CLAIMS

1. A liveness detection method, comprising:

sequentially displaying a ~~preset~~ plurality of images to a user~~,~~; ~~and~~

capturing a plurality of face images of ~~a~~ the user while displaying the plurality of images to the user;

for each of the captured face images:

determining an eye image of an eye of the user based on the face image~~; and~~,

extracting a to-be-verified image from the eye image of the user, wherein the to-be-verified image is a reflection of a corresponding one of the displayed images in the eye of the user, and

comparing the corresponding displayed image with the to-be-verified image to determine whether the to-be-verified image matches the corresponding displayed image;

determining a quantity of matches between the to-be-verified images and the corresponding displayed images; and

performing liveness detection on the user based on the quantity of matches~~preset image and a to-be-verified image included in the eye image~~.

2. The method according to claim 1, wherein the determining ~~an~~ the eye image of the user based on the face image comprises:

determining whether the face image ~~meets a preset condition~~contains the user's face or reaches a clarity; and

in response to determining ~~if it is determined~~ that the face image contains the user's face or reaches the clarity~~meets the preset condition~~, extracting the eye image of the user from the face image.

3. The method according to claim 1, wherein each displayed image ~~the preset image~~ comprises a first character~~ and/or a pattern~~, and ~~the~~ each to-be-verified image comprises a second character~~ and/or a pattern~~; and

wherein the comparing the corresponding displayed image with the to-be-verified image to determine whether the to-be-verified image matches the displayed image ~~the performing liveness detection on the user based on the preset image and a to-be-verified image included in the eye image~~ comprises:

comparing ~~performing liveness detection on the user based on~~ characteristic information in the corresponding displayed ~~preset~~ image and characteristic information in the to-be-verified image to determine whether the characteristic information in the to-be-verified

image matches the characteristic information in the corresponding displayed image, wherein ~~if the preset image or the to-be-verified image comprises a character,~~ the characteristic information in the corresponding displayed image comprises ~~at least one of~~ a size of the first character, a color of the first character, ~~and~~ or a location of the first character ~~in the preset image or the to-be-verified image; if the preset image or the to-be-verified image comprises a pattern~~, and the characteristic information in the to-be-verified image comprises ~~at least one of a shape,~~ a size of the second character, ~~and~~ a color of the second character, ~~and~~ or a location of the ~~pattern in the preset image or the to-be-verified image~~second character.

4. The method according to claim 1, wherein each displayed image comprises a first pattern, and each to-be-verified image comprises a second pattern; and

wherein the comparing the corresponding displayed image with the to-be-verified image to determine whether the to-be-verified image matches the displayed image comprises:

comparing characteristic information in the corresponding displayed image and characteristic information in the to-be-verified image to determine whether the characteristic information in the to-be-verified image matches the characteristic information in the corresponding displayed image, wherein the characteristic information in the corresponding displayed image comprises a shape of the first pattern, a size of the first pattern, a color of the first pattern, or a location of the first pattern, and the characteristic information in the to-be-verified image comprises a shape of the second pattern, a size of the second pattern, a color of the second pattern, or a location of the second pattern.

~~4. The method according to any one of claims 1 to 3, wherein the to-be-verified image is an image formed by reflection of the preset image in an eye of the user; and~~

~~the performing liveness detection on the user based on the preset image and a to-be-verified image included in the eye image comprises:~~

~~comparing the preset image with the to-be-verified image, and performing liveness detection on the user based on an obtained comparison result.~~

5. The method according to claim 41, wherein the sequentially displaying ~~a preset image~~the plurality of images to the user comprises:

sequentially displaying ~~a~~ the plurality of ~~preset~~ images in a specified order within a ~~preset~~ time.

6. The method according to claim 5, wherein the capturing the plurality of face images of the user while displaying the plurality of images to the user ~~; and~~

~~the capturing a face image of a user~~ comprises:

continuously capturing the plurality of face images of the user ~~at least~~ within the ~~preset~~

time.

~~6. The method according to claim 5, wherein the determining an eye image of the user based on the face image comprises:~~

~~for each of the continuously captured face images, determining an eye image of the user based on the face image as an eye image corresponding to the face image; and~~

~~the performing liveness detection on the user based on the preset image and a to-be-verified image included in the eye image comprises:~~

~~determining designated preset images from the displayed plurality of preset images, and performing liveness detection on the user based on the quantity of the designated preset images; and/or determining designated face images from the continuously captured face images, and performing liveness detection on the user based on the quantity of the designated face images, wherein~~

~~each of the designated preset images is a preset image matching a to-be-verified image included in the eye image corresponding to at least one face image; and~~

~~each of the designated face images is a face image for which a to-be-verified image included in the corresponding eye image matches at least one preset image.~~

7. A liveness detection apparatus, comprising:

a display module, configured to sequentially display a ~~preset~~ plurality of images to a user; and capture a plurality of face images of ~~a~~ the user while displaying the plurality of images to the user;

a determination module, configured to, for each of the captured face images:

determine an eye image of an eye of the user based on the face image,~~; and~~

extract a to-be-verified image from the eye image of the user, wherein the to-be-verified image is a reflection of the corresponding displayed image in the eye of the user,

compare the corresponding displayed image with the to-be-verified image to determine whether the to-be-verified image matches the corresponding displayed image, and

determine a quantity of matches between the to-be-verified images and the corresponding displayed images; and

a detection module, configured to perform liveness detection on the user based on the quantity of matches~~preset image and a to-be-verified image included in the eye image~~.

8. The apparatus according to claim 7, wherein when determining the eye image of the user based on the face image, the determination module is configured to:

determine whether the face image contains the user's face or reaches a clarity ~~meets a preset condition~~; and

in response to determining ~~if it is determined~~ that the face image contains the user's face or reaches the clarity~~meets the preset condition~~, extract the eye image of the user from the face image.

9. The apparatus according to claim 7, wherein ~~the preset~~each displayed image comprises a first character ~~and/or a pattern~~, and each ~~the~~ to-be-verified image comprises a second character ~~and/or a pattern~~; and

wherein when comparing the corresponding displayed image with the to-be-verified image to determine whether the to-be-verified image matches the displayed image, the detection module is configured to:

compare characteristic information in the corresponding displayed image and characteristic information in the to-be-verified image to determine whether the characteristic information in the to-be-verified image matches the characteristic information in the corresponding displayed image, wherein the characteristic information in the corresponding displayed image comprises a size of the first character, a color of the first character, or a location of the first character, and the characteristic information in the to-be-verified image comprises a size of the second character, a color of the second character, or a location of the second character~~perform liveness detection on the user based on characteristic information in the preset image and characteristic information in the to-be verified image, wherein if the preset image or the to-be-verified image comprises a character, the characteristic information comprises at least one of a size, a color, and a location of the character in the preset image or the to-be-verified image; if the preset image or the to-be-verified image comprises a pattern, the characteristic information comprises at least one of a shape, a size, and a color, and a location of the pattern in the preset image or the to-be-verified image~~.

10. The apparatus according to claim 7, wherein each displayed image comprises a first pattern, and each to-be-verified image comprises a second pattern; and

wherein when comparing the corresponding displayed image with the to-be-verified image to determine whether the to-be-verified image matches the displayed image, the detection module is configured to:

compare characteristic information in the corresponding displayed image and characteristic information in the to-be-verified image to determine whether the characteristic information in the to-be-verified image matches the characteristic information in the corresponding displayed image, wherein the characteristic information in the corresponding

displayed image comprises a shape of the first pattern, a size of the first pattern, a color of the first pattern, or a location of the first pattern, and the characteristic information in the to-be-verified image comprises a shape of the second pattern, a size of the second pattern, a color of the second pattern, or a location of the second pattern.

~~10. The apparatus according to any one of claims 7 to 9, wherein the to-be-verified image is an image formed by reflection of the preset image in an eye of the user; and~~

~~the detection module is configured to compare the preset image with the to-be-verified image, and perform liveness detection on the user based on an obtained comparison result.~~

11. The apparatus according to claim ~~10~~7, wherein when sequentially displaying the plurality of images to the user, the display module is configured to:

sequentially display ~~a~~ the plurality of ~~preset~~ images in a specified order within a ~~preset~~ time.

12. The apparatus according to claim 7, wherein when capturing the plurality of face images of the user while displaying the plurality of images to the user,

~~; and~~

the display module is configured to:

continuously capture the plurality of face images of the user ~~at least~~ within the ~~preset~~ time.

~~12. The apparatus according to claim 11, wherein the determination module is configured to: for each of the continuously captured face images, determine an eye image of the user based on the face image as an eye image corresponding to the face image; and~~

~~the detection module is configured to determine designated preset images from the plurality of displayed preset images, and perform liveness detection on the user based on a quantity of the designated preset images; and/or determine designated face images from the continuously captured face images, and perform liveness detection on the user based on the quantity of the designated face images, wherein each of the designated preset images is a preset image matching a to-be-verified image included in the eye image corresponding to at least one face image; and each of the designated face images is a face image for which a to be verified image included in the corresponding eye image matches at least one preset image.~~

13. A liveness detection device, comprising one or more memories and processors, wherein the one or more memories storing a program configured to cause the one or more processors to execute the following steps:

sequentially displaying a ~~preset~~ plurality of images to a user~~,~~;

~~and~~ capturing a plurality of face images of ~~a~~ the user while displaying the plurality of images to the user;

for each of the captured face images:

determining an eye image of an eye of the user based on the face image~~; and~~,

extracting a to-be-verified image from the eye image of the user, wherein the to-be-verified image is a reflection of a corresponding one of the displayed images in the eye of the user, and

comparing the corresponding displayed image with the to-be-verified image to determine whether the to-be-verified image matches the corresponding displayed image;

determining a quantity of matches between the to-be-verified images and the corresponding displayed images; and

performing liveness detection on the user based on the quantity of matches ~~preset image and a to-be-verified image included in the eye image~~.