target multidimensional feature information with multidimensional feature information of a plurality of designated users, respectively, to obtain a comparison result; and determining an identity of the target user based on the comparison result.

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USER IDENTITY DETERMINING METHOD, APPARATUS, AND ELECTRONIC DEVICE

Cross-Reference to Related Applications

[0001] This international application is based upon and claims priority to Chinese Patent
5 Application No. 201811025022.8, filed on September 4, 2018, the entire content of all of which
is incorporated herein by reference.

Technical Field

[0002] The present application relates to the field of computer technologies, and more
particularly to a user identity determining method, apparatus and electronic device.

10 Technical Background

[0003] Biometric technologies are widely used in the identification of user identities
because they are more convenient and secure. Biometric technologies are technologies that
integrate computers with optical sensors, acoustic sensors, biosensors, the principles of
biostatistics and other hi-tech means to identify a personal identity using inherent physiological
15 characteristics (such as fingerprint, face, iris, or sound) of the human body.

[0004] However, in some cases, existing solutions for using biometric features to identify
user identities have a misidentification problem. For example, when face recognition is used to
identify identities of twins, misidentification often occurs. Also for example, when voice
recognition is used to identify two users having similar voices, misidentification may also occur.

20 Summary of the Invention

[0005] Embodiments of the present application provide a user identity determining
method, apparatus and electronic device to reduce user identity misidentification.

[0006] To solve the technical problems, the embodiments of the present application are
implemented as follows: A first aspect provides a user identity determining method, comprising:
25 acquiring target multidimensional feature information of a target user, wherein the target

multidimensional feature information comprises at least two types of feature information in biometric feature information and/or non-biometric feature information; comparing the target multidimensional feature information with multidimensional feature information of a plurality of designated users, respectively, to obtain a comparison result; and determining an identity of the target user based on the comparison result.

[0007] A second aspect provides a user identity determining apparatus, comprising: an acquiring module, configured to acquire target multidimensional feature information of a target user, wherein the target multidimensional feature information comprises at least two types of feature information in biometric feature information and/or non-biometric feature information; a comparing module, configured to compare the target multidimensional feature information with multidimensional feature information of a plurality of designated users, respectively, to obtain a comparison result; and a determining module, configured to determine an identity of the target user based on the comparison result.

[0008] A third aspect provides an electronic device, comprising: a processor; and a memory configured to store computer executable instructions, wherein execution of the executable instructions causes the processor to perform the following operations: acquiring target multidimensional feature information of a target user, wherein the target multidimensional feature information comprises at least two types of feature information in biometric feature information and/or non-biometric feature information; comparing the target multidimensional feature information with multidimensional feature information of a plurality of designated users, respectively, to obtain a comparison result; and determining an identity of the target user based on the comparison result.

[0009] A fourth aspect provides a computer readable storage medium, storing one or more programs, wherein the one or more programs, when executed by an electronic device comprising a plurality of applications, cause the electronic device to perform the following

operations: acquiring target multidimensional feature information of a target user, wherein the target multidimensional feature information comprises at least two types of feature information in biometric feature information and/or non-biometric feature information; comparing the target multidimensional feature information with multidimensional feature information of a plurality of designated users, respectively, to obtain a comparison result; and determining an identity of the target user based on the comparison result.

[0010] As can be seen from the technical solutions provided by the foregoing embodiments of the present application, the solutions provided by the embodiments of the present application at least have one of the following technical effects: because the identity of the target user is determined based on the multidimensional feature information of the target user, not based on single feature information such as face or voice, user identity misidentification can be reduced, thereby improving the reliability of the result of user identity determination.

Brief Description of the Drawings

[0011] The accompanying drawings described herein are provided for further comprehension of the present application, and constitute a part of the present application. The schematic embodiments of the present application and the description thereof are used to illustrate the present application, but do not constitute any improper limitation to the present application. In the accompanying drawings:

[0012] FIG. 1 is a schematic flowchart of a user identity determining method according to an embodiment of this specification.

[0013] FIG. 2 is a schematic diagram of building a first database according to an embodiment of this specification.

[0014] FIG. 3 is a schematic diagram of face feature information at multiple poses according to an embodiment of this specification.

[0015] FIG. 4 is a schematic diagram of gait feature information according to an embodiment of this specification.

[0016] FIG. 5 is a detailed schematic flowchart of step 104 in the embodiment shown in FIG. 1.

5 [0017] FIG. 6 is a schematic diagram of an index feature comparison process according to an embodiment of this specification.

[0018] FIG. 7 is a schematic diagram of another index feature comparison process according to an embodiment of this specification.

10 [0019] FIG. 8 is another detailed schematic flowchart of step 104 in the embodiment shown in FIG. 1.

[0020] FIG. 9 is a schematic structural diagram of an electronic device according to an embodiment of this specification.

[0021] FIG. 10 is a schematic structural diagram of a user identity determining apparatus 1000 according to an embodiment of this specification.

15 [0022] FIG. 11 is a detailed schematic structural diagram of a module 1002 in the embodiment shown in FIG. 10.

[0023] FIG. 12 is another detailed schematic structural diagram of the module 1002 in the embodiment shown in FIG. 10.

Detailed Description

20 [0024] To make the objectives, technical solutions and advantages of the present application clearer, the technical solutions of the present application will be described clearly and completely below with reference to the specific embodiments and corresponding accompanying drawings of the present application. Apparently, the described embodiments are only some rather than all embodiments of the present application. On the basis of the
25 embodiments in the present application, all other embodiments acquired by those of ordinary

skill in the art without creative efforts shall belong to the protection scope of the present application.

[0025] To reduce user identity misidentification, the embodiments of this specification provide a user identity determining method and apparatus. The method and apparatus can be applied to a surveillance system requiring user identity identification. For example, nowadays cameras are deployed throughout business districts, and merchants hope to use an existing video surveillance network in a business district to identify its membership consumer based on information acquired by a camera immediately when the membership consumer appears in the business district, and rapidly search historical consumption data and consumption habits of the membership consumer, so as to better serve the membership consumer. For ease of description, the determining of the identity of a user entering a business district is used as an example below to describe the user identity determining method and apparatus provided by the embodiments of this specification.

[0026] A user identity determining method provided by the embodiments of this specification is described in detail below with reference to FIG. 1 to FIG. 8.

[0027] As shown in FIG. 1, a user identity determining method provided by the embodiments of this specification may include the following steps: At step 102, acquiring target multidimensional feature information of a target user, wherein the target multidimensional feature information includes at least two types of feature information in biometric feature information and/or non-biometric feature information.

[0028] The target user may be a user whose identity needs to be determined, identified, or authenticated, for example, a consumer entering a business district (for example, a shopping mall).

[0029] That the target multidimensional feature information includes at least two types of feature information in biometric feature information and/or non-biometric feature information

may mean that the target multidimensional biometric feature information includes at least two types of feature information in the biometric feature information; or, the target multidimensional biometric feature information includes at least two types of feature information in the non-biometric feature information; or, the target multidimensional biometric feature information
5 includes at least two types of feature information in the biometric feature information and the non-biometric feature information.

[0030] For example, the biometric feature information may include: face feature information, body feature information, gait feature information, cloth feature information, age feature information, gender feature information, and the like. Optionally, to further reduce user
10 identity misidentification, the face feature information may include face feature information at multiple poses, for example, face feature information of a frontal face or a 45-degree side face. In practical applications, face feature information at multiple poses may be acquired by using a plurality of cameras. Likewise, the body feature information may also include body feature information at multiple poses, for example, body feature information from the front or a 45-
15 degree side. The gait feature information may include gait feature information in walking and running states.

[0031] The non-biometric feature information may include: user ID information, geographical location information, time information, Wi-Fi address information, and the like. The user ID information may further include information uniquely identifying the user identity,
20 for example, one or more of a user mobile phone number, a user identity number, and user mobile phone media access control (MAC) information. The time information may be information about the time at which the identity of the target user needs to be determined.

[0032] When the target multidimensional feature information includes biometric feature information of the target user, at step 102, an image of the target user may be acquired by using
25 an image capture device, for example, by using a camera disposed in the business district, and

then the acquired image is analyzed to obtain the biometric feature information of the target user, such as face feature information, body feature information, gait feature information, cloth feature information, age feature information, and gender feature information.

[0033] When the target multidimensional feature information includes non-biometric feature information of the target user, at step 102, ID information, geographical location information, and the like of the target user may be obtained in other manners. For example, the mobile phone MAC information of the target user may be detected by using Wi-Fi in the business district, and used as the ID information of the target user; the location information of the target user may be determined according to location information of the business district.

[0034] At step 104, comparing the target multidimensional feature information with multidimensional feature information of a plurality of designated users, respectively, to obtain a comparison result.

[0035] The designated user may be a pre-stored user whose identity is known, for example, a membership consumer pre-stored in a user identity surveillance system of a business district.

[0036] It should be understood that by comparing the acquired target multidimensional feature information of the target user with the multidimensional feature information of the plurality of designated users whose identities are known, similarity values of the target user with respect to the plurality of designated users may be respectively determined, and the determined similarity values are used as the comparison result, so as to determine the identity of the target user at step 106.

[0037] In an example, a weighted sum of similarity values corresponding to various feature information in the multidimensional feature information may be used as a similarity value of the target user with respect to a designated user. For example, it is assumed that four pieces of feature information A, B, C, and D of the target user are respectively compared with four

pieces of feature information A, B, C, and D of the designated user, and four similarity values a, b, c, and d may be correspondingly obtained. In this case, a weighted sum of the similarity values a, b, c, and d may be used as the similarity value of the target user with respect to the designated user. Weights corresponding to different feature information may be determined according to the
5 degree of importance of the feature information.

[0038] In practical applications, a first database storing a correspondence between user ID information of a designated user and multidimensional feature information of the designated user may be built in advance, so that during comparison, the target multidimensional feature information of the target user is compared with the multidimensional feature information of the
10 designated user in the first database built in advance, to obtain the comparison result.

[0039] The process of building the first database is briefly described below with reference to FIG. 2 to FIG. 4.

[0040] In an example, as shown in FIG. 2, it is assumed that the multidimensional feature information of the designated user includes biometric feature information, wherein the biometric
15 feature information specifically includes: face feature information, body feature information, gait feature information, cloth feature information, age feature information, and gender feature information. As can be seen from FIG. 3, the face feature information may include face feature information for different facial expressions and different poses. As can be seen from FIG. 4, the gait feature information may include gait feature information in walking and running states.

20 [0041] Specifically as shown in FIG. 2, for a designated user 1 (corresponding to user ID information represented by ID1), biometric feature information such as face 1, face 2, body 1, body 2, gait 1, gait 2, age, and gender may be acquired from a surveillance video captured by a camera, and stored in the first database. Likewise, for a designated user 2 (corresponding to user ID information represented by ID2), biometric feature information such as face 1, face 2,

body 1, body 2, gait 1, gait 2, age, and gender may be acquired from a surveillance video captured by a camera, and stored in the first database.

[0042] In addition, as shown in FIG. 2, because the biometric feature information of the user changes with time or seasons, the biometric feature information of the designated user 1 and the designated user 2 at different time points (time point 1 and time point 2 in FIG. 2) may be recorded and saved. Optionally, the first database may further record and save spatial dimensional features of the designated user, which specifically include feature information such as face, body, and gait of the designated user captured by different cameras at different angles.

[0043] Moreover, as shown in FIG. 2, a relationship between users may further be considered, and the relationship may also be stored in the first database.

[0044] In another example, the non-biometric feature information of the designated user and the ID information of the designated user may also be correspondingly stored in the first database.

[0045] At step 106, determining an identity of the target user based on the comparison result.

[0046] In the example used in step 104, if the comparison result is the similarity values of the target user with respect to the plurality of designated users, at step 106, an identity of a designated user in the plurality of designated users that has the largest similarity value, which is greater than a preset threshold, with respect to the target user may be determined as the identity of the target user; correspondingly, if the plurality of designated users do not include a designated user whose degree of similarity to the target user is greater than the preset threshold, the target user may be determined as a new user or a non-membership user. The preset threshold may be manually set. For example, the preset threshold may be 80%.

[0047] In the user identity determining method provided by the embodiments of this specification, because the identity of the target user is determined based on the multidimensional

feature information of the target user, not based on single feature information such as face or voice, user identity misidentification can be reduced, thereby improving the reliability of the result of user identity determination.

[0048] Because the target user generally needs to be compared with a large number of designated users (that is, the first database stores a large number of designated users), directly comparing the target multidimensional feature information of the target user with the multidimensional feature information of the plurality of designated users involves comparison of a large amount of data, leading to low comparison efficiency and accordingly low efficiency of determining the identity of the target user.

[0049] To increase the efficiency of determining the identity of the target user, optionally in another embodiment as shown in FIG. 5, step 104 may include the following substeps:

[0050] Substep 502, determining a plurality of index features of the target user based on the target multidimensional feature information.

[0051] It should be understood that the index feature is a feature uniquely identifying original feature information (for example, the feature information acquired in step 102) and having a data amount less than that of the original feature information.

[0052] The plurality of index features may include: a single index feature for the same type of feature information, a composite index feature for at least two types of feature information occurring at the same time, or a composite index feature for feature information of different users occurring at the same time.

[0053] The single index feature may be an index feature determined by one type of feature information. The composite index feature may be an index feature determined by two or more types of feature information.

[0054] For example, the single index feature for the same type of feature information may be: a geographical location index feature for the geographical location information, a face

index feature for face feature information at a particular angle, or the like. For example, the composite index feature for at least two types of feature information occurring at the same time may be: a composite index feature formed by an obvious body feature and an obvious cloth feature. For example, the composite index feature for feature information of different users
5 occurring at the same time may be: a composite index feature formed by faces of a couple shopping at the same time in a shopping mall.

[0055] The process of determining a plurality of index features of the target user is described below by using examples.

[0056] In a first example, assuming that the target multidimensional information of the
10 target user includes the geographical location information of the target user, substep 502 may include: determining a level 1 geographical location index feature of the target user based on the geographical location information of the target user; or, determining a level 1 geographical location index feature and a level 2 geographical location index feature of the target user based on the geographical location information of the target user; or, determining a level 1 geographical
15 location index feature, a level 2 geographical location index feature, and a level 3 geographical location index feature of the target user based on the geographical location information of the target user. The level 3 geographical location index feature is a subindex of the level 2 geographical location index, and the level 2 geographical location index is a subindex of the level 1 geographical location index.

[0057] For example, an area with a fixed flow of people, such as a shopping mall,
20 mansion, office building, or a community, may be determined as the level 1 geographical location index feature; a floor or store in the shopping mall, a floor or room in the mansion, or a unit or floor of the community is determined as the level 2 geographical location index feature; a location of a camera in the store in the shopping mall is determined as the level 3 geographical
25 location index feature.

[0058] In a second example, assuming that the target multidimensional feature information includes the biometric feature information of the target user, for example, face feature information, body feature information, and cloth feature information, substep 502 may include: performing a Principal Component Analysis (PCA) on the biometric feature information of the target user to obtain reduced-dimensionality features of the biometric feature information; bucketizing the reduced-dimensionality features in a plurality of buckets representing the biometric feature information; and determining IDs of the plurality of buckets as the plurality of index features of the target user. For example, a gait bucket index feature, a cloth bucket index feature, a gender bucket index feature, a face bucket index feature, an age bucket index feature, a body bucket index feature, and the like are obtained. A bucket ID may be a serial number such as 1, 2, 3, or 4.

[0059] In addition, assuming that the target multidimensional feature information includes the ID information and the time information of the target user, a time index feature (or referred to as timestamp) and an ID index feature may further be determined based on substep 502. Based on the target multidimensional feature information, a relation-face-character composite index feature, a face-body composite index feature, and the like are determined.

[0060] Substep 504, comparing the plurality of index features with a plurality of index features of the plurality of designated users, respectively, and determining a plurality of first users from the plurality of designated users.

[0061] Similar to the embodiment shown in FIG. 1, in practical applications, a second database storing a correspondence between user ID information of a designated user and a plurality of index features of the designated user may also be built in advance, so that during comparison, the plurality of index features of the target user may be compared with the plurality of index features of the designated user in the second database, to obtain a plurality of first users. The plurality of index features of the designated user is determined in a manner similar to that

in which the plurality of index features of the target user is determined, and the details will not be repeatedly described here.

[0062] For example, finally determined index features stored in the second database may include: a gait bucket index feature, a cloth bucket index feature, a gender bucket index feature, a face bucket index feature, an age bucket index feature, a body bucket index feature, a time index feature (or referred to as timestamp), an ID index feature, a relational-face-character composite index feature, a face-body composite index feature, and the like.

[0063] It should be noted that in the embodiments provided by this specification, the first database and the second database may be the same database or may be different databases.

[0064] As an example, in substep 504, the plurality of index features of the target user may be respectively compared with the index features of the plurality of designated users, to determine, from the plurality of designated users, users having one or more of the plurality of index features matching corresponding index features of the target user as the plurality of first users. It should be understood that the index features matching each other means that the index features are the same or similar. For example, assuming that the plurality of index features of the target user includes the geographical location index feature and the face index feature, a plurality of users whose geographical location index feature and face index feature are the same as the geographical location index feature and the face index feature of the target user may be found from the plurality of designated users as the plurality of first users.

[0065] As another example, in substep 504, the plurality of index features of the target user may be sorted according to a certain rule, for example, sorted at random or according to the degree of accuracy of user identity identification; afterward, a plurality of users matching the index feature ranked the first are determined from the plurality of designated users and then, from the plurality of users, a plurality of users matching the index feature ranked the second are determined, and so on. In this way, a plurality of users matching an index feature is determined

from a determining result obtained according to the matching of an index feature ranked before that index feature. Finally, a plurality of users matching the index feature ranked the last is used as the plurality of first users. The process of determining the plurality of first users in the manner shown in the example is described below with reference to FIG. 6 and FIG. 7.

5 [0066] As shown in FIG. 6, first, multidimensional feature information 601 including face 1, face 2, and face 3 of the target user is acquired. Specifically, three pieces of feature information “face 1, face 2, and face 3” of the target user may be acquired by using a plurality of cameras at different angles at a time at which the identity of the target user needs to be determined. Second, based on the acquired multidimensional feature information of the target
10 user, a plurality of index features of the target user are determined. Then, the plurality of index features of the target user are compared with corresponding index features (for example, composite index feature-relational face feature, or single index feature-face feature) of a plurality of designated users stored in a second database 602, to determine x first users. Finally, in a manner shown in substep 506 below, the three pieces of feature information “face 1, face 2, and
15 face 3” are used as particular feature information of the target user and compared with “particular feature information of the x first users” 603, and similarity values of the target user with respect to the x first users are determined.

 [0067] As shown in FIG. 7, first, multidimensional feature information 601 including face 1, face 2, and face 3 of the target user is acquired. Specifically, three pieces of feature
20 information “face 1, face 2, and face 3” of the target user may be acquired by using a plurality of cameras at different angles at a time at which the identity of the target user needs to be determined. Second, based on the acquired multidimensional feature information of the target user, a plurality of index features of the target user are determined. Then, the plurality of index features of the target user are compared with corresponding index features (for example,
25 composite index feature-relational face feature, or single index feature-face feature and Wi-Fi

address 604) of a plurality of designated users stored in a second database 602, to determine x first users. Finally, in a manner shown in substep 506 below, the three pieces of feature information “face 1, face 2, and face 3” are used as particular feature information of the target user and compared with “particular feature information of the x first users” 603, and similarity values of the target user with respect to the x first users are determined.

[0068] Substep 506, comparing particular feature information in the target multidimensional feature information with particular feature information of the plurality of first users, respectively, and determining similarity values of the target user with respect to the plurality of first users.

[0069] In substep 506, based on the plurality of first users determined in substep 504, particular feature information is further compared, and the similarity values of the target user with respect to the plurality of first users are respectively determined.

[0070] The particular feature information may be biometric feature information of the target user, for example, face feature information, body feature information, cloth feature information, or the like.

[0071] Substep 508, determining the similarity values of the target user with respect to the plurality of first users as the comparison result.

[0072] Based on this, step 106 may include: determining an identity of a user corresponding to the largest similarity value which is greater than a preset threshold in the comparison result as the identity of the target user. That is, in the plurality of first users, an identity of a user that has the largest similarity value, which is greater than the preset threshold, with respect to the target user is determined as the identity of the target user.

[0073] It should be understood that in the embodiment shown in FIG. 5, because index features having a small amount of data are compared first, a plurality of candidate users (that is, a plurality of first users) that may be similar to the target user are determined from the plurality

of designated users so as to reduce the range to be compared, and then in the small range, the identity of the target user is determined through comparison of the particular feature information, the efficiency of determining the identity of the target user can be improved.

[0074] To improve the efficiency of determining the identity of the target user, optionally
5 in still another embodiment as shown in FIG. 8, step 104 may include the following substeps:

[0075] Substep 802, determining a plurality of index features of the target user based on the target multidimensional feature information.

[0076] Substep 804, comparing the plurality of index features with a plurality of index features of the plurality of designated users, respectively, and determining a plurality of first
10 users from the plurality of designated users.

[0077] Specific implementations of substep 802 and substep 804 are correspondingly the same as those of substep 502 and substep 504 in the embodiment shown in FIG. 5, so the details will not be repeated herein.

[0078] Substep 806, selecting a plurality of second users from the plurality of first users
15 based on historical behavior data of the plurality of first users.

[0079] In an example, first the plurality of first users may be sorted based on historical behavior data of the plurality of first users, and then a plurality of second users whose rankings satisfy a preset condition is selected from the plurality of first users.

[0080] When the determining of an identity of a user entering a business district is used
20 as an example, the historical behavior data may be a quantity of historical consumptions, a quantity of historical entry times, or a historical consumption amount; correspondingly, when the plurality of first users is sorted, the first users may be sorted in a descending order of the quantity of historical consumptions, the quantity of historical entry times, or the historical consumption amount.

[0081] In another example, the plurality of first users may be sorted based on a preset sorting model, and then a plurality of second users whose rankings satisfy a preset condition is selected from the plurality of first users. The preset sorting model may be a sorting model in the prior art.

5 [0082] The step of selecting a plurality of second users whose rankings satisfy a preset condition from the plurality of first users may include: selecting the top-ranked several users from the plurality of first users as the plurality of second users.

[0083] Substep 808, comparing particular feature information in the target multidimensional feature information with particular feature information of the plurality of
10 second users, respectively, and determining similarity values of the target user with respect to the plurality of second users.

[0084] Substep 810, determining the similarity values of the target user with respect to the plurality of second users as the comparison result.

[0085] Specific implementations of substep 808 and substep 810 are correspondingly the
15 same as those of substep 506 and substep 508 in the embodiment shown in FIG. 5, so the details will not be repeated herein.

[0086] Based on the embodiment shown in FIG. 8, step 106 may include: determining an identity of a user corresponding to the largest similarity value which is greater than a preset threshold in the comparison result as the identity of the target user. That is, in the plurality of
20 second users, an identity of a user that has the largest similarity value, which is greater than the preset threshold, with respect to the target user is determined as the identity of the target user.

[0087] Compared with the embodiment shown in FIG. 5, in the embodiment shown in FIG. 8, not only index features having a small amount of data are compared first and a plurality of candidate users (that is, a plurality of first users) that may be similar to the target user are
25 determined from the plurality of designated users so as to reduce the range to be compared, but

also a plurality of second users is further selected from the plurality of first users to further reduce the range to be compared; then in the further reduced range, the identity of the target user is determined through comparison of the particular feature information. Therefore, the efficiency of determining the identity of the target user can be further improved.

5 [0088] The above is a description of a user identity determining method provided by this specification. An electronic device provided by this specification is described below.

 [0089] FIG. 9 is a schematic structural diagram of an electronic device according to an embodiment of this specification. Referring to FIG. 9, at the hardware level, the electronic device includes a processor, and optionally can further include an internal bus, a network interface, and
10 a memory. The memory may include an internal memory, such as a high-speed Random Access Memory (RAM), and may further include a non-volatile memory, such as at least one magnetic disk memory. The electronic device can further include other hardware required by services.

 [0090] The processor, the network interface, and the memory may be connected to each other through the internal bus. The internal bus may be an Industry Standard Architecture (ISA)
15 bus, a Peripheral Component Interconnect (PCI) bus, an Extended Industry Standard Architecture (EISA) bus, or the like. The bus may include an address bus, a data bus, a control bus, or the like. For ease of illustration, only one bidirectional arrow is used in FIG. 9 to represent the bus, but it does not represent that there is only one bus or only one type of buses.

 [0091] The memory is configured to store a program. Specifically, the program may
20 include program codes, and the program codes include computer operation instructions. The memory can include an internal memory and a non-volatile memory, and provide instructions and data for the processor.

 [0092] The processor can read a corresponding computer program from the non-volatile memory into the internal memory and then run the program, to form a user identity determining

apparatus at the logical level. The processor can execute the program stored in the memory, and is specifically configured to perform the following operations:

[0093] acquiring target multidimensional feature information of a target user, wherein the target multidimensional feature information includes at least two types of feature information in biometric feature information and/or non-biometric feature information;

[0094] comparing the target multidimensional feature information with multidimensional feature information of a plurality of designated users, respectively, to obtain a comparison result; and

[0095] determining an identity of the target user based on the comparison result.

[0096] The user identity determining method disclosed in the embodiment shown in FIG. 1 of this specification can be applied to the processor or implemented by the processor. The processor may be an integrated circuit chip having a signal processing capability. In an implementation process, the steps of the foregoing method can be completed by hardware integrated logic circuits in the processor or software-form instructions. The processor may be a general-purpose processor including a Central Processing Unit (CPU), a Network Processor (NP), or the like, and may also be a Digital Signal Processor (DSP), an Application Specific Integrated Circuit (ASIC), a Field-Programmable Gate Array (FPGA) or another programmable logic device, a discrete gate, a transistor logic device, or a discrete hardware component. The processor can implement or execute various methods, steps and logic block diagrams disclosed in one or more embodiments of this specification. The general-purpose processor may be a micro processor, or any regular processor or the like. Steps of the method disclosed in combination with one or more embodiments of this specification can be directly embodied as being executed by a hardware decoding processor or executed by a combination of hardware in the decoding processor and software modules. The software modules can be located in a mature storage medium in the art, such as a random access memory, a flash memory, a read-only memory, a

programmable read-only memory, an electrically erasable programmable read-only memory, or a register. The storage medium is located in the memory. The processor reads information in the memory, and completes the steps of the method in combination with the hardware of the processor.

5 [0097] The electronic device may further perform the user identity determining method of FIG. 1, and the details will not be repeated herein.

 [0098] In addition to the software implementation, the electronic device of this specification does not exclude other implementations, such as a logic device, or a combination of hardware and software. In other words, entities executing the following processing procedure
10 are not limited to logic units, but may also be hardware or logic devices.

 [0099] The embodiments of this specification further provide a computer readable storage medium. The computer readable storage medium stores one or more programs. The one or more programs include an instruction. The instruction, when executed by a portable electronic device including a plurality of applications, causes the portable electronic device to perform the
15 method of the embodiment shown in FIG. 1 to specifically perform the following operations:

 [0100] acquiring target multidimensional feature information of a target user, wherein the target multidimensional feature information includes at least two types of feature information in biometric feature information and/or non-biometric feature information;

 [0101] comparing the target multidimensional feature information with
20 multidimensional feature information of a plurality of designated users, respectively, to obtain a comparison result; and

 [0102] determining an identity of the target user based on the comparison result.

 [0103] A user identity determining apparatus provided by this specification is described below.

[0104] FIG. 10 is a schematic structural diagram of a user identity determining apparatus 1000 according to this specification. Referring to FIG. 10, in a software implementation, the user identity determining apparatus 1000 may include an acquiring module 1001, a comparing module 1002, and a determining module 1003.

5 [0105] The acquiring module 1001 is configured to acquire target multidimensional feature information of a target user, wherein the target multidimensional feature information includes at least two types of feature information in biometric feature information and/or non-biometric feature information.

10 [0106] The biometric feature information includes: face feature information, body feature information, gait feature information, cloth feature information, age feature information, and gender feature information; and the non-biometric feature information includes user ID information, geographical location information, and time information, wherein the user ID information includes one or more of a user mobile phone number, a user identity number, and user mobile phone MAC information.

15 [0107] The comparing module 1002 is configured to compare the target multidimensional feature information with multidimensional feature information of a plurality of designated users, respectively, to obtain a comparison result.

20 [0108] As an example, the comparing module 1002 may be specifically configured to: compare the target multidimensional feature information with the multidimensional feature information of the plurality of designated users, respectively, to obtain similarity values of the target user with respect to the plurality of designated users; and determine the similarity values of the target user with respect to the plurality of designated users as the comparison result.

 [0109] The determining module 1003 is configured to determine an identity of the target user based on the comparison result.

[0110] In the user identity determining apparatus provided by the embodiments of this specification, because the identity of the target user is determined based on the multidimensional feature information of the target user, not based on single feature information such as face or voice, user identity misidentification can be reduced, thereby improving the reliability of the result of user identity determination.

[0111] Optionally, in another embodiment as shown in FIG. 11, the comparing module 1002 may specifically include: a first index determining submodule 1101, a first user determining submodule 1102, a first similarity value determining submodule 1103, and a first result determining submodule 1104.

[0112] The first index determining submodule 1101 is configured to determine a plurality of index features of the target user based on the target multidimensional feature information.

[0113] The plurality of index features include: a single index feature for the same type of feature information, a composite index feature for at least two types of feature information occurring at the same time, or a composite index feature for feature information of different users occurring at the same time.

[0114] As an example, if the target multidimensional feature information includes geographical location information of the target user, the determining a plurality of index features of the target user based on the target multidimensional feature information includes: determining a level 1 geographical location index feature of the target user based on the geographical location information of the target user; or, determining a level 1 geographical location index feature and a level 2 geographical location index feature of the target user based on the geographical location information of the target user; or, determining a level 1 geographical location index feature, a level 2 geographical location index feature, and a level 3 geographical location index feature of the target user based on the geographical location information of the target user. The level 3

geographical location index feature is a subindex of the level 2 geographical location index, and the level 2 geographical location index is a subindex of the level 1 geographical location index.

[0115] As another example, if the target multidimensional feature information includes biometric feature information of the target user, the determining a plurality of index features of the target user based on the target multidimensional feature information includes: performing a principal component analysis (PCA) on the biometric feature information of the target user to obtain reduced-dimensionality features of the biometric feature information; bucketizing the reduced-dimensionality features in a plurality of buckets representing the biometric feature information; and determining IDs of the plurality of buckets as the plurality of index features of the target user.

[0116] The first user determining submodule 1102 is configured to compare the plurality of index features with a plurality of index features of the plurality of designated users, respectively, and determine a plurality of first users from the plurality of designated users.

[0117] As an example, the first user determining submodule 1102 may compare the plurality of index features of the target user with the index features of the plurality of designated users, respectively, to determine, from the plurality of designated users, users having one or more of the plurality of index features matching corresponding index features of the target user as the plurality of first users. It should be understood that the index features matching each other means that the index features are the same or similar.

[0118] As another example, the first user determining submodule 1102 may first sort the plurality of index features of the target user according to a certain rule, for example, at random or according to the degree of accuracy of user identity identification; afterward, determine a plurality of users matching the index feature ranked the first from the plurality of designated users, and then determine a plurality of users matching the index feature ranked the second from the plurality of users, and so on. In this way, a plurality of users matching one index feature is

determined from a determining result obtained according to the matching of an index feature ranked before the index feature. Finally, a plurality of users matching the index feature ranked the last is used as the plurality of first users.

[0119] The first similarity value determining submodule 1103 is configured to compare
5 particular feature information in the target multidimensional feature information with particular feature information of the plurality of first users, respectively, and determine similarity values of the target user with respect to the plurality of first users.

[0120] As an example, based on the plurality of first users determined by the first user
determining submodule 1102, the first similarity value determining submodule 1103 further
10 compares particular feature information and determines the similarity values of the target user with respect to the plurality of first users, respectively.

[0121] The particular feature information may be biometric feature information of the target user, for example, face feature information, body feature information, cloth feature information, or the like.

[0122] The first result determining submodule 1104 is configured to determine the
15 similarity values of the target user with respect to the plurality of first users as the comparison result.

[0123] Based on this, the determining module 1003 may be specifically configured to determine an identity of a user corresponding to the largest similarity value which is greater than
20 a preset threshold in the comparison result as the identity of the target user. That is, in the plurality of first users, an identity of a user that has the largest similarity value, which is greater than the preset threshold, with respect to the target user is determined as the identity of the target user.

[0124] It should be understood that in the embodiment shown in FIG. 11, because index features having a small amount of data are compared first, a plurality of candidate users (that is,
25 a plurality of first users) that may be similar to the target user are determined from the plurality

of designated users so as to reduce the range to be compared, and then in the small range, the identity of the target user is determined through comparison of the particular feature information, the efficiency of determining the identity of the target user can be improved.

[0125] Optionally in still another embodiment as shown in FIG. 12, the comparing
5 module 1002 may specifically include: a second index determining submodule 1201, a second user determining submodule 1202, a third user determining submodule 1203, a second similarity value determining submodule 1204, and a second result determining submodule 1205.

[0126] The second index determining submodule 1201 is configured to determine a
10 plurality of index features of the target user based on the target multidimensional feature information.

[0127] The second user determining submodule 1202 is configured to compare the plurality of index features with a plurality of index features of the plurality of designated users, respectively, and determine a plurality of first users from the plurality of designated users.

[0128] Specific implementations of the second index determining submodule 1201 and
15 the second user determining submodule 1202 are correspondingly the same as those of the first index determining submodule 1101 and the first user determining submodule 1102 in the embodiment shown in FIG. 11, so the details will not be repeated herein.

[0129] The third user determining submodule 1203 is configured to select a plurality of
20 second users from the plurality of first users based on historical behavior data of the plurality of first users.

[0130] In an example, the third user determining submodule 1203 may first sort the plurality of first users based on historical behavior data of the plurality of first users, and then a plurality of second users whose rankings satisfy a preset condition are selected from the plurality of first users.

[0131] In another example, the third user determining submodule 1203 may sort the plurality of first users based on a preset sorting model, and then select a plurality of second users whose rankings satisfy a preset condition from the plurality of first users. The preset sorting model may be a sorting model in the prior art.

5 [0132] The third user determining submodule 1203 selecting a plurality of second users whose rankings satisfy a preset condition from the plurality of first users may include: selecting the top-ranked several users from the plurality of first users as the plurality of second users.

[0133] The second similarity value determining submodule 1204 is configured to compare particular feature information in the target multidimensional feature information with
10 particular feature information of the plurality of second users, respectively, and determine similarity values of the target user with respect to the plurality of second users.

[0134] The second result determining submodule 1205 is configured to determine the similarity values of the target user with respect to the plurality of second users as the comparison result.

15 [0135] Specific implementations of the second similarity value determining submodule 1204 and the second result determining submodule 1205 are correspondingly similar to those of the first similarity value determining submodule 1103 and the first result determining submodule 1104 in the embodiment shown in FIG. 11, so the details will not be repeated herein.

[0136] Based on the embodiment shown in FIG. 12, the determining module 1003 may
20 be specifically configured to determine an identity of a user corresponding to the largest similarity value which is greater than a preset threshold in the comparison result as the identity of the target user. That is, in the plurality of second users, an identity of a user that has the largest similarity value, which is greater than the preset threshold, with respect to the target user is determined as the identity of the target user.

[0137] Compared with the embodiment shown in FIG. 11, in the embodiment shown in FIG. 12, not only index features having a small amount of data are compared first and a plurality of candidate users (that is, a plurality of first users) that may be similar to the target user are determined from the plurality of designated users so as to reduce the range to be compared, but also a plurality of second users is further selected from the plurality of first users to further reduce the range to be compared; then in the further reduced range, the identity of the target user is determined through comparison of the particular feature information. Therefore, the efficiency of determining the identity of the target user can be further improved.

[0138] It should be noted that the user identity determining apparatus 1000 can implement the method of the method embodiment of FIG. 1, the user identity determining method of the embodiment shown in FIG. 1 can be referred to for details, and the details will not be repeated herein.

[0139] The above descriptions are merely preferred embodiments of this specification, and are not intended to limit the protection scope of this specification. Any modifications, equivalent replacements or improvements made without departing from the spirit and principle of one or more embodiments of this specification shall be encompassed in the protection scope of one or more embodiments of this specification.

[0140] The system, apparatus, modules or units illustrated in the foregoing embodiments specifically can be implemented by a computer chip or an entity, or implemented by a product having a particular function. A typical implementation device is a computer. Specifically, the computer for example can be a personal computer, a laptop computer, a cellular phone, a camera phone, a smart phone, a personal digital assistant, a media player, a navigation device, an e-mail device, a game console, a tablet computer, a wearable device, or a combination of any of these devices.

[0141] A computer readable medium includes non-volatile and volatile media as well as movable and non-movable media, and can implement information storage by means of any method or technology. Information may be a computer readable instruction, a data structure, and a module of a program or other data. For example, a storage medium of a computer includes, but is not limited to, a phase change memory (PRAM), a static random access memory (SRAM), a dynamic random access memory (DRAM), other types of random access memories (RAMs), a read-only memory (ROM), an electrically erasable programmable read-only memory (EEPROM), a flash memory or other memory technologies, a compact disk read-only memory (CD-ROM), a digital versatile disc (DVD) or other optical storages, a cassette tape, a magnetic tape/magnetic disk storage or other magnetic storage devices, or any other non-transmission media, and can be used to store information accessible to the computing device. According to the definition herein, the computer readable medium does not include transitory media, such as modulated data signals and carriers.

[0142] It should be further noted that the terms “include,” “comprise” or any other variations thereof are intended to cover non-exclusive inclusion, so that a process, method, article or device including a series of elements not only includes the elements, but also includes other elements not expressly listed, or further includes inherent elements of the process, method, article or device. In the absence of more limitations, an element defined by “including a/an...” does not exclude that the process, method, article or device including the element further has other identical elements.

[0143] The embodiments in the specification are described progressively. Identical or similar parts of the embodiments may be obtained with reference to each other. Each embodiment focuses on description of a part different from other embodiments. Especially, the system embodiment is basically similar to the method embodiment, so it is described simply.

For related parts, refer to the descriptions of the parts in the method embodiment.

CLAIMS

1. A user identity determining method, comprising:

acquiring target multidimensional feature information of a target user, wherein the target multidimensional feature information comprises at least two types of feature information in
5 biometric feature information and/or non-biometric feature information;

comparing the target multidimensional feature information with multidimensional feature information of a plurality of designated users, respectively, to obtain a comparison result; and
determining an identity of the target user based on the comparison result.

10 2. The method according to claim 1, wherein the comparing the target multidimensional feature information with multidimensional feature information of a plurality of designated users, respectively, to obtain a comparison result comprises:

comparing the target multidimensional feature information with the multidimensional feature information of the plurality of designated users, respectively, to obtain similarity values
15 of the target user with respect to the plurality of designated users; and

determining the similarity values of the target user with respect to the plurality of designated users as the comparison result.

3. The method according to claim 1, wherein the comparing the target multidimensional
20 feature information with multidimensional feature information of a plurality of designated users, respectively, to obtain a comparison result comprises:

determining a plurality of index features of the target user based on the target multidimensional feature information;

comparing the plurality of index features with a plurality of index features of the plurality
25 of designated users, respectively, and determining a plurality of first users from the plurality of

designated users;

comparing particular feature information in the target multidimensional feature information with particular feature information of the plurality of first users, respectively, and determining similarity values of the target user with respect to the plurality of first users; and

5 determining the similarity values of the target user with respect to the plurality of first users as the comparison result.

4. The method according to claim 1, wherein the comparing the target multidimensional feature information with multidimensional feature information of a plurality of designated users, respectively, to obtain a comparison result comprises:

determining a plurality of index features of the target user based on the target multidimensional feature information;

15 comparing the plurality of index features with a plurality of index features of the plurality of designated users, respectively, and determining a plurality of first users from the plurality of designated users;

selecting a plurality of second users from the plurality of first users based on historical behavior data of the plurality of first users;

20 comparing particular feature information in the target multidimensional feature information with particular feature information of the plurality of second users, respectively, and determining similarity values of the target user with respect to the plurality of second users; and

determining the similarity values of the target user with respect to the plurality of second users as the comparison result.

5. The method according to claim 3 or 4, wherein the plurality of index features comprise:
25 a single index feature for the same type of feature information, a composite index feature for at

least two types of feature information occurring at the same time, or a composite index feature for feature information of different users occurring at the same time.

6. The method according to claim 3 or 4, wherein

5 the biometric feature information comprises: face feature information, body feature information, gait feature information, cloth feature information, age feature information, and gender feature information; and

the non-biometric feature information comprises user identification (ID) information, geographical location information, and time information, wherein the user ID information
10 comprises one or more of a user mobile phone number, a user identity number, and user mobile phone media access control (MAC) information.

7. The method according to claim 6, wherein if the target multidimensional feature information comprises geographical location information of the target user, the determining a
15 plurality of index features of the target user based on the target multidimensional feature information comprises:

determining a level 1 geographical location index feature of the target user based on the geographical location information of the target user; or

determining the level 1 geographical location index feature and a level 2 geographical
20 location index feature of the target user based on the geographical location information of the target user; or

determining the level 1 geographical location index feature, the level 2 geographical location index feature, and a level 3 geographical location index feature of the target user based on the geographical location information of the target user;

25 wherein the level 3 geographical location index feature is a subindex of the level 2

geographical location index, and the level 2 geographical location index is a subindex of the level 1 geographical location index.

8. The method according to claim 6, wherein if the target multidimensional feature
5 information comprises biometric feature information of the target user, the determining a plurality of index features of the target user based on the target multidimensional feature information comprises:

performing a principal component analysis (PCA) on the biometric feature information of the target user to obtain reduced-dimensionality features of the biometric feature information;

10 bucketizing the reduced-dimensionality features in a plurality of buckets representing the biometric feature information; and

determining IDs of the plurality of buckets as the plurality of index features of the target user.

15 9. The method according to any one of claims 2 to 4, wherein the determining an identity of the target user based on the comparison result comprises:

determining an identity of a user corresponding to the largest similarity value which is greater than a preset threshold in the comparison result as the identity of the target user.

20 10. A user identity determining apparatus, comprising:

an acquiring module, configured to acquire target multidimensional feature information of a target user, wherein the target multidimensional feature information comprises at least two types of feature information in biometric feature information and/or non-biometric feature information;

25 a comparing module, configured to compare the target multidimensional feature

information with multidimensional feature information of a plurality of designated users, respectively, to obtain a comparison result; and

a determining module, configured to determine an identity of the target user based on the comparison result.

5

11. An electronic device, comprising:

a processor; and

a memory configured to store computer executable instructions, wherein execution of the executable instructions causes the processor to perform the following operations:

10 acquiring target multidimensional feature information of a target user, wherein the target multidimensional feature information comprises at least two types of feature information in biometric feature information and/or non-biometric feature information;

 comparing the target multidimensional feature information with multidimensional feature information of a plurality of designated users, respectively, to obtain a comparison result; and

15 determining an identity of the target user based on the comparison result.

12. A computer-readable storage medium, storing one or more programs, wherein the one or more programs, when executed by an electronic device comprising a plurality of applications, cause the electronic device to perform the following operations:

20 acquiring target multidimensional feature information of a target user, wherein the target multidimensional feature information comprises at least two types of feature information in biometric feature information and/or non-biometric feature information;

25

comparing the target multidimensional feature information with multidimensional feature information of a plurality of designated users, respectively, to obtain a comparison result; and determining an identity of the target user based on the comparison result.

FIGURES

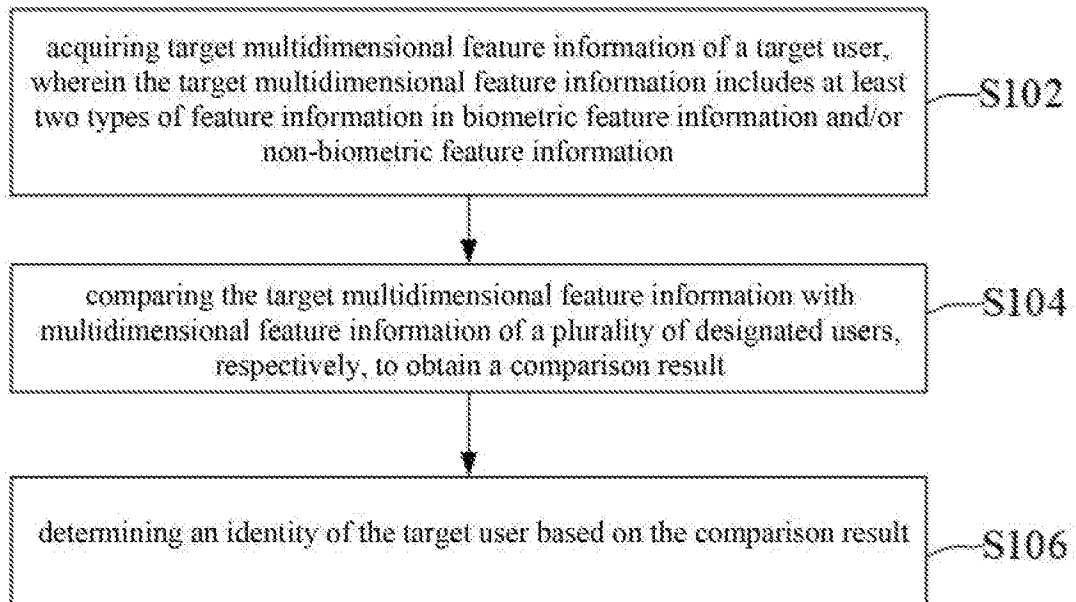


FIG. 1

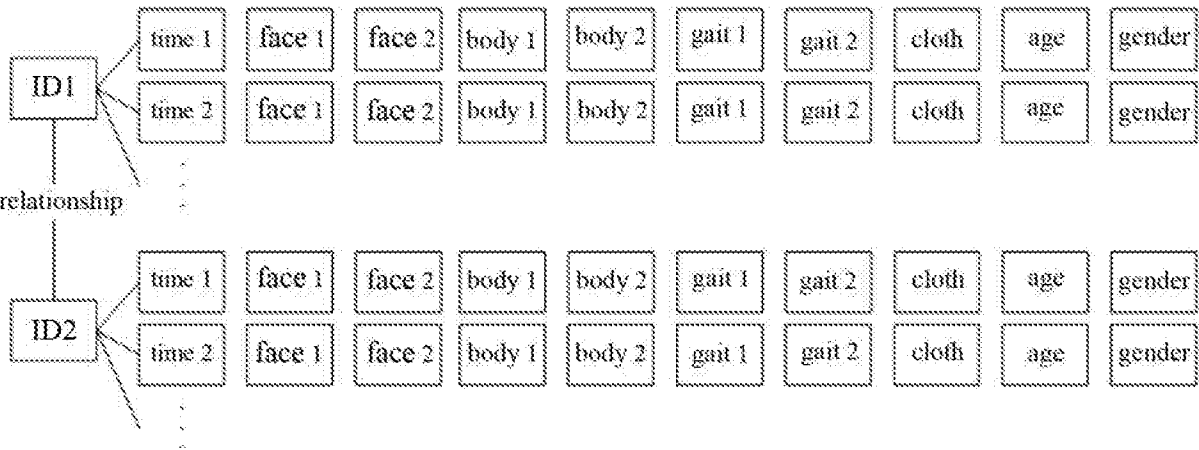


FIG. 2

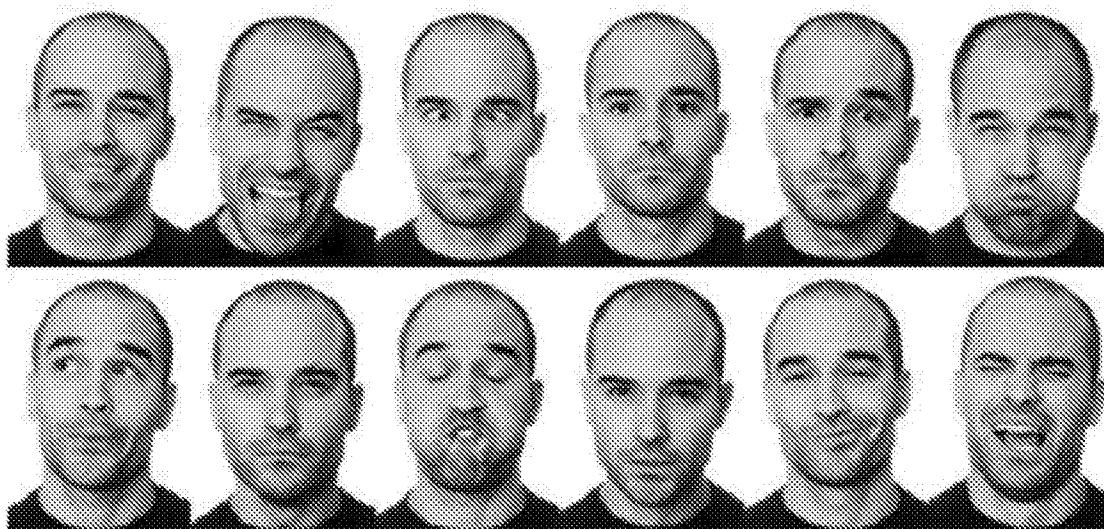
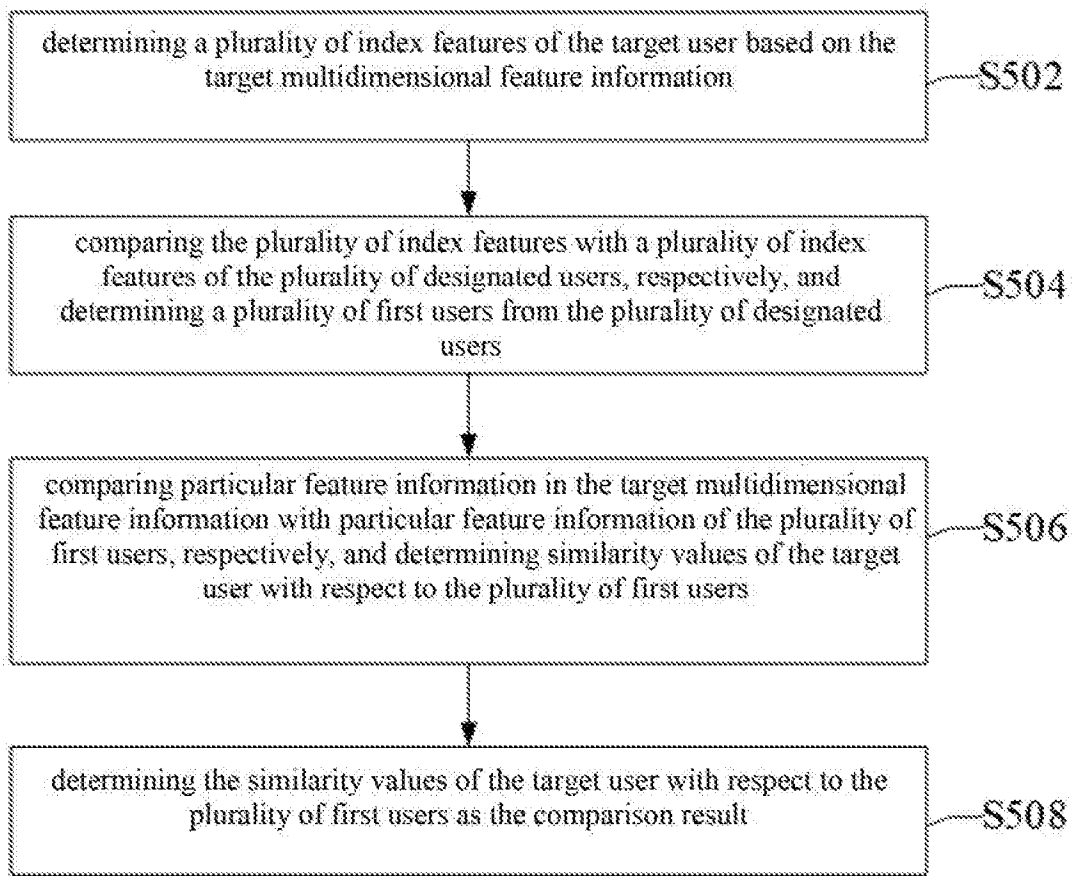
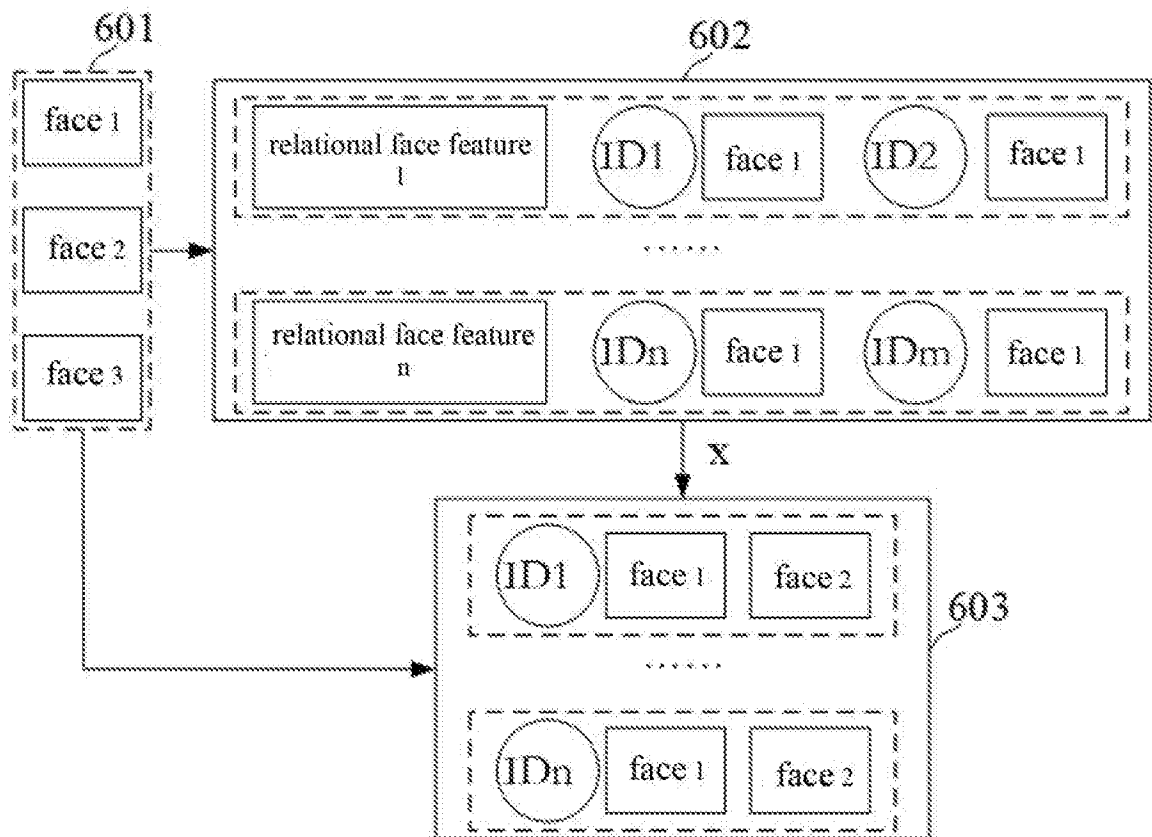


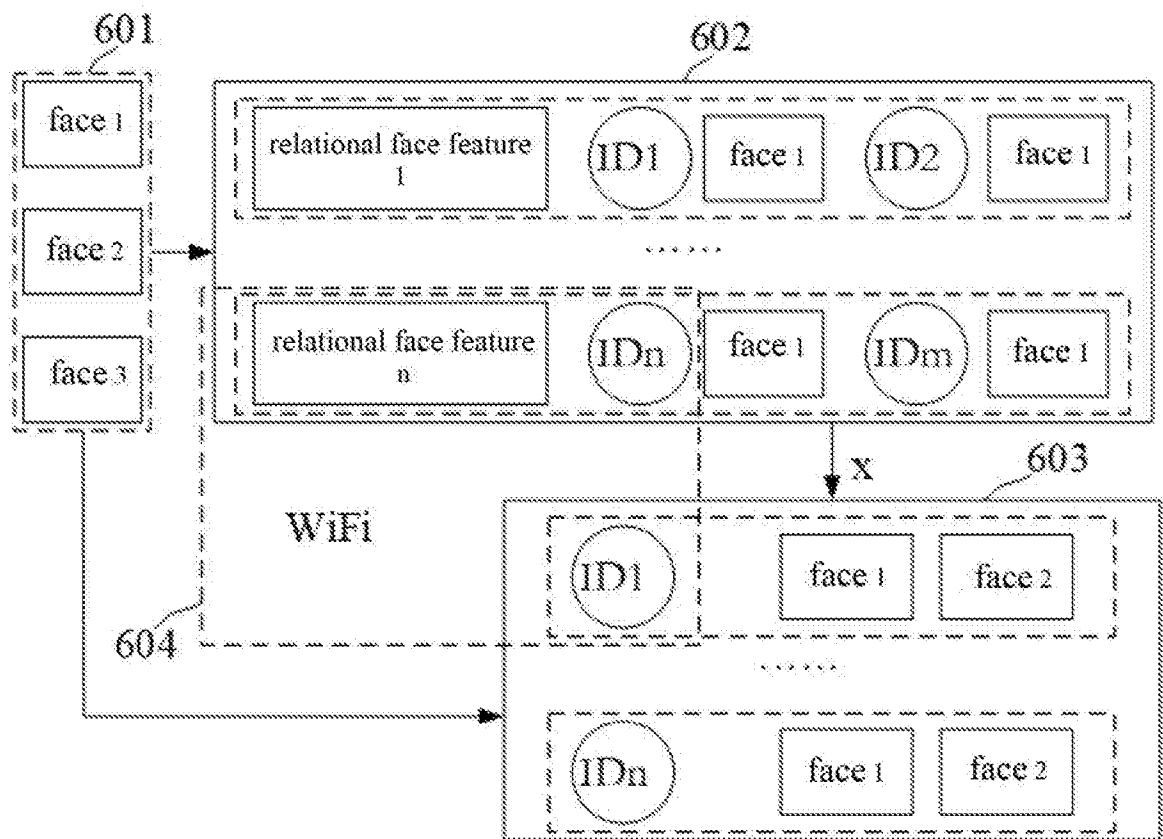
FIG. 3

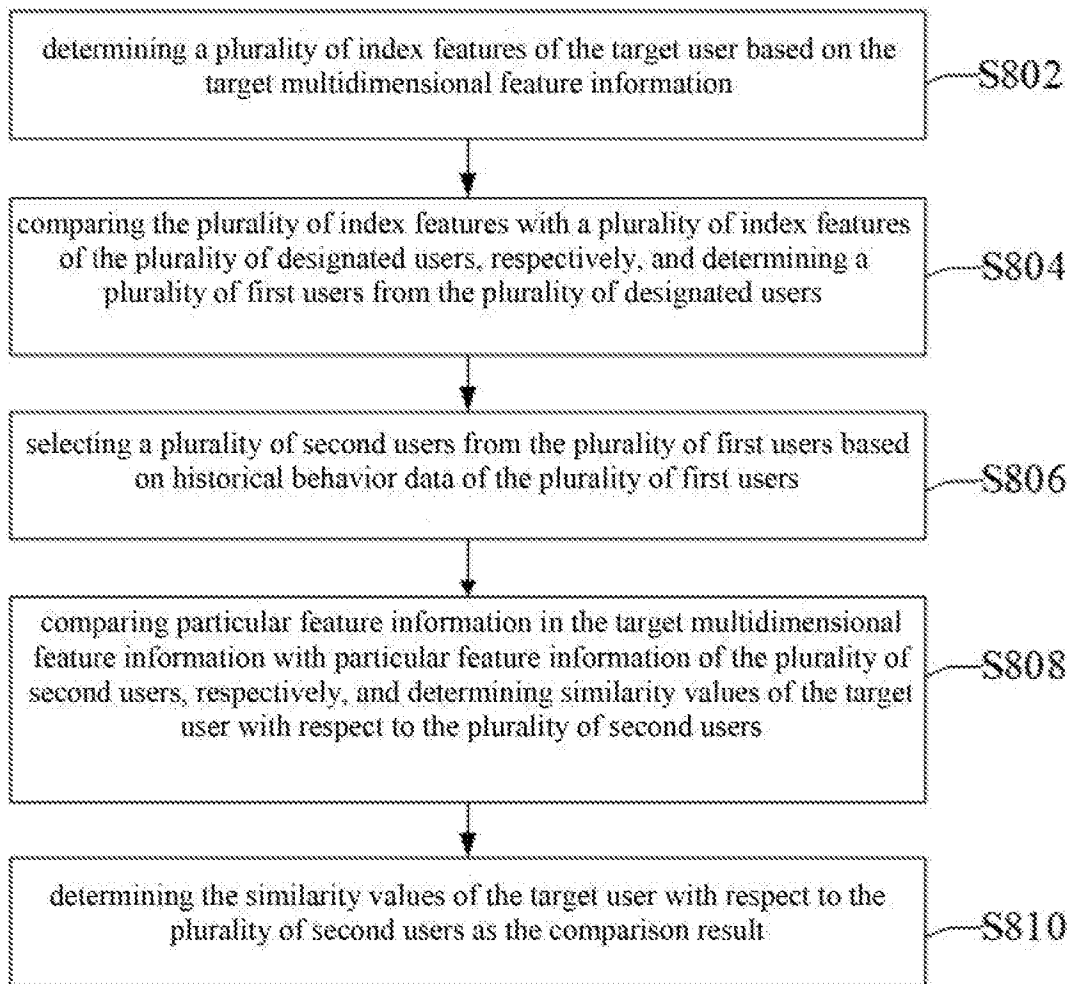


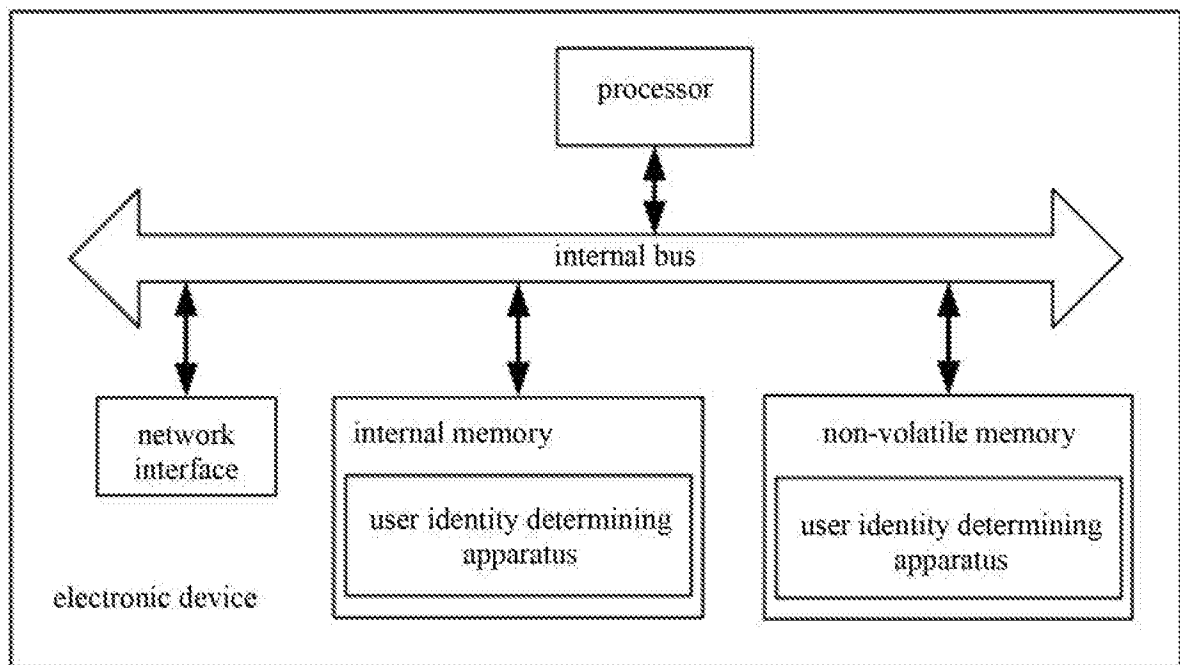
FIG. 4

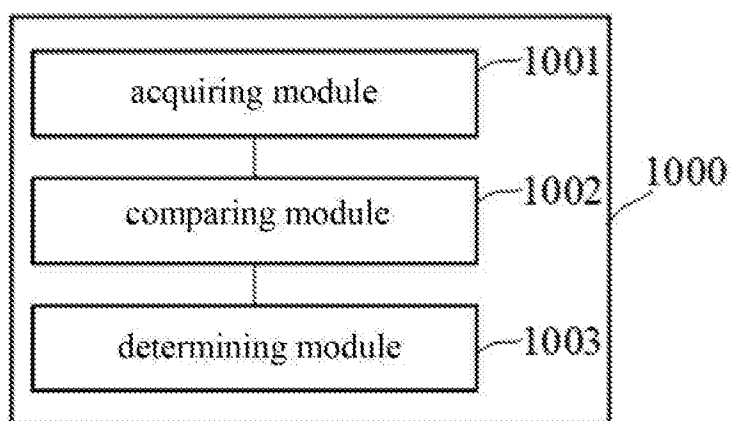
**FIG. 5**

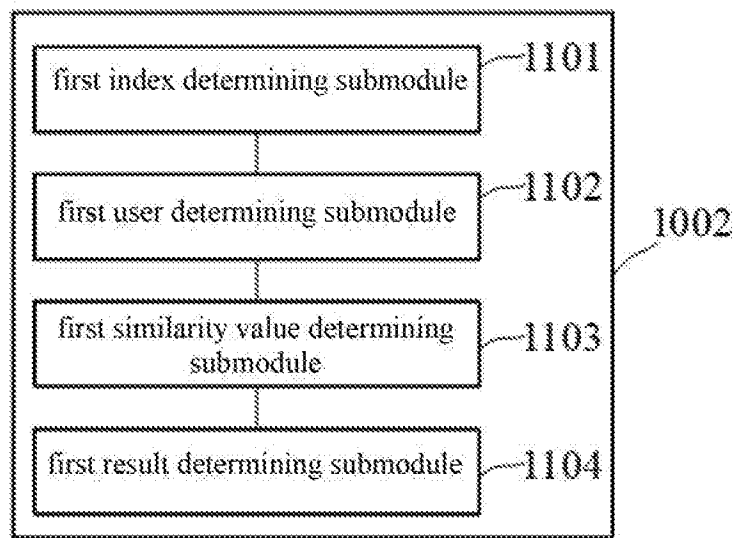
**FIG. 6**

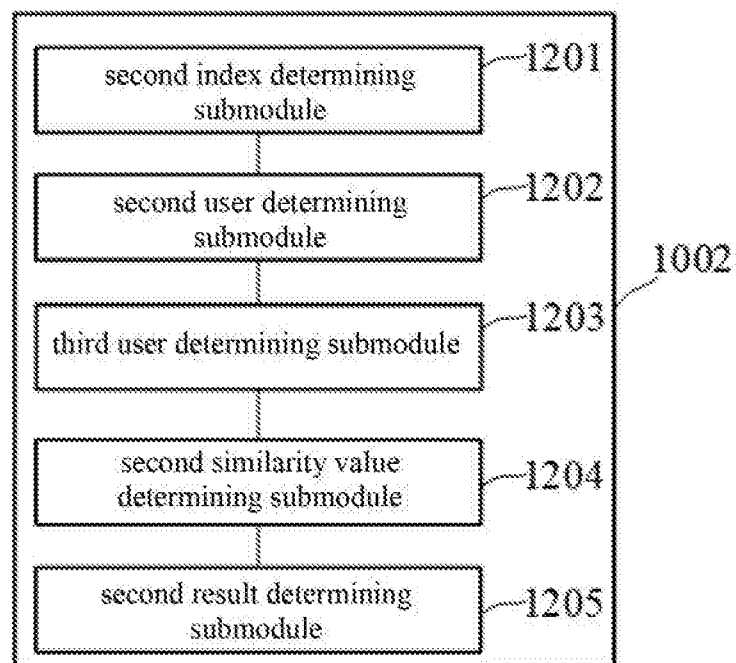
**FIG. 7**

**FIG. 8**

**FIG. 9**

**FIG. 10**

**FIG. 11**

**FIG. 12**

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2019/048981

A. CLASSIFICATION OF SUBJECT MATTER

INV. G06F21/32 G06K9/00 G06K9/62
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G06F G06K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2015/278977 A1 (ROLLER CHRIS [US]) 1 October 2015 (2015-10-01) abstract; figures 2,4,9 paragraph [0018] paragraph [0027] - paragraph [0035] paragraph [0042] paragraph [0051]	1-12
X	US 2014/314283 A1 (HARDING DAVID [US]) 23 October 2014 (2014-10-23) abstract; figures 1-9 paragraph [0008] - paragraph [0011] paragraph [0018] paragraph [0034] - paragraph [0036] paragraph [0044] - paragraph [0065] paragraph [0071] - paragraph [0076]	1-12



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search

21 November 2019

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Authorized officer

Stevanovic, Natasa

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2019/048981

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2015278977	A1	01-10-2015	NONE
US 2014314283	A1	23-10-2014	NONE