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(54) **METHOD FOR OPERATING A PATIENT MONITORING SYSTEM**

VERFAHREN FÜR DEN BETRIEB EINES PATIENTEN-ÜBERWACHUNGSSYSTEMS

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Description

FIELD OF THE INVENTION

[0001] The invention relates to the field of methods for operating monitoring systems for monitoring physiological data of a patient.

BACKGROUND OF THE INVENTION

[0002] Pulse oximeters determine the arterial oxygen saturation of hemoglobin (also called SpO2) and other hemodynamic parameters. The non invasive technique is widely used as a standard method for patient monitoring in the clinical environment. Typically oxygen saturation is continuously measured to monitor critical patients.

[0003] Document WO 2004/016170 A1 describes a technique to compensate for, or eliminate, motion-induced artifacts in patient-attached critical care monitoring instruments.

[0004] Document US 2006/0229520 A1 a method of measuring biometric information.

[0005] For the surveillance of non stationary patients, small and mobile monitoring system, in particular pulse oximeter devices, which are operated by small and lightweight batteries, are needed.

SUMMARY OF THE INVENTION

[0006] It is an object of the present invention to reduce the required electrical power of monitoring systems. This object is solved by the method according to the invention.

[0007] The method according to the invention is described in claim 1. Any example and embodiment which does not fall under the scope of the independent claims is not part of the invention.

[0008] Everyone who is monitored by any reason, for example an athlete, a healthy person, an elderly person, is in particular also understood as a patient. Examples for physiological data are pulse, blood oxygen saturation, blood pressure, temperature, electrical activity of the neurons (EEG), respiration rate, uterine contractions (Toco), fetal ultrasound and/or electrical activity of the myocardial muscle (ECG). A motion activity of zero is in particular understood as no motion or no detectable motion.

[0009] The required electrical power can be reduced by a non-continuous measurement, since the measuring device can consume less power when no measurement is performed.

[0010] Missing motion can indicate that the monitoring system is not attached to the patient. Therefore, the required electrical power can be reduced by not initiating the measurement of physiological data if the motion activity is zero.

[0011] Compared with periods of high motion activity, in which motion artifacts can necessitate the measurement of more data and more calculation effort, which both can raise the required electrical power, a monitoring system, for example a pulse oximeter, which is operated during a period of relatively low motion activity, can in particular record less data and/or apply less complex calculation methods or less complex filtering to separate the wanted physiological parameter from motion induced artifacts. Therefore, a measurement taken under low motion activity can be finished earlier and the required electrical power can be reduced while maintaining the measurement accuracy.

[0012] A reduction of the required electrical power can extend the operating time of a battery powering the monitoring system. Thereby, the battery can be less often replaced or charged, which can make the monitoring system more practical, more ecologically friendly and increases its usability as mobile device.

[0013] The motion activity data of the patient can in particular be obtained by sensing. Sensing motion activity can in particular include the acquisition of position, position change, orientation and orientation change. In particular, a measurement of physiological data of the patient can be initiated/activated/started, if the motion activity is non-zero or rather greater/above zero, and below a selected threshold.

[0014] The method is in particular a non-continuous or rather intermittent measurement method. In particular, single measurements or measurement cycles can be performed at predetermined points in time or on demand by a trigger, such as by a given threshold or for spot checking by the patient or physician (external trigger), followed by periods in which no measurements are performed.

[0015] In one embodiment of the present invention, an ongoing measurement of physiological data is shut down/deactivated/stopped, if the motion activity is above or equal to a selected threshold. Thus, the method can decide to shut down/stop an ongoing measurement, if current movement is likely to extend the needed measurement period.

[0016] When initiating the measurement, one or more electronic parts of the monitoring system, such as one or more electronic parts of a physiological data detector, for example a lamp and/or processor, one or more complete physiological data detectors, or one or more circuit components, can be switched on. Between the measurements, one or more electronic parts of the monitoring system, such as one or more electronic parts of a physiological data detectors, for example a lamp and/or processor, one or more complete physiological data detectors, or one or more circuit components, can be switched off or to stand-by-mode. Switching on or off or to stand-by-mode electronic parts can for example be effected by a superordinate unit, such as a central monitoring and/or controller unit, for example by connecting or interrupting the electrical power supply of the physiological data detector. Thereby further electrical power can be saved. Therefore, in one embodiment of the present invention, one or more electronic parts of the monitoring system,

such as one or more electronic parts of a physiological data detector, for example a lamp and/or processor, one or more complete physiological data detectors, or one or more circuit components, are switched on, if the measurement of physiological data is initiated and/or one or more electronic parts of the monitoring system, such as one or more electronic parts of a physiological data detector, for example a lamp and/or processor, one or more complete physiological data detectors, or one or more circuit components, are switched off or to stand-by-mode, if the measurement of physiological data is shut down/stopped. Again, the required electrical power of the monitoring system can be reduced and the operating time of a battery powering the monitoring system can be further extended.

[0017] An ongoing measurement of physiological data can be stoppable within a configurable stopping window after the initiation/start of the measurement. For example, an ongoing measurement of physiological data is stopped within the configurable stopping window after the initiation/start of the measurement, if the motion activity is above or equal to a selected threshold.

[0018] The length of the stopping window can be chosen by the user or a connected system to set priority between power saving and equidistant intervals. Moreover, choosing the length of the stopping window can get automated to adapt to the current situation of the patient. The method can for example set higher priority to equidistant intervals, if the patient needs more attention. Thus, the length of the stopping window can be set automatically, in particular in a manner adapted to the current situation of the patient, or by a person, such as the patient, a physician, a nurse or a trainer, or by a connected system. By setting the length of the stopping window, the priority between power saving and equidistant intervals can be changed. For example, a higher priority to equidistant intervals can be advantageous, if the patient needs more attention. This can for example be achieved by a shorter length of the stopping window.

[0019] The method can allow to gather data in a certain periodicity, by using the fact that the points in time for a single measurement can be flexible within a schedule and without taking the measurements at exactly the preselected points in time. This in turn, can make the method suitable for low acuity monitoring of, for example non critical or mobile patients, which are free to move or exercise, such as patients in emergency waiting rooms, general ward, during rehabilitation in the clinical environment or at home.

[0020] By the method, the actual point in time to initiate/start a measurement or to shut down/stop an ongoing measurement of a monitoring system in intermittent mode, such as a pulse oximeter in intermittent mode, can be optimized. For example, the method can take information about the body movement and decide whether to alter the schedule for the next measurement. For example, a measurement can be scheduled earlier or later than its predetermined point, in particular depending on the characteristics and/or intensity of the observed motion artifacts and/or the patient's situation. For example, it can be aimed to start the measurement during a period with probable low motion artifacts. This can lead to a shorter measurement interval. Moreover, if a measurement is already started, the method can take information about the body movement and decide whether to shut down/stop the ongoing measurement or not. Stopping an ongoing measurement can be beneficial if the actual observed motion artifacts are likely to extend the needed measuring period. Therefore, in another embodiment of the present invention, there is a time schedule scheduling points in time for measurements of physiological data. In particular the method comprises or rather is based on a time schedule scheduling points in time for measurements of physiological data. The scheduled points in time for measurements of physiological data can be scheduled periodically or non-periodically or a mix of both. For example, the time schedule can comprise only a few, periodically or non-periodically scheduled points in time for measurements of physiological data per minute or per hour.

[0021] Instead of starting a measurement exactly at a predetermined point in time, the method can decide to delay or advance or remove the actual measurement or to add another measurement. For example, the method can advance or delay scheduled points in a configurable window enclosing the predetermined point. Therefore, in a further embodiment of the present invention, a scheduled point in time for a measurement of physiological data is alterable, in particular can be advanced or delayed, within a configurable alteration window enclosing the scheduled point.

[0022] The length of the alteration window can for example be chosen by the user or a connected system to set priority between power saving and equidistant intervals. Moreover, choosing the length of the alteration window can get automated to adapt to the current situation of the patient. For example, the method can set higher priority to equidistant intervals, if the patient needs more attention. Thus, in yet another embodiment of the present invention, the length of the alteration window is set automatically, in particular in a manner adapted to the current situation of the patient, or by a person, such as the patient, a physician, a nurse or a trainer, or by a connected system. By setting the length of the alteration window, the priority between power saving and equidistant intervals can be changed. For example, a higher priority to equidistant intervals can be advantageous, if the patient needs more attention. This can for example be achieved by a shorter length of the alteration window.

[0023] The method can for example decide to advance or add a scheduled point, if the current movement artifacts are low and a short measuring period is probable. Therefore, in another embodiment of the present invention, a scheduled point in time for a measurement of physiological data is advanced or added, if the motion activity is below a selected threshold.

[0024] During low movement the method can control the measurement to end earlier by recording less measured data samples. Thus, in a further embodiment of the present invention, a scheduled measurement of physiological data can be stopped earlier, if the motion activity is below a selected threshold. By this way, time for data capturing and electrical power can be saved while a specified accuracy can be maintained.

[0025] The method can also delay or remove a scheduled point if movement is likely to extend the measurement period. Thus, in yet another embodiment of the present invention, a scheduled point in time for a measurement of physiological data of the patient is delayed or removed, if the motion activity is above a selected threshold.

[0026] The method can also delay or remove a scheduled point, if absence of movement suggests that the measurement device is currently not applied to a patient. Hence, in another embodiment of the present invention, a scheduled point in time for a measurement of physiological data is delayed, if the motion activity is nil or, for example, close to nil.

[0027] From the motion activity characteristics, in particular the motion activity pattern, different motion situations can be classified. For example the motion situation "reading a book" could have long intervals with low motion activity, which are interrupted by short intervals with significant higher motion activity, when a page is turned over. The motion activity characteristics can for example be determined by counting the number, frequency and magnitude of movements, such as very strong, medium strong and weak motions. "Exercising on a home trainer" or "climbing stairs" (situation with fast and repetitive motion) and "sleeping" (situation with very low motion) could for example be different motion situations than "reading a book" (situation with low and regular motion). Preferably, the method provides an individual optimization of the measurement schedule of the different motion situations. For classifying motion situations optionally further data, such as respiration data, could be correlated with the motion parameters.

[0028] Preferably, the method comprises the step: analyzing the motion activity characteristics, in particular the motion activity pattern, for one or more motion situations. For example, the measurement of physiological data of the patient can be initiated, and for example subsequently switched off, at a point in time, which is estimated to have a low motion activity according to the analyzed motion characteristics and/or motion situation. For example, in the motion situation "reading a book" the measurement of physiological data of the patient could be initiated, and preferably subsequently switched off, within the long intervals with low motion activity between the short intervals for page turning.

[0029] The motion activity characteristics, in particular the motion activity pattern, of a patient can be measured, analyzed and stored, for example in a storing unit, during an initialization phase. For example, this initialization phase can be 24 hours long.

[0030] In another embodiment of the present invention, the method comprises the step of identifying motion situation by comparing the current motion activity characteristics, in particular the motion activity pattern, with one or more stored motion activity characteristics, in particular motion activity pattern.

[0031] In another embodiment of the present invention, the measurement of physiological data of the patient is initiated/started, if the current motion activity characteristic, in particular motion activity pattern, has a lower motion activity than a stored motion activity characteristic, in particular motion activity pattern, for this motion situation.

[0032] Furthermore, an ongoing measurement of physiological data can for example be shut down/stopped, if the motion situation suggests that another measurement, in particular an earlier measurement, is more likely to finish earlier and/or if the motion situation suggests that the measurement will take too long. In another embodiment of the present invention, an ongoing measurement of physiological data is shut down/stopped, if the current motion activity characteristic, in particular motion activity pattern, has a higher motion activity than a stored motion activity characteristic, in particular motion activity pattern, for this motion situation.

[0033] In another embodiment of the present invention, a scheduled point in time for a measurement of physiological data is advanced or added, if the current motion activity characteristic, in particular motion activity pattern, has a lower motion activity than a stored motion activity characteristic, in particular motion activity pattern, for this motion situation.

[0034] In another embodiment of the present invention, a scheduled measurement of physiological data is stopped earlier, if the current motion activity characteristic, in particular motion activity pattern, has a higher motion activity than a stored motion activity characteristic, in particular motion activity pattern, for this motion situation.

[0035] In another embodiment of the present invention, a scheduled point in time for a measurement of physiological data is delayed or removed, if the current motion activity characteristic, in particular motion activity pattern, has a higher motion activity than a stored motion activity characteristic, in particular motion activity pattern, for this motion situation.

[0036] The method can define the needed amount of data depending on the present movement artifacts. Thus, in a further embodiment of the present invention, the measured amount of physiological data is adapted to the motion activity, in particular the motion activity characteristics, for example the motion activity pattern.

[0037] In yet another embodiment of the present invention, the method further comprises the step of analyzing the measured physiological data. The method can define the depth and/or method set of analysis depending

on the present movement artifacts. In particular; the depth and/or method set of analysis of the measured physiological data or the selection of mathematical or technical methods is adapted to the motion activity, in particular the motion activity characteristics, for example the motion activity pattern.

[0038] During low movement the method can control the data analysis to use less electrical power for computation by selecting less complex data processing or less complex mathematical or statistical methods. In particular, the complexity of the analysis is reduced if the motion activity is below a selected threshold.

[0039] In yet another embodiment of the present invention, the method further comprises the step of providing scheduling information to at least one further device, for example a mobile or a stationary device, in particular for changing the measurement schedule of the further device or for saving power of the further device or for synchronizing the measurements of at least two devices. Such an input can for example be used to start synchronous measurements or align interfering measurements on the schedule.

[0040] In general, different thresholds can be selected for several aspects of the method, such as for starting, stopping, advancing and delaying the measurement of the physiological data. However, the method can be simplified by selecting a small number or only one threshold for all aspects.

[0041] Another subject of the present invention is a monitoring system for monitoring physiological data of a patient, in particular for carrying out a method according to the invention, comprising

a motion detector configured to sense motion activity of the patient,

at least one physiological data detector configured to measure physiological data of the patient and

a controller unit configured to receive motion activity data of the motion detector and to activate the physiological data detector to measure physiological data if the motion activity is non-zero and below a selected threshold.

[0042] This monitoring system can also have a reduced electrical power consumption.

[0043] In general, the motion detector and physiological data detector of the monitoring system can be integrated in the same device or in different devices.

[0044] Preferably, the controller unit is configured to deactivate the measuring physiological data detector, if the motion activity is above or equal to a selected threshold. In particular, the controller unit can be configured to switch on one or more electronic parts of a physiological data detector, for example a lamp and/or processor, one or more complete physiological data detectors, or one or more circuit components, if the measurement of physiological data is activated and/or to switch off or to stand-by-mode one or more electronic parts of a physiological data detector, for example a lamp and/or processor, one or more complete physiological data detectors, or one or more circuit components, if the measurement of physiological data is deactivated. The controller unit can for example be a superordinate unit, such as a central monitoring and/or controller unit. For example the controller unit can activate or rather deactivate the physiological data detector by connecting or interrupting the electrical power supply of the physiological data detector. Furthermore, the controller unit can be configured to deactivate the physiological data detector within a configurable stopping window after the start of the measurement. For example, the controller unit is configured to deactivate the physiological data detector within the configurable stopping window after the start of the measurement, if the motion activity is above or equal to a selected threshold. Preferably, the controller unit is configured to set the length of the stopping window automatically, in particular in a manner adapted to the current situation of the patient, or by a person, such as the patient, a physician, a nurse or a trainer, or by a connected system. By setting the length of the stopping window, the priority between power saving and equidistant intervals can be changed. For example, a higher priority to equidistant intervals is advantageous, if the patient needs more attention and can be achieved by a shorter length of the stopping window.

[0045] Preferably, the controller unit is configured to activate and/or deactivate the physiological data detector to measure physiological data according to a time schedule, such as a time schedule scheduling points in time for measurements of physiological data. The scheduled points in time for measurements of physiological data can thereby be scheduled periodically or non-periodically. More preferably, the controller unit is configured to alter, in particular to advance or delay or add or remove, a scheduled point in time for a measurement of physiological data, for example within a configurable alteration window enclosing the scheduled point. Preferably, the controller unit is configured to configure the length of the alteration window automatically, in particular in a manner adapted to the current situation of the patient, or by a person, such as the patient, a physician, a nurse or a trainer, or by a connected system. By setting the length of the alteration window, the priority between power saving and equidistant intervals can be changed. For example, a higher priority to equidistant intervals can be advantageous, if the patient needs more attention and can be achieved by a shorter length of the alteration window.

[0046] Even more preferably, the controller unit is configured to advance or add a scheduled point in time for a measurement of physiological data, if the motion activity is below a selected threshold, and/or to stop a scheduled measurement of physiological data earlier, if the motion activity is below a selected threshold, and/or to delay or remove a scheduled point in time for a measurement of physiological data, if the motion activity is above or equal to a selected threshold, and/or to delay or remove a scheduled point in time for a measurement of physiological data, if the motion activity is nil or, for example, close to nil.

[0047] The controller unit can be configured to analyze

the motion activity characteristics, in particular the motion activity pattern, for one or more motion situations. Furthermore, the controller unit can be configured to initiate, and for example subsequently switch off, the measurement of physiological data of the patient at a point in time, which is estimated to have a low motion activity according to the analyzed motion characteristics and/or motion situation. Moreover, the controller unit can be configured to measure, analyze and store, for example in a storing unit, the motion activity characteristics, in particular the motion activity pattern, of a patient during an initialization phase. Further on, the controller unit can be configured to identify a motion situation by comparing the current motion activity characteristics, in particular the motion activity pattern, with one or more stored motion activity characteristics, in particular motion activity pattern. Additionally, the controller unit can be configured to initiate/start the measurement of physiological data of the patient, if the current motion activity characteristic, in particular motion activity pattern, has a lower motion activity than a stored motion activity characteristic, in particular motion activity pattern, for this motion situation. Furthermore, the controller unit can be configured to shut down/stop an ongoing measurement of physiological data, if the current motion activity characteristic, in particular motion activity pattern, has a higher motion activity than a stored motion activity characteristic, in particular motion activity pattern, for this motion situation. Moreover, the controller unit can be configured to advance or add a scheduled point in time for a measurement of physiological data, if the current motion activity characteristic, in particular motion activity pattern, has a lower motion activity than a stored motion activity characteristic, in particular motion activity pattern, for this motion situation. Futher on, the controller unit can be configured to stop a scheduled measurement of physiological data earlier, if the current motion activity characteristic, in particular motion activity pattern, has a higher motion activity than a stored motion activity characteristic, in particular motion activity pattern, for this motion situation. In addition, the controller unit can be configured to delay or remove a scheduled point in time for a measurement of physiological data, if the current motion activity characteristic, in particular motion activity pattern, has a higher motion activity than a stored motion activity characteristic, in particular motion activity pattern, for this motion situation.

[0048] Most preferably, the controller unit is configured to adapt the amount of physiological data measured by the physiological data detector to the motion activity sensed by the motion detector.

[0049] Furthermore, the monitoring system can comprise an analysis unit configured to analyze the measured physiological data. Preferably, the analysis unit is configured to adapt the depth and/or method set of analysis of the measured physiological data or the selection of mathematical or technical methods to the motion activity, in particular the motion activity characteristics, for example the motion activity pattern. For example, the analysis unit can be configured to reduce the complexity of the analysis if the motion activity is below a selected threshold.

[0050] Moreover, the motion detector, the physiological data detector, the controller unit and/or the analysis unit, in particular the controller unit, can be configured to provide scheduling information to at least one further device, for example a mobile or a stationary device, in particular for changing the measurement schedule of the further device or for saving power of the further device or for synchronizing the measurements of at least two devices.

[0051] The motion detector can be configured to acquire position, position change, orientation and/or orientation change data.

[0052] The motion detector can for example be a micro electrical mechanical system (MEMS), for example based on a cantilever beam accelerometer, a heat transfer accelerometer, a surface acoustic wave accelerometer, a laser accelerometer or a gyroscopic accelerometer.

[0053] The motion detector can also be a device which derives movement information indirectly by analyzing suitable patient parameters.

[0054] Moreover, the motion detector can be based on a positioning system, for example locating the position of the patient in a room or building and deriving movement information from positioning changing.

[0055] The motion detector can be a component comprised, in particular integrated, in the monitoring system, in particular in the physiological data detector, for example attachable to the patient or introducible into the patient.

[0056] However, the motion detector can also be a component comprised in a separate device having a data connection to the monitoring system, in particular the controller unit and/or the physiological data detector and possibly to other measurement devices, for example attachable to the patient or introducible into the patient. The connection can thereby for example be realized by cable or radio transmission. The second device can thereby be a device, for example a mobile device, which is attachable to the patient or introducible into the patient. However, the second device can also be a stationary device. For example the second device can be a device comprising a motion sensor with a positioning system, which derives movement information from positioning changing. The second device can also comprise a motion sensor with a camera, which derives movement information by observing the patient.

[0057] Preferably, the monitoring system, in particular the physiological data detector, is battery powered. The physiological data detector can for example be selected from the group consisting of pulse oximeter, none invasive blood pressure detector (NIBP), temperature sensor, electroencephalograph (EEG), respiration rate detector, uterine contraction detector, fetal ultrasound detector and electrocardiograph (ECG). Preferably, the

physiological data detector is a pulse oximeter.

[0058] A further subject of the present invention is a computer program enabling a processor to carry out the method according to the invention. A computer program may be stored/distributed on a suitable 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.

[0059] Yet another subject of the present invention is the use of the method according to the invention and/or of the monitoring system according to the invention and/or of the computer program according to the invention in a patient monitor, in particular for low acuity care, for example for taking vital signs from a mobile patient, for example for emergency waiting rooms and/or for general ward and/or for rehabilitation and/or for home healthcare and/or for elderly care and/or for physical training, such as

- in a pulse oximeter, in particular for low acuity care, for example for taking vital signs from a mobile patient, for example for emergency waiting rooms and/or for general ward and/or for rehabilitation and/or for home healthcare and/or for elderly care and/or for physical training,
- in a none invasive blood pressure detector (NIBP), in particular for low acuity care, for example for taking vital signs from a mobile patient, for example for emergency waiting rooms and/or for general ward and/or for rehabilitation and/or for home healthcare and/or for elderly care and/or for physical training,
- in a temperature sensor, in particular for low acuity care, for example for taking vital signs from a mobile patient, for example for emergency waiting rooms and/or for general ward and/or for rehabilitation and/or for home healthcare and/or for elderly care and/or for physical training,
- in an electroencephalograph (EEG), in particular for low acuity care, for example for taking vital signs from a mobile patient, for example for emergency waiting rooms and/or for general ward and/or for rehabilitation and/or for home healthcare and/or for elderly care and/or for physical training,
- in a respiration rate detector, in particular for low acuity care, for example for taking vital signs from a mobile patient, for example for emergency waiting rooms and/or for general ward and/or for rehabilitation and/or for home healthcare and/or for elderly care and/or for physical training,
- in an uterine contraction detector, in particular for low acuity care, for example for taking vital signs from a mobile patient, for example for emergency waiting rooms and/or for general ward and/or for rehabilitation and/or for home healthcare and/or for elderly care and/or for physical training,
- in a fetal ultrasound detector, in particular for low acuity care, for example for taking vital signs from a mobile patient, for example for emergency waiting rooms and/or for general ward and/or for rehabilitation and/or for home healthcare and/or for elderly care and/or for physical training, and/or
- in an electrocardiograph (ECG), in particular for low acuity care, for example for taking vital signs from a mobile patient, for example for emergency waiting rooms and/or for general ward and/or for rehabilitation and/or for home healthcare and/or for elderly care and/or for physical training.

BRIEF DESCRIPTION OF THE DRAWING

[0060] Additional details, features, characteristics and advantages of the object of the invention are disclosed in the subclaims, the figure and the following description of the respective figure, which --in an exemplary fashion-- shows an embodiment of a method and monitoring system according to the invention.

[0061] Fig. 1 is a flow chart of an embodiment of the method according to the invention performed with an embodiment of the monitoring system according to the invention.

DETAILED DESCRIPTION

[0062] The invention will be further understood by the following example which - in a merely illustrative fashion - shows a flow chart of an embodiment of the method according to the invention performed with an embodiment of the monitoring system according to the invention.

[0063] Figure 1 shows an embodiment of the monitoring system according to the invention, which comprises a motion detector 1, which is configured to sense motion activity of a patient, a physiological data detector 3, which is configured to measure physiological data of the patient, an analysis unit 4, which is configured to analyze the measured physiological data and a controller unit 2. Figure 1 shows that the controller unit 2 is configured to receive motion activity data of the motion detector 1 and to activate the physiological data detector 3. According to the invention, the physiological data detector 3 is activated to measure physiological data if the motion activity sensed by the motion detector 1 is non-zero and below a selected threshold. Furthermore, figure 1 shows that the analysis unit 4 is configured to adapt the depth and/or method set of analysis of the physiological data to the motion activity sensed by and received from the motion detector 1. Moreover, figure 1 shows that the controller unit 2 is configured to provide scheduling information to a further mobile or a stationary device 5, in particular for changing the measurement schedule of the further device 5 or for saving power of the further device 5 or for synchronizing the measurements of the devices 1, 2, 3, 4, 5.

[0064] 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. Accordingly, the foregoing description is by way of example only and is not intended as limiting. The invention's scope is defined in the following 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. 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. Any reference signs in the claims should not be construed as limiting the scope.

Claims

1. Method for operating a monitoring system for monitoring physiological data of a patient, comprising the steps:

   obtaining motion activity data of the patient indicative of a motion activity of the patient, and
   performing a non-continuous measurement of physiological data of the patient with a physiological data detector (3), said non-continuous measurement comprising:

   - omitting initiating the measurement of physiological data of the patient if the motion activity is zero by switching off or to stand-by mode one or more electronic parts of the physiological data detector between measurements, and
   - initiating the measurement of physiological data of the patient if the motion activity is non-zero and below a selected threshold,

   wherein the measured amount of physiological data is adapted to the motion activity.

2. Method according to claim 1, **characterized in that** the method further comprises the step:

   shutting down an ongoing measurement of physiological data, if the motion activity is above or equal to a selected threshold.

3. Method according to claim 1, **characterized in that** the method further comprises the steps:

   switching on one or more electronic parts of the monitoring system, if the measurement of physiological data is initiated, and/or
   switching off, or to stand-by-mode, one or more electronic parts of the monitoring system, if the measurement of physiological data is shut down.

4. Method according to claim 1, **characterized in that** the method further comprises the steps:

   scheduling the measurement of physiological data of the patient based on a time schedule scheduling points in time for measurements of physiological data, wherein a scheduled point in time for a measurement of physiological data is alterable within a configurable alteration window enclosing the scheduled point, and
   advancing in time, or adding a scheduled point in time for a measurement of physiological data, if the motion activity is below a selected threshold.

5. Method according to claim 4, **characterized in that** the method further comprises the step:

   stopping a scheduled measurement of physiological data earlier, if the motion activity is above a selected threshold.

6. Method according to claim 1, **characterized in that** the method comprises the step:

   identifying a motion situation by comparing the current motion activity characteristics with one or more stored motion activity characteristics.

7. Method according to claim 6, **characterized in that** the method further comprises the step:

   initiating the measurement of physiological data of the patient, if the current motion activity characteristics indicate a lower motion activity than a stored motion activity characteristic for the identified motion situation.

8. Method according to claim 6, **characterized in that** the method further comprises the step:

   shutting down an ongoing measurement of physiological data, if the current motion activity characteristics indicate a higher motion activity than a stored motion activity characteristic for the identified motion situation.

9. Method according to claim 1, **characterized in that** the method further comprises the steps:

   analyzing the measured physiological data, and adapting the depth and/or method set of analysis of the measured physiological data to the motion activity.

10. Method according to claim 4, **characterized in that** the method further comprises the step:

providing scheduling information to at least one further device.

11. Monitoring system for monitoring physiological data of a patient, comprising:

a motion detector (1) configured to sense motion activity of the patient,
at least one physiological data detector (3) configured to measure physiological data of the patient and
a controller unit (2) configured to receive motion activity data of the motion detector (1) indicative of a motion activity of the patient and to control the physiological data detector to perform a non-continuous measurement of physiological data of the patient by:

- omitting initiating a measurement of physiological data of the patient if the motion activity is zero by switching off or to stand-by-mode one or more electronic parts of the physiological data detector between measurements, and
- initiating the measurement of physiological data if the motion activity is non-zero and below a selected threshold,

wherein the controller unit (2) is configured to adapt the amount of physiological data measured by the physiological data detector (3) to the motion activity sensed by the motion detector (1).

12. Computer program comprising instructions to cause the monitoring system of claim 11 to carry out the method of claim 1.

13. Use of the method according to any one of the claims 1 to 10 and/or of the monitoring system according to claim 11 and/or of the computer program of claim 12 in a patient monitor for emergency waiting rooms and/or for general ward and/or for rehabilitation and/or for home healthcare and/or for elderly care and/or for physical training.

Patentansprüche

1. Verfahren für den Betrieb eines Überwachungssystems zum Überwachen von physiologischen Daten eines Patienten, wobei das Verfahren die folgenden Schritte umfasst:

Erlangen von Bewegungsaktivitätsdaten des Patienten, die auf eine Bewegungsaktivität des Patienten hinweisen, und
Durchführen einer nicht-kontinuierlichen Messung von physiologischen Daten des Patienten mit einem physiologischen Datendetektor (3), wobei die genannte nicht-kontinuierliche Messung Folgendes umfasst:

- Unterlassen des Initiierens der Messung von physiologischen Daten des Patienten, wenn die Bewegungsaktivität null ist, indem ein oder mehrere elektronische Teile des physiologischen Datendetektors zwischen Messungen ausgeschaltet oder auf Bereitschaftsmodus geschaltet werden, und
- Initiieren der Messung von physiologischen Daten des Patienten, wenn die Bewegungsaktivität ungleich null ist und unter einem ausgewählten Schwellenwert liegt,

wobei die gemessene Menge der physiologischen Daten an die Bewegungsaktivität angepasst wird.

2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** das Verfahren weiterhin den folgenden Schritt umfasst:

Abschalten einer laufenden Messung von physiologischen Daten, wenn die Bewegungsaktivität gleich einem ausgewählten Schwellenwert ist oder darüber liegt.

3. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** das Verfahren weiterhin die folgenden Schritte umfasst:

Einschalten von einem oder mehreren elektronischen Teilen des Überwachungssystems, wenn die Messung der physiologischen Daten initiiert wird, und/oder
Ausschalten oder Umschalten von einem oder mehreren elektronischen Teilen des Überwachungssystems auf Bereitschaftsmodus, wenn die Messung von physiologischen Daten abgeschaltet wird.

4. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** das Verfahren weiterhin die folgenden Schritte umfasst:

Planen der Messung von physiologischen Daten des Patienten basierend auf einem Zeitplan zur Planung von Zeitpunkten für Messungen von physiologischen Daten, wobei ein geplanter Zeitpunkt für eine Messung von physiologischen Daten innerhalb eines konfigurierbaren Veränderungsfensters, das den geplanten Punkt einschließt, veränderbar ist, und
zeitliches Vorverlegen oder Hinzufügen eines geplanten Zeitpunkts für eine Messung von phy-

siologischen Daten, wenn die Bewegungsaktivität unterhalb eines ausgewählten Schwellenwerts liegt.

5. Verfahren nach Anspruch 4, **dadurch gekennzeichnet, dass** das Verfahren weiterhin den folgenden Schritt umfasst:

früheres Stoppen einer geplanten Messung von physiologischen Daten, wenn die Bewegungsaktivität über einem ausgewählten Schwellenwert liegt.

6. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** das Verfahren den folgenden Schritt umfasst:

Identifizieren einer Bewegungssituation durch Vergleichen der aktuellen Bewegungsaktivitätseigenschaften mit einer oder mehreren gespeicherten Bewegungsaktivitätseigenschaften.

7. Verfahren nach Anspruch 6, **dadurch gekennzeichnet, dass** das Verfahren weiterhin den folgenden Schritt umfasst:

Initiieren der Messung von physiologischen Daten des Patienten, wenn die aktuelle Bewegungsaktivitätseigenschaft eine geringere Bewegungsaktivität als eine für die identifizierte Bewegungssituation gespeicherte Bewegungsaktivitätseigenschaft angibt.

8. Verfahren nach Anspruch 6, **dadurch gekennzeichnet, dass** das Verfahren weiterhin den folgenden Schritt umfasst:

Abschalten einer laufenden Messung von physiologischen Daten, wenn die aktuelle Bewegungsaktivitätseigenschaft eine höhere Bewegungsaktivität als eine für die identifizierte Bewegungssituation gespeicherte Bewegungsaktivitätseigenschaft angibt.

9. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** das Verfahren weiterhin die folgenden Schritte umfasst:

Analysieren der gemessenen physiologischen Daten, und
Anpassen der Tiefe und/oder des Verfahrens für die Analyse der gemessenen physiologischen Daten an die Bewegungsaktivität.

10. Verfahren nach Anspruch 4, **dadurch gekennzeichnet, dass** das Verfahren weiterhin den folgenden Schritt umfasst:

Bereitstellen von Planungsinformationen für mindestens eine weitere Vorrichtung.

11. Überwachungssystem zum Überwachen von physiologischen Daten eines Patienten, umfassend:

einen Bewegungsdetektor (1), der dafür konfiguriert ist, Bewegungsaktivität des Patienten zu erfassen,
mindestens einen physiologischen Datendetektor (3), der dafür konfiguriert ist, die physiologischen Daten des Patienten zu messen, und
eine Steuereinheit (2), die dafür konfiguriert ist, Bewegungsaktivitätsdaten des Bewegungsdetektors (1) zu empfangen, die auf eine Bewegungsaktivität des Patienten hinweisen, und den physiologischen Datendetektor zu steuern, um eine nicht-kontinuierliche Messung von physiologischen Daten des Patienten durchzuführen durch:

- Unterlassen des Initiierens der Messung von physiologischen Daten des Patienten, wenn die Bewegungsaktivität null ist, indem ein oder mehrere elektronische Teile des physiologischen Datendetektors zwischen Messungen ausgeschaltet oder auf Bereitschaftsmodus geschaltet werden, und
- Initiieren der Messung von physiologischen Daten des Patienten, wenn die Bewegungsaktivität ungleich null ist und unter einem ausgewählten Schwellenwert liegt,

wobei die Steuereinheit (2) dafür konfiguriert ist, die Menge der durch den physiologischen Datendetektor (3) gemessenen physiologischen Daten an die durch den Bewegungsdetektor (1) erfasste Bewegungsaktivität anzupassen.

12. Computerprogramm umfassend Anweisungen, um das Überwachungssystem aus Anspruch 11 zu veranlassen, das Verfahren aus Anspruch 1 durchzuführen.

13. Verwendung des Verfahrens nach einem der Ansprüche 1 bis 10 und/oder des Überwachungssystems nach Anspruch 11 und/oder des Computerprogramms aus Anspruch 12 in einem Patientenmonitor für Notfallambulanz-Wartezimmer und/oder für allgemeine Wartezimmer und/oder für Rehabilitations- und/oder häusliche Gesundheitsfürsorge und/oder für die Altenpflege und/oder für körperliches Training.

Revendications

1. Procédé de fonctionnement d'un système de sur-

veillance pour surveiller des données physiologiques d'un patient, comprenant les étapes suivantes :

l'obtention de données d'activité de mouvement d'un patient indiquant une activité de mouvement du patient, et
la réalisation d'une mesure non continue de données physiologiques du patient avec un détecteur de données physiologiques (3), ladite mesure non continue comprenant :

- l'omission du déclenchement de la mesure de données physiologiques du patient si l'activité de mouvement est nulle en désactivant ou en passant à un mode veille une ou plusieurs parties électroniques du détecteur de données physiologiques entre des mesures, et
- le déclenchement de la mesure de données physiologiques du patient si l'activité de mouvement n'est pas nulle et inférieure à un seuil sélectionné,

dans lequel la quantité mesurée de données physiologiques est adaptée à l'activité de mouvement.

2. Procédé selon la revendication 1, **caractérisé en ce que** le procédé comprend en outre l'étape suivante :

la coupure d'une mesure continue des données physiologiques, si l'activité de mouvement est supérieure ou égale à un seuil sélectionné.

3. Procédé selon la revendication 1, **caractérisé en ce que** le procédé comprend en outre les étapes suivantes :

l'activation d'une ou de plusieurs parties électroniques du système de surveillance, si la mesure des données physiologiques est déclenchée, et/ou
la désactivation, ou le passage à un mode veille, d'une de plusieurs parties électroniques du système de surveillance, si la mesure des données physiologiques est coupée.

4. Procédé selon la revendication 1, **caractérisé en ce que** le procédé comprend en outre les étapes suivantes :

la planification de la mesure des données physiologiques du patient sur la base d'un calendrier planifiant des points dans le temps pour des mesures des données physiologiques, dans lequel un point planifié dans le temps pour une mesure des données physiologiques peut être modifié au cours d'une fenêtre de modification configurable contenant le point planifié, et
l'avancement dans le temps, ou l'ajout d'un point planifié dans le temps pour une mesure des données physiologiques, si l'activité de mouvement est inférieure à un seuil sélectionné.

5. Procédé selon la revendication 4, **caractérisé en ce que** le procédé comprend en outre l'étape suivante :

l'arrêt d'une mesure planifiée des données physiologiques plus tôt, si l'activité de mouvement est supérieure à un seuil sélectionné.

6. Procédé selon la revendication 1, **caractérisé en ce que** le procédé comprend l'étape suivante :

l'identification d'une situation de mouvement par comparaison des caractéristiques d'activité de mouvement en cours avec une ou plusieurs caractéristiques d'activité de mouvement stockées.

7. Procédé selon la revendication 6, **caractérisé en ce que** le procédé comprend en outre l'étape suivante :

l'amorçage de la mesure de données physiologiques du patient, si les caractéristiques d'activité de mouvement en cours indiquent une activité de mouvement plus faible qu'une caractéristique d'activité de mouvement stockée pour la situation de mouvement identifiée.

8. Procédé selon la revendication 6, **caractérisé en ce que** le procédé comprend en outre l'étape suivante :

la coupure d'une mesure continue des données physiologiques, si les caractéristiques d'activité de mouvement en cours indiquent une activité de mouvement plus importante qu'une caractéristique d'activité de mouvement stockée pour la situation de mouvement identifiée.

9. Procédé selon la revendication 1, **caractérisé en ce que** le procédé comprend en outre les étapes suivantes :

l'analyse des données physiologiques mesurées, et
l'adaptation de la profondeur et/ou du procédé défini pour l'analyse des données physiologiques mesurées en fonction de l'activité de mouvement.

10. Procédé selon la revendication 4, **caractérisé en ce que** le procédé comprend en outre l'étape suivante :

la fourniture d'informations de planification à au moins un dispositif supplémentaire.

11. Système de surveillance pour surveiller des données physiologiques d'un patient, comprenant :

un détecteur de mouvement (1) configuré pour détecter une activité de mouvement du patient, au moins un détecteur de données physiologiques (3) configurée pour mesurer des données physiologiques du patient et
une unité de commande (2) configuré pour recevoir des données d'activité de mouvement du détecteur de mouvement (1) indiquant une activité de mouvement du patient et pour commander le détecteur de données physiologiques pour réaliser une mesure non continue de données physiologiques du patient par :

- l'omission du déclenchement de la mesure de données physiologiques du patient si l'activité de mouvement est nulle en désactivant ou en passant à un mode veille une ou plusieurs parties électroniques du détecteur de données physiologiques entre des mesures, et
- le déclenchement de la mesure de données physiologiques du patient si l'activité de mouvement n'est pas nulle et inférieure à un seuil sélectionné,

dans lequel l'unité de commande (2) est configurée pour adapter la quantité de données physiologiques mesurées par le détecteur de données physiologiques (3) en fonction de l'activité de mouvement détectée par le détecteur de mouvement (1).

12. Programme informatique comprenant des instructions pour amener le système de surveillance selon la revendication 11 à mettre en oeuvre le procédé selon la revendication 1.

13. Utilisation du procédé selon l'une quelconque des revendications 1 à 10 et/ou du système de surveillance selon la revendication 11 et/ou du programme informatique selon la revendication 12 dans un dispositif de surveillance patient pour des salles d'attente des urgences et/ou pour un service général d'hôpital et/ou pour une rééducation et/ou pour des soins à domicile et/ou pour des soins aux personnes âgées et/ou pour l'entraînement physique.

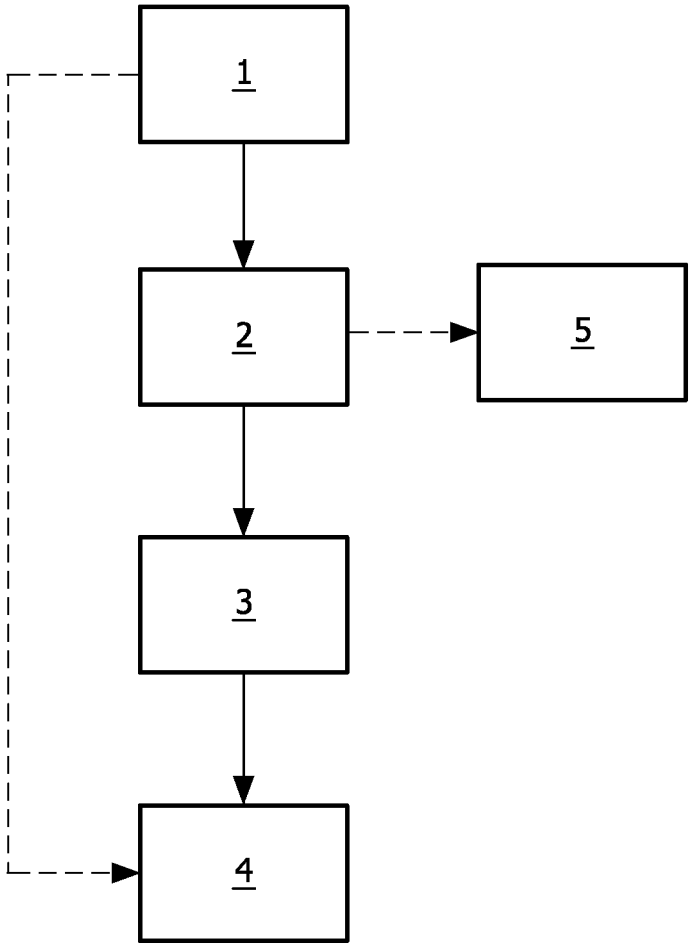

FIG. 1

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2004016170 A1 **[0003]**
- US 20060229520 A1 **[0004]**

专利名称(译)	用于操作患者监测系统的方法		
公开(公告)号	EP2456360B1	公开(公告)日	2017-11-22
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[标]申请(专利权)人(译)	皇家飞利浦电子股份有限公司		
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外部链接	Espacenet		

摘要(译)

为了节省用于监测患者的生理数据的监测系统中的功率，获得患者的运动活动数据，并且仅当运动活动既非零且低于选定阈值时，开始测量患者的生理数据。

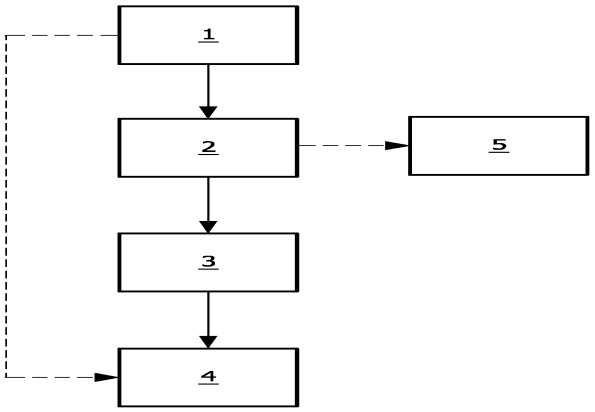

FIG. 1