PERSONAL HEALTH MONITORING AND CONTROL PARAMETER IN HOSPITAL USING ZIGBEE TO REMOTE PC

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ABSTRACT

In hospital during treatment of patient, doctor should have to monitor patient's physiological signals. Like, Physiological signal such as Heart beats, Blood Pressure, Saline monitoring. Different chronic diseases like diabetes, congestive heart failure and also other diseases required to monitor continuously physiological signal of patient. We are not able to completely cure this chronicle diseases but only to way to cure this diseases is to keep continuously monitoring physiological signals related to this diseases and control them.

In proposed system in which different sensors are used to collect the physiological signals from patient and transfer this physiological measurement signals to personal computer of doctor or other paramedical staff. So this way patient can be analyzed by doctors from central observation canter. In this system we are taking three physiological signals from like Heart Beat, Blood Pressure, Saline Monitoring, and transfer this physiological signals with the help of communication medium to the personal computer of observation center. Thus it reduce doctor work load and give more accurate result.

Keywords: Arm7, Blood Pressure Sensor, Heart Beat Sensor, Health Monitoring, Physiological Analog Signals, Remote Pc, Saline Monitoring.

I. INTRODUCTION

In hospital during treatment on line continuously monitoring is very important. Now a days, doctors are more and more busy and their attention towards their patients being of short while due to the number of patients. Hence we introduce the system, here is the alternate solution that helps the doctor and staff member as well as patients to get monitored continuously from being at different locations. The sensor networks which is used to reduce the work load of medical care. With the help of body area networks of sensors the collection of physiological signals can be greatly simplified. The body area network will be worn by patients who need 24HR surveillance due to chronic illness and it will report any abnormalities to a physician or doctor.

We monitors the patient body parameters and to alert during abnormal conditions by using this system. In this system technique consists of transmitter and receiver section. Heart beat, blood pressure and saline monitoring, ARM7 (LPC 2138) and ZigBee are connected in the transmitter side. ZigBee is connected in the receiver side. In the transmitter side the heart beat sensor, blood pressure and saline monitoring sensor are connected to the microcontroller. These sensors are used to detect the blood pressure and heartbeat pulses of the patient's body. These sensors are produces the analog signals, so the analog signals are directly connected to the microcontroller. ZigBee technology used for the purpose of transmitting data. Main advantages of ZigBee is a

low-cost, low-power, wireless mesh networking proprietary standard. The low cost allows the technology to be widely deployed in wireless control and monitoring applications, the low power-usage allows longer life with smaller batteries, and the mesh networking provides high reliability and larger range.

Sensor data is transmitted by transmitter. The receiver is placed in not only in common place but also in doctor's cabin, which receives the signals and decodes the signal from the transmitter and sends it to the microcontroller. Then the received information is updated to the doctor with the help of LCD display & computers, if any abnormal conditions occur in the body of the patient a buzzer, voice announcement is given for the intimate of the doctor. Thus Wireless Sensors Networks (WSN) are getting a special place in the development of e-Health application, due to its characteristics such as less energy consumption, low price and its flexible to integrate into health care environments.

The research indicates that per year more than the millions of people around the world die of heart attack, and hence those people require continuous monitoring of their heart beat signals while they are not in the hospital. This leads to the need for a real time on line monitoring system for those who are not under the care of the physician. The paper deals with easily monitoring of all physiological signals for people who are leading a normal daily life and wireless transmission of the analyzed signals are sent to the doctor in case of only abnormal condition.

II. PROPOSED SYSTEM ARCHITECTURE

The proposed system is to carry out patient physiological signals to monitoring system for hospital in which different sensors to collect the physiological signals from patient and transfer this physiological signals information to PC of doctor or other staff member.

Proposed system uses ARM7 controller that is ultra-low power microcontroller which is used for data processing. The proposed system acquires the different physiological information signals from patient so it require different sensors. This collected physiological information signal data needed to be process so it required microcontroller. And to transfer this processed data to personal computer it requires zigbee model.

In this system we use three sensors like heart beat sensor, blood pressure sensor module and saline monitoring sensors module. These sensors acquire the physiological information data from patient and transfer this information to microcontroller through Zigbee. Then microcontroller performs all the process on data and displays information on LCD connected to the microcontroller. In this way microcontroller transfer information to zigbee model. Zigbee is the medium used for transfer processing data wirelessly to remote PC.

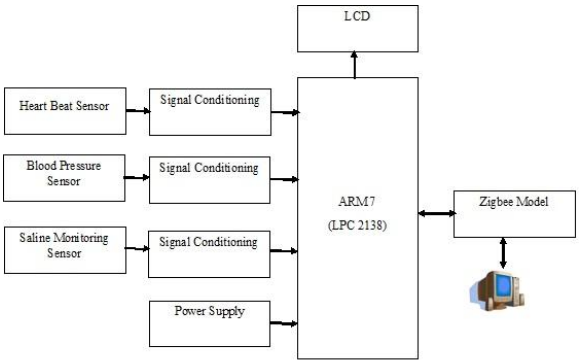

Fig.1 System Architecture

III. HARDWARE DESIGN

3.1 Arm7(Cpu Unit)

The LPC2131/32/34/36/38 microcontrollers are based on a 16/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine the microcontroller with 32 kB, 64 kB, 128 kB, 256 kB and 512 kB of embedded high-speed flash memory. A 128-bit wide memory interface and a unique accelerator architecture enable 32-bit code execution at maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty.

Due to their tiny size and low power consumption, these microcontrollers are ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale. With a wide range of serial communications interfaces and on-chip SRAM options of 8 kB, 16 kB, and 32 kB, they are very well suited for communication gateways and protocol converters, soft modems, voice recognition and low-end imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit 8-channel ADC(s), 10-bit DAC, PWM channels and 47 GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers particularly suitable for industrial control and medical systems.

3.2 Blood Pressure Sensor

The Vernier Blood Pressure Sensor is used to measure systemic arterial blood pressure in humans (non-invasively). When used with Logger *Pro*® 3.4 or newer, Logger Lite® 1.3.1 or newer, or LabQuest App 1.2 or newer, it can measure arterial blood pressure and calculate both the systolic and diastolic blood pressure using the oscillometric method.

Fig 2. Blood Pressure Sensor

The active sensor in this unit is the SenSym SDX05D4 pressure transducer. It has a membrane which flexes as pressure changes. This sensor is arranged to measure differential pressure. The sensor produces an output voltage which varies with the pressure measured in the cuff. It includes special circuitry to minimize errors caused by changes in temperature. We provide an amplifier circuit that conditions the signal from the pressure transducer. With this circuit, the output voltage from the Blood Pressure Sensor will be linear with respect to pressure.

3.3 Heart Beat Sensor

Fig 3. Heart Beat Sensor Module

The sensor consists of a super bright red LED and light detector. The LED needs to be super bright as the maximum light must pass spread in finger and detected by detector.Now, when the heart pumps a pulse of blood through the blood vessels, the finger becomes slightly more opaque and so less light reached the detector. With each heart pulse the detector signal varies. This variation is converted to electrical pulse. This signal is amplified and triggered through an amplifier which outputs +5V logic level signal. The output signal is also indicated by a LED which blinks on each heart beat.

3.4 Saline Monitoring Sensor

Liquid monitoring system using a pressure sensor. Since obtaining the pressure is just one vital piece of the information, how to convert the sensor's output voltage into the liquid's height using an analog-to-digital converter (ADC) will also be explained. Details of the pressure sensor, ADC connections, system calibration and calculations, as well as an example application, are available to guide designers through the development phase.

The height of liquid in a container can be measured using a pressure sensor. Placed at the top of the container, the pressure sensor is connected to an open-ended tube that is submerged in the container. The amount of water in the container exerts a proportional amount of pressure on the sensor via the trapped air in the tube. At its output, the sensor produces a pressure equivalent voltage.

3.5 Zigbee model

ZigBee is specification for wireless personal area network. ZigBee is based on the 802.15.4 standard approved by the institute of electrical and electronic Engineer's standard association.ZigBee is ideal for home, business and industrial automation where control devices and sensor are commonly used. Such devices operate at low power levels and this in conjunction with their duty cycle (typically 0.1% or less) translates into long battery life. ZigBee operates in the industrial, scientific and medical radio bands; 868 MHz in Europe, 915 MHz in USA and Australia and 2.4 GHz worldwide. Using ZigBee devices in WPAN can communicate at speeds of up to 250 kbps while physically separated by distances of up to 50 meters in typical circumstances greater in an ideal environment. ZigBee is compatible with Peer to peer, star network and mesh networks and can handle up to 255 devices in single WPAN. The device interface to a microcontroller unit through 4 wire serial peripheral interface creating a cost effective solution that offers low power, low data rate RF connectivity for a wide range application.

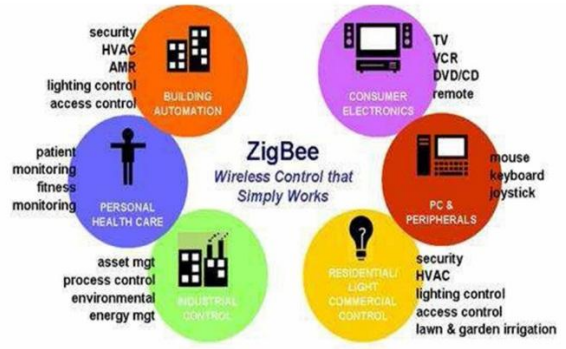

Fig4. Zigbee applications

3.6 ZigBee Feature

- Reliable
- Mesh networking
- Low data-rate applications
- Very long battery life
- Secure
- Scalable
- Low cost
- Global applicability

IV. CONCLUSION

we can conclude that Zigbee communication is most reliable and cost effective for limited area networks. Zigbee is a specification for wireless personal area network. Zigbee is a low-cost, low-power, wireless mesh network standard. Simpler and less expensive than other WPAN.

The Wireless patient Monitoring System effectively acquires and wirelessly transmits diagnostic quality parameters signals to a monitoring unit (PC, bedside monitor) even at ranges over 50 m.

REFERENCES

[1] Li Xuemei, Jiang Liangzhong, Li Jincheng, "Home healthcare platform based on wireless sensor networks", IEEE International Conference onInformation Technology and Application in Biomedicine, pp.263-266, 2008.

[2] Rui Yang, Hong Cai, Ming zhang," Research and Implement of Ethernet Interface Based on Embedded System",IEEE International Symposiumon Computational Intelligence and Design, pp.288-251, 2009.

[3] Yanming Li, Gao Yi, "The Design of Physiological Information Collection Nodes Based on Wireless Body Area Networks", IEEEInternational Conference, 2011.

[4] Chris Nagy," Embedded System Design using TI MSP430 Series" Elsevier publication, 2003.

[5] Mahesh Votarikari, Sudhakar Pillodi "Patient Monitoring System Using ZIG-BEE and Ethernet" IJRRECS/October 2013.

[6] Mohammad Mahdi Ahmadi, Graham A. Jullien," A Wireless-Implantable Microsystem for Continuous Blood Glucose Monitoring", IEEE Transactions On Biomedical Circuits and Systems, Vol. 3, No. 3, pp.169-180,June 2009

[7] Reza S. Dilmaghani, Hossein Bobarshad, M. Ghavami, Sabrieh Choobkar, and Charles Wolfe," Wireless Sensor Networks for Monitoring Physiological Signals of Multiple Patients" IEEE Transactions On Biomedical Circuits And Systems, Vol. 5, No. 4,pp.347-355, August 2011.

[8] Nikhil S Kulkarni, Rakesh R, Sarthak Bhargava, Shantanu Singh Bundela, Rajeshwari Hegde," Zigbee Based Low Power Wireless Sensor Network Motes".

[9] D.Vijaya Kumar, K.Srinivas, B.Srinivas "Design and Implementation of Online Patient Monitoring System Using Cortex-M3 Core", IJEIT**,** Volume 3, Issue 6, December 2013.