Volume 4, Issue 8, August 2014 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

Remote Patient's Health Monitoring by Using Zigbee Protocol

Amruta Chopade[1], Prof. Nitin Raut[2]
[1]M. Tech Student, Computer Science Engineering Department, Nuva College of Engineering, Nagpur, India
[2]Asst. Professor, Guru Nanak Institute of Engineering & Technology, Nagpur, India

Abstract: ***Some severe diseases and disorders e.g. Heart failure needs close and continual monitoring procedure after diagnosis, in order to prevent mortality or further damage as secondary to the mentioned diseases or disorders. The body temperature is also a prime importance for various diseases. Monitoring these types of patients, usually, occur at hospitals or healthcare centers. Heart arrhythmias for instance, in many cases, need continual long-term monitoring. However, the patients are often too early released, owing to need of hospital bed for another patient on the waiting list, who needs to be hospitalized immediately. Long waiting time for hospitalization or ambulatory patient monitoring/treatment, are other well-known issues for both the healthcare institutions and the patients. This paper provides healthcare authorities to maximize the quality and breadth of healthcare services by controlling costs. As the population increases and demand for services increases, the ability to maintain the quality and availability of care, while effectively managing financial and human resources, is achieved. The use of modern communication technology in this context is the sole decisive factor that makes such communication system successful.***

Keyword: ECG, HR, BP, LAN, ADC, LED, LDR, AVR, RISC

I. LITERATURE REVIEW

Mohamed Fezari, et al. [1], describes the development of a heart rate monitor system based on a microcontroller. The implementation of an embedded system based on a microcontroller for real-time analysis of ECG signals has been investigated. The system has been tested successfully on simulated ECG signals for different heart diseases. The system is having ECG signal diagnosis capability, the real-time ECG processing, the remote control of a patient and the transportability. They have used PIC16F876 microcontroller as shown

S.Josephine Selvarani [2] has developed an on-line health monitoring of physiological signals of humans such as temperature and pulse using Zig-Bee by which the temperature and pulse of humans can be monitored from a distant location and some abnormalities can be easily indicated via SMS .The physiological measurements obtained from the Temperature Sensor and Heart Beat Sensor are transmitted to the programmed microcontroller to the PC through GSM. The PC collects the physiological measurements and also sends SMS, to the indicated mobile number through a GSM modem. The limitation of this paper is that if the signal of mobile is not present then the system will not work efficiently. It composed of the patient section and the server section, the communication unit, and the expert software. The graphical user interface programs on the PC are coded using Visual Basic Assembly level language is used for programming the microcontroller. Temperature and pulse signals are measured from the temperature and heart beat sensors and are processed by a built-in microcontroller. The processed data are then transmitted by Zigbee wireless transmission. Finally the received data is sent to the PC.

E-health is a relatively recent term for healthcare practice supported by electronic processes and communication, dating back to at least 1999. Muzhir Shaban Al-Ani et al. [3], worked on the e-healthcare that transmit digital medical data through healthcare system. Online monitoring is concentrated on the process of monitoring and tracking of people at home, car, office, and any other location. E-healthcare deals with patients that they are located far from doctor jurisdiction. Healthcare monitoring including measurements of temperature, blood pressure / pulse monitors and ECG, etc. This works deals with the development of monitoring system via adding intelligent system to distinguish the emergency cases. This work try to keep patient data privacy, reduce attack or penetration of data, reduce processing time and at the same time increasing the efficiency of the overall system. The privacy of patient data is also maintain confidential

Ankush Nayyar and Hemant Lenka [4] have designed the wrist tilt mechanism for checking the movement of patient. Also they have introduced further the sensing techniques which can sense temperature of human.

A smart vest is essentially a wearable physiological monitoring system, incorporated in the vest. There are large amount of research carried out in the field of sensors integrated in fabrics, garments which can sense the bio-signals. The parameters which can be measured by vest include ECG, HR, BP, body temperature and galvanic skin response.

Marci Meingast, Tanya Roosta, Shankar Sastry [5] has developed security mechanisms for Remote Patient Monitoring systems in which the various security issues are solved. This is a new technology in healthcare information technology such as Electronic Patient Records EPR. This integrated system allows the patient's information to others

hackers easily. In order to restrict these security issues in data access, storage, data and conflicting policies mining are solved by providing role based access, data encryption, authentication mechanisms, policy development and data mining rules. These are implemented before the widespread use of the new technologies in Health Care Information Technology

Shobaranimada and Sandhyarani S [6] has developed a biotelemetry system use the biosensor to measure heart rate and blood pressure from human body, Using Zig-Bee the measured signal sends to the PC via the RS-232 serial port communication interface. Through the internet system send the signal to remote PC or PDA. When the measured signals change over the standard value, the personal computer will send short message to absent manager's mobile phone.

B.Chiranjeevini Kumari and K.Rajasekar [7] has proposed a psoc microcontroller and GSM modules which eliminating the cables attached to patient. Psoc has inbuilt ADC and Programmable Gain amplifier which enabled single chip implementation. The hardware complexity is also simple and reduces cost. The basic principle of this system is to read the bio medical signals from the biomedical sensor modules and perform the tasks of data conversion, sending SMS using GSM, as well as providing the ability of simple pre-processing such as waveform averaging or rectification. Heart beat is sensed by using a high intensity type LED and LDR When the finger is placed between the LED and LDR. So the patient has a freedom of doing daily activities and still be under continuous monitoring.

Ms. Kadam Patil D. D. And Mr. Shastri R. K. [8] has developed an embedded digital stethoscope using an embedded processor with the help of PC connectivity. The data can be transmitted through wireless transmission using Zig-Bee module. A microphone is used to pick up the sound of the heart beat PC connectivity is provided through serial port where from audio and video can be made available through LAN and internet for telemedicine consultation. Heart beat signals are sensed, sent, displayed, monitored, stored, reviewed, and analyzed.

II. BASIC DESIGN

Figures 2.1 given below indicate the system to which the messages from the modem present in base station of homecare embedded system are sent. This might be the Zigbee monitoring system caretaker of the patient or a neighbor or a medical doctor or a relation to the patient.

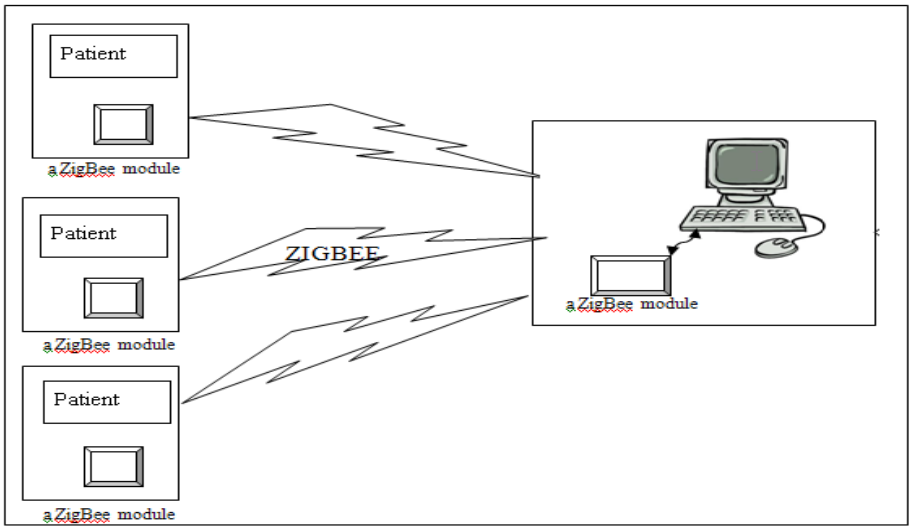

Figure 2.1 Basic Design

The block diagram for the transmitter and receiver are as shown below. The temperature sesor used is LM 35 the transmitter is ATMEGA system and the ZIGBEE unit used for

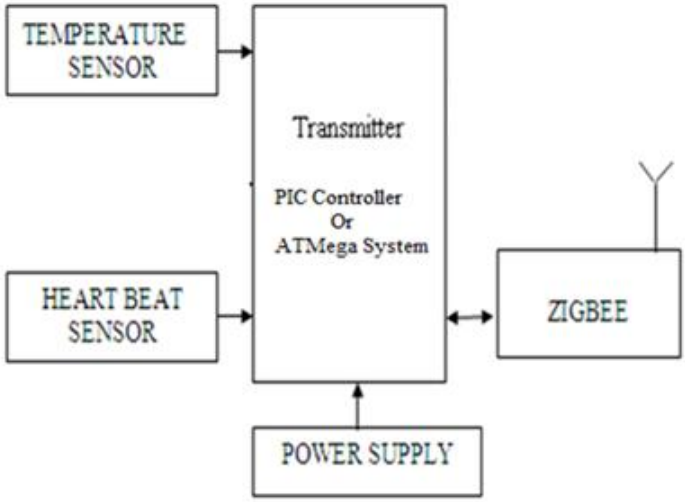

Figure 2.2 Block Diagram of Transmitter

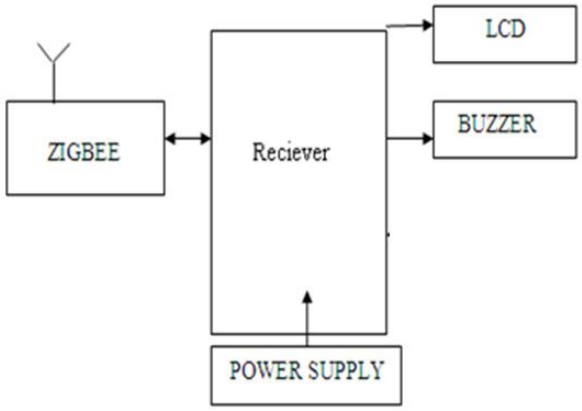

Figure 2.3 Block Diagram of Receiver

2.1 Circuit diagram

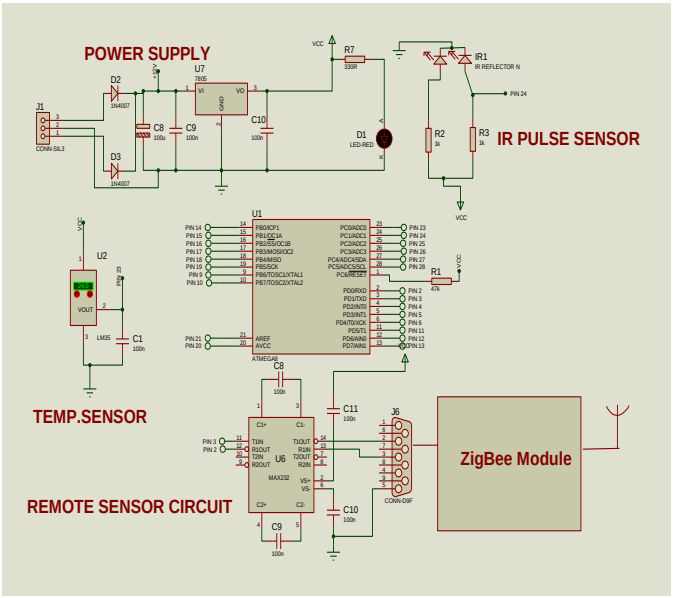

Figure 2.4 Circuit Diagram of Total unit

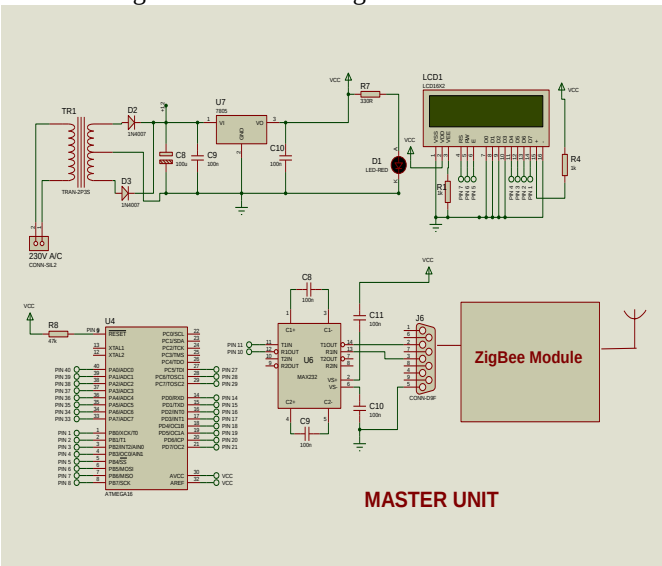

Figure 2.5 Circuit diagram of master unit

III. HARWARE USED

3.1 Power supply

The transformer 230Volts will be stepped down to 12-0-12 one side of the 12V is given to the Atmega16 and Lm35. In this project the microcontroller requires +5V power supply. The design description of power supply is given below.

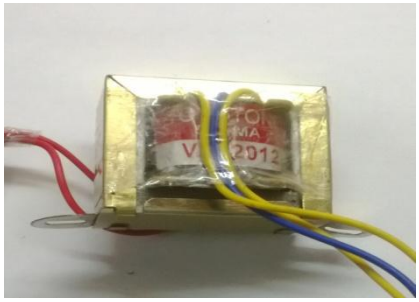

Figure 3.1 Stepped down transformer used

3.2 Heart Beat Sensor

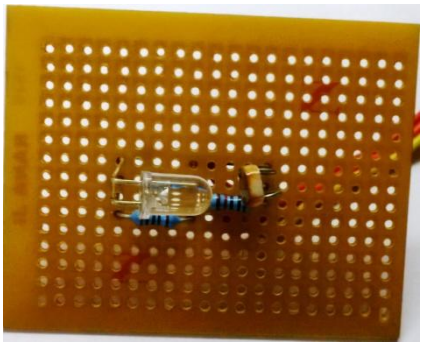

Figure 3.2 Heart beat sensor

The Heart Beat Sensor provides a simple way to study the heart's function. This sensor monitors the flow of blood through Finger. As the heart forces blood through the blood vessels in the Finger, the amount of blood in the Finger changes with time. The sensor shines a light lobe (small High Bright LED) through the ear and measures the light that is transmitted to LDR. The signal is amplified, inverted and filtered, in the Circuit.

3.3 Temperature Sensor LM35

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35D is also available in an 8-lead surface mount small outline package and a plastic TO-220 package.

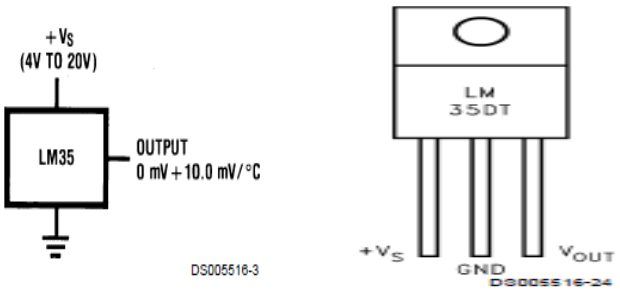

Figure 3.3 Basic Centigrade Temperature Sensor (+2°C to +150°C)

Figure 3.4 LM 35 temperature sensors.

3.4 Transmitter & Receiver (microcontroller atmega 16a):

Atmega16 is an 8-bit high performance microcontroller of Atmel's Mega AVR family with low power consumption. Atmega16 is based on enhanced RISC (Reduced Instruction Set Computing, Know more about RISC and CISC Architecture) architecture with 131 powerful instructions.

Figure 3.5 Atmega 16 microcontrollers

3.5 ZIGBEE Module

Zigbee networks are called personal area networks (PAN). Each network contains a 16-bit identifier called a PAN ID. Zigbee defines three different device types – coordinator, router, and end device. An example of such a network is shown below.

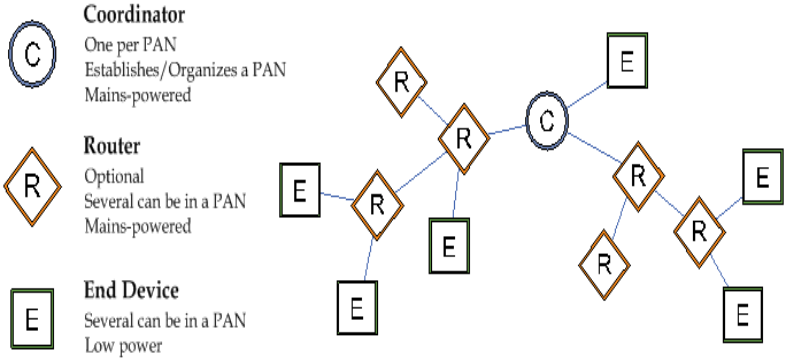

Figure 3.6 Node Types / Sample of a Basic zigbee Network Topology

The upper layers, shown in Figure y, consist of a network layer, which provides network configuration, manipulation, and message routing, and an application layer, which provides the intended function of the device.

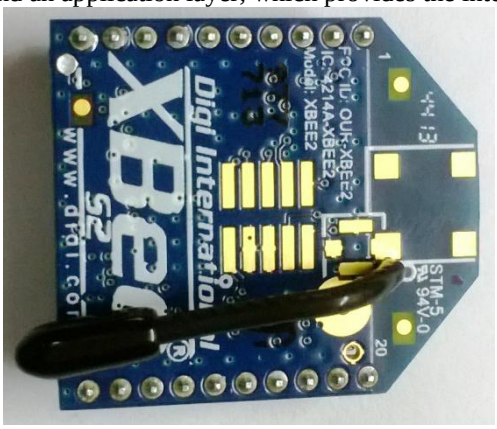

Figure 3.7 ZIGBEE module used

3.6 Liquid Crystal Display

Liquid crystal displays (lcds) offer several advantages over traditional cathode-ray tube displays that make them ideal for several applications. Of course, lcds are flat and they use only a fraction of the power required by cathode-ray tubes. They are easier to read and more pleasant to work with for long periods of time than most ordinary video monitors. There are several tradeoffs as well, such as limited view angle, brightness, and contrast, not to mention high manufacturing cost.16x2 LCD is used in this project to display data to user. There are two rows and 16 columns. It is possible to display 16 characters on each of the 2 rows. It has two registers, command register and data register.

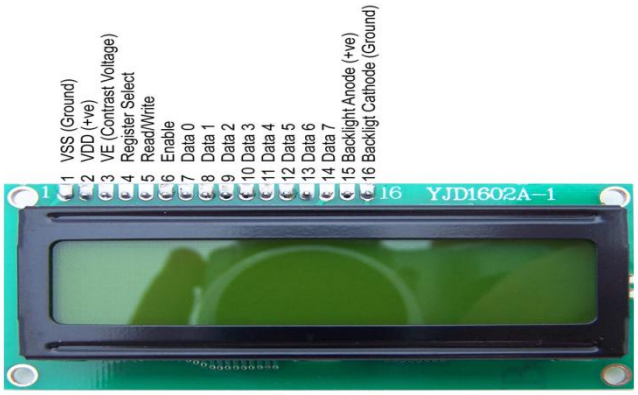

Figure 3.8 Views of LCD

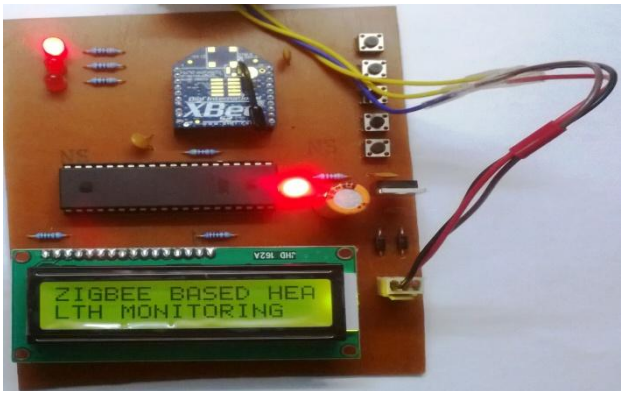

Figure 3.9 LCD screens for displaying results

IV. RESULTS AND DISCUSSIONS

It is necessary to monitor the heart beat rate and body temperature of patients those already receiving some forms of surgical treatment, so the prepared device will be helpful for them. This device is also safe for use in the hospitals. This device will be able to

- Provides early detection of heart attacks by alerting hospital staff/ doctor in case a patient's heart rate, body temperature is detected as abnormal.
- Also it is having provision to set the ranges depending on the age group of the patient and it will alarm if critical ranges have been achieved.
- Eliminates delays in receiving medical treatment as patient can be monitored remotely.
- Improves healthcare services to at risk population
- Saves lives and improves quality of living

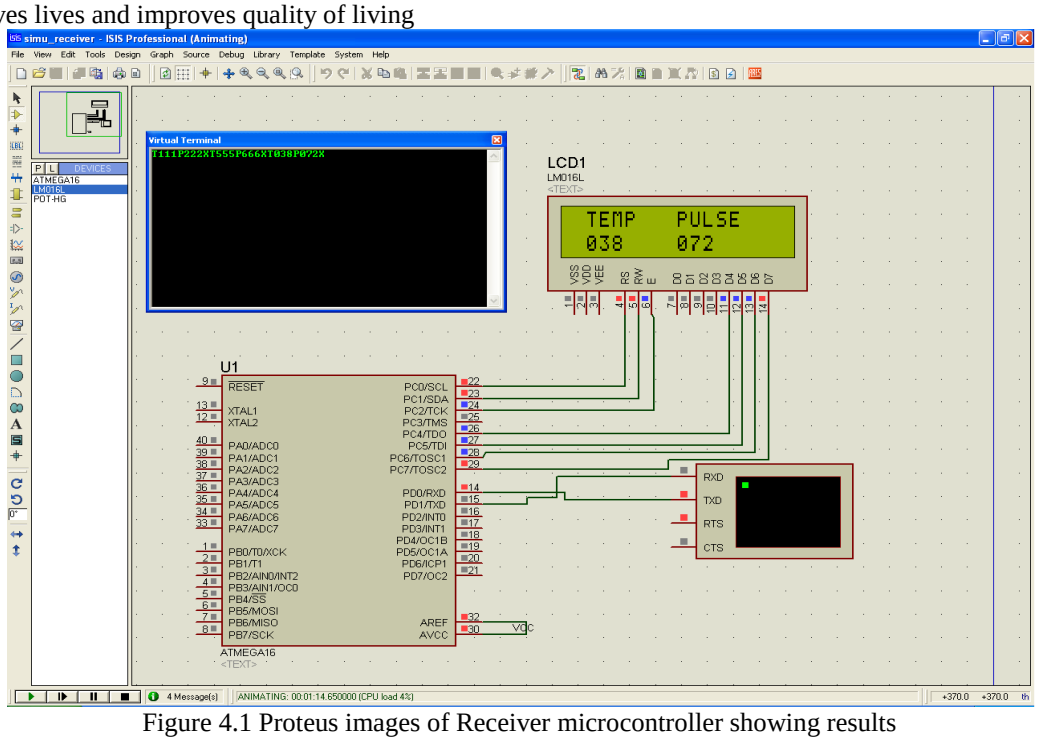

Figure 4.1 Proteus images of Receiver microcontroller showing results

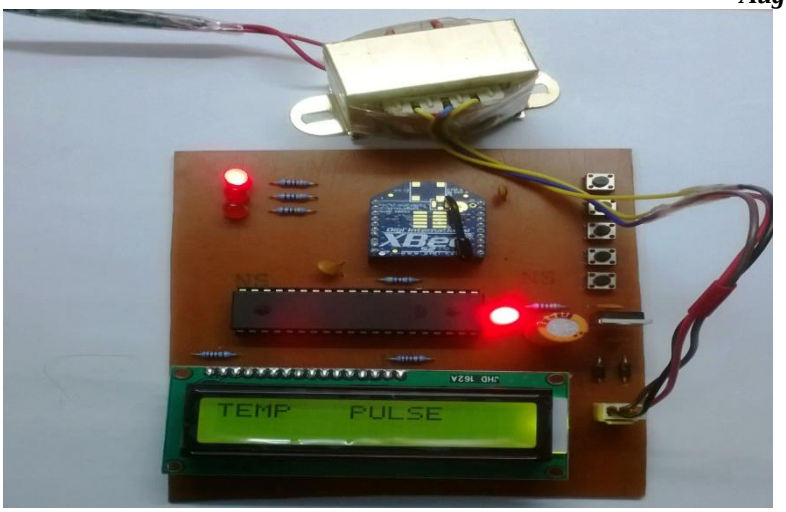

Figure 4.2 Actual Hardware showing start screen

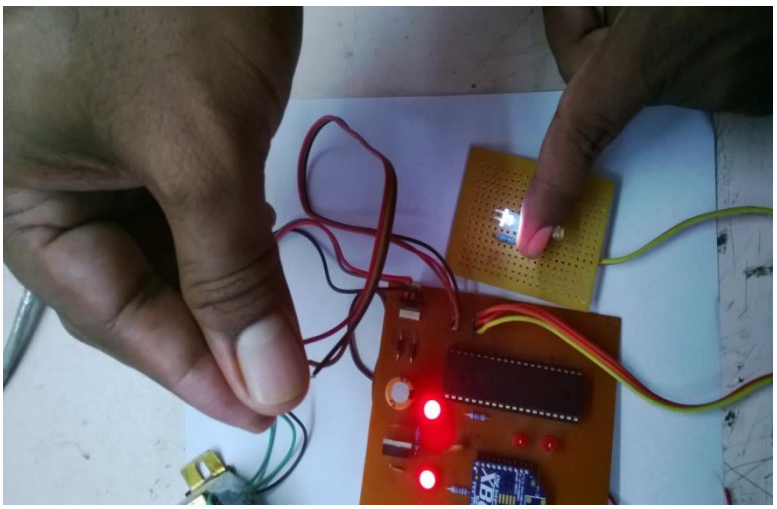

Figure 4.3 Pateints Heart rate and body temperature check

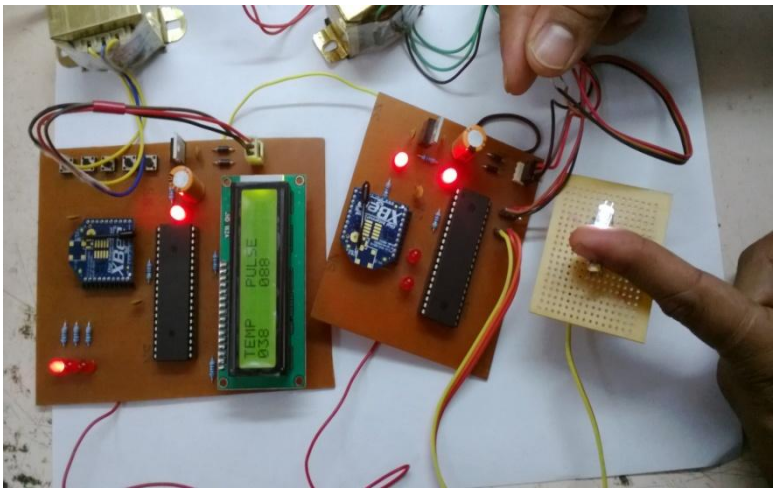

Figure 4.4 Pateints Heart rate and body temperature readings

V. CONCLUSION

With the fast development of the industrialization and urbanization process in the world and hence with the increase of busyness of people it has become difficult

To monitor the health conditions of a patient continuously. Also with the increase in the number senior citizens and chronic diseases, the number of elderly patients who need constant assistance has increased. One key point of all critical care for elderly patient is the continuous monitoring of their vital signs.

To avoid unexpected health problems and obtain higher accuracy in diagnosis of the health conditions of a patient, efficient and comprehensive data collecting, monitoring and control play an important role to improve the health care system more reliable and effective.

A novel wireless data collection for health monitoring system of electric machine based on wireless sensor network (zigbee) is proposed and developed in this project. The unique characteristics of zigbee networks such as low power, low cost, and high flexibility make them ideal for this application. As the focus of this, the hardware design and implementation of a Zigbee based wireless sensor network are discussed in our project.

REFERENCE

[1] Mohamed Fezari, Mounir Bousbia-Salah, 'Microcontroller Based Heart Rate Monitor', the International Arab Journal of Information Technology, Vol. 5, No. 4, October 2008.

[2] S.Josephine Selvarani, 'Online Health Monitoring System Using Zigbee', International Journal on Computer Science and Engineering, Vol. 3 No. 4 Apr 2011

[3] Muzhir Shaban Al-Ani, 'The Mechanism of Monitoring and Tracking of Healthcare Systems', J. Of university of anbar for pure science : Vol.6:NO.2 : 2012

[4] Ankush Nayyar, Hemant Lenka, 'Design And Development Of Wrist-Tilt Based Pc Cursor Control Using Accelerometer', IJCSEA Vol.3, No.4, August 2013.

[5] Marci Meingast, Tanya Roosta, Shankar Sastry, "Security and Privacy Issues with Health Care Information Technology", IEEE, 2006.

[6] Shobaranimada, Sandhyarani.S, "An Adaptive embedded system for helping patients", International Journal of Computer Trends and Technology, volume2, 2011.

[7] B.Chiranjeevini Kumari, K.Rajasekar, "Implementation of SMS based Heartbeat Monitoring System using psoc Microcontroller", International Journal of electronics & communication technology, Volume -2, 2011.

[8] Ms.Kadam Patil D. D. And Mr.Shastri R. K., "Design of Wireless Electronic Stethoscope Based on Zig-Bee", International Journal of Distributed and Parallel Systems, Volume -3, 2012.

[9] V.Ramya, Anuradha Kumari, "Embedded Intensive Patient Care Unit", David Bracewell, et al. (Eds): AIAA 2011, CS & IT 03, pp. 169–176, 2011.

[10] T. Murugan, Azha.Periasamy, 'Embedded based Industrial Temperature Monitoring Systems using GSM', International Journal of Computer Applications Volume 58– No.19, November 2012 Shaojie Lin, Qiong Liu, Xiaoming Wu, Shanglin Li and Zhicong Zhao, "Wireless monitoring system via Zig-Bee in ICUs", IFMBE Proceedings, Volume -19, 2008.

[11] Sherin Sebastian, Neethu Rachel Jacob, Yedu Manmadhan, Anand V. R. , M. J. Jayashree, "Remote Patient Monitoring System", International Journal of Distributed and Parallel Systems (IJDPS) Vol.3, No.5, September 2012.

[12] Ashwin K. Whitchurch, Jose K. Abraham, and Vijay K. Varadan, "Design and Development of a Wireless Remote Point-of-Care Patient Monitoring System", IEEE Region 5 Technical Conference, 2007.

[13] Milan tork, "The System for Spiroergometric Data Measuring and Evaluation", Measurement Science Review, Volume 1, Number 1, 2001.

[14] M.Chaitanya Suman, K. Prathyusha, "Wireless ECG System Based on ARM LPC 2103 Processor", IJECT Vol. 3, Issue 1, Jan. - March 2012.

[15] Mrs. Rajashri Patil , Prof.Balaji Hogade, "On Line Real Time Health Monitoring of ICU Patients using ARM7", International Journal of Computer Science and Network (IJCSN) Volume 1, Issue 3, June 2012.

