Wireless breathing system for long term tele-monitoring of respiratory activity

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ABSTRACT:

Monitoring breathing signal application "Breath Taking" reliably detect variation human in the human breathing rate. Monitoring breathing may have application in detecting the sudden infant death syndrome (SIDS), which is the largest cause of death in infants. Breath taking non-invasively detects the variations. The application does not provide a direct measure of breathing. Our project is a working model which incorporates sensors to measure parameters like body temperature, heart beat rate, respiratory rate and ECG. A micro-controller board is used for analyzing the inputs from the patient and any abnormality felt by the patient causes the monitoring system to give an alarm. Also all the process parameters within an interval selectable by the user are recorded online. This is very useful for future analysis and review of patient's health condition. For more versatile medical applications, this project can be improvised, by incorporating blood pressure monitoring systems, dental sensors and annunciation systems, thereby making it useful in hospitals as a very efficient and dedicated patient care system.

INTRODUCTION:

patient monitoring in health care applications. As one example, post-surgical patients can die from respiratory depression and airway obstruction, which are unfortunately common The ability of a wireless network to make measurements that can monitor a person's breathing can create new opportunities for improving after surgery due the difficulty of correctly dosing sedatives and pain medications administered to a patient. Reliable respiration monitoring is critical to detection of these conditions. Breathing monitoring also has application in diagnosis and treatment for obstructive sleep apnea, in which a person experiences periods of low breathing rate or long pauses in breathing while sleeping. Finally, breathing monitoring may

have application in detecting sudden infant death syndrome (SIDS), which is one of the largest causes of death in infants. Parents with a child at high risk for SIDS may wish to use a baby breathing monitor to alert them in case their child's breathing becomes depressed or stops.

LITERATURE REVIEW:

IMPLEMENTATION AND ANALYSIS OF RESPIRATION RATE ESTIMATION USING IMPULSE-BASED UWB.

Wireless body-area network (WBAN) is a wireless-sensor network that incorporates different networks and wireless devices to enable remote monitoring of the human body functions and the surrounding environment. Technological advancements in sensors, low-power integrated circuits, and wireless communications have enabled the design of economically viable miniaturized sensor nodes that can measure vital physiological parameters. These sensor nodes can be seamlessly integrated into wireless body networks WBANs for remote health monitoring. WBANs can transform health care by providing inexpensive, non-invasive, continuous, ambulatory health monitoring with almost real time updates of medical records via the Internet. Though there are many socio-economic issues about WBAN, yet there are many technical issues to be considered in order to have flexible, reliable, secure, and power-efficient WBANs suitable for medical applications. The focus of this paper will be to provide an overview of such technical aspects like network architecture, signal processing, data analysis, use of Ultra Wide Band (UWB), Government issues and the implementation challenges faced in such networks. To provide a better insight into the network architecture of WBAN details system architectures, protocols, design layers and integration of hardware and software would be explained. However, setting up such a network comes with many challenges like power management, reliability, QOS, time synchronization and energy efficiency. A crucial prospective use of WBAN is to incorporate existing cardiac sensors in large scale networks for remote and ubiquitous monitoring of cardiac patients.

ASSESSMENT OF HEART RATE VARIABILITY AND THE RESPIRATORY SINUS ARRHYTHMIA VIA DOPPLER RADAR.

Recognizing an emotion by its physiological signature is a field of research that presents a particular interest on the last ten years. Understanding emotions can be useful, particularly in virtual therapies, where emotions are feedbacks that regulate the virtual environment level and intensity.

Plethysmographic signals obtained from a web camera are analyzed through a continuous wavelet transform to assess the instantaneous heart rate. The measurements are performed on human faces. Robust image and signal processing are introduced to overcome drawbacks induced by light and motion artifacts. In addition, the respiration signal is recovered using the heart rate series by respiratory sinus arrhythmia, the natural variation in heart rate driven by the respiration. The algorithms are implemented on a mid-range computer and the overall method works in real-time. The performance of the proposed heart and breathing rates assessment method was evaluated using approved contact probes on a set of 12 healthy subjects. Results show high degrees of correlation between physiological measurements even in the presence of motion. A motion-tolerant method that remotely measures the instantaneous heart and breathing rates. These parameters are particularly used in telemedicine and affective computing, where the heart rate variability analysis can provide an index of the autonomic nervous system.

RADAR CROSS SECTION OF THE HUMAN HEARTBEAT AND ESPIRATIONINTHE 500MHZ TO 3MGHZ BAND.

This dissertation is concentrated on the theory study, design, implementation, and measurement of the radar vital sign monitoring systems. First, challenges and limitations occurring in the realization of the vital sign monitoring systems are discussed and analyzed. It is proved that the double-sideband transmission with frequency tuning technique is a good and simple solution to resolve the null point problem and DC offset simultaneously. It is also shown that the harmonics of respiration signal occurring at high frequency may interfere with the detection of heartbeat and thus reduce its accuracy. After that, the first Ka-band vital sign monitoring system adopting double-sideband transmission and frequency-tuning technique is illustrated. The system is built with discrete RF building blocks. This Ka-band system has been demonstrated the ability to detect heartbeat and respiration signal from a human body's four different sides and shown sufficiently high detection accuracy of over 80% at up to 2.5-m distance. Except heartbeat and respiration detection, acoustic signal has also been successfully detected by the Ka-band system. In addition, this Ka-band system demonstrated the robustness in detecting the vital sign through a thick wood board. A portable non-contact vital sign monitoring system using 5 GHz radar is implemented for field test. The system achieved better than 80% detection accuracy at 2.8 m distance with low transmission power. The radar module and the data acquisition module are both powered by the laptop through USB connection. Meantime, by

comparing three different architectures used for the 5 GHz modules, double-sideband indirect-conversion architecture showed prominent advantages over the direct-conversion architecture. Based on the above systems, an integrated monitoring system on silicon working at 5 GHz is designed.

ANALYSIS OF CORRELATED SHADOW FADING IN DUAL-LINK INDOOR RADIOWAVE PROPAGATION.

A portable non-contact vital sign monitoring system using 5GHz radar was implemented for field test. The system achieved good accuracy with low transmission power. The low power radar module and the data acquisition module were both powered by the laptop through USB connection which also carries the data. This portable system can be conveniently used for non-contact detection of respiration and heartbeat of either a human or an animal subject, in various biological, medical, and security application. By comparing three different architectures used for the 5GHz non-contact vital sign sensor modules, double-sideband indirect-conversion architecture showed prominent advantages over the other two direct-conversion architectures. Direct-conversion non quadrature architecture showed severe DC offset and null point problem, while dir version quadrature architecture still had DC offset issue and difficulty in combing two channels after solving the null point problem. All the above problems can be resolved by 90 using the double-sideband indirect-conversion architecture. Without the need to use image reject filter, double-sideband indirect-conversion architecture is also suitable for monolithic integration. It is known that the attenuation in the body increases with increasing frequency. This was attributed to the increase in gain of the body surface with decreasing wavelength.

BREATHING RATE ESTIMATION FROM A NON-CONTACT BIO-SENSOR USING AN ADAPOTIVE IIRNOTCH FILTER.

A procedure similar to characterize the heartbeat and respiration modulation in the 500 MHz to 3 GHz frequency range. The results were called the RCS of the vital signs. The focus was on determining which frequencies in the range were best suited for non-contact vital signs measurements. The frequency dependence of the RCS is useful for determining which transmitting frequencies to use. At the time, the HUBRA radar available as medical radar and wanted to know which parts of this band were best to use. The total frequency range was split into several sub-bandwidths to compute the heartbeat and respiration RCS. Ideally such an

analysis would have been made on each frequency point in the sweep, but since this led to a low SNR integration of frequency sub-bands was necessary. It was found that both the heartbeat and respiration RCS increases with increasing frequency. This was attributed to the increase in gain of the body surface with decreasing wavelength. At the time only recorded reflections off the body surface, or if waves penetrating into the chest and reflecting off the heart itself also contributed. An additional benefit of the RCS measurements is that they provided a hint at answering the question of what is actually measured; surface reflections of the chest or reflections of the wave penetrating inside the body and being reflected from the heart. It is known that the attenuation in the body increases with increasing frequency. The increase in heartbeat RCS found in does not agree well with the increased attenuation of a wave travelling inside the body. A wave being reflected from the body surface on the other hand, should have this property, as the gain of the echo increases when the wavelength decreases compared to the body.

EXISTING SYSTEM

Breathing monitoring via capnography is a standard practice for anesthetized patients in emergency departments and in intensive care unit. The exhaled air is measured using tubes in the nostrils or from tubes connected to a face mask or tracheal tube, which are connected to the capnometer. These tubes may become detached. The mask or nasal cannula may be uncomfortable and limit the patient's movement.

Breathing monitoring can be performed using plethysmography .This methods measure, using electrodes placed in the body, the change in inductance or impedance caused by inhalation and exhalation. These electrodes can be contained in a band worn around the chest.

Limitations

The existing system is needed to be attached to the body.Requires more number of sensors.If the patient stops breathing, it detect only after few minutes.

PROPOSED SYSTEM:

The android application "breathe taking" detects the variations in the pulse rate with the help of a pulse sensor. The applications with the help of Bluetooth module sends message to the multiple phone connected and it also calling to any of the phone connected.In case if the

application user didn't view the message or if he/she is not able to attend the call, an alert system i.e. buzzer with help of the GSM module, it rings .The alert system can mainly places in homes and hospitals. Standard wireless networks which measure received signal strength (RSS) can be used to reliably detect human breathing and estimate the breathing rate, an application called "Breath Taking".The first order approximation, breathing induces sinusoidal variation in the measured RSS on a link, with amplitude a function of the relative amplitude and phase of the breathing-affected multipath. An individual link may not reliably detect breathing, the collective spectral content of a network of devices reliably indicates the presence and rate of breathing.The maximum likelihood estimator (MLE) of breathing rate, amplitude, and phase, which uses the RSS data from many links simultaneously. The experimental results which demonstrate that reliable detection and frequency estimation is possible with 30seconds of data, within 0.07 to 0.42 breaths per minute (bpm) RMS error in several experiments. The ability to detect and monitor breathing using the changes in received signal strength (RSS) measured on many links in a deployed wireless network. The ability of a wireless network to make measurements that can monitor a person's breathing can create new opportunities for improving patient monitoring in health care applications. As one example, post-surgical patients can die from respiratory depression and airway obstruction, which are unfortunately common after surgery due the difficulty of correctly dosing sedatives and pain medications administered to a patient. Reliable respiration monitoring is critical to detection of these conditions.Breathing monitoring also has application in diagnosis and treatment for obstructive sleep apnea, in which a person experiences periods of low breathing rate or long pauses in breathing while sleeping. Finally, breathing monitoring may have application in detecting sudden infant death syndrome (SIDS), which is one of the largest causes of death in infants. Parents with a child at high risk for SIDS may wish to use a baby breathing monitor to alert them in case their child's breathing becomes depressed or stops.The non-invasive respiration monitoring technique called Breathtaking which uses signal strength measurements between many pairs of wireless devices to monitor breathing of an otherwise stationary person. The analysis showing that, as a first order approximation, breathing induces sinusoidal variation in the measured RSS on a link, with amplitude a function of the relative amplitude and phase of the breathing-affected multipath. The maximum likelihood estimator to estimate breathing parameters, including

breathing rate, using all of the measured links' RSS data simultaneously. The detection algorithms based on those estimated parameters, and an experimental test bed and procedure to validate Breathtaking.Using extensive experimental data collected with a person lying in a hospital bed, measuring the performance of Breathtaking. Breathing rate can be estimated within 0.1 to 0.4 bpm error using 30 seconds of measurements. The links most affected by breathing are the ones which receive low average RSS. Breathing detection is demonstrated to reliably distinguish between the breathing and its absence using 15 seconds of RSS data (in patch antenna experiments) and using 30 seconds of data (in dipole antenna experiments), without false alarm or missed detection.

Advantages:

Non-invasive sensors (sensor not physically attached to the patient).It allow the patient to sleep normally. It only requires one sensor. Moreover it allows the patient to walk normally. Sensor did not cause any uncomfortable for the patient's movement. Buzzer which is attached to the system gives more alert to the patient's relative. User friendly system. Because easy to use.Application in detecting sudden infant death syndrome (SIDS).If breathe taking is to be used in medical device, extensive evaluation on many people, and in many settings must be performed.The existing system requires more number of high cost equipments such as electrodes and transceivers..

MODULES:

SMS Alert System

A SMS alert is a service by which a SMS is sends to someone to alert him of an event.Sent messages to the family or friend phone number saved in it SMS alert is set up based on a specific request of the recipient who will specify an alert threshold.Once a message is sent, it is received by a SMSC which must then sent it to the appropriate mobile device.

GSM Module

GSM stands for global system mobile communication.GSM is used to establish communication between a computer and a GSMApplication and the alarm can communicate with the help of GSM.GSM phones make use of a SIM card to identify the user's account.The use of the SIM card allows GSM network users to quickly move their phone number from one GSM phone to another.GSM phones use a SIM smart card that contains user account information.

Bluetooth Module

The wireless technology enables communication between Bluetooth compatible devices.Used for short range connections.It connects the application with the pulse sensor in this system and detects the breathing variations.There is multiple version of the Bluetooth specification in use.

In this system blutooth module named blue link is using.

Embedded device monitoring

An embedded system is a computer system with dedicated function within a large mechanical or electrical system, often with real-time computing constraints.Combination of computer hardware and software, either fixed in capability or programmable, that is specifically designed for a particular kind of application device.Embedded device servers are designed for quick integration.Fastest networking-enabling modules on the market.Pulse sensor, GSM module, Bluetooth module compresses the embedded device monitoring in this system.

CONCLUSION:

A Novel breathe monitoring system to detect the respiration problem is being proposed. The pulse sensor senses the variations in the pulse and sends value to the Bluetooth module. The application detects the pulse variations through the Bluetooth module. Then the application will sends the messages to the multiple phones connected and also it make a call to the one of the phone connected.

In case, if the person didn't able to view the message or if he/she can't able to attend the call, an alarm is been set with the help of GSM module. At the time of sending messages, the device will automatically send a message to the GSM module and then it will ring when it receives that message.

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