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Centralized Patient Monitoring Through ZigBee

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Abstract-Recent advances in wireless communication and in monitoring system made it possible to use the network communication by using pulse oximeter. Pulse oximeter that monitors the oxygen saturation of a patient's blood indirectly. This enable to monitor the more number of patient in a single system (central monitor).This allows the data transmission through zigbee. The nodes are made connected to monitor and also it overcomes the traffic problem that occur through zigbee. Data is obtained from pulseoximeter will be stored and processed using Arduino uno then transmitted to centralized unit.It is possible to effectively combine mesh networking with medical application using pulseoximeter in order to create reliable,large-scale network.

Index Terms -Zigbee1, Arduino uno2, Lab View3.

1. INTRODUCTION

In the past few years, a new idea in information gathering method has been introduced. It is known as wireless sensor network technology. The development of wireless sensor network had got lots of attention from researchers and communities due to the number of self organized sensing network inside it. These self-organized sensing networks cooperate with each other to gather information. Medical application is one of the recent technologies that enabled wireless sensor network through the development and integration of wireless communication, Nowadays, the use of Pulse Oximeter to monitor the blood oxygenation by measuring oxygen level using its sensor probes has been increase. Thermistor is also added to the circuit, it senses the temperature. In most hospital, a set of Pulse Oximeter can only be use by one patient at a time and cannot be monitored simultaneously. Besides, by wearing conventional Pulse Oximeter patients have difficulties to move as the sensor probe was attached directly to the Patient Monitor via wired. Therefore, by having a wireless network, sensor probe and patient monitor can be designed separately and data transmitted can be displayed together on a screen. This project allows data transmission. Thus, this project will use mesh topology as the main approach, This will create a Wireless Mesh Network for the whole system. Instead of conventional microcontroller, Arduino-uno will be adapted in the system since it is more reliable and small in size.

2. BLOCK DIAGRAM

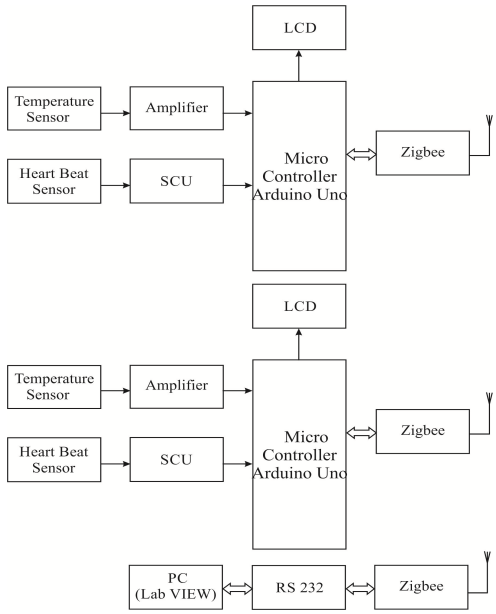

Fig 1: Block diagram of the system

Two pulseoximeter (non-invasive medical equipment) will be used in this project.Both pulseoximeter will be attached to the zigbee via Arduino-uno as the brain of the system. PulseOximeter will be used to get the heart rate data of a patient and thermistor for sensing temperature. Then,these data will go to the Arduino processing before transmit wireless through zigbee. Arduino is one type of microcontroller that had been used widely. This will help to miniaturize the system created. Each pulseoximeter represent as node A (Patient 1) and node B (Patient 2).Each set consist of Arduino- Nano, zigbee and Pulseoximeter. This combination acknowledge as transmitter part. Each node responsible to obtain the data continuously (real time data) and need to be reprocess by the

Arduino-uno to give an unique id address to each of them. While in the receiver part, zigbee was connected to serial port and interface with laptop or Pc.The data transmission will be started as soon as all the connection was done.

Each node has different ID number which had been assigned using Arduino-uno. This ID number is important to differentiate the data once it received at the receiver. Thus, overlapping data can be avoided.Zigbee from node A and node B will get the data from pulseoximeter. After collecting the data, it will transmit to the nearest zigbee or directly transmit to the Coordinator or in this case, the Receiver. After transmission, data will received by the receiver node.

Multiple data identified at the receiver. Thus, it could be easier for the medical practitioner to monitor a number of patients simultaneously. This monitor will also view the active PulseOximeter. Therefore, any idle or inactive PulseOximeter will be neglected.

3. CIRCUIT DIAGRAM

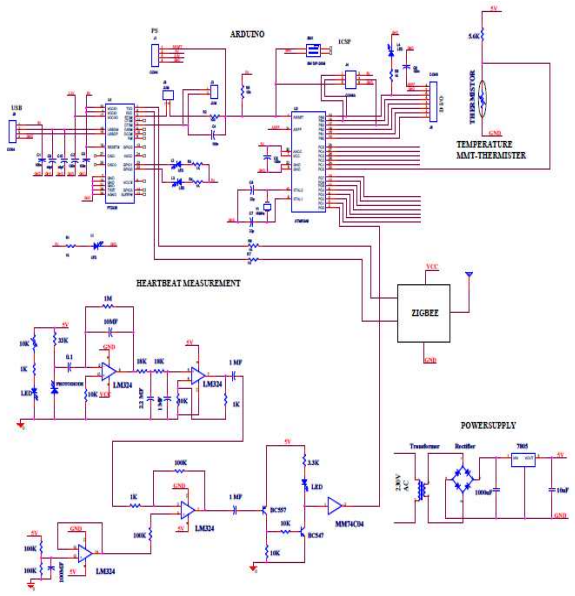

Fig 2: Circuit diagram

3.1 Circuit Working Description

The circuit measure the heart rate uses the IR transmitter and receiver.The transmitter has the LED that is known as transmitter.The receiver will receive the rays that send by the transmitter. IR transmitter and receiver will be placed in pulse rate sensor.The sensor will be placed in the finger.

When supply is ON pulse signal will be given to the amplifier A1 through Capacitor C1.In the DC if the frequency is ZERO the reactance will be infinity and the capacitor act as DC component.

The amplifier section is constructed by the LM 324 operational amplifier. It consists of four independent, high gains and internally frequency compensated operational amplifiers named as A1, A2, A3 and A4 amplifiers. The varying pulse from the potential divider is amplified by the A1 amplifier. In this amplifier the capacitor C2 is connected in parallel with feedback resistor to filter the any DC component in the amplified signal.

If any spikes in the amplified signals, they are further filtered by the C3 and C4 capacitors. After filtration the signal is again amplified by the A2 amplifier.

The amplified signal will be given to inverting terminal of comparator. The comparator function is comparing the two signals and gives the square wave. The square wave is given to transistor of BC 557 and BC 547.The wave is given to microcontroller to monitor the heart rate.

3.2 Arduino Uno

Present industry is increasingly shifting towards automation. Two principle components of today's industrial automations are programmable controllers and robots. In order to aid the tedious work and to serve the mankind, today there is a general tendency to develop an intelligent operation.

ARDUINO is the heart of the device which handles all the sub devices connected across it. It has flash type reprogrammable memory. It has some peripheral devices to play this project perform. It also provides sufficient power to inbuilt peripheral devices. We need not give individually to all devices. The peripheral devices also activates as low power operation mode. These are the advantages are appear here.

Arduino/Genuino Uno is a microcontroller board based on the ATmega328P . It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

Fig 3: Arduino uno

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

3.3 Lab VIEW

LabVIEW (Laboratory Virtual Instrument Engineering Workbench) is a graphical programming language that uses icons instead of lines of text to create applications. LabVIEW is a Laboratory Virtual Instrument Engineering Workbench is a language that using the icons rather using lines or text.The instruction will be determined for a program execution. This has the flow of data programming through the nodes on block diagram. Te interface is done by using the tools and objects. Front panel is a user interface where we can also add the graphical representation. Front panel is a user interface. The graphical source code is known as block diagram that resemble the flow chart.The program of LabVIEW,are called as virtual instruments or VI.It is also used as an oscilloscope or multimeter.

A Virtual Instrument contains the following three components:

• Front panel—Serves as the user interface.
• Block diagram—Contains the graphical source code that defines the functionality of the VI.
• Icon and connector pane—Identifies the interface to the VI so that you can use the VI in another VI. A VI within another VI is called a subVI. A subVI corresponds to a subroutine in text-based programming languages.

4. CONCLUSION

Medical application is one of the important fields that had received an impact coming from the emerging of wireless sensor network.

This gives the immediate care for the patient under emergency. Therefore, it can effectively enhance the quality of life and reduce the higher cost burden owing to the aging society. give the immediate care for the patient under emergency.

The main objective of this project is to establish the wireless Mesh Network for the pulse oximeter based on ZigBee Module. Thus,the hardware interface of XBee and CP2102 usb serial port had been realize and fully functional in this project.

In future, it can nearly collect the data for about 8 patients at a time.When there is a emergency or need of care it gives a alarm. Traffic problem that occurs during the collection of data and mismatch of the result can be avoided by using our proposed system.

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