OBJECT RECOGNITION SYSTEM AND METHOD

TECHNICAL FIELD

[0001] The present disclosure relates to the field of recognition, and more particularly to a system and a method for remotely recognizing an object's identity.

BACKGROUND

[0002] Public security is related to the stability of the country and society, and directly affects the safety of people's lives and property. In order to ensure public security, long-distance, fast, non-perception, non-cooperative personnel information collection and identity recognition technology has gradually become an inevitable trend. Traditional personnel information collection and identity recognition are close, cooperative and inefficient, especially in the peak period, which will cause serious congestion and affect people's travel.

SUMMARY

[0003] One of the main purposes of the present disclosure is to provide an efficient, accurate, non-perceptual, and non-cooperative personnel recognition technology, so as to provide personnel recognition technology for public transportation, major event activities, key areas and densely populated areas without affecting the traffic efficiency and accurately recognizing the identity of personnel.

[0004] In a first aspect of the present disclosure, in order to effectively and accurately recognize the identity information of pedestrians in the densely populated area, there is provided an object recognition system, comprising: an information collection module configured to acquire information about the object to be inspected; a first video acquisition module configured to acquire an image of the object to be inspected, and acquire multiple types of features of the

object to be inspected by using a plurality of recognition methods based on the image of the object to be inspected; a storage module configured to store the information about the object to be inspected in association with the multiple types of features of the object to be inspected; a second video acquisition module configured to track and capture a suspect object to acquire an image of the suspect object, and acquire multiple types of features of the suspect object by using the plurality of recognition methods based on the image of the suspect object; and a recognition module configured to recognize identity information of the suspect object based on the multiple types of features of the suspect object and the multiple types of features of the object to be inspected which are stored in association with the information about the object to be inspected in the storage module.

[0005] According to the first aspect of the present disclosure, the information collection module is configured to recognize a mobile phone number of the object to be inspected based on a WiFi probe method.

[0006] According to the first aspect of the present disclosure, each of the first video acquisition module and the second video acquisition module comprises: an image capture module configured to acquire the image of the object to be inspected; and an image extraction module configured to extract a feature image of the object to be inspected from the image of the object to be inspected.

[0007] According to the first aspect of the present disclosure, each of the first video acquisition module and the second video acquisition module can further comprises: a normalization module configured to normalize the feature image extracted by the image capture module.

[0008] According to the first aspect of the present disclosure, each of the first video acquisition module and the second video acquisition module can further comprises: a serialization module configured to extract features based on the normalized feature image acquired by the normalization module.

[0009] According to the first aspect of the present disclosure, the recognition module

comprises: a pairing module configured to pair the features of the suspect object acquired by the second video acquisition module with the features of the object to be inspected which are stored in the storage module.

[0010] According to the first aspect of the present disclosure, the recognition module can further comprises: a first recognition module configured to calculate the similarity between paired features, and determining M features of the object to be inspected with similarities higher than any other features as the features of the suspect object.

[0011] According to the first aspect of the present disclosure, the recognition module can further comprises: a WiFi probe module configured to detect the mobile phone number of the suspect object.

[0012] According to the first aspect of the present disclosure, the recognition module can further comprises: a second recognition module configured to recognize the features of the suspect object from M features with similarities higher than any other features based on the mobile phone number of the suspect object.

[0013] In the second aspect of the present disclosure, there is provided an object recognition method, comprising: collecting information about an object to be inspected; acquiring an image of the object to be inspected, and acquiring multiple types of features of the object to be inspected by using a plurality of recognition methods based on the image of the object to be inspected; storing the information about the object to be inspected in association with the multiple types of features of the object to be inspected; tracking and capturing a suspect object to acquire an image of the suspect object, and acquiring multiple types of features of the suspect object by using the plurality of recognition methods based on the image of the suspect object; and recognizing identity information of the suspect object based on the multiple types of features of the suspect object and the multiple types of features of the object to be inspected which are stored in association with the information about the object to be inspected.

[0014] According to the second aspect of the present disclosure, the collecting information about the object to be inspected comprises: recognizing a mobile phone number of

the object to be inspected based on a WiFi probe method.

[0015] According to a second aspect of the present disclosure, the acquiring an image of the object to be inspected and acquiring multiple types of features of the object to be inspected by using a plurality of recognition methods based on the image of the object to be inspected comprises: acquiring the image of the object to be inspected; and extracting a feature image of the object to be inspected from the image of the object to be inspected.

[0016] According to the second aspect of the present disclosure, the acquiring an image of the object to be inspected and acquiring multiple types of features of the object to be inspected by using a plurality of recognition methods based on the image of the object to be inspected can further comprises: normalizing the feature image of the object to be inspected.

[0017] According to the second aspect of the present disclosure, the acquiring an image of the object to be inspected and acquiring multiple types of features of the object to be inspected by using a plurality of recognition methods based on the image of the object to be inspected can further comprises: extracting features from the normalized feature image.

[0018] According to the second aspect of the present disclosure, the recognizing identity information of the suspect object based on the acquired multiple types of features of the suspect object and the multiple types of features of the object to be inspected which are stored in association with the information about the object to be inspected comprises: pairing the features of the suspect object with the stored features of the object to be inspected.

[0019] According to the second aspect of the present disclosure, the recognizing identity information of the suspect object based on the acquired multiple types of features of the suspect object and the multiple types of features of the object to be inspected which are stored in association with the information about the object to be inspected can further comprises: calculating a similarity between paired features, and determining M features of the object to be inspected with similarities higher than any other features as the features of the suspect object.

[0020] According to the second aspect of the present disclosure, the recognizing identity information of the suspect object based on the acquired multiple types of features of the suspect

object and the multiple types of features of the object to be inspected which are stored in association with the information about the object to be inspected can further comprises: recognizing a mobile phone number of the suspect object based on a WiFi probe method.

[0021] According to the second aspect of the present disclosure, the recognizing identity information of the suspect object based on the acquired multiple types of features of the suspect object and the multiple types of features of the object to be inspected which are stored in association with the information about the object to be inspected can further comprises: recognizing the features of the suspect object from M features with similarities higher than any other features based on the mobile phone number of the suspect object.

[0022] In a third aspect of the present disclosure, there is provided a non-transitory computer readable medium having recorded thereon program code instructions capable of implementing the method according to any one of the second aspect.

[0023] According to a fourth aspect of the present disclosure, there is provided an electronic device, comprising: one or more processors; and a storage device for storing one or more programs, wherein the one or more programs, when executed by the one or more processors, cause the one or more processors to perform the method according to any one of the second aspect.

[0024] The present disclosure integrates face recognition, gait recognition, pedestrian re-recognition, WiFi probe recognition, iris recognition and other technologies for personnel recognition in complex scenes, which may better deal with personnel information recognition in complex scenes and acquire personnel information in a real time.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] Fig. 1 illustrates a block diagram of an identity recognition system according to an example embodiment.

[0026] Fig. 2 illustrates a detailed block diagram of an information collection module according to an example embodiment.

[0027] Fig. 3 illustrates a detailed block diagram of a first video acquisition module according to an example embodiment.

[0028] Fig. 4 illustrates a detailed block diagram of an recognition module according to an example embodiment.

[0029] Fig. 5 illustrates a flowchart of a method for performing personnel recognition according to an example embodiment.

[0030] Fig. 6 illustrates a flow chart of a method of collecting identity information of a person entering the place according to an example embodiment.

[0031] Fig. 7 illustrates a detailed flow chart of a method of extracting the features of a person according to an example embodiment.

[0032] Fig. 8 illustrates a flow chart of a method for recognizing identity information of a suspect according to an example embodiment.

[0033] Fig. 9 illustrates a block diagram of an electronic device according to an example embodiment.

DETAILED DESCRIPTION OF EMBODIMENTS

[0034] The specific embodiments of the disclosure will be described in detail below. It should be noted that the embodiments described herein are only for illustration and not for limitation of the disclosure. In the following description, in order to provide a thorough understanding of the disclosure, a large number of specific details are described. However, it will be apparent to those of ordinary skill in the art that the disclosure does not need to be implemented with these specific details. In other examples, in order to avoid confusion with the disclosure, well-known circuits, materials or methods are not specifically described.

[0035] Throughout the specification, the reference to "an embodiment", "embodiment", "an example" or "example" means that specific features, structures or characteristics described in combination with the embodiment or example are included in at least one embodiment of the disclosure. Therefore, the phrases "in an embodiment", "in embodiment", "an example" or "example" appearing in various parts of the entire specification do not necessarily refer to the

same embodiment or example. In addition, specific features, structures, or characteristics may be combined in one or more embodiments or examples in any suitable combination and / or sub-combination.

[0036] It should be understood that when a component is said to be "coupled" or "connected" to another component, it may be directly coupled or connected to another component or there may be intermediate components. On the contrary, when a component is said to be "directly coupled" or "directly connected" to another component, there is no intermediate component.

[0037] In addition, the term "and/or" as used herein includes any and all combinations of one or more related listed items.

[0038] It will be understood that nouns in the singular form corresponding to the term may include one or more things, unless the context expressly indicates otherwise. As used herein, each phrase in phrases such as "A or B", "at least one of A and B", "at least one of A or B", "A, B or C", "at least one of A, B and C" and "at least one of A, B or C" may be included in all possible combinations of items listed together with a corresponding phrase in the plurality of phrases. As used herein, terms such as "1" and "2" or "first" and "second" may be used to make a simple distinction between the corresponding part and another part and do not limit the part in other aspects (for example, importance or order).

[0039] As used herein, the term "module" may include a unit implemented in hardware, software, or firmware and may be used interchangeably with other terms (for example, "logic," "logical block," "part," or "circuit"). A module may be a single integrated component adapted to perform one or more functions or the smallest unit or part of the single integrated component. For example, according to an embodiment, a module may be implemented in the form of an ASIC.

[0040] It should be understood that the various embodiments of the present disclosure and the terms used therein are not intended to limit the technical features described herein to specific embodiments, but include various changes, equivalents or alternative forms for the

corresponding embodiments. Unless otherwise defined herein, all terms will give the widest possible explanation, including the meanings implied in the specification and those understood by those skilled in the art and / or defined in dictionaries, papers, etc.

[0041] In addition, it should be understood by those skilled in the art that the drawings provided herein are for the purpose of explanation, and the drawings are not necessarily drawn in proportion. For the description of the drawings, similar reference numerals may be used to refer to similar or related elements. An exemplary description of the present disclosure will be made below with reference to the accompanying drawings.

[0042] As face recognition technology, gait recognition technology, pedestrian re-recognition technology, WiFi probe recognition technology, iris recognition technology etc. can recognize people in a long distance, non-perception, and real-time way, they bring great convenience for personnel identity recognition. However, these technologies have their own characteristics and are suitable for different disclosures.

[0043] Face recognition technology can recognize the face in the video from a long distance, which makes it possible to recognize the pedestrian unconsciously, so as to recognize the pedestrian quickly and non-cooperatively. However, in the case of poor quality of face image and face occlusion, face recognition technology cannot effectively carry out face recognition.

[0044] The recognition distance of gait recognition technology can reach 50 meters without active cooperation of objects. Even if pedestrians walk with their backs to the camera tens of meters away from the camera, gait recognition technology can also recognize them. However, the recognition accuracy of gait recognition technology is lower than that of face recognition technology.

[0045] Pedestrian re-recognition technology can re-recognize the pedestrian in the video, without high-quality face image. Therefore, in the case of failure of face recognition technology, pedestrian re-recognition technology can be used for personnel identity recognition. However, the recognition accuracy of pedestrian re-recognition is lower than that of face recognition technology and gait recognition technology.

[0046] WiFi probe recognition technology can accurately obtain the mobile phone number of pedestrians, but the mobile phone number cannot be used as an independent personnel identity recognition method.

[0047] Iris recognition technology determines identity of people by comparing the features of iris image. It is a highly reliable, mature technology that does not require physical contact, but requires high image quality.

[0048] The disclosure provides a system and method for recognizing pedestrians by integrating face recognition technology, gait recognition technology, pedestrian recognition technology, WiFi probe recognition technology, iris recognition technology and identity card recognition technology, so as to improve the efficiency and accuracy of pedestrian recognition.

[0049] Fig.1 illustrates a block diagram of an identity recognition system 1 according to an example embodiment. The identity recognition system 1 can be applied to any place, such as airport, train station, bus station, stadium, or any other densely populated area.

[0050] As shown in the Fig.1, the identity recognition system 1 may include an information collection module 101, a storage module 102, a first video acquisition module 103, a second video acquisition module 104, and a recognition module 105.

[0051] The information collection module 101 may be configured to collect information of a person entering the place. In an example, the information collection module 101 may be a device that manually inputs or automatically acquires an identity information of a person.

[0052] In an exemplary embodiment, the information collection module 101 may be arranged at the entrance of the place requiring security check, for acquiring a basic information of the person entering the place based on an identity card or other valid identity documents of the person entering the place.

[0053] In an example, the information collection module 101 may be an identity recognition device connected with a public security system, which is used to acquire the identity information of the person entering the place based on the identity card or other valid identity documents of the person entering the place, and at the same time, the acquired identity

information is compared with suspect information stored in the public security system to recognize whether the person entering the place is a suspect.

[0054] In an example, the information collection module 101 may be a gate arranged at the entrance of a public transportation place such as an airport, a railway station, a bus station, etc., for scanning identity cards and ticket surfaces of the person entering the station.

[0055] In an example, the information collection module 101 may be a scanner arranged at the entrance of places such as exhibition halls, libraries, concerts, conference centers, etc., for scanning identity cards, tickets and/or library cards, etc.

[0056] In an example, the information collection module 101 may be a device that manually inputs the identity information of a person through an input device. For example, the input device may be a touchpad, touch screen, keyboard, keypad, mouse, or any combination thereof.

[0057] The first video acquisition module 103 may be configured to capture a video of a person entering the place, thereby acquiring a plurality of images of the person entering the place.

[0058] In an example, the first video acquisition module 103 may be a device arranged at the same position as the information collection module 101 or near the information collection module 101 for capture a video of a person receiving information collection by the information collection module 101.

[0059] In an exemplary embodiment, the first video acquisition module 103 may be configured to acquire multiple types of features of a person entering a place using multiple types of feature recognition techniques based on the acquired a plurality of images of the person entering the place.

[0060] In an example, the first video acquisition module 103 may acquire face features, gait features, human body features, iris features, etc. of a person entering a place by using face recognition technology, gait recognition technology, pedestrian re-recognition technology, iris recognition technology, etc., based on a plurality of images of the person entering the place.

[0061] In an example, the first video acquisition module 103 may acquire bone features and the like of a person entering a place using any other technology, such as bone recognition technology, based on a plurality of images of the person entering the place.

[0062] It should be understood by those skilled in the art that the types and quantities of recognition techniques are not limited.

[0063] In an example, the first video acquisition module 103 may be provided with one or more feature acquisition devices for acquiring information such as face features, gait features, human body features, iris features, etc. In an example, one of the feature acquisition devices may be a depth camera, which is used to acquire an skeleton image of a person, so as to acquire the human body features of a person. In another example, one of the feature acquisition devices may be a face recognition device for face recognition. In another example, one of the feature acquisition devices may be a gait feature acquisition device for gait acquisition. In another example, one of the feature acquisition devices may be an iris acquisition device for iris acquisition.

[0064] In an example, the number and type of feature acquisition devices in the first video acquisition module 103 are not limited.

[0065] In an example, the angle of view of the feature acquisition device in the first video acquisition device with respect to the person being captured may be the same or different.

[0066] When the perspective of the feature acquisition device is different from that of the captured person, there is a deviation between the same features acquired by the same feature acquisition device. At this time, the acquired image can be registered, and then the feature acquisition device can extract the feature based on the registered image.

[0067] The storage module 102 may be configured to store data, information, images, and the like generated in the process of personnel recognition.

[0068] In an exemplary embodiment, the personnel information acquired by the information collection module 101 may be stored in the storage module 102 in association with the personnel features acquired by the first video acquisition module 103.

[0069] In an exemplary embodiment, the storage module 102 may be provided with non-volatile memory, which may always store data when the storage module 102 is powered on or powered off.

[0070] The second video acquisition module 104 may be configured to track and capture any suspect with abnormal behavior, manner, etc., so as to acquire an image of the suspect.

[0071] The second video acquisition module 104 may be the same module as the first video acquisition module 103. The second video acquisition module 104 may be a module having a longer capturing distance, better imaging quality and clearer image than the first video acquisition device 103.

[0072] The second video acquisition device 104 can be configured to acquire the face features, gait features, human body features and iris features of the suspect using face recognition technology, gait recognition technology, pedestrian re-recognition technology, iris recognition technology and other technologies, based on the image of the suspect.

[0073] As shown above, the second video acquisition device 104 may be configured to acquire features using any existing or future development of recognition techniques.

[0074] It should be understood by those skilled in the art that the types and quantities of recognition techniques are not limited.

[0075] The recognition module 105 may be configured to match the features of the suspect acquired by the second video acquisition device 104 with the features stored in the storage module 102 to recognize the suspect's information.

[0076] Fig. 2 illustrates a detailed block diagram of an example of an information collection module 101 according to an example embodiment. The information collection module 101 shown in Fig. 2 is only provided for illustrative purposes, and the present disclosure is not limited thereto.

[0077] As shown in Fig. 2, the information collection module 101 may include an identity information input module 1011, a first matching module 1012, a bill information input module 1013, a second matching module 1014, and a WiFi probe module 1015.

[0078] The identity information input module 1011 can be configured to input the identity information of the person entering the place, such as name, age, gender, native place, etc.

[0079] The first matching module 1012 can be configured to receive the identity information of a person from the identity information input module 1011, and match the received identity information with the suspect information in the suspect information database of the public security system, so as to recognize whether the person entering the place is the suspect.

[0080] The bill information input module 1013 can be configured to input the bill information of the person entering the place. The bill information can be, for example, the person to whom the bill belongs, the destination of the person, the car number, the parking lot number, etc.

[0081] The second matching module 1014 can be configured to match the identity information of the person acquired by the identity information input module 1011 with the information of the person to whom the bill belongs acquired by the bill information input module 1013 to determine whether the person entering the place and the person to whom the bill belongs are the same.

[0082] When the first matching module 1012 determines that the person entering the place is not a suspect, and the second matching module 1014 determines that the person to whom the bill belongs is the same as the person entering the place, the person is allowed to enter the place. In addition, the first matching module 1012 and the second matching module 1014 send to the storage module 102 the identity information of the person acquired by the identity information input module 1011 and the information acquired by the bill information input module 1013.

[0083] The WiFi probe module 1015 can be configured to acquire the mobile phone number information of the person entering the place.

[0084] According to an example embodiment, the identity information of a person acquired by the identity information input module 1011, the information acquired by the bill information input module 1013, and the mobile phone number information acquired by the WiFi

probe module 1015 are stored in association with the storage module 102.

[0085] Fig. 3 illustrates a block diagram of an example of a first video acquisition module 103 according to an example embodiment. The first video acquisition module 103 shown in Fig. 3 is only provided for illustrative purposes, and the present disclosure is not limited thereto.

[0086] As shown in Fig. 3, the first video acquisition module 103 may include an image capture module 1031, an image extraction module 1032, an image normalization module 1033, a feature extraction module 1034, and a serialization module 1035.

[0087] The image capture module 1031 can be configured to track and capture the suspect with strange behavior and strange appearance entering the place, so as to acquire the image of the person.

[0088] The image capture module 1031 may include any capturing device such as a depth camera, an infrared camera, a millimeter wave camera, a terahertz camera, and the like.

[0089] The image capture module 1031 may include one or more capturing devices, and the number of image capture modules 1031 may be one or more.

[0090] The image extraction module 1032 may be configured to receive the captured image from the image capture module 1031, and extract the face image, gait image, human body image and human eye image of the suspect from the image.

[0091] The image normalization module 1033 may be configured to receive the extracted face image, gait image, human body image and human eye image from the image extraction module 1032, and normalize each received image.

[0092] For example, the image normalization module 1033 may be configured to normalize face images, gait images, human body images, and human eye images with pixel values between 0 and 255 to pixel values between 0 and 1. By normalizing the image, we can extract features more quickly, efficiently and accurately.

[0093] Feature extraction module 1034 can be configured to receive normalized face image, gait image, human body image and human eye image from image normalization module

1033, and extract face feature, gait feature, human body feature and iris feature based on each image.

[0094] The serialization module 1035 can be configured to receive the extracted face feature, gait feature, human body feature and iris feature from the feature extraction module 1034, and serialize the received images. For example, face features are represented by 128 digits, gait features are represented by 234 digits, human body features are represented by 140 digits, and iris features are represented by 220 digits. At this time, the numbers representing each feature are sorted to form a serialized feature set.

[0095] The serialization module 1035 may also be configured to store the serialized feature set in the storage module 102.

[0096] The second video acquisition module 104 may be configured to be the same as the first video acquisition module 103. In order to avoid repeating the description, the structure of the second video acquisition module 104 will not be described again.

[0097] Fig. 4 illustrates a block diagram of an example of an recognition module 105 according to an example embodiment. As shown in the figure, the recognition module 105 may include a pairing module 1051, a first recognition module 1052, a second recognition module 1053, and a WiFi probe module 1054.

[0098] The pairing module 1051 may be configured to pair the serialized feature set about the suspect acquired by the second video acquisition module 104 with each serialized feature set stored in the storage module 102. For example, in the case where N serialized feature sets are stored in the storage module 102, the pairing module 1051 will first pair the serialized feature set acquired by the second video acquisition module 104 with the first serialized feature set among the N serialized feature sets, and when the first recognition module 1052 determines the matching rate between the first serialized feature set and the serialized feature set acquired by the second video acquisition module 104, the pairing module 1051 will then pair the serialized feature set acquired by the second video acquisition module 104 with the second serialized feature set, and so on.

[0099] The first recognition module 1052 may be configured to receive a paired feature set from the pairing module 1051 and determine whether the paired feature set is a matched feature set.

[0100] The first recognition module 1052 may include an recognition model established in advance by a neural network, which may be configured to determine the similarity between the serialized feature set input from the second video acquisition module 104 and each serialized feature set stored in the storage module 102.

[0101] The first recognition module 1052 may also be configured to rank each determined similarity.

[0102] The WiFi probe module 1054 can be configured to detect the mobile phone number of the suspect.

[0103] The second recognition module 1053 can be configured to match the first M serialized feature set with the highest similarity acquired by the first recognition module 1052 with the mobile phone number acquired by the WiFi probe, so as to match the suspect's feature set in the first M serialized feature set.

[0104] In the case of few people around the suspect, the WiFi probe can accurately detect a mobile phone number. Thus, the suspect can be accurately identified from the first M serialized feature sets.

[0105] In the case of denser people around the suspect, the WiFi probe can detect a plurality of mobile phone numbers. Thus, a plurality of suspects can be identified from the first M serialized feature set. Thus, the information of the suspect can be further reduced.

[0106] Fig. 5 illustrates a flow chart of an example method for personnel recognition according to an example embodiment. As shown in Figure 5, at step 51, collect the identity information of the person entering the place, such as name, gender, age, native place, etc.

[0107] At step 52, a person entering the place is captured to acquire an image of the person entering the place.

[0108] The step 51 and the step 52 are carried out at the same time or in sequence.

[0109] At step 53, features about the person entering the place are extracted based on the image acquired at step 52. For example, we can extract the face features, gait features, human body features and iris features of people entering the place.

[0110] At step 54, the identity information acquired at step 51 is stored in association with the features acquired at step 53.

[0111] At step 55, the suspect in the place is tracked and captured to acquire a plurality of images of the suspect.

[0112] At step 56, features of the suspect are extracted based on the image acquired at step 55.

[0113] At step 57, the features of the suspect extracted at step 56 is matched with the feature stored in step 54 in association with the identity information to recognize the identity information of the suspect.

[0114] Fig. 6 illustrates a flowchart of an example method of collecting identity information of a person entering the place according to an example embodiment. As shown in Fig. 6, at step 511, input the identity information of the person entering the place, for example, acquire the identity information of the person by scanning the person's identity card or other valid documents. Alternatively, the identity information of a person may also include the mobile phone number of the person detected by the WiFi probe.

At step 512, the identity information of the person inputted at step 511 is compared with the suspect information in the public security system to determine whether the person inputted the identity information is a suspect.

[0115] When the inputted identity information matches the suspect's information in the public security system (the “Yes” at step 512), the processing proceeds to step 516 to capture the suspect or take measures such as alarming.

[0116] When the inputted identity information does not match the suspect's information in the public security system (the “No” at step 512), the processing proceeds to step 513.

[0117] At step 513, input the bill information of the bill held by the person entering the

place, such as destination, vehicle number, car number, seat number, bill owner information, etc.

[0118] At step 514, the bill information inputted in step 513 is compared with the personnel identity information inputted in step 511. When the bill information matches the personnel identity information (the "Yes" at step 514), the processing proceeds to step 515. At step 515, the identity information of the person is stored. In case that the bill information does not match the personnel identity information (the "No" at step 514), the processing proceeds to step 517. At step 517, the person is not allowed to enter the site.

[0119] Fig. 7 illustrates a detailed flowchart of an example method for extracting the features of a person. As shown in Fig. 7, at step 531, an image captured for a person is acquired.

[0120] At step 532, a face image, a gait image, a human body image, a human eye image and the like of the captured person are extracted from the acquired image.

[0121] At step 533, the face image, gait image, human body image, human eye image and other images extracted at step 532 are normalized.

[0122] At step 534, the face features, gait features, human body features and iris features of the captured person are extracted, based on the face image, gait image, human body image, human eye image, etc. normalized at step 533.

[0123] At step 535, the face features, gait features, human body features and iris features acquired at step 534 are serialized.

[0124] After step 535, in combination with the step 515 in Fig. 6, the operation of step 54 in Fig. 5 is jointly performed, that is, the identity information of a person is stored in association with the serialized feature set.

[0125] The operation at 56 in Fig. 5 is similar to the operation described in steps 531 to 535, and will not be repeated here for the purpose of simplifying the description.

[0126] Fig. 8 illustrates a flowchart of an example method for recognizing the identity information of a suspect according to an example embodiment. As shown in Fig. 8, at step 571, a serialized feature set consisting of the face features, gait features, human body features, iris features and the like of the suspect is sequentially paired with a plurality of feature sets stored in

association. For example, when there are N associated feature sets stored, the suspect's feature set can be first paired with the stored first feature set, and then the suspect's feature set can be paired with the second feature set, and so on.

[0127] At step 572, the similarity between each pair of feature sets is calculated in turn. For example, first calculate the similarity between the paired suspect's feature set and the first feature set, and then calculate the similarity between the paired suspect's feature set and the second feature set, and so on.

[0128] At step 573, each similarity calculated in turn is sorted.

[0129] At step 574, detect the suspect's mobile phone number through WiFi probe and other technologies.

[0130] At step 575, the mobile phone number of the suspect detected at step 574 is compared with the first M feature set with the highest similarity. Since the feature set is associated with the identity information including the mobile phone number, the identity information of the suspect can be identified by comparing the mobile phone number.

[0131] Fig. 9 schematically illustrates a block diagram of an electronic device adapted to implement the method described above, according to an embodiment of the present disclosure. The electronic device shown in Fig. 9 is only an example and should not impose any restrictions on the function and scope of use of the embodiment of the present disclosure.

[0132] As shown in Fig. 9, the electronic device 900 according to the embodiment of the present disclosure includes a processor 901, which can perform various appropriate actions and processes according to a program stored in a read only memory (ROM) 902 or a program loaded from a storage portion 908 into a random access memory (RAM) 903. Processor 901 may include, for example, a general-purpose microprocessor (such as CPU), an instruction set processor, and/or a related chipset and/or a special-purpose microprocessor (such as disclosure specific integrated circuit (ASIC)), and so on. Processor 901 may also include on-board memory for caching purposes. Processor 901 may include a single processing unit or a plurality of processing units for performing different actions of a method flow according to the embodiment

of the present disclosure.

[0133] In RAM 903, various programs and data necessary for the operation of the system 900 are stored. Processor 901, ROM 902, and RAM 903 are connected to each other through bus 904. The processor 901 performs various operations of the method flow according to the embodiment of the present disclosure by executing the programs in ROM 902 and / or RAM 903. It should be noted that the programs can also be stored in one or more memories other than ROM 902 and RAM 903. Processor 901 may also perform various operations of the method flow according to the embodiment of the present disclosure by executing the programs stored in the one or more memories.

[0134] According to an embodiment of the present disclosure, system 900 may also include an input/output (I/O) interface 905, which is also connected to bus 904. The system 900 may also include one or more of the following components connected to the I/O interface 905: an input section 906 including a keyboard, a mouse, etc.; an output section 907 including a cathode-ray tube (CRT), a liquid crystal display (LCD), a speaker, etc.; a storage part 908 including a hard disk, etc.; and a communication section 909 including a network interface card, such as a LAN card, a modem, etc. The communication section 909 performs communication processing via a network such as the Internet. The drive 910 is also connected to the I/O interface 905 as required. The removable medium 911, such as a disk, an optical disc, a magneto-optical disc, a semiconductor memory, and the like, is mounted on the drive 910 as required so that the computer program read from it can be mounted on the storage portion 908 as required.

[0135] According to the embodiment of the present disclosure, the method flow according to the embodiment of the present disclosure may be implemented as a computer software program. For example, the embodiment of the present disclosure includes a computer program product, which includes a computer program hosted on a computer-readable storage medium, and the computer program includes program code for executing the method shown in the flowchart. In such an embodiment, the computer program can be downloaded and installed from the network through the communication section 909, and/or installed from the removable

medium 911. When the computer program is executed by the processor 901, the above functions defined in the system of the present disclosure embodiment are executed. According to the embodiment of the present disclosure, the system, apparatus, device, module, unit and the like described above can be realized by a computer program module.

[0136] The present disclosure also provides a computer-readable storage medium, which may be included in the apparatus/device/system described in the above embodiment, or it may exist alone without being assembled into the apparatus/device/system. The computer-readable storage medium carries one or more programs, and when the one or more programs are executed, the method according to the embodiment of the present disclosure is implemented.

[0137] According to an embodiment of the present disclosure, the computer-readable storage medium may be a non-volatile computer-readable storage medium. For example, it may include but not limited to: portable computer disk, hard disk, random access memory (RAM), read only memory (ROM), erasable programmable read only memory (EPROM or flash memory), portable compact disk read only memory (CD-ROM), optical storage device, magnetic storage device, or any suitable combination of the above. In the present disclosure, the computer-readable storage medium may be any tangible medium containing or storing a program that can be used by or in combination with an instruction execution system, apparatus, or device.

[0138] For example, according to an embodiment of the present disclosure, the computer-readable storage medium may include one or more memories other than ROM 902 and/or RAM 903 and/or ROM 902 and RAM 903 described above.

[0139] Although a plurality of components are shown in each of the above block diagrams, it should be understood by those skilled in the art that embodiments of the disclosure can be implemented in the absence of one or more components or combining certain components.

[0140] Although each step has been described above in accordance with the order shown in the drawings, it should be understood by those skilled in the art that each step can be performed in a different order, or embodiments of the present disclosure can be implemented

without one or more of the above steps.

[0141] It is understood from the foregoing that the electronic components of one or more systems or devices may include, but are not limited to, at least one processing unit, memory, and a communication bus or communication device coupling each component including memory to the processing unit. The system or device may include or have access to various device readable media. System memory may include device readable storage media in the form of volatile and/or non-volatile memory (e.g., read only memory (ROM) and/or random access memory (RAM)). System memory may also include operating system, disclosure program, other program modules, and program data by way of example rather than limitation.

[0142] Embodiments may be implemented as systems, methods, or program products. Therefore, embodiments may take the form of full hardware embodiments or embodiments including software (including firmware, resident software, microcode, etc.), which may be collectively referred to herein as "circuit", "module" or "system". In addition, embodiments may take the form of program products embodied in at least one device readable medium on which device readable program code is embodied.

[0143] A combination of device readable storage media can be used. In the context of this document, the device readable storage medium ("storage medium") may be any tangible non signal medium that may contain or store a program composed of program codes configured to be used by or in combination with an instruction execution system, device, or apparatus. For the purposes of the present disclosure, the storage medium or device shall be interpreted as non-transitory, i.e., excluding the signal or propagation medium.

[0144] The present disclosure is presented for illustration and description purposes, but is not intended to be exhaustive or restrictive. Many modifications and changes will be apparent to those skilled in the art. Embodiments are selected and described to illustrate principles and practical disclosures, and to enable those of ordinary skill in the art to understand various embodiments of the present disclosure with various modifications suitable for the specific purpose intended.

What is claimed is:

1. An object recognition system (1), comprising:

an information collection module (101) configured to collect information about an object to be inspected;

a first video acquisition module (103) configured to acquire an image of the object to be inspected, and acquire multiple types of features of the object to be inspected by using a plurality of recognition methods based on the image of the object to be inspected;

a storage module (102) configured to store the information about the object to be inspected in association with the multiple types of features of the object to be inspected;

a second video acquisition module (104) configured to track and capture a suspect object to acquire an image of the suspect object, and acquire multiple types of features of the suspect object by using the plurality of recognition methods based on the image of the suspect object, ; and

a recognition module (105) configured to recognize identity information of the suspect object based on the multiple types of features of the suspect object and the multiple types of features of the object to be inspected which are stored in association with the information about the object to be inspected in the storage module (102).

2. The object recognition system (1) according to claim 1, wherein the information collection module (101) is configured to recognize a mobile phone number of the object to be inspected based on a WiFi probe method.

3. The object recognition system (1) according to claim 1, wherein each of the first video acquisition module (103) and the second video acquisition module (104) comprises:

an image capture module (1031)configured to acquire the image of the object to be inspected; and

an image extraction module (1032) configured to extract a feature image of the object to be inspected from the image of the object to be inspected.

4. The object recognition system (1) according to claim 1, wherein the recognition

module (105) comprises: a pairing module (1051) configured to pair the features of the suspect object acquired by the second video acquisition module with the features of the object to be inspected which are stored in the storage module (102).

5. An object recognition method, comprising:

collecting information about an object to be inspected (51);

acquiring an image of the object to be inspected (52), and acquiring multiple types of features of the object to be inspected by using a plurality of recognition methods based on the image of the object to be inspected (53);

storing the information about the object to be inspected in association with the multiple types of features of the object to be inspected (54);

tracking and capturing a suspect object to acquire an image of the suspect object (55), and acquiring multiple types of features of the suspect object by using the plurality of recognition methods based on the image of the suspect object (56); and

recognizing identity information of the suspect object based on the multiple types of features of the suspect object and the multiple types of features of the object to be inspected which are stored in association with the information about the object to be inspected (57).

6. The object recognition method according to claim 5, wherein collecting information about the object to be inspected (51) comprises:

recognizing a mobile phone number of the object to be inspected based on a WiFi probe method (511).

7. The object recognition method according to claim 5, wherein acquiring an image of the object to be inspected (52) and acquiring multiple types of features of the object to be inspected by using a plurality of recognition methods based on the image of the object to be inspected (53) comprises:

acquiring the image of the object to be inspected (531); and

extracting a feature image of the object to be inspected from the image of the object to be inspected (532).

8. The object recognition method according to one of claims 5 to 7, wherein acquiring an image of the object to be inspected (52) and acquiring multiple types of features of the object to be inspected by using a plurality of recognition methods based on the image of the object to be inspected (53) further comprises:

normalizing the feature image of the object to be inspected (533).

9. The object recognition method according to one of claims 5 to 8, wherein acquiring the image of the object to be inspected (52) and acquiring multiple types of features of the object to be inspected by using a plurality of recognition methods based on the image of the object to be inspected (53) further comprises:

extracting features from the normalized feature image (534).

10. The object recognition method according to one of claims 5 to 9, wherein recognizing identity information of the suspect object based on the acquired multiple types of features of the suspect object and the multiple types of features of the object to be inspected which are stored in association with the information about the object to be inspected (57) comprises:

pairing the features of the suspect object with the stored features of the object to be inspected (571).

11. The object recognition method according to one of claims 5 to 10, wherein recognizing identity information of the suspect object based on the acquired multiple types of features of the suspect object and the multiple types of features of the object to be inspected which are stored in association with the information about the object to be inspected (57) further comprises:

calculating a similarity between paired features, and determining M features of the object to be inspected with similarities higher than any other features as the features of the suspect object (572, 573).

12. The object recognition method according to one of claims 5 to 10, wherein recognizing identity information of the suspect object based on the acquired multiple types of

features of the suspect object and the multiple types of features of the object to be inspected which are stored in association with the information about the object to be inspected (57) further comprises:

recognizing a mobile phone number of the suspect object based on a WiFi probe method (574).

13. The object recognition method according to one of claims 5 to 12, wherein recognizing identity information of the suspect object based on the acquired multiple types of features of the suspect object and the multiple types of features of the object to be inspected which are stored in association with the information about the object to be inspected (57) further comprises:

recognizing the features of the suspect object from M features with similarities higher than any other features based on the mobile phone number of the suspect object (575).

14. A non-transitory computer readable medium, comprising program code instructions recorded thereon for implementing the method according to any one of claims 5 to 13.

15. An electronic device, comprising:

one or more processors;

a storage device for storing one or more programs, which causes the one or more processors to perform the method according to any one of claims 5 to 13 when executed by the one or more processors.