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(54) **DEVICE AND METHOD FOR VITAL SIGN MEASUREMENT OF A PERSON**

VORRICHTUNG UND VERFAHREN ZUR MESSUNG DER LEBENSZEICHEN EINER PERSON

DISPOSITIF ET PROCÉDÉ DE MESURE DE SIGNES VITAUX D'UNE PERSONNE

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a device and a corresponding method for vital sign measurement of a person.

BACKGROUND OF THE INVENTION

[0002] It is nowadays possible to remotely measure vital signs, such as heart rate and respiration rate. Remote photo-plethysmography (RPPG) measures small brightness variation of the skin using reflected ambient light. Respiration measurement is based on detection of motion and differences between video frames.

[0003] Within Ambient Healing Environments (AHE), the patient is presented with an audiovisual theme to assist in relaxing, for instance before or during an MRI or PET-CT scanning procedure. Remote (camera based) vital signs monitoring is susceptible to changes in the environment, notably the ambient lighting conditions. Within Ambient Healing Environments the environment is under full control, showing a comforting (visual or audiovisual) theme using video projection, light effects and/or sounds.

[0004] WO 2009/153700 A1 discloses a method of monitoring a vital parameter of a patient by measuring attenuation of light emitted onto tissue of the patient. In particular, a modulation scheme is disclosed for rejecting noise from ambient light.

[0005] US 2009/0299675 A1 discloses a system and a method for controlling a light emitting device for an optical sensor based on signal quality and/or power consumption requirements. Drive current and/or integration time is controlled as a function of detected ambient light or signal quality. As the signal quality decreases the drive current or integration time can be adjusted to provide a more usable signal. The method is particularly integrated in a fingerclip sensor.

[0006] Further relevant prior art is disclosed by US 2009/093688 A1.

[0007] However, there is currently no remote vital signs measurement equipment in the AHE, and there is also no connection between the vital signs measurement devices and ambience equipment.

SUMMARY OF THE INVENTION

[0008] It is an object of the present invention, which is defined by claims 1 and 14, to provide a device and a corresponding method for vital sign measurement of a person enabling an accurate and reliable detection of vital signs of a person.

[0009] In a first aspect of the present invention a device for vital sign measurement of a person is presented comprising

- presentation means for presenting a person with an visual theme,
- illumination means arranged to illuminate an illumination area, in which said person is located, whose vital signs shall be measured,
- optical measurements means for optically detecting optical detection signals from said illumination area,
- evaluation means for evaluating said optical detection signals and deriving a vital sign information from them,
- control means for controlling said illumination means in accordance with the visual theme to illuminate said illumination area so as to allow the detection of optical detection signal, from which a vital sign information can be derived despite changes of the visual theme.

[0010] In a further aspect of the present invention a corresponding method is presented.

[0011] Still further, in an aspect of the present invention a computer program is presented comprising program code means for causing a computer to carry out the steps of evaluating optical detection signals and deriving a vital sign information from them, and controlling said step of illuminating to illuminate said illumination area allowing the detection of optical detection signal, from which a vital sign information can be derived despite changes of the visual theme, when said computer program is carried out on the computer.

[0012] Preferred embodiments of the invention are defined in the dependent claims. It shall be understood that the claimed method and the claimed computer program have similar and/or identical preferred embodiments as the claimed device and as defined in the dependent claims.

[0013] The present invention is based on the idea to combine presentation means, e.g. an AHE, and vital sign measurement means and to control said illumination area in a way to guarantee minimum illumination conditions for vital sign measurements even if the presentation of a visual theme to the person changes. In this context, "illumination conditions" may be understood as conditions with respect to the emission of light from the illumination means including conditions with respect to color, texture, brightness, angle of lights, etc. One or more of the parameters relevant for controlling these conditions are controlled according to the present invention by the control means, e.g. implemented in a controller or programmed processor, included in the proposed device.

[0014] In an embodiment said control means is configured to control said presentation means to provide a visual theme in a way that does not prevent the detection of optical detection signals allowing deriving vital signal information from them, in particular to provide a visual theme having changes at a speed outside of the range of the detection of optical detection signals. This shall particularly avoid that the changes of the light effects of the visual theme interfere with the change rate of the vital

signs such as heart rate or respiration rate, which would result in a decrease of the measurement accuracy.

[0015] In another embodiment said control means is configured to control said illumination means and/or said presentation means based on a feedback from said evaluation means. Thus, based on the feedback the illumination and/or the presentation of the visual theme can be appropriately influenced, e.g. in case of decreasing measurement accuracy to increase the accuracy again by providing better illumination conditions for the desired measurement of vital signs.

[0016] Preferably, said control means is configured to control said illumination means and/or said presentation means based on a quality indicator indicating the quality of the vital sign information and/or the derivation of said vital sign information from said optical detection signals.

[0017] In an embodiment the proposed device comprises a remote photoplethysmography (RPPG) device including said optical detection means and said evaluation means, wherein said evaluation means is configured to derive a PPG (photoplethysmography) signal as said vital sign information from said optical detection signals. RPPG is generally known. Such a method to measure skin color variations is described in Wim Verkruysse, Lars O. Svaasand, and J. Stuart Nelson, "Remote plethysmographic imaging using ambient light", Optics Express, Vol. 16, No. 26, December 2008. It is based on the principle that temporal variations in blood volume in the skin lead to variations in light absorptions by the skin. Such variations can be registered by a video camera that takes images of a skin area, e.g. the face, while processing calculates the pixel average over a manually selected region (typically part of the cheek in this system). By looking at periodic variations of this average signal, the heart beat rate and respiratory rate can be extracted. Such an RPPG device can be used in a device according to the present invention for measuring vital signs.

[0018] It has been found that RPPG signal amplitude is largest in green and infrared wavelengths. A second color channel is therefore proposed in another embodiment as a reference signal, where there is no influence from PPG (blue and red wavelengths). The illumination means is then preferably adapted to ensure that the illumination area is constantly illuminated with a suitable mix of wavelengths. Additionally, light effects should not change in same tempo as heart rate.

[0019] The RPPG amplitude is generally determined by the absorption spectrum of (de-)oxyhemoglobin. The optimal wavelengths are e.g. known from fingerclip sensors.

[0020] While in one embodiment the illumination area is constantly illuminated, in another embodiment said control means is configured to control said illumination means and said presentation means to alternately illuminate said illumination area and present said visual theme and to control said optical detection means to detect optical detection signals only when said illumination area is illuminated. Thus, the illumination can be optimized for the detection of optical detection signal for optimum vital sign measurement.

[0021] Further, said control means is preferably configured to control the percentage of the time during which the illumination means illuminates said illumination area and said optical detection means detects optical detection signals. This is preferably advantageous if the illumination light and the visual them are "conflicting", e.g. leading to a bad visual impression for the user, in which case the time during which the illumination means illuminates the illumination area is minimized.

[0022] Preferably, said control means is configured to control said illumination means to compensate for changes in illumination by the presentation of the visual theme, in particular for changes in brightness and/or color. Thus, the illumination, in particular the brightness and color, can be modified such that despite potentially negative changes of brightness and color of the visual theme, the measurement of vital signs is still possible with sufficient accuracy.

[0023] In another embodiment said evaluation means is configured to derive a respiration rate and/or a respiration depth of said person from said optical detection signals.

[0024] Respiration is generally detected using small frame-to-frame changes in a video sequence. To detect such small changes, the subject should have some surface contrast. Thus, it is proposed that the illumination means ensures that there is sufficient contrast. Contrast can e.g. be created by adjusting the angle of incident light. Even on a uniformly colored surface (e.g. a blanket) small shadows will appear if a point source is illuminating the surface at an angle.

[0025] In still another embodiment the proposed device further comprises correction means for correcting said optical detection signals to correct for changes of the visual theme, in particular per complete illumination area or sub-areas thereof. Thus, particularly changes of color and/or brightness of the visual theme are corrected per whole image, image areas or even per pixel. Additionally, direct light (e.g. from the visual theme) and indirect light (from ambience or reflections of the visual theme) are preferably corrected.

[0026] Said presentation means preferably includes an ambient healing equipment for presenting a person with an audiovisual theme. Such an ambient healing equipment, e.g. as particularly used in ambient healing environments (AHE), is generally known and e.g. described in "Ambient Experience helps soothe patients for successful scans", FieldStrength, published by the applicant, Issue 42, December 2010. Such an ambient healing equipment may, for instance, comprise lighting elements and/or displays which can provide different visual impressions to a patient, e.g. by completely coloring one or more walls of the room and/or by displaying pictures or textures on one or more walls or screens.

[0027] The illumination means may include a point light source, in particular an LED for emitting visual or infrared

light. This enables, compared to the use of a large diffuse illuminator, to create sharply defined shadows to enhance the measurement of respiration rate and/or a respiration depth as mentioned above. When the person breathes, any shadows and surface texture will change in received image, i.e. the optical detection signals. These changes are then used for the vital sign measurement.

[0028] In an embodiment said illumination means includes at least two light sources for separately illuminating illumination sub-areas of said illumination area, wherein said control unit is configured to individually control said at least two light sources, wherein a light source is only controlled if a person is present in the associated illumination sub-area. For this detection, a RPPG signal, a respiration signal and/or any other detection, such as a motion detection by use of a known motion detector (e. g. a movement sensor).

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] These and other aspects of the invention will be apparent from and elucidated with reference to the embodiment(s) described hereinafter. In the following drawing

Fig. 1 shows a block diagram of an embodiment with several variations of a device according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0030] Fig. 1 shows a block diagram of an embodiment of a proposed device 1 for vital sign measurement of a person 2 according to the present invention. Fig. 1 particularly shows an embodiment with essential elements, but also depicts further variants with various optional elements as will be explained below. The essential and optional elements can generally be arbitrarily combined in several different embodiments.

[0031] The device 1 comprises a presentation means 10 for presenting the person 2 with a visual or audiovisual theme 20. The presentation means 10 may be part of an ambient healing environments (AHE) for presenting visual or audiovisual themes 20 to persons and may e.g. include a video or image projection apparatus, a TV set or a beamer.

[0032] Further, the device 1 comprises an illumination means 11 for illuminating an illumination area 3, in which said person 2 is located, whose vital signs shall be measured, i.e. for directing an illumination signal 21 (e.g. visual light or infrared light) to the person 2. The illumination means 11 may e.g. include one or more controllable light units such as one or more LEDs or LED assemblies.

[0033] For optically detecting optical detection signals 23 from said illumination area 3 the device 1 comprises optical measurements means 12, e.g. including one or more photo diodes, an image sensor or a video camera, for measuring light 22 from said illumination area 3, from which the optical detection signals 23 are generated.

[0034] The detected optical detection signals 23 are evaluated by evaluation means 13, from which the desired vital sign information 24 is derived. The evaluation means 13 may e.g. include an evaluation unit as commonly provided in a RPPG device, by which a heartbeat signal of a person can be derived from optical detection signals, in particular video images of the skin (e.g. the cheeks) of the person.

[0035] For controlling said illumination means 11 via a control line 30 to illuminate said illumination area 3 allowing the detection of optical detection signal 23, from which the desired vital sign information 24 can be derived despite changes of the visual theme 20, control means 14 are provided. Said control means 14 may be implemented by a dedicated controller or by an appropriately programmed processor. Furthermore, also the evaluation means 13 can be implemented as a programmed processor, either separate from or integrated with the control means 14.

[0036] In an embodiment said illumination means 11 provides a constant illumination of the illumination area 3 (also called measurement area), e.g. a patient table, independent from theme setting. The constant light of the illumination means 11 may be in infrared wavelengths so that it does not interfere with visual stimuli.

[0037] Alternatively, the light in at least the illumination area 3 is alternating rapidly (e.g. at 100 Hz) between a setting optimized for measurement, and a complementary setting adding the theme colors. For instance, if the measurement requires only green light, and the theme requires white light, the light will alternate between green and magenta. Visibly, there will be no or very little difference to a human observer. However, a measurement system (i.e. the optical detection means) that is synchronized to the light can easily distinguish between the settings.

[0038] In case the measurement and theme conditions are conflicting, the visual impact can be minimized by measuring for only a small percentage of the time (e.g. a 10% duty cycle), i.e. the presentation means 10 and the illumination means 11 are controlled accordingly by the control means 14.

[0039] The device 1 may cycle through multiple measurement settings (e.g. one for heart rate, a second for respiration rated (Sp02) in addition to the visual themes.

[0040] In an embodiment the optical detection signals 23, e.g. a video image, presented to the evaluation means 13, i.e. the vital signs detection, is compensated for changes in illumination from the presentation means 10. The brightness and color of the video image are corrected for direct and/or indirect illumination (reflections) from the ambient theme, preferably for both direct and indirect illumination. This can e.g. be implemented in (optional) corrections means 130, preferably included in the evaluation means 13.

[0041] There can be a single correction for the entire image or a correction per image area or even per pixel.

The correction factors can be pre-computed when the AHE system is installed, via a so-called 'dark room calibration', whereby the contribution of each lamp is measured individually.

[0042] If the theme consists of predetermined content, the illumination effect can be recorded, and played back synchronously along with the theme.

[0043] Preferably, in an embodiment the (audio-)visual themes are optimized (preferably offline) to have only changes at a speed that falls outside of vital signs measurement range, preferably much slower. This allows the evaluation means 13 to filter out any changes due to the theme content.

[0044] A diffuse light source used as illumination means 11 may create insufficient contrast (shadows) for respiration sensing. Hence, in an embodiment the device 1 employs a point source light to create sharply defined shadows. The point source is preferably an infrared LED.

[0045] Within certain rooms in the hospital (e.g. PET uptake room and patient ward), the patients are covered with a blanket as to maintain a constant body temperature. However, the blanket could interfere with respiration sensing. The measurement can be aided by using blankets with visible pattern to assist respiration sensing. In combination with an infrared sensitive camera, the pattern may be visible only in infrared wavelengths.

[0046] In an embodiment the (audio-)visual theme is adapted using feedback from vital signs measurement, i.e. there is optionally a feedback loop 31 from the evaluation means 13 to the control means 14 which accordingly controls the illumination means 10 via optional control line 32 that the theme does not interfere with measurements. For example, changes in the light effects can be sped up or slowed down to a rate that does not overlap with the heart rate and respiration rate, respectively.

[0047] Additionally, measurement quality indicators, such as signal to noise ratio, generated by the optical detection means 12 or the evaluation means 13 and provided to the control means 14 by feedback loop 31 or feedback loop 33, can be used by the control means 14 via control line 32 to modify the theme, e.g. by dimming the lights only to a point where measurement quality is sufficient. This prevents measurement problems, for instance with dark-skinned patients, where an RPPG signal amplitude is lower.

[0048] Preferably, in an embodiment the illumination means 11 includes multiple (at least two) light sources 110, 111 that provide the constant or alternating light (as described above) at several illumination sub-areas 3a, 3b. However, the light setting in an illumination sub-area 3a, 3b is only adapted when a person (i.e. a vital sign) is present in that illumination sub-area 3a, 3b. The identification of a person in the illumination sub-area 3a, 3b may be based on "polling" for a vital sign information 24, e.g. a RPPG or respiration signal (e.g. once every minute) and/or by other (optional) detection means 15, such as motion detection means.

[0049] In an embodiment the device 1 comprises a signaling unit 16 to give a visual and/or auditory warning to the staff when presence is detected in the illumination area 3, but no vital sign can be measured within a predetermined interval. This either indicates a problem with the measurement (e.g. no skin visible resulting in no RPPG signal), or a problem with the patient (e.g. apnoea, heart failure).

[0050] The present invention can be implement in various devices and methods, including particularly ambient healing environments (e.g. for MRI and PET/CT), ambient relaxation environments for home use, patient monitoring, vital signs measurement (e.g. for fitness gyms), security systems (e.g. coupled to lights), etc.

[0051] While the invention has been illustrated and described in detail in the drawings and foregoing description, such illustration and description are to be considered illustrative or exemplary and not restrictive; the invention is not limited to the disclosed embodiments. Other variations to the disclosed embodiments can be understood and effected by those skilled in the art in practicing the claimed invention, from a study of the drawings, the disclosure, and the appended claims.

[0052] In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality. A single element or other unit may fulfill the functions of several items recited in the claims. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

[0053] A computer program may be stored / distributed on a suitable non-transitory medium, such as an optical storage medium or a solid-state medium supplied together with or as part of other hardware, but may also be distributed in other forms, such as via the Internet or other wired or wireless telecommunication systems.

[0054] Any reference signs in the claims should not be construed as limiting the scope.

Claims

1. Device (1) for vital sign measurement of a person (2), comprising:

   - presentation means (10) for presenting a person (2) with a visual theme (20),
   - illumination means (11) arranged to illuminate an illumination area (3), in which said person (2) is located, whose vital signs shall be measured,
   - optical measurement means (12) for optically detecting optical detection signals (23) from said illumination area (3),
   - evaluation means (13) for evaluating said optical detection signals (23) and deriving a vital sign information (24) from them,
   - control means (14) for controlling said illumination means in accordance with the visual

theme (11) to illuminate said illumination area (3) so as to allow the detection of optical detection signals (23), from which a vital sign information (24) can be derived despite changes of the visual theme (20).

2. Device (1) as claimed in claim 1, wherein said control means (14) is configured to control said presentation means (10) to provide a visual theme (20) in a way that does not prevent the detection of optical detection signals (23) allowing deriving vital signal information from them, in particular to provide a visual theme (20) having changes at a speed outside of the range of the detection of optical detection signals (23).

3. Device (1) as claimed in claim 1 or 2, wherein said control means (14) is configured to control said illumination means (11) and/or said presentation means (10) based on a feedback from said evaluation means (13).

4. Device (1) as claimed in claim 3, wherein said control means (14) is configured to control said illumination means (11) and/or said presentation means (10) based on a quality indicator indicating the quality of the vital sign information (24) and/or the derivation of said vital sign information (24) from said optical detection signals (23).

5. Device (1) as claimed in claim 1, comprising a remote photoplethysmography device including said optical detection means and said evaluation means (13), wherein said evaluation means (13) is configured to derive a PPG signal as said vital sign information (24) from said optical detection signals (23).

6. Device (1) as claimed in claim 1, wherein said control means (14) is configured to control said illumination means (11) and said presentation means (10) to alternately illuminate said illumination area (3) and present said visual theme (20) and to control said optical detection means to detect optical detection signals (23) only when said illumination area (3) is illuminated.

7. Device (1) as claimed in claim 6, wherein said control means (14) is configured to control the percentage of the time during which the illumination means (11) illuminates said illumination area (3) and said optical detection means detects optical detection signals (23).

8. Device (1) as claimed in claim 1, wherein said control means (14) is configured to control said illumination means (11) to compensate for changes in illumination by the presentation of the visual theme (20), in particular for changes in brightness and/or color.

9. Device (1) as claimed in claim 1, wherein said evaluation means (13) is configured to derive a respiration rate and/or a respiration depth of said person (2) from said optical detection signals (23).

10. Device (1) as claimed in claim 1, further comprising correction means (130) for correcting said optical detection signals (23) to correct for changes of the visual theme (20), in particular per complete illumination area (3) or sub-areas (3a, 3b) thereof.

11. Device (1) as claimed in claim 1, wherein said presentation means (10) includes an ambient healing equipment for presenting a person (2) with an audiovisual theme (20).

12. Device (1) as claimed in claim 1, wherein said illumination means (11) includes a point light source, in particular an LED for emitting visual or infrared light.

13. Device (1) as claimed in claim 1, wherein said illumination means (11) includes at least two light sources for separately illuminating illumination sub-areas of said illumination area (3) and wherein said control unit is configured to individually control said at least two light sources, wherein a light source is only switched on if a person (2) is present in the associated illumination sub-area.

14. Method for vital sign measurement of a person, comprising the steps of:

- presenting a person (2) with a visual theme (20),
- illuminating an illumination area (3), in which said person (2) is located, whose vital signs shall be measured,
- optically detecting optical detection signals (23) from said illumination area (3),
- evaluating said optical detection signals (23) and deriving a vital sign information (24) from them,
- controlling said step of illuminating to illuminate said illumination area (3) in accordance with the visual theme so as to allow the detection of optical detection signals (23), from which a vital sign information (24) can be derived despite changes of the visual theme (20).

15. Computer program comprising program code means for causing a computer to carry out the steps of evaluating and controlling of the method as claimed in

claim 14 when said computer program is carried out on the computer.

Patentansprüche

1. Vorrichtung (1) zur Vitalzeichenmessung einer Person (2), umfassend:

   - Darstellungsmittel (10) zur Darstellung einer Person (2) mit einer visuellen Thematik (20),
   - Beleuchtungsmittel (11), die zur Beleuchtung eines Beleuchtungsbereichs (3) angeordnet sind, in dem sich die Person (2) befindet, deren Vitalzeichen gemessen werden sollen,
   - optische Messmittel (12) zur optischen Detektion optischer Detektionssignale (23) aus dem Beleuchtungsbereich (3),
   - Auswertungsmittel (13), um die optischen Detektionssignale (23) auszuwerten und Vitalzeicheninformationen (24) von diesen abzuleiten,
   - Steuermittel (14), um die Beleuchtungsmittel der visuellen Thematik (11) entsprechend so zu steuern, dass diese den Beleuchtungsbereich (3) beleuchten, um die Detektion optischer Detektionssignale (23) zu ermöglichen, von denen Vitalzeicheninformationen (24) trotz Veränderungen der visuellen Thematik (20) abgeleitet werden können.

2. Vorrichtung (1) nach Anspruch 1,
wobei das Steuermittel (14) so konfiguriert ist, dass es die Darstellungsmittel (10) so steuert, dass eine visuelle Thematik (20) in einer Weise vorgesehen wird, welche die Detektion optischer Detektionssignale (23) nicht verhindert und damit Vitalzeicheninformationen von diesen abgeleitet werden können, dass vorzugsweise eine visuelle Thematik (20) vorgesehen wird, die Veränderungen bei einer Geschwindigkeit außerhalb des Bereichs der Detektion optischer Detektionssignale (23) aufweist.

3. Vorrichtung (1) nach Anspruch 1 oder 2,
wobei das Steuermittel (14) so konfiguriert ist, dass es die Beleuchtungsmittel (11) und/oder die Darstellungsmittel (10) aufgrund eines Feedbacks von den Auswertungsmitteln (13) steuert.

4. Vorrichtung (1) nach Anspruch 3,
wobei das Steuermittel (14) so konfiguriert ist, dass es die Beleuchtungsmittel (11) und/oder die Darstellungsmittel (10) auf der Grundlage eines Qualitätsindikators steuert, der die Qualität der Vitalzeicheninformationen (24) und/oder der Ableitung der Vitalzeicheninformationen (24) von den optischen Detektionssignalen (23) anzeigt.

5. Vorrichtung (1) nach Anspruch 1,
umfassend eine rechnerferne Photoplethysmographieeinrichtung mit den optischen Detektionsmitteln und den Auswertungsmitteln (13), wobei die Auswertungsmittel (13) so konfiguriert sind, dass sie ein PPG-Signal als die Vitalzeicheninformationen (24) von den optischen Detektionssignalen (23) ableiten.

6. Vorrichtung (1) nach Anspruch 1,
wobei das Steuermittel (14) so konfiguriert ist, dass es die Beleuchtungsmittel (11) und die Darstellungsmittel (10) so steuert, dass diese den Beleuchtungsbereich (3) abwechselnd beleuchten und die visuelle Thematik (20) darstellen und die optischen Detektionsmittel so steuern, dass diese optische Detektionssignale (23) nur detektieren, wenn der Beleuchtungsbereich (3) beleuchtet wird.

7. Vorrichtung (1) nach Anspruch 6,
wobei das Steuermittel (14) so konfiguriert ist, dass es den Prozentsatz der Zeit steuert, in dem die Beleuchtungsmittel (11) den Beleuchtungsbereich (3) beleuchten und die optischen Detektionsmittel optische Detektionssignale (23) detektieren.

8. Vorrichtung (1) nach Anspruch 1,
wobei das Steuermittel (14) so konfiguriert ist, dass es die Beleuchtungsmittel (11) so steuert, dass sie Veränderungen in der Beleuchtung durch die Darstellung der visuellen Thematik (20), insbesondere Veränderungen der Helligkeit und/oder Farbe ausgleichen.

9. Vorrichtung (1) nach Anspruch 1,
wobei die Auswertungsmittel (13) so konfiguriert sind, dass diese eine Atmungsrate und/oder eine Atmungstiefe dieser Person (2) von den optischen Detektionssignalen (23) ableiten.

10. Vorrichtung (1) nach Anspruch 1,
weiterhin umfassend Korrekturmittel (130) zur Korrektur der optischen Detektionssignale (23), um Veränderungen der visuellen Thematik (20), insbesondere je komplettem Beleuchtungsbereich (3) oder Subbereichen (3a, 3b) von diesem, zu korrigieren.

11. Vorrichtung (1) nach Anspruch 1,
wobei die Darstellungsmittel (10) ein Ambient-Healing-Equipment enthalten, um eine Person (2) mit einer audiovisuellen Thematik (20) darzustellen.

12. Vorrichtung (1) nach Anspruch 1,
wobei die Beleuchtungsmittel (11) eine Punktlichtquelle, insbesondere eine LED zur Abstrahlung von sichtbarem oder Infrarotlicht enthalten.

13. Vorrichtung (1) nach Anspruch 1,
wobei die Beleuchtungsmittel (11) mindestens zwei Lichtquellen zur separaten Beleuchtung von Be-

leuchtungssubbereichen des Beleuchtungsbereichs (3) enthalten, und
wobei die Steuereinheit so konfiguriert ist, dass sie die mindestens zwei Lichtquellen individuell steuert, wobei eine Lichtquelle nur dann eingeschaltet wird, wenn eine Person (2) in dem zugeordneten Beleuchtungssubbereich anwesend ist.

14. Verfahren zur Vitalzeichenmessung einer Person, das die folgenden Schritte umfasst, wonach:

- eine Person (2) mit einer visuellen Thematik (20) dargestellt wird,
- ein Beleuchtungsbereich (3) beleuchtet wird, in dem sich die Person (2) befindet, deren Vitalzeichen gemessen werden sollen,
- optische Detektionssignale (23) aus dem Beleuchtungsbereich (3) optisch detektiert werden,
- die optischen Detektionssignale (23) ausgewertet und Vitalzeicheninformationen (24) von diesen abgeleitet werden,
- der Schritt des Beleuchtens so gesteuert wird, dass der Beleuchtungsbereich (3) der visuellen Thematik entsprechend beleuchtet wird, um die Detektion optischer Detektionssignale (23) zu ermöglichen, von denen Vitalzeicheninformationen (24) trotz Veränderungen der visuellen Thematik (20) abgeleitet werden können.

15. Computerprogramm mit Programmcodemitteln, um einen Computer zu veranlassen, die Schritte des Auswertens und Steuerns des Verfahrens nach Anspruch 14 auszuführen, wenn das Computerprogramm auf dem Computer ausgeführt wird.

Revendications

1. Dispositif (1) de mesure des signes vitaux d'une personne (2) comprenant :

- des moyens de présentation (10) pour présenter à une personne (2) un thème visuel (20),
- des moyens d'éclairage (11) agencés pour éclairer une zone d'éclairage (3) dans laquelle se trouve ladite personne (2), dont les signes vitaux doivent être mesurés,
- des moyens de mesure optique (12) pour détecter des signaux de détection optique (23) à partir de ladite zone d'éclairage (3),
- des moyens d'évaluation (13) pour évaluer lesdits signaux de détection optique (23) et obtenir des informations sur les signes vitaux (24) à partir de ceux-ci,
- des moyens de commande (14) pour commander lesdits moyens d'éclairage conformément au thème visuel (11) pour éclairer ladite zone d'éclairage (3) de façon à permettre la détection de signaux de détection optiques (23), à partir desquels une information sur des signes vitaux (24) peut être obtenue malgré des changements du thème visuel (20).

2. Dispositif (1) selon la revendication 1,
dans lequel lesdits moyens de commande (14) sont configurés pour commander ledit moyen de présentation (10) afin de fournir un thème visuel (20) de façon à ne pas empêcher la détection de signaux de détection optiques (23) permettant d'obtenir des informations sur les signes vitaux à partir de ceux-ci, en particulier de fournir un thème visuel (20) ayant des changements à une vitesse hors de la plage de détection des signaux de détection optiques (23).

3. Dispositif (1) selon la revendication 1 ou 2,
dans lequel lesdits moyens de commande (14) sont configurés pour commander lesdits moyens d'éclairage (11) et/ou lesdits moyens de présentation (10) sur la base du retour desdits moyens d'évaluation (13).

4. Dispositif (1) selon la revendication 3,
dans lequel lesdits moyens de commande (14) sont configurés pour commander lesdits moyens d'éclairage (11) et/ou lesdits moyens de présentation (10) sur la base d'un indicateur de qualité indiquant la qualité des informations sur les signes vitaux (24) et/ou l'obtention desdites informations sur les signes vitaux (24) à partir desdits signaux de détection optiques (23).

5. Dispositif (1) selon la revendication 1
comprenant un dispositif de photopléthysmographie distant incluant lesdits moyens de détection optiques et lesdits moyens d'évaluation (13), dans lequel lesdits moyens d'évaluation (13) sont configurés pour obtenir un signal PPG à titre d'information de signe vital (24) desdits signaux de détection optiques (23).

6. Dispositif (1) selon la revendication 1,
dans lequel lesdits moyens de commande (14) sont configurés pour commander lesdits moyens d'éclairage (11) et lesdits moyens de présentation (10) afin d'éclairer alternativement ladite zone d'éclairage (3) et présenter ledit thème visuel (20) et commander lesdits moyens de détection optiques afin de détecter des signaux de détection optique (23) uniquement quand ladite zone d'éclairage (3) est éclairée.

7. Dispositif (1) selon la revendication 6,
dans lequel lesdits moyens de commande (14) sont configurés pour commander le pourcentage du temps pendant lequel les moyens d'éclairage (11) éclairent ladite zone d'éclairage (3) et lesdits moyens de détection optiques détectent les signaux de dé-

tection optiques (23).

8. Dispositif (1) selon la revendication 1, dans lequel lesdits moyens de commande (14) sont configurés pour commander lesdits moyens d'éclairage (11) afin de compenser les changements d'éclairage par la présentation du thème visuel (20), en particulier pour les changements de luminosité et/ou de couleur.

9. Dispositif (1) selon la revendication 1, dans lequel lesdits moyens d'évaluation (13) sont configurés pour obtenir une fréquence respiratoire et/ou une profondeur de respiration de ladite personne (2) à partir desdits signaux de détection optiques (23).

10. Dispositif (1) selon la revendication 1, comprenant en outre des moyens de correction (130) pour corriger lesdits signaux de détection optiques (23) afin de corriger des changements du thème visuel (20), en particulier pour la zone d'éclairage complète (3) ou des sous-zones (3a, 3b) de celle-ci.

11. Dispositif (1) selon la revendication 1, dans lequel lesdits moyens de présentation (10) incluent un équipement de guérison ambiant pour présenter un thème audiovisuel (20) à une personne (2).

12. Dispositif (1) selon la revendication 1, dans lequel ledit moyen d'éclairage (11) inclut une source lumineuse ponctuelle, en particulier une LED pour émettre une lumière visuelle ou infrarouge.

13. Dispositif (1) selon la revendication 1, dans lequel ledit moyen d'éclairage (11) inclut au moins deux sources lumineuses pour éclairer séparément des sous-zones d'éclairage de ladite zone d'éclairage (3) et
dans lequel ladite unité de commande est configurée pour commander individuellement lesdites au moins deux sources lumineuses, dans lequel une source lumineuse est allumée uniquement si une personne (2) est présente dans la sous-zone d'éclairage associée.

14. Procédé de mesure de signes vitaux d'une personne, comprenant les étapes consistant à :

- présenter un thème visuel (20) à une personne (2),
- éclairer une zone d'éclairage (3), dans laquelle se trouve ladite personne (2), dont les signes vitaux doivent être mesurés,
- détecter optiquement des signaux de détection optiques (23) de ladite zone d'éclairage (3),
- évaluer lesdits signaux de détection optiques (23) et obtenir des informations sur les signes vitaux (24) à partir de ceux-ci ;
- commander ladite étape d'éclairage pour éclairer ladite zone d'éclairage (3) conformément au thème visuel afin de permettre la détection de signaux de détection optiques (23) à partir desquels des informations sur les signes vitaux (24) peuvent être tirées malgré des changements du thème visuel (20).

15. Programme informatique comprenant des moyens de codage du programme pour amener un ordinateur à réaliser les étapes d'évaluation et de commande du procédé selon la revendication 14, quand ledit programme informatique est exécuté sur l'ordinateur.

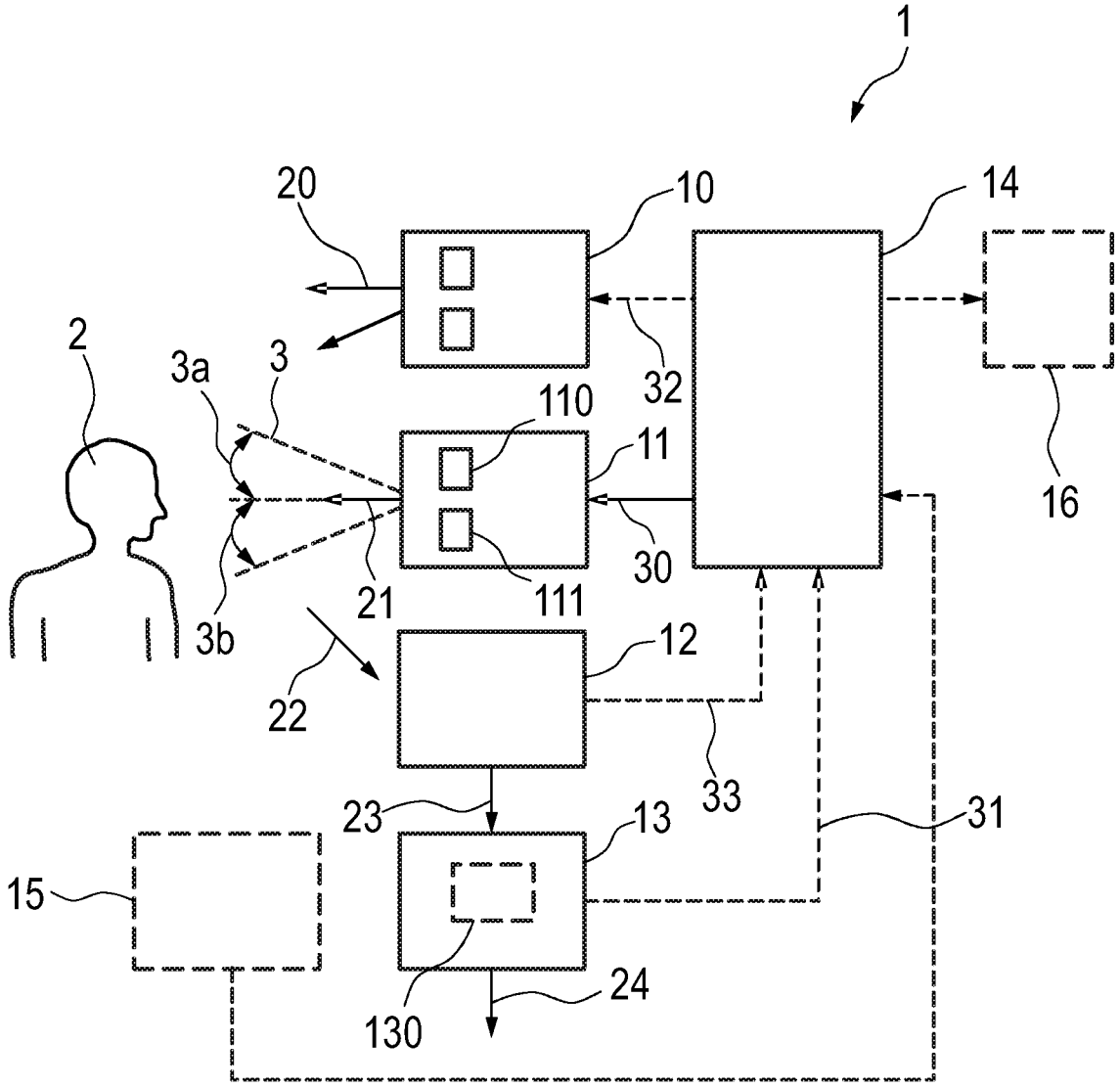

Fig. 1

REFERENCES CITED IN THE DESCRIPTION

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专利名称(译)	用于人的生命体征测量的装置和方法		
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摘要(译)

本发明涉及一种用于人（2）的生命体征测量的装置（1），包括用于向人（2）呈现视觉主题（20）的呈现装置（10），用于照亮人（2）的照明装置（11）。照明区域（3），其中所述人（2）所在的，其生命体征应被测量，光学测量装置（12）用于光学检测来自所述照明区域（3）的光学检测信号（23），评估装置（13）用于评估所述光学检测信号（23）并从它们导出生命体征信息（24），以及控制装置（14），用于控制所述照射装置（11）以照射所述照射区域（3），从而允许检测光学检测信号（23），尽管视觉主题（20）发生变化，也可以从中导出生命体征信息（24）。

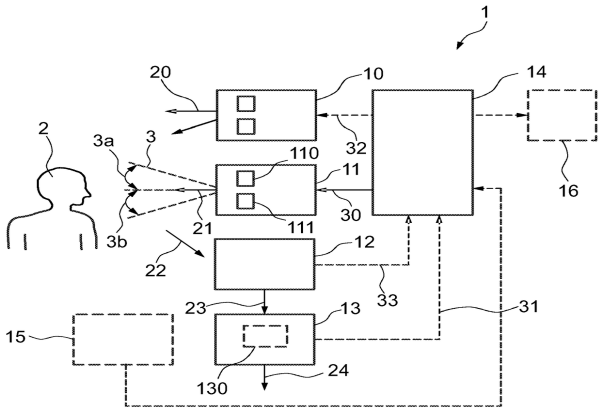

Fig. 1