

CLAIMS

1. A method of authenticating a genuine presence of a user, the method comprising:
 - generating a probe of a given type that is imperceivable to human senses;
 - modulating the probe according to a pattern, wherein the pattern is not duplicated when performing a succeeding authentication of the user using the probe;
 - directing the modulated probe towards a body part of the user;
 - receiving a response of the body part to the modulated probe;
 - sending data representing the response of the body part to the modulated probe to a digital data processor; and
 - at a digital data processor, analyzing the data representing the response of the body part and authenticating the user if the analysis indicates that:
 - the data representing the response includes a modulation consistent with the pattern used to modulate the probe; and
 - a quality of match between spectral characteristics of the data representing the response and spectral characteristics of a class of responses to a probe of the given type for the human body part in a human population exceeds a threshold quality of match, wherein the spectral characteristics of the data representing the response include at least one characteristic attributable to an absorption of the probe by human skin.
2. The method of claim 1, wherein the human population comprises a population having a specific skin type.
3. The method of claim 2, wherein the specific skin type is determined by analysis of the spectral properties of the data representing the response of the body part.
4. The method of claim 1, wherein the given type of probe comprises infra-red radiation.

5. The method of claim 1, wherein the given type of probe comprises electromagnetic radiation having a frequency corresponding to a water vapor absorption band.
6. The method of claim 1, wherein the modulation includes temporal modulation of the intensity of the probe.
7. The method of claim 1, wherein the modulation includes temporal modulation of the frequency of the probe.
8. The method of claim 1, wherein the modulation includes spatial modulation of the probe.
9. The method of claim 1, wherein the response of the body part includes reflection of the probe.
10. The method of claim 1, wherein the response of the body part includes scintillation.
11. The method of claim 1, wherein the response of the body part includes fluorescence.
12. The method of claim 1, wherein the response of the body part includes persistent luminescence.
13. The method of claim 1, wherein the body part is an ear.
14. The method of claim 1, wherein the body part is a palm.
15. The method of claim 1, wherein the body part is one of an iris, an eyelid, a hand silhouette, a fingerprint, an elbow, a foot, a retina, and a skin melanin pattern.

16. The method of claim 1, wherein the probe comprises electromagnetic radiation in a first set of one or more narrow frequency bands.
17. The method of claim 16, wherein the response of the body part is received by a sensor capable of detecting electromagnetic radiation in a second set of one or more narrow frequency bands.
18. The method of claim 17, wherein at least one of the first set of frequency bands is included within the second set of frequency bands.
19. The method of claim 17, wherein the response of the body part is received by a sensor capable of detecting broadband electromagnetic radiation.
20. The method of claim 1, wherein the probe comprises broadband electromagnetic radiation.
21. The method of claim 20, wherein the response of the body part is received by a sensor capable of detecting electromagnetic radiation in a set of one or more narrow frequency bands.
22. The method of claim 20, wherein the response of the body part is received by a sensor capable of detecting broadband electromagnetic radiation.
23. A mobile device comprising:
 - a CPU; and
 - a memory storing instructions for execution by the CPU, wherein execution of the instructions on the CPU implements a method of authenticating a genuine presence of a user, the method comprising:
 - generating a probe of a given type that is imperceivable to human senses;
 - modulating the probe according to a pattern, wherein the pattern is not duplicated when performing a succeeding authentication of the user using the probe;
 - directing the modulated probe towards a body part of the user;
 - receiving a response of the body part to the modulated probe;

sending data representing the response of the body part to the modulated probe to a digital data processor; and

at a digital data processor, analyzing the data representing the response of the body part and authenticating the user if the analysis indicates that:

the data representing the response includes a modulation consistent with the pattern used to modulate the probe; and

a quality of match between spectral characteristics of the data representing the response and spectral characteristics of a class of responses to a probe of the given type for the human body part in a human population exceeds a threshold quality of match, wherein the spectral characteristics of the data representing the response include at least one characteristic attributable to an absorption of the probe by human skin.

24. An application for a mobile device comprising:

instructions for execution on a CPU of a mobile device, the instructions being stored on a non-transitory computer-readable storage, wherein the instructions, when processed on the CPU of the mobile device, instruct the mobile device to perform a method of authenticating a genuine presence of a user, the method comprising: generating a probe of a given type that is imperceivable to human senses;

modulating the probe according to a pattern, wherein the pattern is not duplicated when performing a succeeding authentication of the user using the probe;

directing the modulated probe towards a body part of the user; receiving a response of the body part to the modulated probe; sending data representing the response of the body part to the modulated probe to a digital data processor; and

at a digital data processor, analyzing the data representing the response of the body part and authenticating the user if the analysis indicates that:

the data representing the response includes a modulation consistent with the pattern used to modulate the probe; and

a quality of match between spectral characteristics of the data representing the response and spectral characteristics of a class of responses to a probe of the given type for the human body part in a human population exceeds a threshold quality of match, wherein the spectral characteristics of the data

representing the response include at least one characteristic attributable to an absorption of the probe by human skin.

25. A method of controlling a physical access of a user, the method comprising:

generating on a user device a first probe of a first type;

modulating the probe according to a first pattern wherein the first pattern is not duplicated when performing a succeeding authentication of the user using the first probe;

directing the modulated first probe towards a body part of the user;

illuminating the body part with a second probe of a second type, wherein the second probe is physically associated with a physical space in which the user is located when the modulated first probe is directed towards the body part of the user;

modulating the second probe according to a second pattern wherein the second pattern is not duplicated when performing a succeeding authentication of the user using the second probe;

receiving a response of the body part of the user to the modulated first probe and the modulated second probe;

sending data representing the response of the body part to the modulated first probe and the modulated second probe to a digital data processor;

at the digital data processor, receiving the data representing the response of the body part, analyzing the received data; and allowing the user to gain physical access if the analysis indicates that:

the received data includes a modulation consistent with the first pattern and the second pattern; and

a quality of match between spectral characteristics of the received data and spectral characteristics of a class of responses of the body part in a human population to a probe of the first type and to a probe of the second type exceeds a predetermined threshold quality of match.

26. The method of claim 25, wherein the user device is a smartphone.

27. The method of claim 25, wherein the second probe is imperceivable to human senses.