

MONITORING METHOD AND SYSTEM, ELECTRONIC EQUIPMENT, AND STORAGE MEDIUM

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is based on, and claims benefit of priority to, Chinese Application No. 202010177537. 0, filed on March 13, 2020. Disclosure of the Chinese Application is hereby incorporated by reference in its entirety.

TECHNICAL FIELD

[0002] Embodiments of the present disclosure relate to the field of computer vision, and more particularly, to a monitoring method and system, electronic equipment, and a storage medium.

BACKGROUND

[0003] In respiratory virus epidemic prevention and control, early quarantine is the most primitive and extremely effective measure. Early detection refers to early detection of a suspicious person by medical diagnostic means, which may include body temperature detection. Early quarantine refers to reducing exposure of a virus-carrying patient to others and reducing the risk of cross infection, which may include measures such as contactless body temperature detection, face mask wearing, etc.

[0004] In related art, body temperature detection may be performed via a thermometer, a thermal image, etc. However, the process of body temperature detection is cumbersome, and is difficult to adapt to a place of heavy traffic. In addition, when a suspected case with a fever symptom is detected, it is difficult to verify identity information of the suspected case.

SUMMARY

[0005] Embodiments of the present disclosure provide a monitoring method and system, electronic equipment, and a storage medium.

[0006] According to an aspect of embodiments of the present disclosure, there is provided a monitoring method, including: performing target region identification on an image of visible light of a monitored region, acquiring a first region in which a target object is located in the image of visible light and a second region in which a preset part of the target object is located; performing liveness detection on the target object according to size information of the first region and a third region corresponding to the first region in an infrared image of the monitored region, acquiring a liveness detection result; in response to the liveness detection result indicating liveness, performing identification processing on the first region, acquiring identity information of the target object, and performing temperature detection processing on a fourth region corresponding to the second region in the infrared image, acquiring temperature information of the target object; and in response to the temperature information being greater than or equal to a preset temperature threshold, generating first warning information according to the identity information of the target object.

[0007] With the monitoring method of embodiments of the present disclosure, liveness detection and temperature detection may be performed based on an infrared image. Body temperature of a target object in an image may be detected quickly, improving efficiency in body temperature detection, adapting to a place of heavy traffic. Moreover, the identity information of the target object may be identified via the image of visible light, which helps to determine identity information of a suspected case, improving efficiency in epidemic prevention.

[0008] In a possible implementation, performing liveness detection on the target object according to the size information of the first region and the third region corresponding to the first region in the infrared image, acquiring the liveness detection result includes: determining a distance between the target object and an image acquiring

device having acquired the image of visible light according to the size information of the first region; determining a liveness detection strategy according to the distance; determining a location of the third region in the infrared image according to a location of the first region in the image of visible light; and performing liveness detection processing on the third region in the infrared image according to the liveness detection strategy, acquiring the liveness detection result.

[0009] In this mode, a liveness detection strategy may be determined via the size of the first region, and liveness detection may be performed based on the liveness detection strategy, improving accuracy in liveness detection in a far infrared image via isothermal analysis.

[0010] In a possible implementation, determining the liveness detection strategy according to the distance includes one of: in response to the distance being greater than or equal to a first distance threshold, determining the liveness detection strategy as a liveness detection strategy based on body morphology; or in response to the distance being greater than or equal to a second distance threshold and less than the first distance threshold, determining the liveness detection strategy as a liveness detection strategy based on head and neck morphology; or in response to the distance being less than the second distance threshold, determining the liveness detection strategy as a liveness detection strategy based on face morphology.

[0011] In a possible implementation, performing liveness detection processing on the third region according to the liveness detection strategy, acquiring the liveness detection result includes: performing morphology detection processing on the third region according to the liveness detection strategy, acquiring a morphology detection result; in response to the morphology detection result indicating living body morphology, performing isothermal analysis processing on a face region in the third region, acquiring an isothermal analysis result; determining a first weight of the morphology detection result and a second weight of the isothermal analysis result according to the liveness detection strategy; and determining the liveness detection result according to the first weight, the second weight, the morphology detection result, and the isothermal analysis result.

- [0012] In a possible implementation, the monitoring method further includes: in response to the liveness detection result indicating liveness, detecting whether the first region includes a preset target, acquiring a first detection result. The preset target may include an article blocking view of a portion of a face. When the liveness detection result indicates liveness, performing identification processing on the first region, acquiring the identity information of the target object may include: in response to the liveness detection result indicating liveness, performing identification processing on the first region according to the first detection result, acquiring the identity information of the target object.
- [0013] In this mode, a method for identification may be selected according to whether a preset target exists, improving accuracy in identification.
- [0014] In a possible implementation, detecting whether the first region includes the preset target, acquiring the first detection result includes: detecting a face region in the first region, determining a result of lack of feature in the face region; and in response to the result of lack of feature indicating lack of a preset feature, detecting whether the face region includes the preset target, acquiring the first detection result.
- [0015] In a possible implementation mode, performing identification processing on the first region according to the first detection result, acquiring the identity information of the target object includes one of: in response to the first detection result indicating nonexistence of the preset target, performing first identification processing on a face region in the first region, acquiring the identity information of the target object; or in response to the first detection result indicating existence of the preset target, performing second identification processing on the face region in the first region, acquiring the identity information of the target object, a weight of a feature of a viewable region of the face in the second identification processing being greater than a weight of a feature of a region corresponding to the viewable region in the first identification processing.
- [0016] In a possible implementation, the method further comprises generating second warning information in response to the first detection result indicating nonexistence of the preset target.

[0017] In a possible implementation, the method further comprises: acquiring gender information of the target object; and determining the preset temperature threshold according to the gender information.

[0018] In a possible implementation, the method further comprises superimposing location information of the first region or the third region, the temperature information of the target object, and the identity information of the target object on at least one of the image of visible light or the infrared image, acquiring a detected image.

[0019] According to an aspect of embodiments of the present disclosure, there is provided a monitoring system, including a visible light image acquiring portion, an infrared image acquiring portion, and a processing portion. The processing portion is configured to implement: performing target region identification on an image of visible light of a monitored region acquired by the visible light image acquiring portion, acquiring a first region in which a target object is located in the image of visible light and a second region in which a preset part of the target object is located; performing liveness detection on the target object according to size information of the first region and a third region corresponding to the first region in an infrared image acquired by the infrared image acquiring portion, acquiring a liveness detection result; in response to the liveness detection result indicating liveness, performing identification processing on the first region, acquiring identity information of the target object, and performing temperature detection processing on a fourth region corresponding to the second region in the infrared image, acquiring temperature information of the target object; and in response to the temperature information being greater than or equal to a preset temperature threshold, generating first warning information according to the identity information of the target object.

[0020] In a possible implementation, the processing portion is further configured to implement: determining a distance between the target object and an image acquiring device having acquired the image of visible light according to the size information of the first region; determining a liveness detection strategy according to the distance; determining a location of the third region in the infrared image according to a location of the first region in the image of visible light; and performing liveness detection processing

on the third region in the infrared image according to the liveness detection strategy, acquiring the liveness detection result.

[0021] In a possible implementation, the processing portion is further configured to implement: in response to the distance being greater than or equal to a first distance threshold, determining the liveness detection strategy as a liveness detection strategy based on body morphology; or in response to the distance being greater than or equal to a second distance threshold and less than the first distance threshold, determining the liveness detection strategy as a liveness detection strategy based on head and neck morphology; or in response to the distance being less than the second distance threshold, determining the liveness detection strategy as a liveness detection strategy based on face morphology.

[0022] In a possible implementation, the processing portion is further configured to implement: performing morphology detection processing on the third region according to the liveness detection strategy, acquiring a morphology detection result; in response to the morphology detection result indicating living body morphology, performing isothermal analysis processing on a face region in the third region, acquiring an isothermal analysis result; determining a first weight of the morphology detection result and a second weight of the isothermal analysis result according to the liveness detection strategy; and determining the liveness detection result according to the first weight, the second weight, the morphology detection result, and the isothermal analysis result.

[0023] In a possible implementation, the processing portion is further configured to implement: in response to the liveness detection result indicating liveness, detecting whether the first region includes a preset target, acquiring a first detection result. The preset target may include an article blocking view of a portion of a face. The processing portion may be further configured to implement: in response to the liveness detection result indicating liveness, performing identification processing on the first region according to the first detection result, acquiring the identity information of the target object.

[0024] In a possible implementation, the processing portion is further configured to implement: detecting a face region in the first region, determining a result of lack of

feature in the face region; and in response to the result of lack of feature indicating lack of a preset feature, detecting whether the face region includes the preset target, acquiring the first detection result.

[0025] In a possible implementation, the processing portion is further configured to implement: in response to the first detection result indicating nonexistence of the preset target, performing first identification processing on a face region in the first region, acquiring the identity information of the target object; or in response to the first detection result indicating existence of the preset target, performing second identification processing on the face region in the first region, acquiring the identity information of the target object. A weight of a feature of a viewable region of the face in the second identification processing may be greater than a weight of a feature of a region corresponding to the viewable region in the first identification processing.

[0026] In a possible implementation, the processing portion is further configured to implement: superimposing location information of the first region or the third region, the temperature information of the target object, and the identity information of the target object on at least one of the image of visible light or the infrared image, acquiring a detected image.

[0027] In a possible implementation, the processing portion is further configured to implement: acquiring gender information of the target object; and determining the preset temperature threshold according to the gender information.

[0028] In a possible implementation, the processing portion is further configured to implement: generating second warning information in response to the first detection result indicating nonexistence of the preset target.

[0029] According to an aspect of embodiments of the present disclosure, there is provided electronic equipment, including: a processor; and a memory configured to store processor executable instructions. The processor is configured to implement the monitoring method.

[0030] According to an aspect of embodiments of the present disclosure, there is provided a computer-readable storage medium having stored therein computer executable

instructions which, when executed by a processor, implement the monitoring method.

[0031] According to an aspect of the present disclosure, there is provided a computer program including a computer-readable code which, when run in electronic equipment, allows a processor in the electronic equipment to perform the monitoring method.

[0032] It should be understood that the general description above and the elaboration below are illustrative and explanatory only, and do not limit embodiments of the present disclosure.

[0033] Other characteristics and aspects of the present disclosure will become clear according to detailed description of illustrative embodiments made below with reference to the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0034] Drawings here are incorporated in and constitute part of the specification, illustrate embodiments in accordance with the present disclosure, and together with the specification, serve to illustrate a technical solution of embodiments of the present disclosure.

[0035] FIG. 1 is a flowchart of an image processing method according to an embodiment of the present disclosure.

[0036] FIG. 2 is an illustrative diagram of liveness detection according to an embodiment of the present disclosure.

[0037] FIG. 3 is an illustrative diagram of identification according to an embodiment of the present disclosure.

[0038] FIG. 4A and FIG. 4B each are an illustrative diagram of applying a monitoring method according to an embodiment of the present disclosure.

[0039] FIG. 5 is a block diagram of a monitoring system according to an embodiment of the present disclosure.

[0040] FIG. 6 is a block diagram of electronic equipment according to an embodiment of the present disclosure.

[0041] FIG. 7 is a block diagram of electronic equipment according to an embodiment of the present disclosure.

DETAILED DESCRIPTION

[0042] Illustrative embodiments, characteristics, and aspects of the present disclosure are elaborated below with reference to the drawings. Same reference signs in the drawings represent elements with the same or similar functions. Although various aspects of embodiments are illustrated in the drawings, the drawings are not necessarily to scale unless expressly pointed out otherwise.

[0043] The dedicated word "illustrative" refers to "as an example or an embodiment, or for descriptive purpose". Any embodiment illustrated herein as being "illustrative" should not be construed as being preferred to or better than another embodiment.

[0044] A term "and / or" herein merely describes an association between associated objects, indicating three possible relationships. For example, by A and / or B, it may mean that there may be three cases, namely, existence of but A, existence of both A and B, or existence of but B. In addition, a term "at least one" herein means any one of multiple, or any combination of at least two of the multiple. For example, including at least one of A, B, and C may mean including any one or more elements selected from a set composed of A, B, and C.

[0045] Moreover, a great number of details are provided in embodiments below for a better understanding of embodiments of the present disclosure. A person having ordinary skill in the art may understand that the present disclosure may be implemented without some details. In some embodiments, a method, means, an element, a circuit, etc., that is well-known to a person having ordinary skill in the art may not be elaborated in order to highlight the main point of the present disclosure.

[0046] FIG. 1 is a flowchart of an image processing method according to an embodiment of the present disclosure. As shown in FIG. 1, the method includes a step as follows.

[0047] In S11, target region identification is performed on an image of visible light of a monitored region, acquiring a first region in which a target object is located in the image of visible light and a second region in which a preset part of the target object is located.

[0048] In S12, liveness detection is performed on the target object according to size information of the first region and a third region corresponding to the first region in an infrared image of the monitored region, acquiring a liveness detection result.

[0049] In S13, when the liveness detection result indicates liveness, identification processing is performed on the first region, acquiring identity information of the target object, and temperature detection processing is performed on a fourth region corresponding to the second region in the infrared image, acquiring temperature information of the target object.

[0050] In S14, when the temperature information is greater than or equal to a preset temperature threshold, first warning information is generated according to the identity information of the target object.

[0051] With the monitoring method of embodiments of the present disclosure, liveness detection and temperature detection may be performed based on an infrared image. Body temperature of a target object in an image may be detected quickly, improving efficiency in body temperature detection, adapting to a place of heavy traffic. Moreover, the identity information of the target object may be identified via the image of visible light, which helps to determine identity information of a suspected case, improving efficiency in epidemic prevention.

[0052] In a possible implementation, the monitoring method may be performed by terminal equipment or other processing equipment, wherein the terminal equipment may be User Equipment (UE), mobile equipment, a user terminal, a terminal, a cell phone, a cordless phone, a Personal Digital Assistant (PDA), handheld equipment, computing

equipment, on-board equipment, wearable equipment, etc. Other processing equipment may be a server or a cloud server, etc. In some possible implementations, the monitoring method may be implemented by a processor by calling computer-readable instructions stored in memory.

[0053] In a possible implementation, the monitoring method may be used in front-end monitoring equipment. For example, the front-end monitoring equipment may be equipment that integrates a processor, a camera, etc., and may acquire an image of a monitored region by controlling the camera, etc., by the processor, and execute the monitoring method via the processor. In a possible implementation, the monitoring method may also be used in a server (e.g., where a processor executing the monitoring method is located, where the processor, the camera, etc., are not integrated, but are distributed in the monitored region and a back-end processor, forming a monitoring system). The server may receive an image captured by the camera in the monitored region, and perform the monitoring method on the image.

[0054] In a possible implementation, the processor may be a System on a Chip (SoC). The camera may include an infrared camera for acquiring an infrared image, and a camera for acquiring an image of visible light. In a possible implementation, a special sensor, such as a vanadium oxide uncooled infrared focal plane detector, may be used to capture a spatial light signal. The sensor may be used in a far infrared camera to acquire life light and perform temperature monitoring.

[0055] In a possible implementation, a camera may shoot a video of a surveillance area. Video frames of the video may be images of visible light and infrared images. An infrared camera and a visible light camera may be disposed in close proximity. For example, the infrared camera and the visible light camera may be disposed adjacent to each other, side by side, etc. Alternatively, the two cameras may be disposed as one piece, which is not limited in embodiments of the present disclosure. Therefore, in images captured by the two cameras at the same time, locations of a target object are similar. That is, deviation of locations of the same target object in an image of visible light and a corresponding infrared image is small, and the deviation may be corrected according to the relationship between locations of the two cameras. For example, the location of a

third region of a target object in the infrared image may be determined according to the location of a first region in the image of visible light (that is, the region in which the target object is located).

[0056] In one possible implementation, an image captured by a camera may be of poor image quality, e.g., an imaging blur, a focus error, a camera contaminated or blocked from view, etc. Image quality detection may first be performed on an image. For example, image quality detection may be performed on an image of visible light. For example, texture of the image of visible light, as well as boundary clarity, may be detected. When the clarity is greater than or equal to a clarity threshold, the image may be considered to be of good quality, and subsequent processing such as location detection may be performed. When the clarity is less than the clarity threshold, the image may be considered to be of poor quality, and both the image of visible light and the infrared image corresponding to the image of visible light may be deleted.

[0057] In a possible implementation, in S11, a first region in which the target object is located may be acquired by performing target region identification on the image of visible light. The first region may be at least one of the face region of the target object or a body region of the target object. With the processing, a location coordinate of the first region in which the target object is located, or a location coordinate of a detection box including the first region, may be acquired.

[0058] In a possible implementation, temperature of a forehead region, etc., may be measured during temperature detection. For example, temperature of the forehead region may be determined via a pixel value of the infrared image, thereby acquiring body temperature of the target object. Therefore, a second region in which a preset part (such as the forehead region) is located may be detected in the image of visible light. Further, a fourth region in which the preset part is located in the infrared image may be determined. A correspondence between a pixel value of the infrared image and temperature may be established in advance. Further, body temperature of the target object may be determined according to a pixel value in the fourth region.

[0059] In one possible implementation, a living body is a biologically active, real-world biological modality exhibited by a human being with a vital sign. Meanwhile, a

prosthesis is a living-body-like model (e.g., a photo, a face mask, a headgear, etc.) made mimicking a biological characteristic of a living body. Generally, liveness detection is performed using a near infrared image of a face. A living body may be differentiated from a prosthesis mainly based on different imaging characteristics between the living body and the prosthesis under near infrared light, such as different light flow, texture, color, etc. However, during temperature monitoring, an infrared image acquired by far infrared photography is a far infrared image (i.e., an image based on life light), instead of a near infrared image commonly used. Therefore, a liveness detection strategy may be determined via the size of the first region in which the target object is located, improving accuracy in liveness detection.

[0060] In a possible implementation, S12 may be implemented as follows. A distance between the target object and an image acquiring device having acquired the image of visible light may be determined according to the size information of the first region. A liveness detection strategy may be determined according to the distance. A location of the third region in the infrared image may be determined according to a location of the first region in the image of visible light. Liveness detection processing may be performed on the third region in the infrared image according to the liveness detection strategy, acquiring the liveness detection result.

[0061] In a possible implementation, the first region is a region in which a target object in the image of visible light is located, such as a face region of the target object. The size of the region may be negatively correlated to the distance between the target object and the image acquiring device (visible light camera) that acquires the image of visible light. That is, the greater the region is, the less the distance, and the less the region is, the greater the distance. Further, a living body is characterized by a unique vital sign in an infrared image (such as a far infrared image based on life light). Body blood vessels spread over the human body (such as the body, the face, the neck, shoulders, etc.). Although, in case the target object is close to the location in the image of visible light, only part of the human body, such as the face, the head, the neck, etc., appears in the image of visible light, a facial feature may be clearer. The greater the distance, the less the amount of facial features, the more the amount of body features. Different liveness detection strategies may be combined based on different distances, improving accuracy

in liveness detection, applicable to different distances.

[0062] A correspondence between a reference distance and a reference size in an image may be established in advance. The distance between a target object and a camera may be determined according to a ratio of the size of the region in which the target object is located and a reference size, as well as a reference distance.

[0063] FIG. 2 is an illustrative diagram of liveness detection according to an embodiment of the present disclosure. As shown in FIG. 2, a distance between a target object and a camera may be determined according to size information of the first region, and a liveness detection strategy may be selected according to the distance. A third region in the infrared image corresponding to the first region in the image of visible light may be determined. For example, the first region is a face region of a target object A in the image of visible light (such as when the target object A is close to the camera, and only the face region of the target object A may be captured). Then, the third region is a face region of the target object A in the infrared image. The first region may be a head-neck region of a target object B in the image of visible light (such as when a face and a shoulder-neck region, or an upper body region, etc., of the target object B may be captured). Then, the third region may be a head-neck region of the target object B in the infrared image. The first region may be a body region of a target object C in the image of visible light (such as when the target object C is away from the camera, and a body region of the target object C may be captured). Then, the third region may be a body region of the target object C in the infrared image.

[0064] In a possible implementation, the liveness detection strategy may be determined according to the distance of the target object as follows. When the distance is greater than or equal to a first distance threshold, the liveness detection strategy may be determined as a liveness detection strategy based on body morphology. When the distance is greater than or equal to a second distance threshold and less than the first distance threshold, the liveness detection strategy may be determined as a liveness detection strategy based on head and neck morphology. When the distance is less than the second distance threshold, the liveness detection strategy may be determined as a liveness detection strategy based on face morphology.

[0065] In a possible implementation, the first distance threshold and the second distance threshold may be determined according to a parameter such as a range, a focal length, etc., of a camera detection region. For example, when the distance between the target object and the camera is greater than or equal to the first distance threshold, the picture captured by the camera may include the whole body, or most of the body, of the target object, and then a liveness detection strategy based on body morphology may be selected. When the distance between the target object and the camera is less than the first distance threshold and greater than or equal to the second distance threshold, the picture captured by the camera may not include the whole body of the target object, but may include the face and the shoulder-neck region, or the upper body region, of the target object, and then a liveness detection strategy based on head and neck morphology may be selected. When the distance between the target object and the camera is less than the second distance threshold, the picture captured by the camera may include only the face region of the target object, and then a liveness detection strategy based on face morphology may be selected.

[0066] In a possible implementation, the location of the third region in the infrared image is determined based on the location of the first region in the image of visible light. In an example, the image of visible light may include one or more target objects, i.e., include one or more first regions. Locations of the third regions in the infrared image may be determined based on the relation between locations of the infrared camera and the visible light camera, as well as locations of the first regions.

[0067] In a possible implementation, as an infrared camera may acquire a far infrared image for detecting life light, instead of a near infrared image for detecting an image feature, a third region in which a target object is located detected directly in the far infrared image may be inaccurate. Moreover, in case of multiple target objects, when the third regions in which the target objects are located are detected directly in the infrared image, the correspondence between the third regions and the first regions in the image of visible light may be unclear. Therefore, the location of a third region corresponding to a first region may be acquired according to the location of the first region in the image of visible light and the relation between locations of the two cameras. Similarly, the location of a fourth region in the infrared image corresponding to a second region may be

acquired via the location of the second region in the image of visible light.

[0068] In a possible implementation, after determining the liveness detection strategy, a selected liveness detection strategy may be used to perform liveness detection processing on a third region in the infrared image. Liveness detection processing may be performed on the third region according to the liveness detection strategy, acquiring the liveness detection result, as follows. Morphology detection processing may be performed on the third region according to the liveness detection strategy, acquiring a morphology detection result. When the morphology detection result indicates living body morphology, isothermal analysis processing may be performed on a face region in the third region, acquiring an isothermal analysis result. A first weight of the morphology detection result and a second weight of the isothermal analysis result may be determined according to the liveness detection strategy. The liveness detection result may be determined according to the first weight, the second weight, the morphology detection result, and the isothermal analysis result.

[0069] In a possible implementation, morphology detection may be performed on a third region according to a liveness detection strategy.

[0070] In a possible implementation, in a liveness detection strategy based on body morphology, a third region may include a face region and a body region of a target object, with a great amount of body features. The amount of body features may be acquired for morphology detection processing by performing feature extraction processing via a neural network, etc. It may be determined whether body morphology of the target object is living body morphology. For example, it may be determined whether morphology of the target object is living body morphology according to a feature such as a posture, an action, a shape, etc., of the target object.

[0071] In a possible implementation, in a liveness detection strategy based on head and neck morphology, a third region may include a face and a shoulder-and-neck region, or an upper body region, of a target object. Feature extraction processing may be performed via a neural network, etc., acquiring an amount of features in the face and the shoulder-and-neck region for morphology detection processing. It may be determined whether head-and-neck morphology of the target object indicates living body

morphology. For example, it may be determined whether the target object is of living body morphology according to a feature such as a posture, an action, a shape, etc., of the target object.

[0072] In a possible implementation mode, in a liveness detection strategy based on face morphology, a third region may include a face region of a target object, with a small amount of body features and a great amount of facial features. Feature extraction processing may be performed via a neural network, etc., acquiring an amount of features in the face region for morphology detection processing. It may be determined whether face morphology of the target object indicates living body morphology. For example, it may be determined whether the target object is of living body morphology according to a feature such as an expression, a texture, etc., of the face of the target object.

[0073] In a possible implementation, the morphology detection result of morphology detection processing may be a score. For example, when the morphology detection score is greater than or equal to a first score threshold, the morphology detection result may be considered to indicate living body morphology. The form of the morphology detection result is not limited in embodiments of the present disclosure.

[0074] In a possible implementation, when the morphology detection result indicates living body morphology, isothermal analysis processing may be performed on a face region in the third region, acquiring an isothermal analysis result.

[0075] In one possible implementation, it may be determined whether the face region is of a living body via isothermal analysis. For example, the real face of the target object has a uniform blood vessel distribution. Meanwhile, if the target object is wearing a prosthesis such as a face mask, a headgear, etc., as the prosthesis has no blood vessel distribution, an isothermal line thereof differs from that of a real face, it may be determined whether the face region is of a living body by isothermal analysis.

[0076] In one possible implementation, the isothermal analysis result may be in form of a score. For example, if an isothermal analysis score is greater than or equal to a second score threshold, the isothermal analysis result may be considered to indicate a living body. The form of the isothermal analysis result is not limited in embodiments of

the present disclosure.

[0077] In a possible implementation, the proportion of the amount of features in the face region may differ in different liveness detection strategies. For example, in the liveness detection strategy based on body morphology, the third region includes the face region and the body region, and the proportion of the face region is small, while in the liveness detection strategy based on face morphology, the third region includes only the face region, and the proportion of the face region is large. Therefore, the first weight of the morphology detection result and the second weight of the isothermal analysis result may be determined according to a liveness detection strategy.

[0078] For example, in the liveness detection strategy based on body morphology, as the proportion of the face region is small, the second weight of the isothermal analysis result based on the face region may be small, and the first weight of the morphology detection result may be large. For example, in the liveness detection strategy based on face morphology, as the proportion of the face region is large, the second weight of the isothermal analysis result based on the face region may be large, and the first weight of the morphology detection result may be small. For example, in the liveness detection strategy based on head and neck morphology, the second weight and the first weight may be close or equal. Values of the first weight and the second weight are not limited in embodiments of the present disclosure.

[0079] In a possible implementation, weighted summation processing may be performed on the morphology detection result and the isothermal analysis result according to the first weight and the second weight, acquiring the liveness detection result. In a possible implementation, the liveness detection result may be a score. When the liveness detection result is greater than or equal to a liveness score threshold, the target object may be considered a living body. If the liveness detection result is less than the liveness score threshold, the target object may be considered a prosthesis or non-human, requiring no subsequent processing.

[0080] In this mode, a liveness detection strategy may be determined via the size of the first region, and liveness detection may be performed based on the liveness detection strategy, improving accuracy in liveness detection in a far infrared image via isothermal

analysis.

[0081] In a possible implementation, in S13, identification processing may be performed on a target object when the target object is a living body. In one possible implementation, it is generally necessary to wear a protective tool (such as a face mask, goggles, etc.) in a medical and health place (such as a hospital, an operating room, etc.) or in a public place during epidemic. However, the protective tool may somehow block view of the face region. Therefore, it may have to be monitored whether a target object is wearing a preset article such as a face mask, and a mode of identification may have to be determined according to a detection result.

[0082] FIG. 3 is an illustrative diagram of identification according to an embodiment of the present disclosure. The method may further include an option as follows. When the liveness detection result indicates liveness, it may be detected whether the first region includes a preset target, acquiring a first detection result. The preset target may include an article blocking view of a portion of a face. The first detection result may indicate whether the target object is wearing an article that can block view of a face region, such as a face mask. Further, identification may be performed according to the first detection result. S13 may be implemented as follows. When the liveness detection result indicates liveness, identification processing may be performed on the first region according to the first detection result, acquiring the identity information of the target object.

[0083] In a possible implementation, it may first be determined whether there is a preset target (such as a face mask, etc.) in the face of the target object. It may be detected whether the first region includes a preset target, acquiring a first detection result, as follows. A face region in the first region may be detected, determining a result of lack of feature in the face region. When the result of lack of feature indicates lack of a preset feature, it may be detected whether the face region includes the preset target, acquiring the first detection result.

[0084] In a possible implementation, a face region in the first region may be detected via a neural network. For example, a feature map of the face region may be acquired via a convolutional neural network. When the target object is wearing an article (a preset target) capable of blocking view of the face, such as a face mask, a feature is lacking in

the feature map of the face region. For example, if the target object is wearing a face mask, it is impossible to detect any feature of the target object's mouth and nose. That is, any feature of the mouth and the nose is missing. When the target object is wearing sunglasses, it is impossible to detect any feature of the eyes. That is, any feature of the eyes is missing.

[0085] In one possible implementation, when a preset feature (such as an orinasal feature or an eye feature, etc.) is missing, the target object may be wearing an article such as a face mask, sunglasses, etc. Further detection may be performed. For example, it may be monitored, via a method such as a convolutional neural network, etc., whether a preset target such as a face mask exists on the face of the target object. For example, an article such as a face mask may be identified by monitoring a feature such as the shape, the texture, etc., of the face mask, and it may be ruled out that view of the face is blocked by hand by the target object or by another person.

[0086] In one possible implementation, when a preset feature (e.g., an orinasal feature or an eye feature, etc.) is not missing (i.e., the facial features are complete), then the preset target such as a face mask does not exist. If the monitored region is a medical and health place such as a hospital, or a public place during epidemic, it may be a violation not to wear a face mask. The method may further include an option as follows. Second warning information may be generated when the first detection result indicates nonexistence of the preset target. Further, a second warning message may be output through a warning device or a display to remind the target object to wear a face mask. For example, the warning device may include a device such as an audio, a warning light, etc. The second warning information may be output as sound, light, etc. Alternatively, information that the target object is not wearing a face mask may be displayed on the display. A mode of outputting the second warning information is not limited in embodiments of the present disclosure.

[0087] In a possible implementation, a method for identification may also be determined according to the first detection result (i.e., whether the target object is wearing an article capable of blocking view of the face). Identification processing may be performed on the first region according to the first detection result, acquiring the identity

information of the target object, as follows. When the first detection result indicates nonexistence of the preset target, first identification processing may be performed on a face region in the first region, acquiring the identity information of the target object. Alternatively, when the first detection result indicates existence of the preset target, second identification processing may be performed on the face region in the first region, acquiring the identity information of the target object. A weight of a feature of a viewable region of the face in the second identification processing may be greater than a weight of a feature of a region corresponding to the viewable region in the first identification processing.

[0088] In a possible implementation, identification processing may be performed using a neural network. The neural network for the first identification processing may differ from the neural network for the second identification processing. In an example, when view of the face region of the target object is partially blocked, only a viewable region is available as the face region for identification. A feature in the viewable region may have a greater weight during neural network training. For example, an attention mechanism of the neural network may be focused on any feature in the viewable region and identification may be performed using the any feature in the viewable region.

[0089] In a possible implementation, when view of the face region of the target object is not blocked, and any feature of the face region may be available for identification processing, the neural network may perform identification according to the any feature of the face region.

[0090] For example, when the target subject is wearing a face mask, and the neural network may acquire only features of the eyes and the eyebrows (with orinasal features missing), the neural network may increase the weight of any feature of the eyes and the eyebrows in training, so as to perform identification according to the any feature of the eyes and the eyebrows. When the target object is not wearing a face mask and the neural network may acquire all features of the face region, the neural network may perform identification according to all features of the face region.

[0091] For example, the neural network may determine the similarity between the any feature of the eyes and the eyebrows and a reference feature (a reference feature of the

eyes and the eyebrows) in a database, and determine identity information corresponding to a reference feature with a similarity greater than or equal to a similarity threshold as identity information of the target object. Similarly, the neural network may determine the similarity between a facial feature and a reference feature (a facial reference feature) in the database, and determine the identity information corresponding to a reference feature with a similarity greater than or equal to a similarity threshold as identity information of the target object.

[0092] For example, when there is no reference feature in the database that has a similarity to features of the target object greater than or equal to the similarity threshold (i.e., the target object does not match existing identity information in the database), the features of the target object may be stored in the database, and an identifier (such as an identity code, etc.) may be added for the target object. A method for identification is not limited in embodiments of the present disclosure.

[0093] In this mode, a method for identification may be selected according to whether a preset target exists, improving accuracy in identification.

[0094] In a possible implementation, the gender of the target object may also be identified. In a possible implementation, average body temperature for male and female may differ. Therefore, a preset temperature threshold may be set according to the gender. For example, female average body temperature is higher than male average body temperature by 0.3°C. In monitoring temperature, the preset temperature threshold may be set according to the gender, such as to be 37°C for male and 37.3°C for female. The method may further include an option as follows. Gender information of the target object may be acquired. The preset temperature threshold may be determined according to the gender information.

[0095] In a possible implementation, the gender information of the target object may be determined according to the facial features of the target object. For example, when the target object is not wearing a face mask, the gender of the target object may be determined according to all features of the face of the target object. When the target object is wearing a face mask, the gender of the target object may be determined

according to any feature of the eyes and the eyebrows of the target object. Alternatively, when the facial features or the any feature of the eyes and the eyebrows of the target object match reference features in the database, the gender of the target object may be determined according to the gender recorded in identity information corresponding to the reference features in the database. A method of determining the gender is not limited in embodiments of the present disclosure.

[0096] In a possible implementation, the preset temperature threshold may be determined according to the gender information. For example, if female average body temperature is higher than male average body temperature, the preset temperature threshold for female may be higher than the preset temperature threshold for male. A method for determining the preset temperature threshold is not limited in embodiments of the present disclosure.

[0097] In a possible implementation, in S13, temperature detection processing may also be performed on a fourth region (corresponding to a second region in the image of visible light in which a preset part is located) in the infrared image in which the preset part (such as the forehead) is located, to determine temperature information (such as body temperature) of the target object. For example, the value of a pixel in the infrared image may represent color temperature. The color temperature may be used to determine temperature of the forehead region of the target object. A mode of determining the temperature information is not limited in embodiments of the present disclosure.

[0098] In a possible implementation, in S14, if the temperature information is greater than or equal to the preset temperature threshold, the first warning information is generated according to the identity information of the target object. For example, during epidemic, fever is a suspected symptom. Focus may be put on monitoring a target subject with a symptom. When body temperature of a target object is greater than or equal to the preset temperature threshold, the target object is considered to have a fever symptom. First warning information may be generated according to the identity information of the target object. For example, the identity information and the body temperature of the target object may be displayed on the display, to focus on monitoring the target object. As another example, the first warning information may be sent by an audio device, etc. to

remind epidemic preventing personnel to focus on the target object, or to quarantine the target object, etc. A mode of outputting the first warning information is not limited in embodiments of the present disclosure.

[0099] In a possible implementation, the method may further include an option as follows. Location information of the first region or the third region, the temperature information of the target object, and the identity information of the target object, may be superimposed on at least one of the image of visible light or the infrared image, acquiring a detected image.

[00100] In a possible implementation, the image of visible light and/or the infrared image may be displayed by a display, and the identity information and/or the temperature information of the target object may be displayed where the target object is located in the image of visible light and/or the infrared image. For example, the identity information and/or the temperature information of the target object may be superimposed on the first region in which the target object is located in the image of visible light. That is, the identity information and/or the temperature information of the target object are displayed in the first region. Similarly, the identity information and/or the temperature information of the target object may be displayed in the third region of the infrared image. A mode of display is not limited in embodiments of the present disclosure.

[00101] With the monitoring method of embodiments of the present disclosure, a liveness detection strategy may be determined via the size of the first region. Liveness detection may be performed based on the liveness detection strategy. Accuracy in liveness detection in the far infrared image may be improved using isothermal analysis. A method for identification may be selected according to whether a preset target exists, improving accuracy in identification. Further, it is possible to detect the temperature of a preset part, implementing quick detection of the body temperature of the target object in an image, improving efficiency in body temperature detection, applicable to a place of heavy traffic. Moreover, the identity information of the target object may be identified via the image of visible light, which helps to determine identity information of a suspected case, improving efficiency in epidemic prevention.

[00102] FIG. 4A and FIG. 4B each are an illustrative diagram of applying a monitoring

method according to an embodiment of the present disclosure. As shown in FIG. 4A, the monitoring method may be used in a monitoring system for monitoring a monitored region, the monitoring system may include: an infrared camera 1 for acquiring life light and an infrared image; a visible light camera 2 for acquiring an image of visible light; and a processor 3 (such as a System-on-Chip, SoC). The system may further include: a light supplementing unit 4 for use in an environment of poor illumination; a display 5 for displaying the image of visible light, the infrared image, and/or warning information; a communication unit 6 for transmitting the warning information, temperature information, etc.; a warning unit 7 for outputting warning information; an interaction unit 8 for inputting an instruction, etc.

[00103] In a possible implementation, as shown in FIG. 4B, the infrared camera 1 and the visible light camera 2 may take video frames of the monitored region, such as an image of visible light AF (AF1-AF25) and an infrared image BF (BF1-BF25). In addition, location correction may be performed on the image of visible light AF and the infrared image BF. That is, the location of a third region in the infrared image BF may be determined according to the location of a first region in the image of visible light AF.

[00104] In a possible implementation, the processor 3 may detect quality of the image of visible light AF, such as by detecting boundary sharpness and texture of the image of visible light, and delete an image of visible light of poor quality and a corresponding infrared image. Further, when there is no target object in an image of visible light, the image of visible light and the corresponding infrared image are deleted. For example, when there is no one in the monitored region, the image of visible light and the corresponding infrared image may be deleted.

[00105] In a possible implementation, the processor 3 may perform location detection processing on the image of visible light AF, acquiring a first region in which a target object is located, and may also acquire a second region in which the forehead of the target object is located. The location of the third region in which the target object is located in the infrared image and the location of the fourth region in which the forehead of the target object is located in the infrared image may be determined according to locations of the first region and the second region in the image of visible light.

- [00106] In a possible implementation, the processor 3 may determine a distance between the target object and a camera according to the size information of the first region, and determine a liveness detection strategy based on the distance.
- [00107] In a possible implementation, when the distance of the target object is greater than or equal to a first distance threshold, the liveness detection strategy is determined as a liveness detection strategy based on body morphology. Morphology detection may be performed on the third region in the infrared image, acquiring a morphology detection score. Isothermal analysis may be performed on a face region in the infrared image, acquiring an isothermal analysis score. Further, according to a liveness detection strategy based on body morphology, a large first weight may be assigned to the morphology detection score, and a small second weight may be assigned to the isothermal analysis score. The liveness detection result may be acquired by weighted summation.
- [00108] In a possible implementation, when the distance of the target object is less than the first distance threshold and greater than or equal to a second distance threshold, the liveness detection strategy is determined as a liveness detection strategy based on head and neck morphology. Morphology detection may be performed on the third region in the infrared image, acquiring a morphology detection score. Isothermal analysis may be performed on a face region in the infrared image, acquiring an isothermal analysis score. Further, according to a liveness detection strategy based on head and neck morphology, comparable weights may be assigned to the morphology detection score and the isothermal analysis score. The liveness detection result may be acquired by weighted summation.
- [00109] In a possible implementation, when the distance of the target object is less than the second distance threshold, the liveness detection strategy is determined as a liveness detection strategy based on face morphology. Morphology detection may be performed on the third region in the infrared image, acquiring a morphology detection score. Isothermal analysis may be performed on a face region in the infrared image, acquiring an isothermal analysis score. Further, according to a liveness detection strategy based on face morphology, a small first weight may be assigned to the morphology detection score, and a large second weight may be assigned to the isothermal analysis score. The liveness

detection result may be acquired by weighted summation.

[00110] In a possible implementation, the processor 3 may detect, in the first region of the image of visible light, whether the target object is wearing a face mask, generate second warning information if the target object is not wearing a face mask, and display the second warning information through the display 5, or play the second warning information through the warning unit 7.

[00111] In a possible implementation, the processor 3 may determine a method for identification based on whether the target object is wearing a face mask. For example, when the target object is not wearing a face mask, identity information of the target object may be determined by comparing all facial features of the target object with reference features in the database. When the target object is wearing a face mask, the identity information of the target object may be determined by comparing any feature of the eyes and the eyebrows of the target object with the reference features in the database. Further, the second warning information may also include the identity information of the target object. For example, it may be displayed on the display 5 that XXX (name) is not wearing a face mask, etc.

[00112] In a possible implementation, the processor 3 may identify the gender of the target object. For example, the gender of the target object may be identified according to the facial features of the target object. Alternatively, the gender of the target object may be acquired according to the identity information of the target object. Further, the preset temperature threshold of a male target object and the preset temperature threshold of a female target may be determined according to the gender of a target object. Alternatively, the preset temperature threshold may be input through the interaction unit 8. A mode of setting the preset temperature threshold is not limited in embodiments of the present disclosure.

[00113] In a possible implementation, temperature monitoring is performed on the fourth region (i.e., the region where the forehead is located in the infrared image), acquiring the body temperature of the target object. If the body temperature exceeds the preset temperature threshold, the processor 3 may generate the first warning information. The first warning information may be displayed through the display 5, or played through

the warning unit 7. Further, the identity information and the body temperature of a target object having a fever, and the location information of the camera (that is, the location where the target object having a fever appears) may be transmitted to a background database or a server through the communication unit 6, so as to facilitate tracking a suspected case and determining the activity trajectory of the suspected case.

[00114] In a possible implementation, identity information and body temperature of a target object may be superimposed on a first region in the image of visible light or a third region in the infrared image. The resulting image may be displayed on the display 5, such that temperature information and identity information of each target object in the monitored region may be observed visually. In addition, the image resulting from superimposition may be stored.

[00115] In a possible implementation, with the monitoring method, temperature monitoring may be performed using but the image of visible light and the infrared image, reducing hardware cost of the camera, reducing data processing pressure. It may also be monitored whether a target object is wearing a face mask. The method may be used in a field such as monitoring in a medical and health place, epidemic prevention monitoring, etc. A field for applying the monitoring method is not limited in embodiments of the present disclosure.

[00116] FIG. 5 is a block diagram of a monitoring system according to an embodiment of the present disclosure. As shown in FIG. 5, the monitoring system include an infrared image acquiring portion 11, a visible light image acquiring portion 12, and a processing portion 13.

[00117] The processing portion 13 is configured to implement:

[00118] performing target region identification on an image of visible light of a monitored region acquired by the visible light image acquiring portion 12, acquiring a first region in which a target object is located in the image of visible light and a second region in which a preset part of the target object is located;

[00119] performing liveness detection on the target object according to size information of the first region and a third region corresponding to the first region in an

infrared image acquired by the infrared image acquiring portion 11, acquiring a liveness detection result;

[00120] in response to the liveness detection result indicating liveness, performing identification processing on the first region, acquiring identity information of the target object, and performing temperature detection processing on a fourth region corresponding to the second region in the infrared image, acquiring temperature information of the target object; and

[00121] in response to the temperature information being greater than or equal to a preset temperature threshold, generating first warning information according to the identity information of the target object.

[00122] In a possible implementation, the processing portion 13 may include a processor (such as the processor 3 in FIG. 4A), the infrared image acquiring portion 11 may include an infrared camera (such as the infrared camera 1 in FIG. 4A), and the visible light image acquiring portion 12 may include a visible light camera (such as the visible light camera 2 in FIG. 4A).

[00123] In a possible implementation, the processing portion is further configured to implement:

[00124] determining a distance between the target object and an image acquiring device having acquired the image of visible light according to the size information of the first region;

[00125] determining a liveness detection strategy according to the distance;

[00126] determining a location of the third region in the infrared image according to a location of the first region in the image of visible light; and

[00127] performing liveness detection processing on the third region in the infrared image according to the liveness detection strategy, acquiring the liveness detection result.

[00128] In a possible implementation, the processing portion is further configured to implement:

- [00129] in response to the distance being greater than or equal to a first distance threshold, determining the liveness detection strategy as a liveness detection strategy based on body morphology; or
- [00130] in response to the distance being greater than or equal to a second distance threshold and less than the first distance threshold, determining the liveness detection strategy as a liveness detection strategy based on head and neck morphology; or
- [00131] in response to the distance being less than the second distance threshold, determining the liveness detection strategy as a liveness detection strategy based on face morphology.
- [00132] In a possible implementation, the processing portion is further configured to implement:
- [00133] performing morphology detection processing on the third region according to the liveness detection strategy, acquiring a morphology detection result;
- [00134] in response to the morphology detection result indicating living body morphology, performing isothermal analysis processing on a face region in the third region, acquiring an isothermal analysis result;
- [00135] determining a first weight of the morphology detection result and a second weight of the isothermal analysis result according to the liveness detection strategy; and
- [00136] determining the liveness detection result according to the first weight, the second weight, the morphology detection result, and the isothermal analysis result.
- [00137] In a possible implementation, the processing portion is further configured to implement:
- [00138] in response to the liveness detection result indicating liveness, detecting whether the first region comprises a preset target, acquiring a first detection result, the preset target comprising an article blocking view of a portion of a face.
- [00139] The processing portion may be further configured to implement:

- [00140] in response to the liveness detection result indicating liveness, performing identification processing on the first region according to the first detection result, acquiring the identity information of the target object.
- [00141] In a possible implementation, the processing portion is further configured to implement:
- [00142] detecting a face region in the first region, determining a result of lack of feature in the face region; and
- [00143] in response to the result of lack of feature indicating lack of a preset feature, detecting whether the face region comprises the preset target, acquiring the first detection result.
- [00144] In a possible implementation, the processing portion is further configured to implement:
- [00145] in response to the first detection result indicating nonexistence of the preset target, performing first identification processing on a face region in the first region, acquiring the identity information of the target object; or
- [00146] in response to the first detection result indicating existence of the preset target, performing second identification processing on the face region in the first region, acquiring the identity information of the target object. A weight of a feature of a viewable region of the face in the second identification processing may be greater than a weight of a feature of a region corresponding to the viewable region in the first identification processing.
- [00147] In a possible implementation, the processing portion is further configured to implement:
- [00148] superimposing location information of the first region or the third region, the temperature information of the target object, and the identity information of the target object on at least one of the image of visible light or the infrared image, acquiring a detected image.

- [00149] In a possible implementation, the processing portion is further configured to implement:
- [00150] acquiring gender information of the target object; and
- [00151] determining the preset temperature threshold according to the gender information.
- [00152] In a possible implementation, the processing portion is further configured to implement:
- [00153] generating second warning information in response to the first detection result indicating nonexistence of the preset target.
- [00154] It may be understood that method embodiments mentioned in the present disclosure may be combined with each other to form a combined embodiment as long as the combination does not go against a principle or a logic, which is not elaborated in the present disclosure due to a space limitation.
- [00155] In addition, embodiments of the present disclosure also provide a monitoring system, electronic equipment, a computer-readable storage medium, and a program, all of which may be used to implement any monitoring method provided in embodiments of the present disclosure. Refer to corresponding description in the method part for the corresponding technical solution and description, which are not repeated.
- [00156] A person having ordinary skill in the art may understand that in the method of an implementation, the order in which the steps are put is not necessarily a strict order in which the steps are implemented, and does not form any limitation to the implementation process. A specific order in which the steps are implemented should be determined based on a function and a possible intrinsic logic thereof.
- [00157] In some embodiments, a function or a module of a device provided in embodiments of the present disclosure may be configured to implement a method described in a method embodiment herein. Refer to description of a method embodiment herein for implementation of the device, which is not repeated here for brevity.

- [00158] Embodiments of the present disclosure also propose a computer-readable storage medium having stored thereon a computer program which, when executed by a processor, implements a method herein. A computer-readable storage medium may be a non-volatile computer-readable storage medium.
- [00159] Embodiments of the present disclosure further provide electronic equipment including a processor and memory configured to store processor-executable instructions. The processor is configured to implement the monitoring method.
- [00160] Embodiments of the present disclosure also provide a computer program product including a computer readable code which, when run on equipment, allows a processor in the equipment to execute instructions for implementing the monitoring method provided in any of the above embodiments.
- [00161] Embodiments of the present disclosure also provide another computer program product for storing computer readable instructions that, when executed, cause a computer to perform the operations of the monitoring method provided in any of the above embodiments.
- [00162] Electronic equipment may be provided as a terminal, a server or equipment in another form.
- [00163] FIG.6 is a block diagram of electronic equipment 800 according to an illustrative embodiment. For example, the electronic equipment 800 may be a terminal such as a mobile phone, a computer, a digital broadcasting terminal, messaging equipment, a game console, tablet equipment, medical equipment, fitness equipment, a Personal Digital Assistant (PDA), etc.
- [00164] Referring to FIG. 6, the electronic equipment 800 may include one or more components as follows: a processing component 802, memory 804, a power component 806, a multimedia component 808, an audio component 810, an Input / Output (I/O) interface 812, a sensor component 814, and a communication component 816.
- [00165] The processing component 802 generally controls an overall operation of the electronic equipment 800, such as operations associated with display, a telephone call,

data communication, a camera operation, a recording operation, etc. The processing component 802 may include at least one processor 820 to execute instructions so as to complete all or some options of the method. In addition, the processing component 802 may include one or more sub-portions to facilitate interaction between the processing component 802 and other components. For example, the processing component 802 may include a multimedia sub-portion to facilitate interaction between the multimedia component 808 and the processing component 802.

[00166] The memory 804 is configured to store various types of data to support operation on equipment 1700. Example of such data may include instructions of any application or method configured to operate on the electronic equipment 800, contact data, phonebook data, messages, pictures, videos, and/or the like. The memory 804 may be realized by any type of volatile or non-volatile storage equipment or combination thereof, such as Static Random Access Memory (SRAM), Electrically Erasable Programmable Read-Only Memory (EEPROM), Erasable Programmable Read-Only Memory (EPROM), Programmable Read-Only Memory (PROM), Read-Only Memory (ROM), magnetic memory, flash memory, magnetic disk, or compact disk.

[00167] The power component 806 supplies electric power to various components of the electronic equipment 800. The power component 806 may include a power management system, one or more power supplies, and other components related to generating, managing and distributing electric power for the electronic equipment 800.

[00168] The multimedia component 808 includes a screen providing an output interface between the electronic equipment 800 and a user. in some embodiments, the screen may include a Liquid Crystal Display (LCD) and a Touch Panel (TP). If the screen includes a TP, the screen may be realized as a touch screen to receive an input signal from a user. The TP includes one or more touch sensors for sensing touch, slide and gestures on the TP. The touch sensors not only may sense the boundary of a touch or slide move, but also detect the duration and pressure related to the touch or slide move. In some embodiments, the multimedia component 808 includes a front camera and/or a rear camera. When the equipment 1700 is in an operation mode such as a shooting mode or a video mode, the front camera and/or the rear camera may receive external multimedia data. Each of the

front camera and the rear camera may be a fixed optical lens system or may have a focal length and be capable of optical zooming.

[00169] The audio component 810 is configured to output and/or input an audio signal. For example, the audio component 810 includes a microphone (MIC). When the electronic equipment 800 is in an operation mode such as a call mode, a recording mode, and a voice recognition mode, the MIC is configured to receive an external audio signal. The received audio signal may be further stored in the memory 804 or may be sent via the communication component 816. In some embodiments, the audio component 810 further includes a loudspeaker configured to output the audio signal.

[00170] The I/O interface 812 provides an interface between the processing component 802 and a peripheral interface sub-portion. Such a peripheral interface sub-portion may be a keypad, a click wheel, a button or the like. Such a button may include but is not limited to: a homepage button, a volume button, a start button, and a lock button.

[00171] The sensor component 814 includes one or more sensors for assessing various states of the electronic equipment 800. For example, the sensor component 814 may detect an on/off state of the equipment 1700 and relative positioning of components such as the display and the keypad of the electronic equipment 800. The sensor component 814 may further detect a change in the position of the electronic equipment 800 or of a component of the electronic equipment 800, whether there is contact between the electronic equipment 800 and a user, the orientation or acceleration/deceleration of the electronic equipment 800, and a change in the temperature of the electronic equipment 800. The sensor component 814 may include a proximity sensor configured to detect existence of a nearby object without physical contact. The sensor component 814 may further include an optical sensor such as a Complementary Metal-Oxide-Semiconductor (CMOS) or Charge-Coupled-Device (CCD) image sensor used in an imaging application. In some embodiments, the sensor component 814 may further include an acceleration sensor, a gyroscope sensor, a magnetic sensor, a pressure sensor, or a temperature sensor.

[00172] The communication component 816 is configured to facilitate wired or wireless/radio communication between the electronic equipment 800 and other equipment. The electronic equipment 800 may access a radio network based on a

communication standard such as WiFi, 2-Generation wireless telephone technology (2G), 3-Generation wireless telephone technology (3G), ... , or a combination thereof. The communication component 816 receives a broadcast signal or broadcasts related information from an external broadcast management system via a broadcast channel. In an illustrative embodiment, the communication component 816 further includes a Near Field Communication (NFC) sub-portion for short-range communication. For example, the NFC sub-portion may be realized based on Radio Frequency Identification (RFID), Infrared Data Association (IrDA), Ultra-WideBand (UWB) technology, BlueTooth (BT) technology, and other technologies.

[00173] In an illustrative embodiment, the electronic equipment 800 may be realized by one or more of Application Specific Integrated Circuit (ASIC), Digital Signal Processing (DSP), Digital Signal Processing Device (DSPD), Programmable Logic Device (PLD), Field Programmable Gate Array (FPGA), controllers, microcontrollers, microprocessors or other electronic components, to implement the method.

[00174] In an illustrative embodiment, there is also provided a non-volatile computer-readable storage medium, such as the memory 804 including computer program instructions. The computer program instructions may be executed by the processor 820 of the electronic equipment 800 to implement a method herein.

[00175] FIG. 7 is a block diagram of electronic equipment 1900 according to an illustrative embodiment. For example, the electronic equipment 1900 may be provided as a server. Referring to FIG. 7, the electronic equipment 1900 may include a processing component 1922 (which per se may include one or more processors), and a memory resource indicated by memory 1932, adapted to storing instructions, such as an APP, executable by the processing component 1922. An APP stored in the memory 1932 may include one or more modules each corresponding to a set of instructions. In addition, the processing component 1922 may be adapted to executing instructions to execute at least a part of an aforementioned method.

[00176] The electronic equipment 1900 may further include a power supply component 1926 adapted to managing the power supply of the electronic equipment 1900, a wired or wireless network interface 1950 adapted to connecting the electronic equipment 1900 to

a network, and an I/O interface 1958. The electronic equipment 1900 may operate based on an operating system stored in the memory 1932, such as Windows Server™, Mac OS X™, Unix™, Linux™, FreeBSD™, or the like.

[00177] In an illustrative embodiment, there is also provided a non-volatile computer-readable storage medium, such as the memory 1932 including computer program instructions. The computer program instructions may be executed by the processor 1922 of the electronic equipment 1900 to implement a method herein.

[00178] Embodiments of the present disclosure may be a system, a method, and /or a computer program product. The computer program product may include a computer-readable storage medium, having borne thereon computer-readable program instructions allowing a processor to implement various aspects of embodiments of the present disclosure.

[00179] A computer-readable storage medium may be tangible equipment capable of keeping and storing an instruction used by instruction executing equipment. For example, a computer-readable storage medium may be, but is not limited to, electric storage equipment, magnetic storage equipment, optical storage equipment, electromagnetic storage equipment, semiconductor storage equipment, or any appropriate combination thereof. A non-exhaustive list of more specific examples of a computer-readable storage medium may include a portable computer disk, a hard disk, Random Access Memory (RAM), Read Only Memory (ROM), Erasable Programmable Read Only Memory (EPROM, or flash memory), Static Random Access Memory (SRAM), Compact Disc Read-Only Memory (CD-ROM), a Digital Video Disc (DVD), a memory stick, a floppy disk, mechanical coding equipment such as a protruding structure in a groove or a punch card having stored thereon an instruction, as well as any appropriate combination thereof. A computer-readable storage medium used here may not be construed as a transient signal per se, such as a radio wave, another freely propagated electromagnetic wave, an electromagnetic wave propagated through a wave guide or another transmission medium (such as an optical pulse propagated through an optical fiber cable), or an electric signal transmitted through a wire.

[00180] A computer-readable program instruction described here may be downloaded

from a computer-readable storage medium to respective computing/processing equipment, or to an external computer or external storage equipment through a network such as the Internet, a Local Area Network (LAN), a Wide Area Network (WAN), and /or a wireless network. A network may include a copper transmission cable, optical fiber transmission, wireless transmission, a router, a firewall, a switch, a gateway computer, and /or an edge server. A network adapter card or a network interface in respective computing/processing equipment receives the computer-readable program instruction from the network, and forwards the computer-readable program instruction to computer-readable storage media in respective computing/processing equipment.

[00181] A computer program instruction for implementing an operation herein may be an assembly instruction, an Instruction Set Architecture (ISA) instruction, a machine instruction, a machine related instruction, a microcode, a firmware instruction, state setting data, or a source code or object code written in any combination of one or more programming languages. A programming language includes an object-oriented programming language such as Smalltalk, C++, etc., as well as a conventional procedural programming language such as C or a similar programming language. Computer-readable program instructions may be executed on a computer of a user entirely or in part, as a separate software package, partly on the computer of the user and partly on a remote computer, or entirely on a remote computer / server. When a remote computer is involved, the remote computer may be connected to the computer of a user through any type of network including a Local Area Network (LAN) or a Wide Area Network (WAN). Alternatively, the remote computer may be connected to an external computer (such as connected through the Internet using an Internet service provider). In some embodiments, an electronic circuit such as a programmable logic circuit, a Field-Programmable Gate Array (FPGA), or a Programmable Logic Array (PLA) is customized using state information of a computer-readable program instruction. The electronic circuit may execute the computer-readable program instruction, thereby implementing various aspects of the present disclosure.

[00182] Aspects of the present disclosure have been described with reference to flowcharts and / or block diagrams of the method, device (system), and computer program product of embodiments of the present disclosure. It is be understood that each

block in the flowcharts and / or the block diagrams and a combination of respective blocks in the flowcharts and / or the block diagrams may be implemented by computer-readable program instructions.

[00183] These computer-readable program instructions may be provided to a general-purpose computer, a dedicated computer, or a processor of another programmable data processing device, thereby producing a machine to allow the instruction to produce, when executed through a computer or the processor of another programmable data processing device, a device implementing a function / move specified in one or more blocks in the flowcharts and / or the block diagrams. The computer-readable program instructions may also be stored in a computer-readable storage medium. The instructions allow a computer, a programmable data processing device and / or other equipment to work in a specific mode. Accordingly, the computer-readable medium including the instructions includes a manufactured article including instructions for implementing each aspect of a function / move specified in one or more blocks in the flowcharts and / or the block diagrams.

[00184] Computer-readable program instructions may also be loaded to a computer, another programmable data processing device, or other equipment, such that a series of operations are executed in the computer, the other programmable data processing device, or the other equipment to produce a computer implemented process, thereby allowing the instructions executed on the computer, the other programmable data processing device, or the other equipment to implement a function / move specified in one or more blocks in the flowcharts and / or the block diagrams.

[00185] The flowcharts and block diagrams in the drawings show possible implementation of architectures, functions, and operations of the system, method, and computer program product according to multiple embodiments of the present disclosure. In this regard, each block in the flowcharts or the block diagrams may represent part of a module, a program segment, or an instruction. The part of the module, the program segment, or the instruction includes one or more executable instructions for implementing a specified logical function. In some alternative implementations, functions noted in the blocks may also occur in an order different from that noted in the

drawings. For example, two consecutive blocks may actually be implemented basically in parallel. They sometimes may also be implemented in a reverse order, depending on the functions involved. Also note that each block in the block diagrams and / or the flowcharts, as well as a combination of the blocks in the block diagrams and / or the flowcharts, may be implemented by a hardware-based application-specific system for implementing a specified function or move, or by a combination of an application-specific hardware and a computer instruction.

[00186] The computer program product may be implemented by hardware, software or a combination thereof. In an optional embodiment, the computer program product is embodied as a computer storage medium. In another optional embodiment, the computer program product is embodied as a software product, such as a Software Development Kit (SDK), etc.

[00187] Description of embodiments of the present disclosure is illustrative, not exhaustive, and not limited to the embodiments disclosed herein. Various modification and variations can be made without departing from the principle of embodiments of the present disclosure. The modification and variations will be apparent to a person having ordinary skill in the art. Choice of a term used herein is intended to best explain the principle and / or application of the embodiments, or improvement to technology in the market, or allow a person having ordinary skill in the art to understand the embodiments disclosed herein.

CLAIMS

What is claimed is:

1. A monitoring method, comprising:

performing target region identification on an image of visible light of a monitored region, acquiring a first region in which a target object is located in the image of visible light and a second region in which a preset part of the target object is located;

performing liveness detection on the target object according to size information of the first region and a third region corresponding to the first region in an infrared image of the monitored region, acquiring a liveness detection result;

in response to the liveness detection result indicating liveness, performing identification processing on the first region, acquiring identity information of the target object, and performing temperature detection processing on a fourth region corresponding to the second region in the infrared image, acquiring temperature information of the target object; and

in response to the temperature information being greater than or equal to a preset temperature threshold, generating first warning information according to the identity information of the target object.

2. The monitoring method of claim 1, wherein performing liveness detection on the target object according to the size information of the first region and the third region corresponding to the first region in the infrared image, acquiring the liveness detection result comprises:

determining a distance between the target object and an image acquiring device having acquired the image of visible light according to the size information of the first region;

determining a liveness detection strategy according to the distance;

determining a location of the third region in the infrared image according to a location of the first region in the image of visible light; and

performing liveness detection processing on the third region in the infrared image according to the liveness detection strategy, acquiring the liveness detection result.

3. The monitoring method of claim 2, wherein determining the liveness detection strategy according to the distance comprises one of:

in response to the distance being greater than or equal to a first distance threshold, determining the liveness detection strategy as a liveness detection strategy based on body morphology; or

in response to the distance being greater than or equal to a second distance threshold and less than the first distance threshold, determining the liveness detection strategy as a liveness detection strategy based on head and neck morphology; or

in response to the distance being less than the second distance threshold, determining the liveness detection strategy as a liveness detection strategy based on face morphology.

4. The monitoring method of claim 2, wherein performing liveness detection processing on the third region according to the liveness detection strategy, acquiring the liveness detection result comprises:

performing morphology detection processing on the third region according to the liveness detection strategy, acquiring a morphology detection result;

in response to the morphology detection result indicating living body morphology, performing isothermal analysis processing on a face region in the third region, acquiring an isothermal analysis result;

determining a first weight of the morphology detection result and a second weight of the isothermal analysis result according to the liveness detection strategy; and

determining the liveness detection result according to the first weight, the second weight, the morphology detection result, and the isothermal analysis result.

5. The monitoring method of claim 1, further comprising:

in response to the liveness detection result indicating liveness, detecting whether the first region comprises a preset target, acquiring a first detection result, the preset target comprising an article blocking view of a portion of a face,

performing identification processing on the first region, acquiring the identity information of the target object comprising:

performing identification processing on the first region according to the first detection result, acquiring the identity information of the target object.

6. The monitoring method of claim 5, wherein detecting whether the first region comprises the preset target, acquiring the first detection result comprises:

detecting a face region in the first region, determining a result of lack of feature in the face region; and

in response to the result of lack of feature indicating lack of a preset feature, detecting whether the face region comprises the preset target, acquiring the first detection result.

7. The monitoring method of claim 5, wherein performing identification processing on the first region according to the first detection result, acquiring the identity information of the target object comprises one of:

in response to the first detection result indicating nonexistence of the preset target, performing first identification processing on a face region in the first region, acquiring the identity information of the target object; or

in response to the first detection result indicating existence of the preset target, performing second identification processing on the face region in the first region, acquiring

the identity information of the target object, a weight of a feature of a viewable region of the face in the second identification processing being greater than a weight of a feature of a region corresponding to the viewable region in the first identification processing.

8. The monitoring method of claim 5, further comprising:

generating second warning information in response to the first detection result indicating nonexistence of the preset target.

9. The monitoring method of any one of claims 1 to 8, further comprising:

superimposing location information of the first region or the third region, the temperature information of the target object, and the identity information of the target object on at least one of the image of visible light or the infrared image, acquiring a detected image.

10. A monitoring system, comprising a visible light image acquiring portion, an infrared image acquiring portion, and a processing portion,

the processing portion being configured to implement:

performing target region identification on an image of visible light of a monitored region acquired by the visible light image acquiring portion, acquiring a first region in which a target object is located in the image of visible light and a second region in which a preset part of the target object is located;

performing liveness detection on the target object according to size information of the first region and a third region corresponding to the first region in an infrared image acquired by the infrared image acquiring portion, acquiring a liveness detection result;

in response to the liveness detection result indicating liveness, performing identification processing on the first region, acquiring identity information of the target object, and performing temperature detection processing on a fourth region corresponding to the second region in the infrared image, acquiring temperature information of the target object; and

in response to the temperature information being greater than or equal to a preset temperature threshold, generating first warning information according to the identity information of the target object.

11. The monitoring system of claim 10, wherein the processing portion is further configured to implement:

determining a distance between the target object and an image acquiring device having acquired the image of visible light according to the size information of the first region;

determining a liveness detection strategy according to the distance;

determining a location of the third region in the infrared image according to a location of the first region in the image of visible light; and

performing liveness detection processing on the third region in the infrared image according to the liveness detection strategy, acquiring the liveness detection result.

12. The monitoring system of claim 11, wherein the processing portion is further configured to implement:

in response to the distance being greater than or equal to a first distance threshold, determining the liveness detection strategy as a liveness detection strategy based on body morphology; or

in response to the distance being greater than or equal to a second distance threshold and less than the first distance threshold, determining the liveness detection strategy as a liveness detection strategy based on head and neck morphology; or

in response to the distance being less than the second distance threshold, determining the liveness detection strategy as a liveness detection strategy based on face morphology.

13. The monitoring system of claim 11, wherein the processing portion is further configured to implement:

performing morphology detection processing on the third region according to the liveness detection strategy, acquiring a morphology detection result;

in response to the morphology detection result indicating living body morphology, performing isothermal analysis processing on a face region in the third region, acquiring an isothermal analysis result;

determining a first weight of the morphology detection result and a second weight of the isothermal analysis result according to the liveness detection strategy; and

determining the liveness detection result according to the first weight, the second weight, the morphology detection result, and the isothermal analysis result.

14. The monitoring system of claim 10, wherein the processing portion is further configured to implement:

in response to the liveness detection result indicating liveness, detecting whether the first region comprises a preset target, acquiring a first detection result, the preset target comprising an article blocking view of a portion of a face,

the processing portion being configured to implement:

performing identification processing on the first region according to the first detection result, acquiring the identity information of the target object.

15. The monitoring system of claim 14, wherein the processing portion is further configured to implement:

detecting a face region in the first region, determining a result of lack of feature in the face region; and

in response to the result of lack of feature indicating lack of a preset feature, detecting whether the face region comprises the preset target, acquiring the first detection result.

16. The monitoring system of claim 14, wherein the processing portion is further configured

to implement:

in response to the first detection result indicating nonexistence of the preset target, performing first identification processing on a face region in the first region, acquiring the identity information of the target object; or

in response to the first detection result indicating existence of the preset target, performing second identification processing on the face region in the first region, acquiring the identity information of the target object, a weight of a feature of a viewable region of the face in the second identification processing being greater than a weight of a feature of a region corresponding to the viewable region in the first identification processing.

17. The monitoring system of any one of claims 10 to 16, wherein the processing portion is further configured to implement:

superimposing location information of the first region or the third region, the temperature information of the target object, and the identity information of the target object on at least one of the image of visible light or the infrared image, acquiring a detected image.

18. Electronic equipment, comprising:

a processor; and

a memory configured to store processor executable instructions,

wherein the processor is configured to implement the monitoring method of any one of claims 1 to 9.

19. A computer-readable storage medium having stored therein computer executable instructions which, when executed by a processor, implement the monitoring method of any one of claims 1 to 9.

20. A computer program comprising a computer-readable code which, when run in electronic equipment, allows a processor in the electronic equipment to perform the monitoring method

of any one of claims 1 to 9.