comprising a plurality of registration eye gaze images of the user, wherein two or more of the plurality of registration eye gaze images differ in a registration gaze location, a registration gaze display period, or both; displaying a sequence of two or more authentication eye gaze icons, wherein the sequence of authentication eye gaze icons are displayed with a random authentication gaze location, a random authentication gaze display period, a random number of subsequent authentication gaze locations, or any combination thereof on the screen of the mobile device; determining that the user's gaze is directed towards the authentication gaze location of at least a portion of the authentication gaze icons during the display of the authentication eye gaze icons based on a position of the user's eyes, a path of the user's eyes, or both, with respect to the mobile device and independently of a position of the user's head and a movement of the user's head with respect to the mobile device; capturing a plurality of authentication eye gaze images of the user, using the front facing camera, wherein each authentication eye gaze image is captured during the display of one of the plurality of authentication gaze icons; and determining that a spoofing attempt has occurred if at least a portion of the authentication eye gaze images has a similarity score below an authentication threshold with the registration eye gaze images associated with the registration display location that is equivalent to the authentication gaze location of the authentication eye gaze icons; wherein the user's eye gaze profile is registered by steps comprising: (f) displaying a registration eye gaze icon, wherein the registration eye gaze icon is displayed in a different registration display location on the screen of the mobile device; (g) determining that the user's gaze is directed towards the registration display location of the registration gaze icon during the display of the registration eye gaze icon based on a position of the user's eyes, a path of the user's eyes, or both, with respect to the mobile device and independently of a position of the user's head and a movement of the user's head with respect to the mobile device; (h) capturing the registration eye gaze image of the user, wherein the registration eye gaze image is captured during the display of the registration gaze icon; and (i) creating the user's eye gaze profile comprising the captured registration eye gaze image of the user during the display of the registration gaze icon, wherein the captured registration eye gaze image is associated with the registration display location of the registration gaze icon.

[0008] In some embodiments displaying the authentication eye gaze icon comprises displaying a sequence of two or more authentication eye gaze icons. In some embodiments the sequence of the two or more authentication eye gaze icons is a random sequence. In some embodiments the authentication display location of the sequence of the two or more authentication eye gaze icons is a randomized location. In some embodiments the sequence of two or more authentication eye gaze icons is unknown to the user. In some embodiments the user's gaze is determined to be directed towards the authentication display location by a machine learning algorithm. In some

embodiments the authentication display location is at a corner of the screen of the mobile device. In some embodiments the method further comprises displaying a live video feed on the screen of the mobile device, wherein the live video feed comprises a live video feed captured by the front facing camera. In some embodiments the live video feed is overlaid with an image of a face positioning region. In some embodiments the method further comprises determining that the user's face is at least partially displayed within the face positioning region. In some embodiments the user's eye gaze profile is registered by: displaying a registration eye gaze icon, wherein the registration eye gaze icon is displayed in a different registration display location on the screen of the mobile phone; determining that the user's gaze is directed towards the registration display location of each registration gaze icon during the display of each registration eye gaze icon; capturing the registration eye gaze image of the user, wherein the registration eye gaze image is captured during the display of the registration gaze icon; and creating the user's eye gaze profile comprising the captured registration eye gaze images of the user during the display of the registration gaze icon, wherein each captured registration eye gaze image is associated with the registration display location of the registration gaze icon. In some embodiments displaying the registration eye gaze icon comprises displaying a sequence of two or more registration eye gaze icons. In some embodiments the sequence of the two or more

comprises requesting an authentication confirmation by the user before granting access for the user to the resource. In some embodiments the method further comprises notifying the user to position their face with respect to the mobile devices such that their face is at least partially displayed within the face positioning region. In some embodiments the method further comprises notifying the user to gaze at the authentication eye gaze icon. In some embodiments the method further comprises determining if at least a portion of the user's face is occluded by a mask.

[0009] Another aspect provided herein is a computer-implemented system comprising: a digital processing device comprising: at least one processor, an operating system configured to perform executable instructions, a memory, and a computer program including instructions executable by the digital processing device to create an application to determine a spoofing attempt by a user during a request to access a resource via a mobile device having a screen and a front facing camera, the application comprising: a module receiving a user eye gaze profile comprising a plurality of registration eye gaze images of the user, wherein two or more of the plurality of registration eye gaze images differ in a registration gaze location, a registration gaze display period, or both; a module displaying a sequence of two or more authentication eye gaze icons, wherein the sequence of authentication eye gaze icons are displayed with a random authentication gaze location, a random authentication gaze display period, a random number of subsequent authentication gaze locations, or any combination thereof on the screen of the mobile device; a module determining that the user's gaze is directed towards the authentication gaze location of at least a portion of the authentication gaze icons during the display of the authentication eye gaze icons based on a position of the user's eyes, a path of the user's eyes, or both, with respect to the mobile device and independently of a position of the user's head and a movement of the user's head with respect to the mobile device; a module capturing a plurality of authentication eye gaze images of the user, wherein each authentication eye gaze image is captured during the display of one of the plurality of authentication gaze icons; and a module determining that a spoofing attempt has occurred if at least a portion of the authentication eye gaze images has a similarity score below an authentication threshold with the registration eye gaze images associated with the registration display location that is equivalent to the authentication gaze location of the authentication eye gaze icons; wherein the user's eye gaze profile is registered by steps comprising: (f) a module displaying a registration eye gaze icon, wherein the registration eye gaze icon is displayed in a different registration display location on the screen of the mobile device; (g) a module determining that the user's gaze is directed towards the registration display location of the registration gaze icon during the display of the registration eye gaze icon based on a position of the user's eyes, a path of the user's eyes, or

both, with respect to the mobile device and independently of a position of the user's head and a movement of the user's head with respect to the mobile device; (h) a module capturing the registration eye gaze image of the user, wherein the registration eye gaze image is captured during the display of the registration gaze icon; and (i) a module creating the user's eye gaze profile comprising the captured registration eye gaze image of the user during the display of the registration gaze icon, wherein the captured registration eye gaze image is associated with the registration display location of the registration gaze icon.

[0010] In some embodiments displaying the authentication eye gaze icon comprises displaying a sequence of two or more authentication eye gaze icons. In some embodiments the sequence of the two or more authentication eye gaze icons is a random sequence. In some embodiments the authentication display location of the sequence of the two or more authentication eye gaze icons is a randomized location. In some embodiments the sequence of two or more authentication eye gaze icons is unknown to the user. In some embodiments the user's gaze is determined to be directed towards the authentication display location by a machine learning algorithm. In some embodiments the authentication display location is at a corner of the screen of the mobile device. In some embodiments the system further comprises a module displaying a live video feed on the screen of the mobile device, wherein the live video feed comprises a live video feed captured by the front facing camera. In some embodiments the live video feed is overlaid with

user's face is displayed outside the face positioning region for a notification period, if the user's gaze is determined to be directed away from the authentication display location of each authentication gaze icon during the display of each authentication eye gaze icon for the notification period, or both. In some embodiments the system further comprises a module denying the request to access the resource if at least a majority of the user's face is displayed outside the face positioning region, if the user's gaze is determined to be directed away from the authentication display location of at least one authentication gaze icon during the display of each authentication eye gaze icon, or both. In some embodiments the system further comprises a module denying the request to access the resource if at least a majority of the user's face is displayed outside the face positioning region for a termination period, if the user's gaze is determined to be directed away from the authentication display location of each authentication gaze icon during the display of at least one authentication eye gaze icon for the termination period, or both. In some embodiments the system further comprises a module requesting a user name, an identification parameter, or both and associating the user name, the identification parameter, or both with the user's eye gaze profile. In some embodiments the system further comprises a module requesting an authentication confirmation by the user before granting access for the user to the resource. In some embodiments the system further comprises a module notifying the user to position their face with respect to the mobile devices such that their face is at least partially displayed within the face positioning region. In some embodiments the system further comprises a module notifying the user to gaze at the authentication eye gaze icon. In some embodiments the system further comprises a module determining if at least a portion of the user's face is occluded by a mask.

[0011] Another aspect provided herein is a non-transitory computer-readable storage media encoded with a computer program including instructions executable by a processor to create an application to determine a spoofing attempt by a user during a request to access a resource via a mobile device having a screen and a front facing camera, the application comprising: a module receiving a user eye gaze profile comprising a plurality of registration eye gaze images of the user, wherein two or more of the plurality of registration eye gaze images differ in a registration gaze location, a registration gaze display period, or both; a module displaying a sequence of two or more authentication eye gaze icons, wherein the sequence of authentication eye gaze icons are displayed with a random authentication gaze location, a random authentication gaze display period, a random number of subsequent authentication gaze locations, or any combination thereof on the screen of the mobile device; a module determining that the user's gaze is directed towards the authentication display location of at least a portion of the authentication gaze icons during the display of the authentication eye gaze icons based on a position of the user's eyes, a

path of the user's eyes, or both, with respect to the mobile device and independently of a position of the user's head and a movement of the user's head with respect to the mobile device; a module capturing a plurality of authentication eye gaze images of the user, wherein each authentication eye gaze image is captured during the display of one of the plurality of authentication gaze icons; and a module determining that a spoofing attempt has occurred if at least a portion of the authentication eye gaze images has a similarity score below

an authentication threshold with the registration eye gaze images associated with the registration display location that is equivalent to the authentication gaze location of the authentication eye gaze icons; wherein the user's eye gaze profile is registered by: (f) a module displaying a registration eye gaze icon, wherein the registration eye gaze icon is displayed in a different registration display location on the screen of the mobile device; (g) a module determining that the user's gaze is directed towards the registration display location of the registration gaze icon during the display of the registration eye gaze icon based on a position of the user's eyes, a path of the user's eyes, or both, with respect to the mobile device and independently of a position of the user's head and a movement of the user's head with respect to the mobile device; (h) a module capturing the registration eye gaze image of the user, wherein the registration eye gaze image is captured during the display of the registration gaze icon; and (i) a module creating the user's eye gaze profile comprising the captured registration eye gaze images of the user during the display of the registration gaze icon, wherein the captured registration eye gaze image is associated with the registration display location of the registration gaze icon.

[0012] In some embodiments, displaying the authentication eye gaze icon comprises displaying a sequence of two or more authentication eye gaze icons. In some embodiments, the sequence of the two or more authentication eye gaze icons is a random sequence. In some embodiments, the authentication display location of the sequence of the two or more authentication eye gaze icons is a randomized location. In some embodiments, the sequence of two or more authentication eye gaze icons is unknown to the user. In some embodiments, the user's gaze is determined to be directed towards the authentication display location by a machine learning algorithm. In some embodiments, the authentication display location is at a corner of the screen of the mobile device. In some embodiments the media further comprises a module displaying a live video feed on the screen of the mobile device, wherein the live video feed comprises a live video feed captured by the front facing camera. In some embodiments, the live video feed is overlaid with an image of a face positioning region. In some embodiments the media further comprises a module determining that the user's face is at least partially displayed within the face positioning region. In some embodiments, the user's eye gaze profile is registered by: displaying a registration eye gaze icon, wherein the registration eye gaze icon is displayed in a different registration display location on the screen of the mobile phone; determining that the user's gaze is directed towards the registration display location of each registration gaze icon during the display of each registration eye gaze icon; capturing the registration eye gaze image of the user, wherein the registration eye gaze image is captured during the display of the registration gaze icon; and creating the user's eye gaze profile comprising the captured registration eye gaze images of the user during the display of the registration gaze icon, wherein each captured

registration eye gaze image is associated with the registration display location of the registration gaze icon. In some embodiments, displaying the registration eye gaze icon comprises displaying a sequence of two or more registration eye gaze icons. In some embodiments, the sequence of the two or more registration eye gaze icons is a random sequence. In some embodiments, the registration display location of the sequence of the two or more registration eye gaze icons is a randomized location. In some embodiments, the registration display location is a corner of the screen of the mobile device. In some embodiments the media further comprises a module displaying a live video feed on the screen of the mobile device, wherein the live video feed comprises a live video feed captured by the front facing camera. In some embodiments, the live video feed is overlaid with an image of a face positioning region. In some embodiments the media further comprises a module determining that the user's face is at least partially displayed

CLAIMS

WHAT IS CLAIMED IS:

1. A computer-implemented method of determining a spoofing attempt by a user during a request to access a resource via a mobile device having a screen and a front facing camera, the method comprising:

(a) receiving a user eye gaze profile comprising a plurality of registration eye gaze images of the user, wherein two or more of the plurality of registration eye gaze images differ in a registration gaze location, a registration gaze display period, or both;

(b) displaying a sequence of two or more authentication eye gaze icons, wherein the sequence of authentication eye gaze icons are displayed with a random authentication gaze location, a random authentication gaze display period, a random number of subsequent authentication gaze locations, or any combination thereof on the screen of the mobile device;

(c) determining that the user's gaze is directed towards the authentication gaze location of at least a portion of the authentication gaze icons during the display of the authentication eye gaze icons based on a position of the user's eyes, a path of the user's eyes, or both, with respect to the mobile device and independently of a position of the user's head and a movement of the user's head with respect to the mobile device;

(d) capturing a plurality of authentication eye gaze images of the user, using the front facing camera, wherein each authentication eye gaze image is captured during the display of one of the plurality of authentication gaze icons; and

(e) determining that a spoofing attempt has occurred if at least a portion of the authentication eye gaze images has a similarity score below an authentication threshold with the registration eye gaze images associated with the registration display location that is equivalent to the authentication gaze location of the authentication eye gaze icons;

wherein the user's eye gaze profile is registered by steps comprising:

(f) displaying a registration eye gaze icon, wherein the registration eye gaze icon is displayed in a different registration display location on the screen of the mobile device;

(g) determining that the user's gaze is directed towards the registration display location of the registration gaze icon during the display of the registration eye gaze icon based on a position of the user's eyes, a path of the user's eyes, or both, with respect to the mobile device and independently of a position of the user's head and a movement of the user's head with respect to the mobile device;

(h) capturing the registration eye gaze image of the user, wherein the registration eye gaze image is captured during the display of the registration gaze icon; and

(i) creating the user's eye gaze profile comprising the captured registration eye gaze image of the user during the display of the registration gaze icon, wherein the captured registration eye gaze image is associated with the registration display location of the registration gaze icon.

2. The method of claim 1, wherein the sequence of the two or more authentication eye gaze icons is a random sequence.

3. The method of claim 1, wherein the authentication gaze location of the sequence of the two or more authentication eye gaze icons is a randomized location.

4. The method of claim 1, wherein the sequence of two or more authentication eye gaze icons is unknown to the user.

5. The method of claim 1, wherein the user's gaze is determined to be directed towards the authentication gaze location by a machine learning algorithm.

6. The method of claim 1, wherein the authentication display location is at a corner of the screen of the mobile device.

7. The method of claim 1, further comprising displaying a live video feed on the screen of the mobile device, wherein the live video feed comprises a live video feed captured by the front facing camera.

8. The method of claim 7, wherein the live video feed is overlaid with an image of a face positioning region.

9. The method of claim 8, further comprising determining that the user's face is at least partially displayed within the face positioning region.

10. The method of claim 1, wherein displaying the registration eye gaze icon comprises displaying a sequence of two or more registration eye gaze icons.

11. The method of claim 10, wherein the sequence of the two or more registration eye gaze icons is a random sequence.

12. The method of claim 10, wherein the registration display location of the sequence of the two or more registration eye gaze icons is a randomized location.

13. The method of claim 1, wherein the registration display location is a corner of the screen of the mobile device.

14. The method of claim 1, further comprising displaying a live video feed on the screen of the mobile device, wherein the live video feed comprises a live video feed captured by the front facing camera.

15. The method of claim 14, wherein the live video feed is overlaid with an image of a face positioning region.

16. The method of claim 15, further comprising determining that the user's face is at least partially displayed within the face positioning region.

17. The method of claim 1, wherein the number of registration eye gaze images in the registration eye gaze image is greater than the number of authentication eye gaze images in the plurality of authentication eye gaze images.

18. The method of claim 1, wherein the authentication eye gaze icon, the registration eye gaze icon, or both is a geometric shape, an irregular shape, or an image.

19. The method of claim 1, wherein the authentication eye gaze icon, the registration eye gaze icon, or both is displayed for an icon display period.

20. The method of claim 19, wherein the icon display period is about 0.01 seconds to about 60 seconds.

21. The method of claim 1, wherein the authentication eye gaze icon, the registration eye gaze icon, or both comprises an indicator associated with the amount of time remaining in the icon display period, or an amount of time lapsed during the icon display period.

22. The method of claim 1, wherein the indicator comprises a number of seconds, a dynamic pie chart, a dynamic bar chart, a size of the authentication eye gaze icon, a color of the authentication eye gaze icon, or any combination thereof.

23. The method of claim 1, wherein the authentication eye gaze icon, the registration eye gaze icon, or both is static with respect to the mobile device.

24. A computer-implemented system comprising: a digital processing device comprising: at least one processor, an operating system configured to perform executable instructions, a memory, and a computer program including instructions executable by the digital processing device to create an application to determine a spoofing attempt by a user during a request to access a resource via a mobile device having a screen and a front facing camera, the application comprising:

(a) a module receiving a user eye gaze profile comprising a plurality of registration eye gaze images of the user, wherein two or more of the plurality of registration eye gaze images differ in a registration gaze location, a registration gaze display period, or both;

(b) a module displaying a sequence of two or more authentication eye gaze icons, wherein the sequence of authentication eye gaze icons are displayed with a random authentication gaze location, a random authentication gaze display period, a random number of subsequent authentication gaze locations, or any combination thereof on the screen of the mobile device;

(c) a module determining that the user's gaze is directed towards the authentication gaze location of at least a portion of the authentication gaze icons during the display of the authentication eye gaze icons based on a position of the user's eyes, a path of the user's eyes, or both, with respect to the mobile device and independently of a position of the user's head and a movement of the user's head with respect to the mobile device;

(d) a module capturing a plurality of authentication eye gaze images of the user, wherein each authentication eye gaze image is captured during the display of one of the plurality of authentication gaze icons; and

(e) a module determining that a spoofing attempt has occurred if at least a portion of the authentication eye gaze images has a similarity score below an authentication threshold with the registration eye gaze images associated with the registration display location that is equivalent to the authentication gaze location of the authentication eye gaze icons;

wherein the user's eye gaze profile is registered by steps comprising:

(f) a module displaying a registration eye gaze icon, wherein the registration eye gaze icon is displayed in a different registration display location on the screen of the mobile device;

(g) a module determining that the user's gaze is directed towards the registration display location of the registration gaze icon during the display of the registration eye gaze icon based on a position of the user's eyes, a path of the user's eyes, or both, with respect to the mobile device and independently of a position of the user's head and a movement of the user's head with respect to the mobile device;

(h) a module capturing the registration eye gaze image of the user, wherein the registration eye gaze image is captured during the display of the registration gaze icon; and

(i) a module creating the user's eye gaze profile comprising the captured registration eye gaze image of the user during the display of the registration gaze icon, wherein the captured registration eye gaze image is associated with the registration display location of the registration gaze icon.

25. A non-transitory computer-readable storage media encoded with a computer program including instructions executable by a processor to create an application to determine a spoofing attempt by a user during a request to access a resource via a mobile device having a screen and a front facing camera, the application comprising:

(a) a module receiving a user eye gaze profile comprising a plurality of registration eye gaze images of the user, wherein two or more of the plurality of registration eye gaze images differ in a registration gaze location, a registration gaze display period, or both;

(b) a module displaying a sequence of two or more authentication eye gaze icons, wherein the sequence of authentication eye gaze icons are displayed with a random authentication gaze location, a random authentication gaze display period, a random number of subsequent authentication gaze locations, or any combination thereof on the screen of the mobile device;

(c) a module determining that the user's gaze is directed towards the authentication display location of at least a portion of the authentication gaze icons during the display of the authentication eye gaze icons based on a position of the user's eyes, a path of the user's eyes, or both, with respect to the mobile device and independently of a position of the user's head and a movement of the user's head with respect to the mobile device;

(d) a module capturing a plurality of authentication eye gaze images of the user, wherein each authentication eye gaze image is captured during the display of one of the plurality of authentication gaze icons; and

(e) a module determining that a spoofing attempt has occurred if at least a portion of the authentication eye gaze images has a similarity score below an authentication threshold with the registration eye gaze images associated with the registration display location that is equivalent to the authentication gaze location of the authentication eye gaze icons;

wherein the user's eye gaze profile is registered by:

(f) a module displaying a registration eye gaze icon, wherein the registration eye gaze icon is displayed in a different registration display location on the screen of the mobile device;

(g) a module determining that the user's gaze is directed towards the registration display location of the registration gaze icon during the display of the registration eye gaze icon based on a position of the user's eyes, a path of the user's eyes, or both, with respect to the mobile device and independently of a position of the user's head and a movement of the user's head with respect to the mobile device;

(h) a module capturing the registration eye gaze image of the user, wherein the registration eye gaze image is captured during the display of the registration gaze icon; and

(i) a module creating the user's eye gaze profile comprising the captured registration eye gaze images of the user during the display of the registration gaze icon, wherein the captured registration eye gaze image is associated with the registration display location of the registration gaze icon.