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HUMAN HEALTH MONITORING SYSTEM IN ABNORMAL CONDITION USING MSP 430 TO REMOTE PC

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ABSTRACT

In hospital during the treatment of patient, doctor should have to monitor patient's physiological information. Like, Physiological signal such as Heart beats, Blood sugar (glucose), Body Temperature. Different chronic diseases like diabetes, congestive heart failure and also other diseases required to monitor physiological signal of patient. Because we are not able to completely cure this chronicle diseases only to way to cure this diseases is to keep monitoring signals related to this diseases and control them.

In this paper, 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 Blood sugar (glucose), Body Temperature, Heart rate and transfer this physiological signals using communication module to the personal computer of observation center. Thus it reduce doctor work load and give more accurate result.

KEY WORDS: Health monitoring, Physiological signals, Heart beat sensor, Blood glucose sensor, Body temperature, MSP430, Remote PC.

INTRODUCTION

In medical field on line 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. Because of this we introduce 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 we are using to reduce the work load of medical care. With the help of body area networks of wireless sensors the collection of physiological information 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.

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. Temperature, blood glucose and heartbeat sensors, microcontroller (MSP 430), ZigBee are connected in the transmitter side. ZigBee is connected in the receiver side. In the transmitter the temperature sensor, blood pressure and heartbeat sensor are connected to the microcontroller. These sensors are used to detect the temperature 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 room, 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.

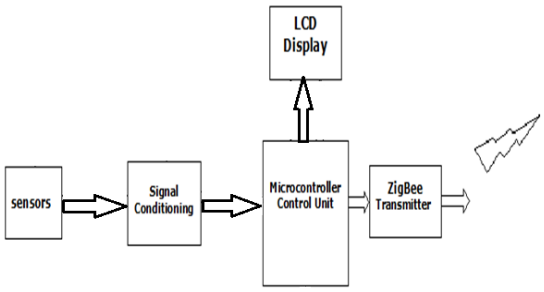
The research indicates that per year more than the millions of people around the world die of heart attack, and hence those people require continuous monitoring of their heart beat signals while they are not in the hospital. This leads to the need for a real time on line monitoring system for those who 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.

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 to PC of doctor or other staff member.
Proposed system uses MSP430 controller that is ultra-low power microcontroller which is used for data processing. The proposed system acquires the different physiological signals from patient so it require different sensors. This collected physiological 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 digital temperature sensor, blood glucose sensor module and heart rate sensors module. These sensors acquire the physiological 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.

Transmitter section -



Receiver section -

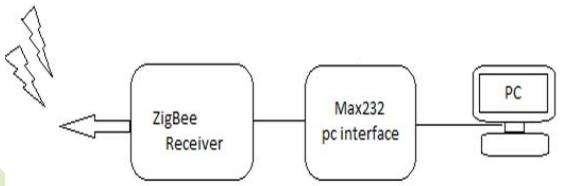


Fig.1 System architecture

HARDWARE DESIGN

A. **MSP 430(CPU UNIT**)

The MSP430 is a 16-bit microcontroller that has a number of special features not commonly available with other microcontrollers. The 27 core instructions combined with these special features make it easy to program the MSP430 in assembler or in C, and provide exceptional flexibility and functionality. The MSP430 families are MSP430C31x, MSP430C32x, 33x.

The MSP430 concept differs considerably from other microcontrollers and offers some significant advantages over more traditional designs.

Typical RISC architectures show their highest performance in calculation- intensive applications in which several registers are loaded with input data, all calculations are made within the registers, and the results are stored back into RAM. Memory accesses (using addressing modes) are necessary only for the LOAD instructions at the beginning and the

STORE instructions at the end of the calculations. The MSP430 can be programmed for such operation, for example, performing a pure calculation task in the floating point without any I/O accesses.

The MSP430 architecture was designed to include the best of both worlds, taking advantage of RISC features for fast and efficient calculations, and addressing modes for real-time requirements. The RISC architecture provides a limited number of powerful instructions, numerous registers, and single-cycle execution times. The more traditional microcomputer features provide addressing modes for all instructions. This functionality is further enhanced with 100% orthogonally, allowing any instruction to be used with any addressing mode.

The analog-to-digital converter (ADC) of the MSP430 family can work in two modes: the 12-bit mode or the 14-bit mode. Hardware registers allow easy adaptation to different ADC tasks. The following paragraphs describe the modes and hardware registers.

B. Digital Temperature Sensor:

The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly proportional to the Centigrade temperature.

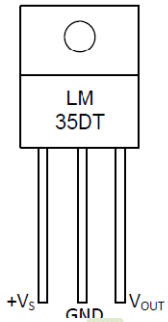


Fig.2 LM35

The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 device does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55°C to 150°C temperature range. Lower cost is assured by trimming and calibration at the wafer level. The low-output impedance, linear output, and precise inherent calibration of the LM35 device makes interfacing to readout or control circuit especially easy.

C. Heart Rate Sensor:

Fig 3. Heart rate 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.

D. Blood Glucose Sensor:

Blood glucose monitoring has been established as a valuable tool in the management of diabetes. Since maintaining normal blood glucose levels is recommended, a series of suitable glucose biosensors have been developed. During the last 50 years, glucose biosensor technology including point-of-care devices, continuous glucose monitoring systems and noninvasive glucose monitoring systems has been significantly improved. However, there continues to be several challenges related to the achievement of accurate and reliable glucose monitoring. Multiple laboratory tests are used for the diagnosis and management of patients with diabetes. The blood glucose concentration is the major diagnostic criterion for diabetes with HbA1c level and is a useful tool for patient monitoring. Self-monitoring of blood glucose (SMBG) has been established as a Valuable tool for the management of diabetes

E. 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.

Fig.4. Zigbee applications

ZigBee Feature

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

CONCLUSION

From above 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.

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