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(54) **AUTOMATIC WIRELESS PAN/LAN SWITCHING**

AUTOMATISCHE UMSCHALTUNG ZWISCHEN DRAHTLOSEM PAN/LAN

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to the field of patient monitoring and/or treatment devices which may be connected to hospital local area networks (LANs), and more specifically, to patient monitoring and/or treatment devices which may be coupled to hospital LANs via more than one communications channel.

BACKGROUND OF THE INVENTION

[0002] In hospital environments, patients often require continual monitoring with relatively short repetition intervals, even when the patient is being transported from one location in the hospital to another. Portable patient monitors have been developed which are battery operated and are able to travel with the patient to provide uninterrupted patient monitoring. Portable patient monitors may include electrodes attached to a patient to receive electrical signals representing physiological parameters of the patient. These parameters may be displayed on the portable patient device, but may also be supplied to a central location in the hospital where they may be displayed on a patient monitoring system, or stored in a patient medical record or a patient data repository.

[0003] In such a hospital environment, docking stations for portable devices are provided at fixed locations throughout the hospital, such as patient rooms, therapy rooms, operating rooms, and so forth. Such docking stations permit the batteries in the portable patient monitor to be recharged and also permit the portable patient monitor to be connected to the central location through a wired link from the docking station to the central location. It is also possible for the portable patient monitor to remain in communication with the docking station when undocked in proximity of the docking station. For example, the portable patient monitor may be undocked within a therapy room to allow the patient to exercise without the restraint of being attached to the docking station. When the patient is being moved from one location to another, the portable patient monitor may remain in communication with the central location wirelessly. To do this, wireless access points with associated antennae are located throughout the hospital, e.g. in hallways, elevators, etc.; wherever a patient may be transported from one room to another.

[0004] US 2004/0004460 A1 discloses a communication system for connecting a portable patient monitoring device to a plurality of other networks, the portable patient monitoring device processing signal parameters acquired from a patient and comprising a communication interface. In a first mode of operation, the portable patient monitoring device is attached to the docking station (i.e. with optical transducer) via a communication link exclusively (i.e. in alignment of the photo devices) between said docking station and said portable patient monitoring device. Acquired patient parameters are transmitted via said first wireless communication link. When said portable patient monitoring is unattached to its docking station a second wireless communication link is established between the portable processing device and a network and the acquired patient parameters are communicated via said wireless communication link to another destination. A similar system, with corresponding features, is also disclosed in US 2004/0147818 A1. US 6525854 B1 discloses transmitting identification information from a docking station to a portable terminal via a wireless communication link.

[0005] Thus, a portable patient monitor may include multiple channels for maintaining communication with the central location of the hospital. It is desirable that transitions between communications channels be handled properly so that continual monitoring may be maintained.

BRIEF SUMMARY OF THE INVENTION

[0006] In accordance with principles of the present invention, a communication system is provided according to independent claim 1.

[0007] Further preferred embodiments of the invention are as defined in the dependent claims.

BRIEF DESCRIPTION OF THE DRAWING

[0008] In the drawing:

Fig. 1 is a block diagram of respective communications channels between a portable patient monitor and a hospital central location;

Fig. 2 is a block diagram of a portable patient monitor and a docking station according to principles of the present invention; and

Fig. 3 is a flowchart useful in understanding the operation of the portable patient monitor and docking station illustrated in Fig. 2 according to principles of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0009] A processor, as used herein, operates under the control of an executable application to (a) receive information from an input information device, (b) process the information by manipulating, analyzing, modifying, converting and/or transmitting the information, and/or (c) route the information to an output information device. A processor may use, or comprise the capabilities of, a controller or microprocessor, for example. The processor may operate with a display processor or generator. A display processor or generator is a known element for generating signals representing display images or portions thereof. A processor and a display processor com-

prises any combination of, hardware, firmware, and/or software.

[0010] An executable application, as used herein, comprises code or machine readable instructions for conditioning the processor to implement predetermined functions, such as those of an operating system, remote patient monitoring system or other information processing system, for example, in response to user command or input. An executable procedure is a segment of code or machine readable instruction, sub-routine, or other distinct section of code or portion of an executable application for performing one or more particular processes. These processes may include receiving input data and/or parameters, performing operations on received input data and/or performing functions in response to received input parameters, and providing resulting output data and/or parameters.

[0011] Fig. 1 is a block diagram of respective communications channels between a portable patient monitor 20 and a hospital central location 15. In Fig. 1, a hospital central location 15 includes a patient data repository 40, a patient medical record 50 and a patient monitoring system 60 coupled together via a local area network (LAN) 5. The LAN 5 is also coupled to a plurality of patient area networks (PAN) 70, which are described in more detail below. The LAN 5 is also coupled to an access point 80.

[0012] A patient area network (PAN) 70 may include a plurality of patient monitoring and/or treatment devices which are coupled together via a network. Typically, PANs 70 are located in fixed locations in the hospital where diagnosis, monitoring and treatment of a patient may be performed, such as in a patient room a therapy room, an operating room, a diagnostic test room (e.g. X-ray, CAT scan, etc.), and so forth. The respective PANs 70 are assigned a unique identifier which is used to identify messages to and from the PAN 70. The unique identifier may also be used to determine a geographical location of the PAN 70.

[0013] At the top left of Fig. 1, a particular PAN 70 is illustrated in more detail. In this PAN 70, a patient 90 has sensors (not shown) attached to him to generate various signals which may be processed to derive physiological parameters of that patient, such as (a) electro-cardiograph (ECG) data, (b) blood parameter data, (c) ventilation parameter data, (d) infusion pump related data, (e) blood pressure data, (f) pulse rate data, and (g) temperature data. These signals are coupled to a portable patient monitor device 20. The portable patient monitor device 20 includes circuitry for processing these signals to generate patient physiological parameters, and a display screen for displaying the physiological parameters for a clinician. The portable patient monitor device 20 may be physically and electrically coupled to a docking station 10. The docking station 10 is coupled to a patient monitor processor 30. The patient monitor 30 may provide processing capabilities beyond what the portable patient monitor device 20 alone has, and also includes a link, termed a bridge, between the PAN 70 and the LAN 5. This permits the patient monitor processor 30 to access data at the central location 15 and to display this data on the patient monitor 30.

[0014] In operation, the destination of the patient physiological parameter data from the portable patient monitor device 20 is the central location 15. Also, because the unique identifier identifying the network node sending the patient physiological parameter data to the central location 15 is associated with a docking station 10, and because the geographical location of the docking station 10 is known, the unique identifier enables determination of the geographical location of the docking station 10. A map may be maintained in the central location 15 associating the identifier with a geographical location. The central location 15 may display the patient physiological parameter data on the patient monitoring system 60. This permits the medical status of one or more patients to be monitored at a single location. The patient physiological parameter data may also be stored in a patient medical record 50. This data may be reviewed by a physician or other clinician as part of a diagnosis or treatment process. The patient physiological parameter data may also be stored in a patient data repository 40, providing for longer term storage and retrieval of patient data.

[0015] When the docking station 10 detects that the portable patient monitor device 20 has been docked, it initiates a first mode of operation. In this mode of operation, the portable patient monitor device 20 is configured to connect to the LAN 5 via the docking station 10 and the patient monitor processor 30, in a manner described in more detail below. This mode of operation may continue even if the portable patient monitor device 20 is undocked from the docking station 10. This is illustrated in phantom in Fig. 1. If the portable patient monitor device 20 remains in relative proximity to the docking station 10, then a wireless link may be maintained between the portable patient monitor device 20 and the docking station 10, allowing the portable patient monitor device 20 to continue to communicate with the central location 15 via the docking station 10 and the patient monitor processor 30.

[0016] At the bottom left of Fig. 1, a wire less access point 80 is coupled to the LAN 5. Typically, the wireless access points 80 are located at locations in the hospital where patients may be transported, but which are not in fixed locations where a docking station 10 and patient monitor processor 30 may be placed, such as a hallway, elevator, and so forth. A portable patient monitor device 20 is illustrated as being connected to a patient 90. In this case, the portable patient monitor device 20 is not in close proximity to a docking station 10 or patient monitor processor 30. The portable patient monitor device 20 includes a wireless link which may connect to the LAN 5 via the wireless access point 80. In this situation, the portable patient monitor device 20 is configured to operate in a second mode of operation. In this mode of operation, the portable patient monitor device 20 communicates patient physiological parameter data to the central

location 15 via the LAN 5.

[0017] Fig. 2 is a block diagram of a portable patient monitor device 20 and a docking station 10 according to principles of the present invention. In Fig. 2, those elements which are the same as those illustrated in Fig. 1 are designated by the same reference number. In Fig. 2, a source of electrical power (not shown) is coupled to a power input terminal (PWR IN) of a docking station 1 0. The power input terminal is coupled to respective input terminals of a load sense circuit 13 and a modulator/demodulator (modem) 16. An output terminal of the modem 16 is coupled to an input terminal of a power coupler 15. A bidirectional Ethernet link is coupled to a network connection (not shown), such as the LAN 5, or to LAN 5 via a patient monitor processor 30 (also not shown). The Ethernet link is coupled to a first communication terminal of an interface processor 25. A second communication terminal of the interface processor 25 is coupled to an optical link, e.g. optical driver 17 and optical receiver 19. A third communications terminal is coupled to a PAN RF link 109. A fourth communications terminal is coupled to the modem 16. A first control input terminal is coupled to an output terminal of the load sense circuit 13. A second control input terminal is coupled to a source 14 of a unique identifier. A radio frequency identification (RFID) tag 115 is also located on the docking station 10. The RFID tag 115 may be passive, requiring no power, or active, requiring power for operation.

[0018] The portable patient monitor device 20 includes a power coupler 39. An output terminal of the power coupler 39 is coupled to respective input terminals of a load sense circuit 25 and a modem 24. An output terminal of the modem 24 is coupled to a battery charger 37. The battery charger is coupled to a battery 43. A data acquisition unit 50 is coupled to a plurality of patient attachable electrodes (not shown) which may be attached to a patient to generate electrical signals representing patient physiological parameter data. An output terminal of the data acquisition unit 50 is coupled to an input terminal of a processor 35. An output terminal of the processor 35 is coupled to an input terminal of a display unit 45. A bidirectional communications terminal of the processor 35 is coupled to a first communications terminal of an adaptive communications interface 33. A second communications terminal of the adaptive communications interface 33 is coupled to a LAN RF link 107. A third communications terminal is coupled to a PAN RF link 111. A fourth communications terminal is coupled to an optical link, e.g. optical driver 21 and optical receiver 23. A fifth communications terminal is coupled to the modem 24. A sixth communications terminal is coupled to an RFID tag reader 113. A control input terminal of the adaptive communications interface 33 is coupled to an output terminal of the load sense circuit 25 and a bidirectional control terminal of the adaptive communications interface 33 is coupled to storage 34 for a unique identifier.

[0019] In operation, the portable patient monitor device 20 may be docked in the docking station 10. In this configuration, illustrated in Fig. 2, the power couplers 15 and 39 are physically aligned to pass power from the docking station 10 to the portable patient monitor device 20. For example, the power couplers 15 and 39 may be a split transformer in which the primary winding is in the power coupler 15 and the secondary winding is in the power coupler 39. When docked, the primary winding 15 and secondary winding 39 are magnetically coupled so that power is transferred from the docking station 10 to the portable patient monitor device 20. In the portable patient monitor device 20, the battery charger 37 receives power from the power coupler 39, recharges the battery 43 and maintains it at full charge.

[0020] The docking station 10 may detect that the portable patient monitor device 20 is docked by sensing the status of the signal at the power input terminal. For example, when the portable patient monitor device 20 is docked, the current through the power input terminal will be higher than when the portable patient monitor device 20 is undocked. The load sense circuit 13 monitors the signal on the power input terminal and generates a control signal 'Docked' indicating that the portable patient monitor device 20 is docked to the docking station 10. In a similar manner, the load sense circuit 25 in the portable patient monitor device 20 may also detect when it is docked to the docking station 10. Alternatively, the adaptive communications interface 33 in the portable patient monitor device 20 may detect that it is docked to the docking station 10 by detecting that an active communication link is present between the docki ng station 10 and the portable patient monitor device 20.

[0021] When the portable patient monitor device 20 is docked, the optical link in the docking station 10, e.g. optical driver 17 and optical receiver 19, is physically aligned with the optical link in the portable patient monitor device 20, e.g. optical receiver 23 and optical driver 21 respectively. When aligned, it is possible for the interface processor 25 in the docking station 10 to communicate with the adaptive communications interface 33 in the portable patient monitor device 20 via the optical link. Because it is an optical link, this communications link may not receive signals from another location. That is, it is a wireless link which exists exclusively between the docking station 10 and the portable patient monitor device 20.

[0022] When the portable patient monitor device 20 is docked to the docking station 10, the modem 16 in the docking station 10 may be configured to receive data from the interface processor 25 and to modulate the amplitude and/or frequency of the power input signal with that data. The modem 24 in the portable patient monitor device 20 demodulates data received from the interface processor 25 via the modem 16 in the docking station 10, and supplies that data to the adaptive communications interface 33. Correspondingly, the modem 24 in the portable patient monitor device 20 may be configured to receive data from the adaptive communications interface 33 and modulate the amplitude and/or frequency of the

power input signal with that data. Th e modem 16 in the docking station 10 demodulates data received from the adaptive communications interface 33 in the portable patient monitor device 20 via the modem 24, and supplies that data to the interface processor 25. Because this is a magnetically coupled link, this communications link, too, may not receive signals from another location. Thus, it, also, is a wireless link which exists exclusively between the docking station 10 and the portable patient monitor device 20.

[0023] The interface processor 25 in the docking station 10 may communicate with the adaptive communications interface 33 in the portable patient monitor device 20 via the PAN wireless link 109, 111. This link may be activated when the portable patient monitor device 20 is docked to the docking station 10 and may remain activated when it is not docked. This link is implemented as an RF link, and thus is subject to receiving signals from other locations. However, the power in the RF link may be constricted so that the range of operation of this link is limited. More specifically, in the illustrated embodiment, the typical range of operation of this link is approximately the size of a room, such as a patient room, operating room, therapy room, etc. However, the power in this link may be controlled so that when the portable patient monitor device 20 is docked, the power is constricted to be low enough that the range of operation is only several inches. In this way, while possible, it is improbable that a signal will be received from another location. Thus, in practical terms, this wireless link exists exclusively between the docking station 10 and the portable patient monitor device 20.

[0024] When the portable patient monitor device 20 is attached to the docking station 10, the adaptive communications interface 33 initiates a first mode of operation using a first wireless link. In the first operational mode the portable patient monitor device 20 communicates patient physiological parameter data to a first destination. For example, the portable patient monitor device 20 may send patient physiological parameter data to the patient monitor processor 30 (Fig. 1) via the docking station 10. The patient monitor processor 30 may include a display device larger than the display device on th e portable patient monitor device 20 and further processing power. This enables the patient monitor processor 30 to display more sophisticated patient physiological parameter data than possible by the portable patient monitor device 20 alone. Further, the patient monitor processor 30 may communicate with the central location 15, enabling it to retrieve data from the central location 15, such as X-ray images, or laboratory test results and display them for the clinician. Alternatively, the portable patient monitor device 20 may send patient physiological parameter data to the central location 15 via the docking station 10, patient monitor processor 30 and LAN 5. Referring again to Fig. 1, as described above, at the central location, the patient physiological parameter data may be sent to (a) an electronic patient record 50, (b) a patient monitoring system 60, and/or (c) a patient data repository 40.

[0025] In order to send and receive messages over the LAN 5 via the Ethernet link from the docking station 10, the portable patient monitor device 20 uses a unique identifier associated with the docking station 10. This identifier may be: (a) an Ethernet compatible MAC address, (b) an IP address, (c) a port identifier, (d) an Internet compatible address and/or (e) a LAN address. Messages sent from the portable patient monitor device 20 include this unique identifier to identify the network node which sent the message. The unique identifier associated with the portable patient monitor device 20 is derived from the docking station 10 to which it is docked.

[0026] In order to ensure that the unique identifier assigned to the portable patient monitor device 20 comes from the docking station 10 to which it is docked, the communications channel used to transmit this data is exclusive between the docking station 10 and the portable patient monitor device 20. The unique identifier may be communicated from the docking station 10 to the portable patient monitor device 20 using one of the three wireless links discussed above: (a) the optical link 17, 19, 21, 23; (b) the magnetic link 15, 16, 24, 39; or (c) the PAN RF link 109, 111, with constricted power. More specifically, in the illustrated embodiment, the interface processor 25 in the docking station 10 retrieves the unique identifier from the identifier source 14. The interface processor 25 then establishes one of the communication links described above, and sends the identifier representative data to the adaptive communications interface 33 in the portable patient monitor device 20. The adaptive communications interface 33 receives the identifier representative data and stores it in the identifier store 34.

[0027] Alternatively, the RFID tag 115 in the docking station 10 may be encoded to return data representing the unique identifier associated with the docking station 10 when queried. The adaptive communications interface 33 may activate the RFID tag reader 113 to query the RFID tag 115 in the docking station 10 to retrieve the unique identifier. When queried, the RFID tag 115 in the docking station 10 returns a signal carrying the unique identifier representative data to the RFID tag reader 113. The adaptive communications interface 33 receives this signal from the RFID tag reader 113 and stores data representing the unique identifier in the identifier store 34.

[0028] One skilled in the art understands that other information may also be stored in the identifier store 34. For example: (a) an identifier associated with a previous docking station 10 to which the portable patient monitor device 20 was docked prior to the current docking station 10, (b) information representing the time a portable patient monitor device 20 is docked in a docking station 10 and undocked from that docking station 10 (e.g. time stamps), and/or (c) other information derived using the identifier associated with said previous docking station may also be stored in the identifier store 34.

[0029] In subsequent communications with the patient monitor processor 30 (Fig. 1) or the central location 15

via the Ethernet link, the adaptive communications interface 33 uses the unique identifier. More specifically, in the illustrated em bodiment, after the unique identifier has been received by the portable patient monitor device 20, the portable patient monitor device 20 communicates acquired patient parameters from the data acquisition unit 50 via the first wireless communication link to the first destination e.g. patient monitor processor 30 and/or the central location 15 associated with the particular docking station identified by the unique identifier. More specifically, in the illustrated embodiment, the adaptive communication interface 33 supports communication via the Ethernet link in the docking station 10 using wireless technologies including at least one of, (a) WLAN 802.11 b standard compatible communication, (b) 802.11 a standard compatible communication, (c) 802.11 g standard compatible communication, (d) Bluetooth 802.15 standard compatible communication, (e) GSM/GPRS standard compatible communication, (f) UWB standard compatible communication 802.15.3, and (g) RFID sensing. (The 802.11 standard compatible communications links are sometimes termed WiFi communications links.)

[0030] Referring again to the bottom left-hand portion of Fig. 1, a patient 90 may also be monitored by an undocked portable patient monitor device 20 outside of a PAN 70. When the portable patient monitor device 20 is not attached to, or in communication with, a docking station 10, the portable patient monitor device 20 operates in a second mode of operation. In this mode of operation, the portable patient monitor device 20 establishes a second wireless link to the network LAN 5. This mode of operation may be established when it is detected that the first more of operation, described above, becomes non-operational. In this mode of operation, the portable patient monitor device 20 communicates patient physiological parameter data to a second destination via the second wireless link. More specifically, in the illustrated embodiment, the second destination may be the central location 15, where the data may be supplied to the patient record 50, the patient monitoring system 60 and/or the patient data repository 40. This second destination may be the same as the first destination, or may be different.

[0031] Referring again to Fig. 2, the adaptive communications interface 33 includes circuitry which may monitor the status of established communications links. Specifically, the adaptive communications interface 33 may detect when a communications link becomes non-operational. For example, a status signal from a link, e.g. optical link 21, 23, PAN RF link 111 or the modem 24, may indicate that the link has become non-operational. When it is detected that the first communications link is non-operational, the adaptive communications interface 33 conditions the LAN RF link 107 to attempt to connect to the LAN 5 via an access point 80. In this manner, patient physiological parameter data may be continually supplied from the portable patient monitor device 20 to the central location 15 even if the portable patient monitor device 20 is undocked from the docking station 10 and removed from the vicinity of the PAN 70. One skilled in the art understands that the LAN RF link 107 has a relatively longer range than the PAN RF LINK 111.

[0032] It is also possible for a portable patient monitor device 20 to be returned to a PAN 70 from which it was removed, as when a patient returns from a diagnostic testing room to the patient room. The portable patient monitor device 20 may then be redocked in the docking station 10. In this case, communications may be reestablished using the wireless links described above. The manner of transitioning among (a) a communications link used when a portable patient monitor device 20 is docked in a docking station 10, (b) a communications link used when the portable patient monitor device 20 is undocked but is within range of a PAN 70, and (c) a communications link used when a portable patient monitor device 20 is undocked, is not within range of a PAN 70 but is within range of the LAN 5, is described in more detail below.

[0033] Fig. 3 is a flowchart useful in understanding the operation of the portable patient monitor 20 and docking station 10 illustrated in Fig. 2 according to principles of the present invention, during the transitions. In the following description, reference will be made to both Fig. 2 and Fig. 3. Fig. 3 begins in step 302 when the portable patient monitor device 20 is not operating within range of a PAN 70. This may, for example, occur when a portable patient monitor device 20 is initially powered on and attached to a patient, or when it is operating within range of the LAN 5 but not within range of a PAN 70. In step 304, the portable patient monitor device 20 determines if it has been docked in a docking station 10. This may be determined via the load sense circuit 25 as described above. In step 306, the unique identifier for the PAN 70 is retrieved from the docking station 10 using a first communications link (e.g. optical link, magnetic link, PAN RF link or RFID link), as described above. In step 308, the portable patient monitor device 20 establishes Ethernet communications with the patient monitor processor 30 via the docking station 10. Patient physiological parameter data from the data acquisition unit 50 are supplied to the first destination (patient monitor processor 30 and/or central location 15) via the first communications link (e.g. optical link, magnetic link, or PAN RF link).

[0034] In step 310, the portable patient monitor device 20 monitors whether it is still docked. This may be done by the load sense circuit 25. If the portable patient monitor device 20 remains docked, it maintains the first communications link established in step 308. If the portable patient monitor device 20 becomes undocked, then communications with the PAN 70 is maintained, possibly using a different communications link. This may occur if the portable patient monitor device 20 is undocked from the docking station 10, but remains within the patient room. In this case, in step 312, the adaptive communications interface 33 activates the PAN RF link 109,111 if it is not already active. The transmission power of the PAN RF link 109, 111 in this mode of operation is substantially higher than the constricted power used by the PAN RF

link 109, 111 when the portable patient monitor device 20 is docked in the docking station 10. This enables a transmission range sufficient to cover the patient room. Patient physiological parameter data from the data acquisition unit 50 is communicated over the PAN RF link 109, 111, with substantially higher power, to the patient monitor processor 30 and/or the central location 15 via the docking station 10.

[0035] In general, a portable patient monitor device 20 will attempt to remain in communication with the PAN 70 containing the docking station 10 from which it received the unique identifier as long as it remains within range. In step 314 the adaptive communications interface 33 in the portable patient monitor device 20 monitors communication with the docking station 10. So long as the portable patient monitor device 20 remains within range of the docking station 10, the portable patient monitor device 20 communicates with the docking station 10 using the PAN RF communication link 109, 111 in step 312.

[0036] If, however, the PAN RF link 109, 111 becomes inoperative, e.g. because the portable patient monitor device 20 goes out of range, then in step 316 the adaptive communications interface 33 activates the LAN RF link 107, establishing a second communications link between the portable patient monitor device 20 and the LAN 5. The patient physiological parameter data from the data acquisition unit 50 is supplied to the central location 15 via the LAN 5 in this mode of operation. As described above, this may occur when a patient is removed from the patient room and taken to e.g. an operating room, diagnostic testing room, therapy room, etc., though the hospital.

[0037] The LAN RF link 107 is maintained so long as the portable patient monitor device 20 remains within range of the LAN 5 and out of range of a PAN 70. Because of the varying ranges of PAN RF communication links in the respective PANs 70, the portable patient monitor device 20 may come within range of a PAN RF link during transportation of the patient in the hospital, and/or when the patient arrives at the final destination, if that destination contains a PAN 70. In step 318 the adaptive communications interface 33 determines (a) that the portable patient monitor device 20 is within range of a PAN, and (b) whether the identifier stored in the identifier store 34 matches the identifier of the PAN RF link currently within range, i.e. is the same PAN from which the portable patient monitor device 20 was undocked.

[0038] The adaptive communications interface 33 is inhibited from establishing communication with a PAN 70 which fails to provide the previously received unique identifier unless the portable patient monitor device 20 is docked. If a different PAN 70 is detected, then in step 322 the adaptive communications interface 33 in the portable patient monitor device 20 monitors whether the portable patient monitor device 20 is docked. If the portable patient monitor device 20 is docked in the newly entered PAN 70, communication is established between the portable patient monitor device 20 and the new PAN 70 e.g. using the optical link, magnetic link, PAN RF link at constricted power, or RFID link. In step 306 the unique identifier associated with the docking station 10 in the new PAN 70 is retrieved, and in step 308 communications between the portable patient monitor device 20 and the docking station 10 established. Patient physiological parameter data from the data acquisition unit 50 is sent to the patient monitor processor 30 or central location 15 via the docking station 10 in the new PAN 70.

[0039] If in step 318 the same PAN is detected, as may happen if the patient is returned to the patient room from which he was originally taken, then in step 320 the adaptive communications interface 33 in the portable patient monitor device 20 activates the PAN RF link 109,111, with substantially higher power. This reestablishes the first communications link with the docking station 10. In this case, patient physiological parameter data from the data acquisition unit 50 is sent to the patient monitor processor 30 or central location 15 through the docking station 10 via the PAN RF link 109, 111. In step 314, the adaptive communications interface 33 in the portable patient monitor device 20 monitors the PAN RF link 109, 111 to detect if the portable patient monitor device 20 goes out of range.

[0040] The embodiment above is described as having multiple communications links available, e.g five links: (1) optical link 17, 19, 21, 23; (2) magnetic link 15, 16, 24, 39; (3) PAN RF link 109,111; (4) LAN RF link 107; and (5) RFID link 113,115. One skilled in the art, however, understands that different combinations of communication links may be available in the portable patient monitor device 20 and docking station 10.

[0041] For example, in another configuration, the portable patient monitor device 20 may have three links: (1) a short-range wireless PAN link e.g. the optical link 17, 19, 21, 23, used by the docking station 10 to communicate the unique identifier to the portable patient monitor device 20 and by the portable patient monitor device 20 to communicate patient physiological parameter data to the patient monitor processor 30 and/or central location 15 via the docking station 10 when it's docked; (2) a short-range wireless RF PAN link 109, 111 used by the portable patient monitor device 20 to communicate patient physiological parameter data to the patient monitor processor 30 and/or central location 15 via the docking station 10 when it's undocked but within the PAN 70; and (3) a longer-range wireless link used by the portable patient monitor device 20 to communicate patient physiological parameter data to the central location 15 via the LAN 5 when it's undocked and not within the PAN 70.

[0042] Another exemplary configuration includes two links: (1) a short-range wireless RF PAN link 109, 111 used by the docking station 10 to communicate the unique identifier to the portable patient monitor device 20 in a constricted power mode, and by the portable patient monitor device 20 to communicate patient physiological parameter data to the patient monitor processor 30 and/or central location 15 when it's within range of the

docking station 10; and (2) a longer-range wireless link used by the portable patient monitor device 20 to communicate patient physiological parameter data to the central location 15 via the docking station 10 when it's undocked and not within the PAN 70.

[0043] Another exemplary configuration includes a single link: a wireless link for communicating between the portable patient monitor device 20 and the docking station 10. That is, the first and second wireless communication links are the same link used in different first and second communication modes. In this case, the single link may operate in two different operational modes. For example, a Bluetooth RF link may operate in a very low power mode when the portable patient monitor device 20 is communicating with the docking station 10 within a PAN 70, and in a high power mode when communicating directly with the LAN 5. Alternatively, the single link may be a WiFi (802.11 standard) communications link which operates in the "ad-hoc" mode when communicating with the docking station 10 within a PAN and in "station" mode when communicating directly to the LAN 5.

[0044] In this manner, the adaptive communications interface 33 in the portable patient monitor device 20 automatically, and without user intervention, remains in continual communication with either the patient monitor processor 30 in the PAN 70 and/or with the central location 15 via the LAN 5. Once associated with a particular PAN 70 by receiving and using the unique identifier associated with that PAN 70, it communicates through that PAN 70 as long as it remains within range. Otherwise it communicates with the LAN 5.

Claims

1. A communication system configured to connect a portable patient monitoring device (20) to a plurality of networks (5, 70) via separate communication links (17, 19, 21, 23; 15, 16, 24, 39; 107; 109, 111; 113, 115), comprising:

a docking station (10),
an adaptive communication interface (33) in the portable patient monitoring device (20) which is adapted to automatically:

establish, in response to detecting that the portable patient monitoring device (20) is attached to the docking station (10), a first wireless communication link (17, 19, 21, 23; 15, 16, 24, 39; 109, 111; 113, 115) between the docking station (10) and the portable patient monitoring device (20) and communicates acquired patient parameters via the first wireless communication link to a first destination, and
maintain, in response to detecting that the portable patient monitoring device (20) is unattached to the docking station (10) but remains in relative proximity to the docking station, a wireless communication link (109, 111) between the portable patient monitoring device (20) and the docking station (10), and to communicate acquired patient parameters via the wireless communication link (109,111) to the first destination; and
establish, in response to detecting that the portable patient monitoring device (20) is unattached to the docking station (10) and unable to communicate with the docking station (10) via the wireless communication link (109, 111), a second wireless communication link (107) between the portable patient monitoring device (20) and a second destination,

characterized in that

the adaptive communication interface (33) in the portable patient monitoring device (20), in order to send and receive messages, is arranged to use a unique identifier associated with the portable patient monitor device (20) and derived from the docking station (10) to which the portable patient monitoring device is docked; and wherein said docking station (10) is arranged,
in order to ensure that the unique identifier assigned to the portable patient monitor device (20) comes from the docking station (10) to which it is docked, to use a communications channel used to transmit this data, said channel being exclusive between the docking station (10) and the portable patient monitor device (20);
furthermore, the adaptive communication interface (33) is inhibited from establishing communication with systems, which fail to provide the previously received unique identifier unless the portable patient monitoring device (20) is docked.

2. A system according to claim 1, wherein the second destination is at least one of, (a) an electronic patient record (50), (b) a patient monitoring system (60) and (c) a patient data repository (40).

3. A system according to claim 1, wherein the adaptive communication interface (33) is arranged to operate automatically without human intervention.

4. A system according to claim 1, wherein the detection of the portable patient monitoring device (20) being attached to said docking station (10) is performed by detection of at least one of, (a) a change in charging current being provided by the docking station (10) to the portable patient monitoring device (20) and (b) an active communication link is present between the

docking station (10) and the portable patient monitoring device (20).

5. A system according to claim 1, wherein the first wireless communication link exclusively between the docking station (10) and the portable patient monitoring device (20) comprises magnetically coupled signal modulation.

6. A system according to claim 1, wherein the adaptive communication interface (33) supports communication using wireless technologies including at least one of, (a) WLAN 802.11b standard compatible communication, (b) 802.11a standard compatible communication, (c) 802.11g standard compatible communication, (d) Bluetooth 802.15 standard compatible communication, (e) GSM/GPRS standard compatible communication, (f) UWB standard compatible communication 802.15.3, and (g) RFID sensing.

7. A system according to claim 1, wherein the identifier associated with the particular docking station (10) comprises at least one of, (a) an Ethernet compatible MAC address, (b) an IP address, (c) a port identifier, (d) an internet compatible address, and (e) a LAN address.

8. A system according to claim 1, wherein the first wireless communication link is a short range RF link or comprises at least one of, (a) an optical link (17, 23, 19, 21), (b) a RF link (109, 111), and (c) a magnetically coupled link (15, 16, 24, 39).

9. A system according to claim 1, wherein the first wireless communication
link (109, 111) is via a Personal Area Network (PAN, 70).

10. A system according to claim 1, wherein the second wireless communication
link (107) is via a Local Area Network (LAN, 5).

11. A system according to claim 1, wherein the first wireless communication
link (109, 111) is at least one of: (a) Bluetooth compatible and (b) UWB compatible; and the second wireless communication link (107) is WiFi compatible.

12. A system according to claim 1, wherein the first and second destinations are
identical.

13. A system according to claim 1, wherein the first destination comprises a patient monitoring processor (30) and the second destination comprises a central monitoring system (60).

14. A system according to claim 1, further comprising:

a data acquisition processor (35) that is arranged to receive and process patient parameter data comprising physiological data including at least one of, (a) electro-cardiograph (ECG) data, (b) blood parameter data, (c) ventilation parameter data, (d) infusion pump related data, (e) blood pressure data, (f) pulse rate data and (g) temperature data, from a plurality of different patient attached sensors to provide processed patient parameter data;
a display device (45) that is arranged to display processed patient parameter data; and
a power coupler (15) in the docking station (10, 39) comprising a power unit (37) that is arranged to recharge a battery (43) and to supply power to the portable patient monitoring device (20).

15. A system according to claim 1, wherein the assigned unique identifier associated with the particular docking station (10) enables determination of a geographic location of the particular docking station (10) from a map associating the identifier with a corresponding geographic location.

16. A system according to claim 1, wherein the portable patient monitoring
device (20) comprises a storage (34) that stores at least one of (a) the unique identifier assigned by the docking station (10), (b) information derived from the assigned unique identifier and (c) a time stamp of undocking.

17. A system according to claim 16, wherein the adaptive communication interface (33) in the portable patient monitoring device (20): is arranged
to monitor wether the portable patient monitoring device (20) is docked, and to determine, in response to detecting that the portable patient monitoring device (20) is undocked, (a) that the portable patient monitor device (20) is within range of a network (70) and (b) whether the identifier stored in the identifier store (34) matches the identifier of the network link currently within range, i.e. is the same docking station (10) from which the portable patient monitor device 20 was undocked.

18. A system according to claim 12, wherein the first and second destinations comprise at least one of (a) an electronic patient record (50), (b) a patient monitoring system (60) and (c) a patient data repository (40).

Patentansprüche

1. . Kommunikationssystem zur Verbindung einer tragbaren

Patientenüberwachungsvorrichtung (20) mit mehreren Netzwerken (5, 70) über mehrere separate Kommunikationsverbindungen (17, 19, 21, 23; 15, 16, 24, 39; 107, 109, 111; 113, 115) umfassend:

- eine Datenübertragungsstation (10),
- eine adaptive Kommunikationsschnittstelle (33) an der tragbaren Patientenüberwachungsvorrichtung (20), welche dazu ausgelegt ist, automatisch:

i. eine erste drahtlose Kommunikationsverbindung (17, 19, 21, 23; 15, 16, 24, 39; 109, 111; 113, 115) zwischen der Datenübertragungsstation (10) und der tragbaren Patientenüberwachungsvorrichtung als Antwort auf die Feststellung aufzubauen, dass die tragbare Patientenüberwachungsvorrichtung (20) mit der Datenübertragungsstation (10) verbunden ist, und die erhaltenen Patientenparameter über die erste drahtlose Kommunikationsschnittstelle einer ersten Zieladresse zu übermitteln, und
ii. die drahtlose Kommunikationsverbindung (109, 111) zwischen der tragbaren Patientenüberwachungsvorrichtung (20) und der Datenübertragungsstation (10) als Antwort auf die Feststellung aufrecht zu erhalten, dass die tragbare Patientenüberwachungsvorrichtung (20) zwar von der Datenübertragungsstation (10) entkoppelt ist, sich aber in relativer Nähe von der Datenübertragungsstation befindet, und die erhaltenen Patientenparameter über die drahtlose Kommunikationsverbindung (109, 111) der ersten Zieladresse zu übermitteln; und
iii. eine zweite drahtlose Kommunikationsverbindung (107) zwischen der tragbaren Patientenüberwachungsvorrichtung (20) und einer zweiten Zieladresse in Antwort auf die Feststellung aufzubauen, dass die tragbare Patientenüberwachungsvorrichtung (20) von der Datenübertragungsstation (10) entkoppelt und zur Kommunikation mit der Datenübertragungsstation (10) über die erste drahtlose Kommunikationsverbindung (109, 111) nicht in der Lage ist,

dadurch gekennzeichnet,

dass die adaptive Kommunikationsschnittstelle (33) an der tragbaren Patientenüberwachungsvorrichtung (20) zum Senden und Empfangen von Nachrichten dazu ausgelegt ist, eine einmalige Kennung, die der tragbaren Patientenüberwachungsvorrichtung (20) zugeordnet ist und die von der Datenübertragungsstation (10) bezogen wird, mit welcher die tragbare Patientenüberwachungsvorrichtung verbunden ist, zu nutzen; und wobei die genannte Datenübertragungsstation (10) dazu ausgelegt ist, einen Kommunikationskanal zur Übermittlung der Daten zu nutzen, welcher ausschließlich zwischen der Datenübertragungsstation (10) und der tragbaren Patientenüberwachungsvorrichtung (20) besteht, um sicherzustellen, dass die einmalige Kennung, die der tragbaren Patientenüberwachungsvorrichtung (20) zugeordnet ist, von der Datenübertragungsstation (10) kommt, mit welcher diese verbunden ist;
ferner, dass die adaptive Kommunikationsschnittstelle (33) dran gehindert wird, eine Kommunikation mit Systemen aufzubauen, die nicht in der Lage sind, die zuvor empfangene einmalige Kennung bereit zu stellen, es sei denn, dass die tragbare Patientenüberwachungsvorrichtung (20) hiermit verbunden ist.

2. . System nach Anspruch 1, wobei die zweite Zieladresse (a) eine elektronische Patientenakte (50) und/oder (b) ein Patientenüberwachungssystem (60) und/oder (c) eine Patientendatenbank (40) ist.

3. . System nach Anspruch 1, wobei die adaptive Kommunikationsschnittstelle (33) dazu ausgelegt ist, automatisch ohne menschliches Eingreifen zu funktionieren.

4. . System nach Anspruch 1, wobei die Feststellung, dass die tragbare Patientenüberwachungsvorrichtung (20) mit der besagten Datenübertragungsstation (10) verbunden ist, mit der Feststellung erfolgt, dass (a) ein Ladestromwechsel von der Datenübertragungsstation (10) für die tragbare Patientenüberwachungsvorrichtung (20) vorgenommen wird und/oder (b) eine aktive Kommunikationsverbindung zwischen der Datenübertragungsstation (10) und der tragbaren Patientenüberwachungsvorrichtung (20) besteht.

5. . System nach Anspruch 1, wobei die erste drahtlose Kommunikationsverbindung, die ausschließlich zwischen der Datenübertragungsstation (10) und der tragbaren Patientenüberwachungsvorrichtung (20) besteht, eine magnetisch gekoppelte Signalmodulation umfasst.

6. . System nach Anspruch 1, wobei die adaptive Kommunikationsschnittstelle (33) eine Kommunikation unterstützt, die wenigstens eine der folgenden Drahtlos-Technologien nutzt: (a) eine mit dem Standard WLAN 802.11 kompatible Kommunikation und/oder (b) eine mit dem Standard 802.11a kompatible Kommunikation und/oder (c) eine mit dem Standard

802.11c kompatible Kommunikation und/oder (d) eine mit dem Standard Bluetooth 802.15 kompatible Kommunikation und/oder (e) eine mit dem Standard GSM/GPRS kompatible Kommunikation und/oder (f) eine mit dem Standard UWB kompatible Kommunikation und/oder (g) RFID Abtastung.

7. . System nach Anspruch 1, wobei die Kennung, die einer bestimmten Datenübertragungsstation (10) zugeordnet ist, wenigstens (a) eine Ethernet kompatible MAC-Adresse und/oder (b) eine IP-Adresse und/oder (c) eine Anschluss-Kennung und/oder (d) eine Internet kompatible Adresse und/oder (e) eine LAN-Adresse umfasst.

8. . System nach Anspruch 1, wobei die erste drahtlose Kommunikationsverbindung eine RF-Verbindung für kurze Distanzen ist oder wenigstens (a) eine optische Verbindung (17, 23, 19, 21) und/oder (b) eine RF-Verbindung (109, 111) und/oder (c) eine magnetisch gekoppelte Verbindung 15, 16, 24, 39) umfasst.

9. . System nach Anspruch 1, wobei die erste drahtlose Kommunikationsverbindung (109, 111) über ein Personal Area Network (PAN, 70) herstellbar ist.

10. . System nach Anspruch 1, wobei die zweite drahtlose
Kommunikationsverbindung (107) über ein Local Area Network (LAN, 5) herstellbar ist.

11. . System nach Anspruch 1, wobei die erste drahtlose Kommunikationsverbindung (109, 111) wenigstens (a) Bluetooth kompatibel und/oder (b) UWB kompatibel und wobei die zweite drahtlose Kommunikationsverbindung (107) WiFi kompatibel ist.

12. . System nach Anspruch 1, wobei die erste und die zweite Zieladresse identisch sind.

13. . System nach Anspruch 1, wobei die erste Zieladresse einen Patientenüberwachungsrechner (30) und die zweite Zieladresse ein zentrales Überwachungssystem (60) umfasst.

14. . System nach Anspruch 1, ferner umfassend:

- Einen Datenerfassungsrechner (35), der dazu ausgelegt ist, Patientenparameterdaten zu empfangen und zu verarbeiten, welche physiologische Daten umfassen einschließlich wenigstens eines Wertes der nachfolgenden Werte (a) elektrokardiographische Werte (EKG) und/oder (b) Blutwerte und/oder (c) Beatmungswerte und/oder (d) Werte, die sich auf eine Infusionspumpe beziehen und/oder (e) Blutdruckwerte und/oder (f) Pulswerte und/oder (g) Temperaturwerte mehrerer verschiedener am Patienten angebrachter Sensoren, um verarbeitete Patientenparameterdaten bereit zu stellen;
- eine Anzeigevorrichtung (45), die dazu ausgelegt ist, verarbeitete Patientenparameterdaten anzuzeigen; und
- eine Stromversorgung (15) innerhalb der Datenübertragungsstation (10, 39), umfassend eine Stromversorgungseinheit (37), die dazu ausgelegt ist, eine Batterie (43) zu laden und die tragbare Patientenüberwachungsvorrichtung (20) mit Strom zu versorgen.

15. . System nach Anspruch 1, wobei die zugeordnete einmalige Kennung, welche einer bestimmten Datenübertragungsstation (10) zugeordnet ist, die Bestimmung der geographischen Lage der jeweiligen Datenübertragungsstation (10) auf einer Karte ermöglicht, auf welcher die Kennung einer korrespondierenden geographischen Lage zugeordnet ist.

16. . System nach Anspruch 1, wobei die tragbare Patientenüberwachungsvorrichtung (20) einen Speicher (34) umfasst, der wenigstens eine der folgenden Informationen speichert: (a) die einmalige, über die Datenübertragungsstation (10) zugeordnete Kennung und/oder (b) Informationen, die von der zugeordneten einmaligen Kennung abgeleitet werden, und/oder (c) eine auf die Entkopplung bezogene Datumsangabe.

17. . System nach Anspruch 16, wobei die adaptive Kommunikationsschnittstelle (33) in der tragbaren Patientenüberwachungsvorrichtung (20) dazu ausgelegt ist:

- zu überwachen, ob die tragbare Patientenüberwachungsvorrichtung (20) verbunden ist, und
- in Antwort auf die Feststellung, dass die tragbare
Patientenüberwachungsvorrichtung (20) entkoppelt ist, zu bestimmen, ob (a) sich die tragbare Patientenüberwachungsvorrichtung (20) in der Nähe eines Netzwerkes (70) befindet und/oder (b) die im Kennungsspeicher (34) gespeicherte Kennung der Kennung der sich derzeit in der Nähe befindenden Netzwerkverbindung, das heißt, der selben Datenübertragungsstation (10) entspricht, von welcher die tragbare Patientenüberwachungsvorrichtung (20) entkoppelt wurde.

18. . System nach Anspruch 12, wobei die erste und zweite Zieladresse wenigstens (a) eine elektronische Patientenakte (50) und/oder (b) ein Patientenüberwachungssystem (60) und/oder (c) eine Patientendatenbank (40) umfassen.

Revendications

1. Système de communication configuré pour connecter un appareil de surveillance de patient portable (20) à une pluralité de réseaux (5, 70) via des liaisons de communication séparées (17, 19, 21, 23 ; 15, 18, 24, 39 ; 107 ; 109, 111 ; 113, 115), comprenant :

une station d'accostage (10),
une interface de communication adaptative (33) dans l'appareil de surveillance de patient portable (20) qui est adaptée pour, automatiquement :

établir, en réponse à une détection que l'appareil de surveillance de patient portable (20) est attaché à la station d'accostage (10), une première liaison de communication sans fil (17, 19, 21, 23 ; 15, 18, 24, 39 ; 107 ; 109, 111 ; 113, 115) entre la station d'accostage (10) et l'appareil de surveillance de patient portable (20) et communiquer des paramètres patients acquis via la première liaison de communication sans fil vers une première destination, et
maintenir, en réponse à la détection que l'appareil de surveillance de patient portable (20) n'est pas attaché à la station d'accostage (10) mais reste en proximité relative de la station d'accostage, une liaison de communication sans fil (109, 111) entre l'appareil de surveillance de patient portable (20) et la station d'accostage (10) et communiquer des paramètres patients acquis via la liaison de communication sans fil (109, 111) vers la première destination ; et
établir, en réponse à la détection que l'appareil de surveillance de patient portable (20) n'est pas attaché à la station d'accostage (10) et incapable de communiquer avec la station d'accostage (10) via la liaison de communication sans fil (109, 111), une seconde liaison de communication sans fil (107) entre l'appareil de surveillance de patient portable (20) et une seconde destination,
caractérisé en ce que
l'interface de communication adaptative (33) dans l'appareil de surveillance de patient portable (20), afin de recevoir et d'émettre des messages, est agencée pour utiliser un identificateur unique associé à l'appareil de surveillance de patient portable (20) et
dérivé de la station d'accostage (10) auquel l'appareil de surveillance de patient portable est accosté ; et dans lequel ladite station d'accostage (10) est agencée, afin de d'assurer que l'identificateur unique attribué à l'appareil de surveillance de patient portable (20) provienne de la station d'accostage (10) à laquelle il est accosté, pour utiliser un canal de communication utilisé pour transmettre ces données, ledit canal étant exclusif entre la station d'accostage (10) et l'appareil de surveillance de patient portable (20) ;
en outre, l'interface de communication adaptative (33) est empêchée d'établir des communications avec des systèmes qui ne fournissent pas l'identificateur unique précédemment reçu, à moins que l'appareil de surveillance de patient portable (20) soit accosté.

2. Système selon la revendication 1, dans lequel la seconde destination est au moins une destination parmi : (a) un enregistrement patient électronique (50), (b) un système de surveillance de patient (60), et (c) une archive de données patient (40).

3. Système selon la revendication, dans lequel l'interface de communication adaptative (33) est agencée de manière à fonctionner automatiquement sans intervention humaine.

4. Système selon la revendication 1, dans lequel la détection que l'appareil de surveillance de patient portable (20) est attaché à ladite station d'accostage (10) est exécutée par détection d'au moins un phénomène parmi (a) un changement du courant de charge fourni par la station d'accostage (10) à l'appareil de surveillance de patient portable (20) et (b) une liaison de communication active est présente entre la station d'accostage (10) et l'appareil de surveillance de patient portable (20).

5. Système selon la revendication 1, dans lequel la première liaison de communication sans fil exclusive entre la station d'accostage (10) et l'appareil de surveillance de patient portable (20) comprend une modulation de signal à couplage magnétique.

6. Système selon la revendication, dans lequel l'interface de communication adaptative (33) supporte une communication en utilisant des technologies sans fil qui incluent au moins une communication parmi (a) communication compatible au standard WLAN 802. 11 b, (b) communication compatible au standard 802.11a, (c) communication compatible au standard 802.11g, (d) communication compatible au standard Bluetooth 802.15, (e) communication compatible au standard GSM/GPRS, (f) communication compatible au standard UWB 802.15.3, et (g) détection RFID.

7. Système selon la revendication penchée un milieu dans lequel identificateur associé à la station d'accostage particulière (10) comprend au moins une adresse parmi (a) une adresse "MAC" compatible Ethernet, (b) une adresse IP, (c) un identificateur de port, (d) une adresse compatible Internet, et (e) une adresse LAN.

8. Système selon la revendication, dans lesquels la première liaison de communication sans fil est une liaison RF à courte portée ou comprend au moins une liaison parmi (a) une liaison optique (17, 23, 19, 21), (b) une liaison RF (109, 111), et (c) une liaison à couplage magnétique (15, 16, 24, 39).

9. Système selon la revendication penchée un, dans lequel la première liaison de communication sans fil (109, 111) est un réseau dit "PAN" (PAN, 70).

10. Système selon la revendication 1, dans lequel la seconde liaison de communication sans fil (107) est un réseau local "Local Area Network" (LAN, 5).

11. Système selon la revendication 1, dans lequel la première liaison de communication sans fil (109, 111) est au moins une liaison parmi (a) liaison compatible Bluetooth et (b) liaison compatible UWB ; et la seconde liaison de communication sans fil (107) est une liaison compatible WIFI.

12. Système selon la revendication 1, dans lequel la première et la seconde destination sont identiques.

13. Système selon la revendication 1, dans lequel la première destination comprend un processeur de surveillance patient (30) et la seconde destination comprend un système de surveillance central (60).

14. Système selon la revendication 1, comprenant en outre :

un processeur d'acquisition de données (35) qui est agencé pour recevoir et traiter les données de paramètres patients comprenant des données physiologiques incluant au moins une des données suivantes (a) données électrocardiographiques (ECG), données de paramètres sanguins (b), (c) données de paramètres de ventilation, (d) données en relation avec la pompe de perfusion (e), données de pression sanguine, (f) données de cadence de pouls, et (c) données de température, parmi une pluralité de différents capteurs attachés à un patient pour fournir des données de paramètres patient traités ;
un dispositif d'affichage (45) qui est agencé pour traiter des données de paramètres patient ; et
un coupleur de puissance (15) dans la station d'accostage (10, 39) comprenant une unité de puissance (37) qui est agencée pour recharger une batterie (43) et pour fournir une puissance au dispositif de surveillance de patient portable (40).

15. Système selon la revendication 1, dans lequel identificateur unique attribué associé à la station d'accostage particulière (10) permet la détermination d'un emplacement géographique de la station d'accostage particulière (des) depuis une carte associant l'identificateur à un emplacement géographique correspondant.

16. Système selon la revendication 1, dans lequel l'appareil de surveillance de patient portable (20) comprend un stockage (37) qui stocke au moins un élément parmi (a) l'identificateur unique attribué par la station d'accostage (10), (b) des informations dérivées de l'identificateur unique attribué et (c) un marqueur temporel correspondant à l'enlèvement de l'inspection d'accostage.

17. Système selon la revendication 16, dans lequel l'interface de communication adaptative (33) dans l'appareil de surveillance de patient portable (20) est agencée pour :

surveiller si l'appareil de surveillance de patient portable (20) est accosté, et
déterminer, en réponse à la détection que l'appareil de surveillance de patient portable (20) n'est pas en accostage (a), que l'appareil de surveillance de patient portable (20) est à l'intérieur d'une plage d'un réseau (70) et (b) si l'identificateur stocké dans le magasin d'identification (34) est accordé à l'identificateur de la liaison de réseau actuellement dans cette plage, c'est-à-dire est la même station d'accostage (10) de laquelle l'appareil de surveillance de patient portable (20) a été déplacé sans être accosté.

18. Système selon la revendication 12, dans lequel la première et la seconde destination comprennent au moins (a) un rapport électronique du patient (50), (b) un système de surveillance de patient (60), et (17) une archive de données patient (40).

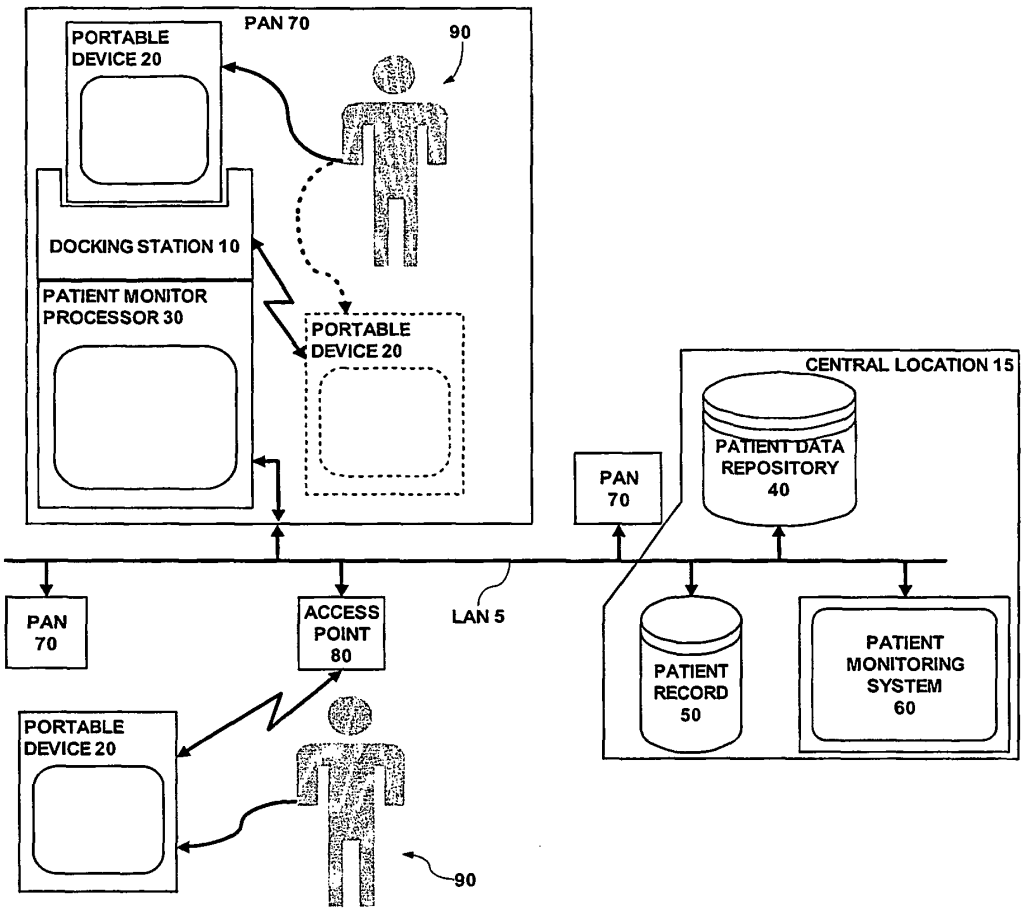
PAN 70
90
PORTABLE DEVICE 20
DOCKING STATION 10
PATIENT MONITOR PROCESSOR 30
PORTABLE DEVICE 20
CENTRAL LOCATION 15
PATIENT DATA REPOSITORY 40
PAN 70
PAN 70
ACCESS POINT 80
LAN 5
PATIENT RECORD 50
PATIENT MONITORING SYSTEM 60
PORTABLE DEVICE 20
90

Fig. 1

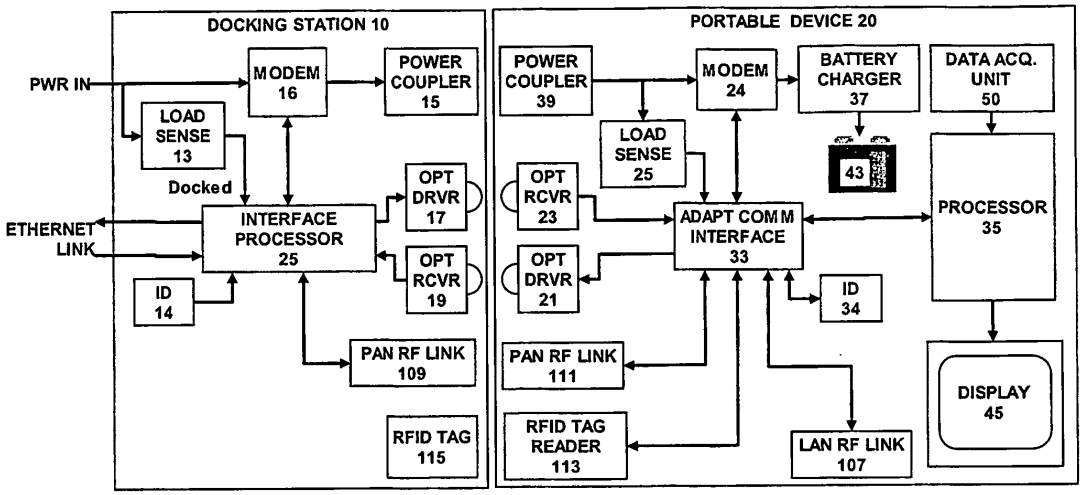
DOCKING STATION 10
PWR IN
MODEM 16
POWER COUPLER 15
LOAD SENSE 13
Docked
ETHERNET LINK
INTERFACE PROCESSOR 25
OPT DRVR 17
OPT RCVR 19
ID 14
PAN RF LINK 109
RFID TAG 115
PORTABLE DEVICE 20
POWER COUPLER 39
MODEM 24
BATTERY CHARGER 37
DATA ACQ. UNIT 50
LOAD SENSE 25
43
OPT RCVR 23
OPT DRVR 21
ADAPT COMM INTERFACE 33
PROCESSOR 35
ID 34
PAN RF LINK 111
DISPLAY 45
RFID TAG READER 113
LAN RF LINK 107

Fig. 2

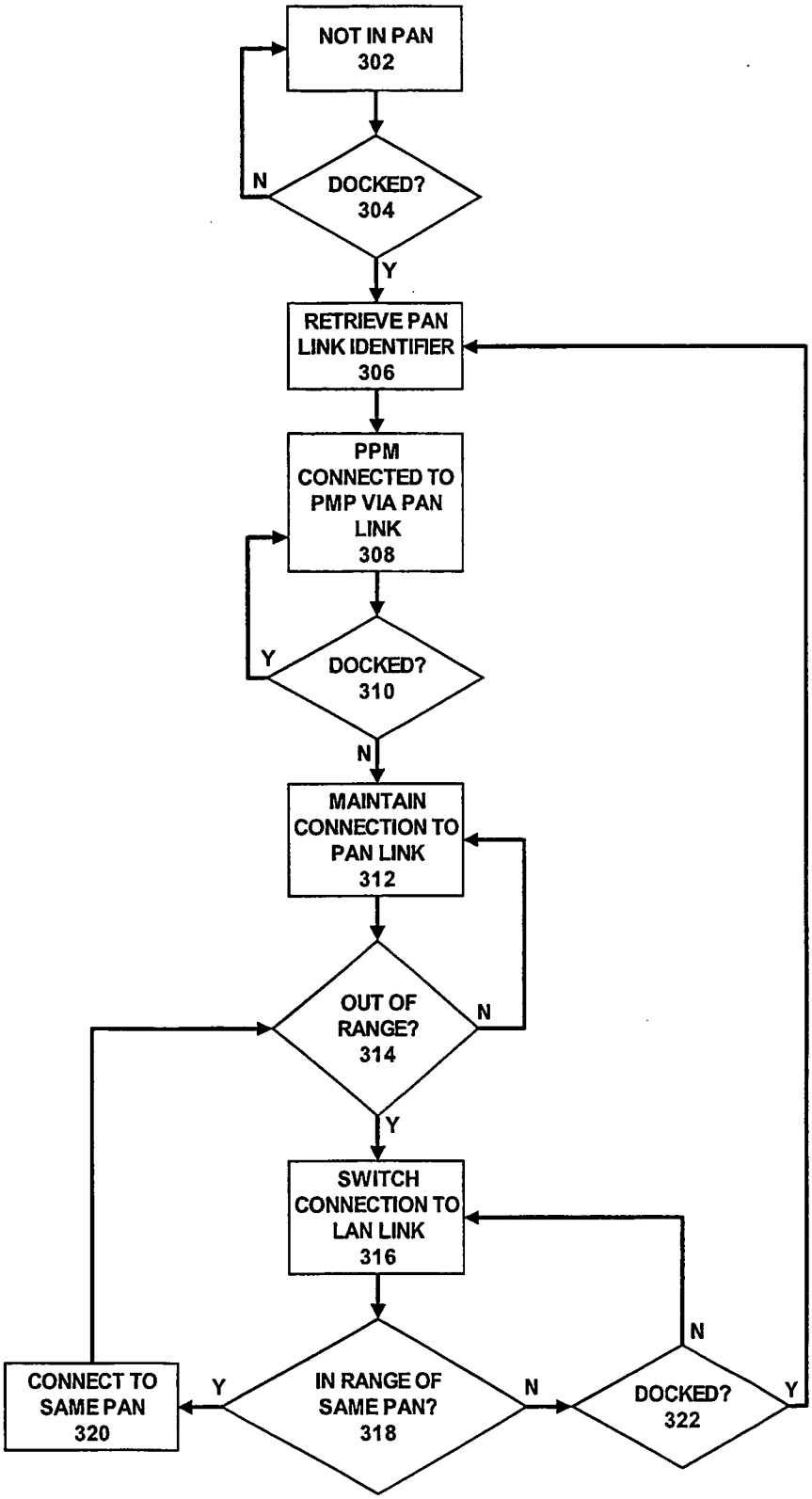
NOT IN PAN
302
DOCKED?
304
N
Y
RETRIEVE PAN LINK IDENTIFIER
306
PPM CONNECTED TO PMP VIA PAN LINK
308
DOCKED?
310
Y
N
MAINTAIN CONNECTION TO PAN LINK
312
OUT OF RANGE?
314
N
Y
SWITCH CONNECTION TO LAN LINK
316
IN RANGE OF SAME PAN?
318
Y
N
CONNECT TO SAME PAN
320
DOCKED?
322
N
Y

Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 20040004460 A1 **[0004]**
- US 20040147818 A1 **[0004]**
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专利名称(译)	自动无线平移/ LAN切换		
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CPC分类号	A61B5/002 A61B5/0017 A61B5/0205 A61B5/0402 A61B2560/0456 H04M1/725 H04M1/72527 H04M1/7253 H04W36/14 H04W48/16 H04W76/10 H04W84/10 H04W84/12 H04W88/02 H04W88/06		
代理机构(译)	MAIWALD专利ADVOCATE GMBH		
优先权	60/623706 2004-10-29 US		
其他公开文献	EP1829290A1		
外部链接	Espacenet		

摘要(译)

便携式患者监测设备使用通信系统连接到多个其他设备，包括适于附接到便携式患者监测设备的对接站。便携式患者监测设备处理从患者获取的信号参数。通信系统包括自适应通信接口，用于当便携式患者监测设备连接到对接站时在第一操作模式下自动操作。在第一操作模式中，便携式患者监测器响应于检测到便携式患者监测设备附接到对接，经由专用于对接站和便携式患者监测设备之间的第一无线通信链路接收标识特定对接站的标识符。站。经由第一无线通信链路获取的患者参数被传送到与由所接收的标识符标识的特定对接站相关联的目的地。在便携式患者监测设备未连接到对接站的第二操作模式中，便携式患者监测器响应于检测到第一通信链路是非操作性的，在便携式处理设备和网络之间建立第二无线通信链路。经由第二无线通信链路获取的患者参数被传送到目的地。

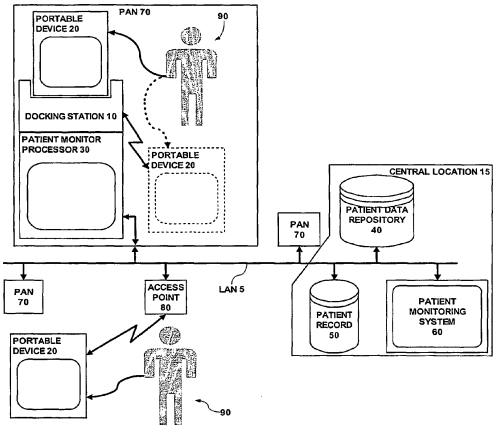

Fig. 1