RADIATION STRESS NON-INVASIVE BLOOD PRESSURE METHOD

BACKGROUND OF THE INVENTION

Current methods for measurement of blood pressure and other vital signs are inefficient. Many measurements of patient vital signs are invasive procedures that are uncomfortable or inconvenient for the patient. Typically, the measurement of blood pressure requires the use of a cuff around the arm of a patient and is a non-continuous "spot-check" that does not reflect the true state of patient physiology.

Needs exist for improved methods of continuous non-invasive blood pressure measurements.

SUMMARY OF THE INVENTION

The present invention is a system that provides non-invasive, real-time, continuous collection and processing of signals from a patient to determine the current condition of the patient. The present invention relates preferably to the measurement of blood pressure. This measurement includes the average, mean, systolic and diastolic arterial blood pressure. However, the present invention is not limited to the measurement of blood pressure; other vital signs can be measured and processed as well. The present method also provides for continuous, non-invasive monitoring of hypertension and other related medical conditions.

The present invention uses acoustic, electromechanical or other related physiological signals collected from a patient. To operate the monitoring device, the patient engages discritized, discrete, separated sensors in one or more discrete sensing arrays installed in a bed, chair or any other equipment that the patient will use. The patient lies down on, sits on, stands on, or otherwise engages the discritized sensing array, and signals are monitored over a range of frequencies or at a specific frequency. Data is collected as a time series or another similar

method. Data is transferred to a computing device in the form of a voltage signal via wire, fiber optics or wireless technology.

The energy spectra of each array point are determined and then are used to determine the variance of each array. Computational analysis of the data collected is used to determine energy momentum flux of blood flowing through the patient. Non-time series methods are used to determine energy at various array points or at a combination of array points. Momentum flux is determined from the data collected by the discritized separate sensors in each array. Blood pressure is related to the momentum flux through a mathematical algorithm. A computing device performs the computation of blood pressure.

These and further and other objects and features of the invention are apparent in the disclosure, which includes the above and ongoing written specification, with the claims and the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a diagram of the monitoring system with a discritized array.

Figure 2 is a diagram of energy spectra collected from location 1 to location n.

Figure 3 is a schematic representation of a person lying on an array of sensors.

Figures 4 and 5 are schematic representations of portions of sheets with sensor arrays.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is a system that provides real-time, continuous collection and processing of signals from a patient to determine the condition of the patient. The present invention relates preferably to the measurement of blood pressure. The measurements include the average, mean, systolic and diastolic arterial blood pressure. The present invention is not limited to the measurement of blood pressure; other vital functions, for example, heart rate and pulses and

electrical signals, can be measured and processed as well. The present method provides for continuous, non-invasive monitoring of hypertension and other related medical conditions.

Figure 1 shows a diagram of a monitoring system 1 and a discritized array 3 of separate sensors 9. The present invention uses acoustic, electromechanical or other related physiological signals collected from a patient 5 in contact with the discritized sensors in the sensing array 3. The discritized sensing array 3 is a relatively flat device 7 with individual sensing arrays 9 dispersed throughout the surface of the discritized sensing array 3. The patient 5 lies down on, stands on, or otherwise engages the discritized sensing array 3, and signals are monitored over a range of frequencies or at a specific frequency, as shown in Figure 3. Data is collected as a time series or another similar method. Data is collected from individual sensing arrays 9, from grid locations 1 to n, via acoustic, electromechanical or other physiological signals.

The discritized sensing array 3 can have sensors arranged in various regular or irregular configurations. Figure 4 and Figure 5 show different arrangements of individual sensors 9 on a portion of the large discritized sensing array.

The discritized sensing array 3 provides time series data that is analyzed to produce energy spectra at locations 1 to n, as shown in Figure 2. The data is used to determine the variance of the time series signals. Computational analysis of data collected is used to determine momentum flux of energy through the patient.

Blood pressure is related to the momentum flux through a mathematical model. The following relationship relates the incoming data to blood pressure:

$Pa = K*(E1 - En)$ = Average pressure due to excess flow of momentum

Pa = Average blood pressure

K = Constant

E1 = Summation of energy spectra (area under the curve – variance of time series) at location 1 x Pulse wave velocity

En = Summation of energy spectra (area under the curve – variance

of time series) at location n x Pulse wave velocity

A computing device performs the computation of blood pressure. The results of computation are output to the user.

The radiation stress, non-invasive blood pressure device of the present invention uses time series analysis and computational methods to process acoustic, electromechanical or other physiological signals from the patient. An energy spectrum is created by the sensing arrays to calculate the variance. The variance is the area under the energy spectra curve. Non-time series methods are used to determine energy at various array points.

While the invention has been described with reference to specific embodiments, modifications and variations of the invention may be constructed without departing from the scope of the invention, which is described in the following claims.

Claims:

1. A radiation stress, non-invasive vital sign monitoring method comprising:

providing one or more discretized sensor arrays,

engaging the one or more discretized sensor arrays,

measuring and collecting discretized acoustic, electromechanical or other physiological signals with the discretized sensing array,

transmitting discretized signals to a receiving and computing device,

producing time series data from various discretized sensor array signals,

calculating energy spectrum from the time series data,

determining variance of each discretized sensor array,

calculating a value for vital signs of a patient.

2. The method of claim 1, wherein the vital signs are average, mean, systolic and diastolic arterial blood pressure.

3. The method of claim 1, wherein the vital signs are hypertension and related medical conditions.

4. The method of claim 1, further comprising lying on, standing on, or otherwise contacting the discretized sensor arrays.

5. The method of claim 1, wherein the collecting the discretized acoustic, electromechanical or other physiological signals is performed over a range of frequencies.

6. The method of claim 1, wherein the collecting the discretized acoustic, electromechanical or other physiological signals is performed over a single frequency.

7. The method of claim 1, wherein the collecting acoustic, electromechanical or other physiological signals further comprises collecting data in a time domain or frequency domain.

8. The method of claim 1, wherein the calculating a value for vital signs is performed with non-time series methods for determining energy at various array points or a combination of array points.

9. The method of claim 1, wherein the transmitting of discretized signals comprises transmitting discretized signals via wire, fiber optics or wirelessly.

10. The method of claim 1, further comprising providing continuous, real-time monitoring of a patient's vital signs.

11. The method of claim 1, further comprising calculating the momentum flux from data gathered from the discretized signal arrays.

12. The method of claim 11, further comprising calculating a patient's vital signs from the momentum flux.

13. The method of claim 1, wherein the one or more discretized sensor arrays are not attached to the patient.

14. A radiation stress, non-invasive vital sign monitoring device comprising:

one or more discretized sensor arrays for measuring and collecting discretized acoustic, electromechanical, or other physiological signals from a patient,

a surface on the one or more discretized sensor arrays for engaging a patient,

a transmission system for transmitting data collected by the one or more discretized sensor arrays,

a receiving device for receiving the transmitted data from the one or more discretized sensor arrays, and

a computing device connected to the receiving device for calculating values of vital signs of the patient by

producing time series data from various discretized sensor array signals,

calculating energy spectrum from the time series data, and

determining variance of each discretized sensor array.

15. The device of claim 14, wherein the vital signs are average, mean, systolic and diastolic arterial blood pressure.

16. The device of claim 14, wherein the vital signs are hypertension and related medical conditions.

17. The device of claim 14, wherein the patient lies on, stands on, or otherwise contacts the discretized sensor arrays.

18. The device of claim 14, wherein the discretized sensor arrays collect the discretized acoustic, electromechanical or other physiological signals over a range of frequencies.

19. The device of claim 14, wherein the discretized sensor arrays collect the discretized acoustic, electromechanical or other physiological signals is performed over a single frequency.

20. The device of claim 14, wherein the discretized sensor arrays collect the discretized acoustic, electromechanical or other physiological signals in a time domain or frequency domain.

21. The device of claim 14, wherein the computing device calculates a value for vital signs with non-time series methods for determining energy at various array points or a combination of array points.

22. The device of claim 14, wherein the transmission system transmits discretized signals via wire, fiber optics or wirelessly.

23. The device of claim 14, wherein the discretized sensor arrays provide continuous, real-time monitoring of a patient's vital signs.

24. The device of claim 14, wherein the computing device computes the momentum flux from data gathered from the discretized signal arrays.

25. The device of claim 24, wherein the computing device further computes a patient's vital signs from the momentum flux.

26. The device of claim 14, wherein the one or more discretized sensor arrays are not attached to the patient.