bandwidth network, including network interface devices, cable modems, and storage devices such as disk or tape. One or more input devices may be connected to the computer system. Example input devices include, but are not limited to, a keyboard, keypad, track ball, mouse, pen and tablet, touchscreen, camera, communication device, and data input devices. The invention is not limited to the particular input or output devices used in combination with the computer system or to those described herein.

~~**[0083]** Having now described an example embodiment, it should be apparent to those skilled in the art that the foregoing is merely illustrative and not limiting, having been presented by way of example only. Numerous modifications and other embodiments are within the scope of one of ordinary skill in the art and are contemplated as falling within the scope of the invention.~~

[00838~~4~~] The computer system may be a general-purpose computer system, which is programmable using a computer programming language, a scripting language or even assembly language. The computer system may also be specially programmed, special purpose hardware. In a general-purpose computer system, the processor is typically a commercially available processor. The general-purpose computer also typically has an operating system, which controls the execution of other computer programs and provides scheduling, debugging, input/output control, accounting, compilation, storage assignment, data management and memory management, and communication control and related services. The computer system may be connected to a local network and/or to a wide area network, such as the Internet. The connected network may transfer to and from the computer system program instructions for execution on the computer, media data such as video data, still image data, or audio data, metadata, review and approval information for a media composition, media annotations, and other data.

[00845~~5~~] A memory system typically includes a computer readable medium. The medium may be volatile or non-volatile, writeable or nonwriteable, and/or rewriteable or not rewriteable. A memory system typically stores data in binary form. Such data may define an application program to be executed by the microprocessor, or information stored on the disk to be processed by the application program. The invention is not limited to a particular memory system. Time-based media may be

stored on and input from magnetic, optical, or solid-state drives, which may include an array of local or network attached disks.

[00855~~6~~] A system such as described herein may be implemented in software, hardware, firmware, or a combination of the three. The various elements of the system, either individually or in combination may be implemented as one or more computer program products in which computer program instructions are stored on a computer readable medium for execution by a computer or transferred to a computer system via a connected local area or wide area network. Various steps of a process may be performed by a computer executing such computer program instructions. The computer system may be a multiprocessor computer system or may include multiple computers connected over a computer network. The components described herein may be separate modules of a computer program, or may be separate computer programs, which may be operable on separate computers. The data produced by these components may be stored in a memory system or transmitted between computer systems by means of various communication media such as carrier signals.

CLAIMS

1. A method of authenticating a genuine presence of a user, the method comprising:

generating a first probe and a second probe, at least one of said probes being of a given type that is imperceivable to human senses;

at least one of said probes utilizing electromagnetic radiation having a frequency corresponding to a water absorption band in human skin that is not visible to the human eye

modulating at least one of the said first and second ~~the~~ probes according to a pattern, wherein the pattern is not duplicated when performing a succeeding authentication of the user using the said modulated probe wherein the said modulated probe illuminates the physical space surrounding the user;

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 verifying that the body part is genuine ~~authenticating the user~~ if the analysis indicates that:

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

a quality of match between spectral characteristics of the data representing the response and spectral characteristics of a class of responses to the first and second probes ~~a probe~~ of the given type for the human body part in a human population exceeds a threshold quality of match consistent with both illuminations being present, wherein the spectral characteristics of the data representing the response include at least one characteristic attributable to an absorption or reflection of the modulated 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 modulated probe.

7. The method of claim 1, wherein the modulation includes temporal modulation of the frequency of the modulated probe.

8. The method of claim 1, wherein the modulation includes spatial modulation of the modulated probe.

9. The method of claim 1, wherein the response of the body part includes reflection of the modulated probe.

~~10. The method of claim 1, wherein the response of the body part includes scintillation.~~

10.~~11.~~ The method of claim 1, wherein the response of the body part includes fluorescence.

11.~~12.~~ The method of claim 1, wherein the response of the body part includes persistent luminescence.

12.~~13.~~ The method of claim 1, wherein the body part is an ear.

13.~~14.~~ The method of claim 1, wherein the body part is a palm.

14.~~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.

15.~~16.~~ The method of claim 1, wherein the modulated probe comprises electromagnetic radiation in a first set of one or more narrow frequency bands.

16.~~17.~~ The method of claim 15~~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.

17.~~18.~~ The method of claim 16~~17~~, wherein at least one of the first set of frequency bands is included within the second set of frequency bands.

18.~~19.~~ The method of claim 16~~17~~, wherein the response of the body part is received by a sensor capable of detecting broadband electromagnetic radiation.

19.~~20.~~ The method of claim 1, wherein the probe comprises broadband electromagnetic radiation.

20.~~21.~~ The method of claim 19~~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.

21.~~22.~~ The method of claim 19~~20~~, wherein the response of the body part is received by a sensor capable of detecting broadband electromagnetic radiation.

22. The method of any one of Claims 1 to 21, wherein both the first and second probes are modulated probe according to a pattern, wherein the pattern is not duplicated when performing a succeeding authentication of genuine presence of the user using the said modulated probe.

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; the probe utilizing electromagnetic radiation having a frequency corresponding to a water absorption or reflection band in human skin that is not visible to the human eye

modulating the probe according to a pattern, wherein the pattern is not duplicated when performing a succeeding authentication of genuine presence of the user using the said modulated probe wherein the said modulated probe illuminates the physical space surrounding the user;

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 genuine presence of 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 first and second probe of the given type for the human body part in a human population exceeds a threshold quality of match consistent with both illuminations being present, wherein the spectral characteristics of the data representing the response include at least one characteristic attributable to an absorption or reflection 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; the probe utilizing electromagnetic radiation having a frequency corresponding to a water absorption or reflection band in human skin that is not visible to the human eye

modulating the said probe according to a pattern, wherein the pattern is not duplicated when performing a succeeding authentication of the genuine presence of the user using the said modulated probe wherein the modulated probe illuminates the physical space surrounding the user;

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 genuine presence of 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 first and second probe of the given type for the human body part in a human population exceeds a threshold quality of match consistent with both illuminations being present , wherein the spectral characteristics of the data representing the response include at least one characteristic attributable to an absorption or reflection of the probe by human skin.

25. A method of controlling a physical access of a user, wherein the method comprises the step of authenticating the genuine presence of a user according to any one of Claims 1 to 24. ~~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.~~