

Wireless Body Area Network For Rural Healthcare

Ashish Thawkar, Dhanshree Fukatkar, Harish Pathrabe, Vidya Zade, Ujwala Marghade

Ashish Thawkar, Dhanshree Fukatkar, Harish Pathrabe, Vidya Zade, Ujwala Marghade
(B.E. ETC), Suryodaya college of Engg. & Tech, Nagpur University, India
(B.E. ETC), Suryodaya college of Engg. & Tech, Nagpur University, India
(B.E. ETC), Suryodaya college of Engg. & Tech, Nagpur University, India
(B.E. ETC), Suryodaya college of Engg. & Tech, Nagpur University, India
(Assistant Professor, ETC) , Suryodaya college of Engg. & Tech, Nagpur University, India
Email-id: ashishthawkar@rediffmail.com, harish_pathrabe@yahoo.in, ujwala_marghade@yahoo.com

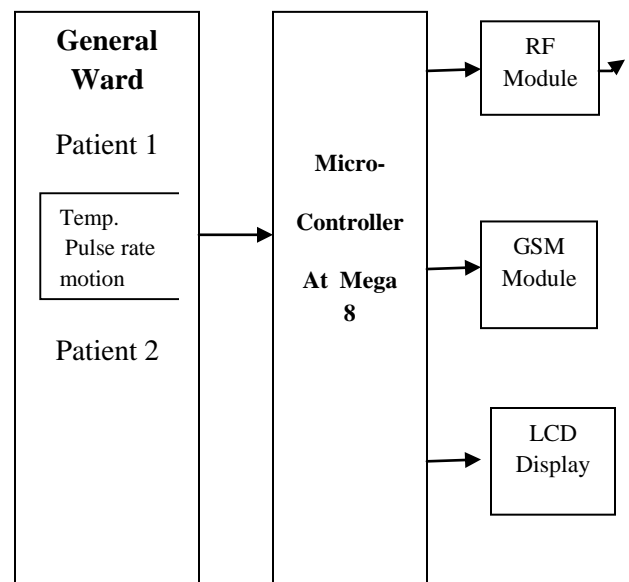
ABSTRACT: In this paper, Design and Implementation of Wireless Body Area Network for Rural Health Care (WBANRHC) Based Health Monitoring System (HMS) is presented. In the era of miniature and wearable gadgets monitoring of health parameters for patient with medical warning is essential. These health parameters are then communicated to physician's server Room. The physician set various threshold values for the health parameters to caution the patient .A BAN, consisting of two nodes and a base station was successfully built and tested using open source and inexpensive hardware to measure pulse rate, body temperature, and patient's location. Each node consisted of a pulse sensor, a temperature sensor, a GSM module Camera and a RF Trans-receiver Module.

Keywords: Wireless Body Area Network for Rural Health Care(WBANRHC); HMS (Health Monitoring System);Health Parameters; Miniature Sensors; Physician' Server Room. International Care Unit(ICU).

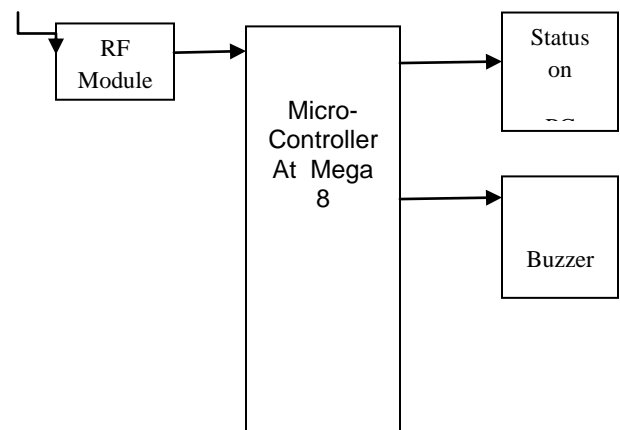
1. INTRODUCTION:

According to the World Health Organization's statistics, millions of people suffer from obesity or chronic diseases every day also all health parameter monitoring system are present in ICU but Rural people are not Affordable Charges of ICU in Rural Health Care. Wireless communication technology, miniaturization of sensors and internet technology, there has been considerable interest in development of wearable and wireless health monitoring systems. Wireless Body Area Network For Rural healthcare (WBANFRHC).WBANFRHC is one of the most Advance in building wearable health monitoring systems. WBANFRHC plays an important role in enabling ubiquitous communication between the patient and the physician which targets at ambulatory health status monitoring. Medical sensor is capable of measuring one or more significant physiological parameters, e.g. body temperature, heart rate, blood pressure, Motion of Patient by using Camera attach to the patient room i.e. General ward. This project is use in rural healthcare then we will design the wireless health monitoring system in this the different sensors like temperature, pulse rate, Motion sensors are attached to the general ward patient and measure the biomedical parameter of patient this measure parameter are transmit from transmitter i.e. From general ward to the server room by using RF trans receiver to the server room. In server room nurse is present to continuously monitor the all parameter of the patient the threshold parameter is set by doctor in transmitter side. if any parameter is vary above or below this threshold value which is set by doctor then the Buzzer is ON and also the Message is send to the doctors mobile through GSM module i.e. MODEM which is connected to the receiver circuit. in this project two microcontroller is used one for transmitter side and second is for receiver side. Also temperature sensor, blood pressure sensor and motion sensor i.e. (camera) use to monitor movement of the patient.

2. BLOCK DIAGRAM OF TRANSMITTER:

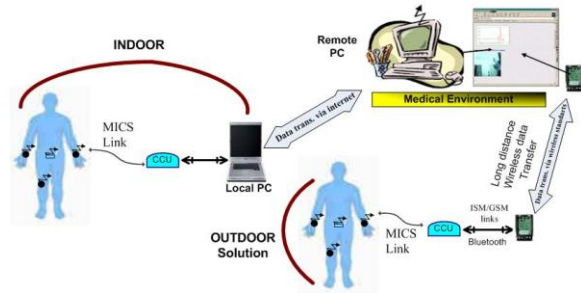


3. BLOCK DIAGRAM OF RECEIVER:



4. HARDWARE ARCHITECTURE:

Hardware architecture is implemented at the patient side. The components of the wireless health monitoring system include sensors, microcontroller, and LCD display i.e. Computer. The different sensors are placed strategically on human body to collect health signals from human body. The different vital sign sensors are, infrared sensors for body temperature estimation and heart rate measurement Camera for capturing movement of Patient. These physiological sensor nodes are connected to Atmega8 microcontroller unit to continuously collect the data From Patient body like; body temperature, heart rate and Movement of patient using camera.. Microcontroller displays the measurement results of health parameter on medical server via RF or internet using GSM/GPRS modem. In addition, Atmega8 always compare the measured values of the patients' health parameters and the threshold values of the health parameters set by the Doctor, if in case any value of measured health parameters would cross the threshold value, then the facility is provided to send message on to physicians mobile phone Using MODEM.



5. TEMPERATURE SENSOR:

The body temperature is measured by LM35, a precision integrated-circuit Temperature Sensors, whose output voltage is linearly proportional to the Celsius temperature. It is an electronic device which provides a voltage analogue of the temperature of the surface on which it is mounted. The LM35 is a 3 pin IC, pin configuration of which is shown in figure 3. The data sensed by the temperature sensor is send to ADC at PC3 of Atmega8 MCU through a wired transmission to convert the measured analog output voltage at pin number 3 into digital form.

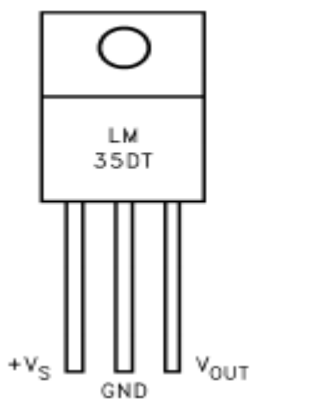


Figure: 3 Temperature sensors

The LM35 generates a higher output voltage Than thermocouples and may not require that the output voltage be amplified. Normally the body temperature for a normal human being is about 35 degree Celsius. Belt of this temperature sensor is attached to the patient body to measure temperature.

[h] Heartbeat Sensor:-

The Heartbeat rate sensor provides a simple way to measure the heart rate Heart rate is measured in pulses per minute. As the heart forces blood through the blood vessels in the finger, the amount of blood in the finger changes with respect to time. This sensor comprise of transmitter and receiver which monitors the flow of blood and generates a pulse by placing it on a fingertip this generated pulse is interrupt the microcontroller. Normal resting heart rates range from 60-100 beats per minute. At rest, an adult man has an average pulse of 72 per minute. Children have a higher heart rate (approx. 90 beats per minute) and it exhibits large variations as well. Often it is more convenient to use a program that simply displays the pulse rate in beats per minute.



6. MOTION SENSOR (CAMERA):

A digital camera should have these basic parts: a lens, a shutter, a sensor, a battery, and a memory card. Apart from these, light is necessary for taking a picture. A typical digital camera and its basic parts are given below. Digital cameras provide near-photographic quality and, therefore, are being increasingly used. They can be combined with a computer monitor for applications like videoconferencing, or can be used simply to take photographs that can be displayed in any software. A digital camera takes photographs and stores them, in a digital form rather than on film. These photographs are then downloaded onto a computer where the images can be manipulated in a software program such as Photoshop. In this project the camera is used to capture the movement of the patient which is in general ward. if any patients move then this movement is capture by camera and display on server room computer with the help of RF trans receiver module.

7. MICROCONTROLLER:

The microcontroller used is Atmega8. The program on the microcontroller, reads the value of body temperature, heart rate & Motion of patient using camera. Then the processed output in digital form is sent to the medical server through RF trans-receiver and also display on PC in Server room.

The microcontroller programming is done using Embedded C or DOTNET, a middle level language for controller units. It has 8KB of flash program memory 512bytes of EEPROM 1Kbyte internal SRAM Three ports i.e. B, C & D Two 8 bit & one 16 Bit internal timer Counter Inbuilt analog to digital converter

7. GSM MODULE(MODEM):

GSM/GPRS modem used is i ball AIRWAY, whose coverage is the widest and reliability is very high. SMS (Short Message Service) is a kind of message service, by which the limited data or text message can be transmitted A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. Microcontroller transmits and receives the data through GSM by connecting TxD pin of ATmega8 to RxD pin of GSM modem and RxD pin of ATmega8 to TxD pin of GSM modem.

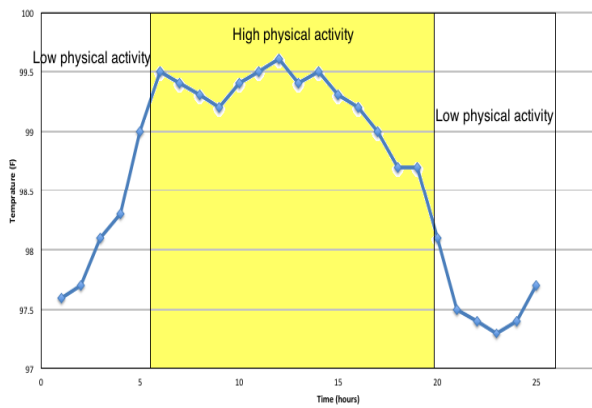
8. SOFTWARE ARCHITECTURE:

At the medical server the database is created using VS(visual studio 2010) and PHP (Personal Home Pages). Database of patient is stored by giving unique ID to the patient having Wireless WBANFRHC based HMS. The physician can monitor the health parameters of the patient by observing the graph of each health parameter. When the values of the health parameters would cross the threshold values, physician receives message (SMS) and he will initiate a healthcare action accordingly.

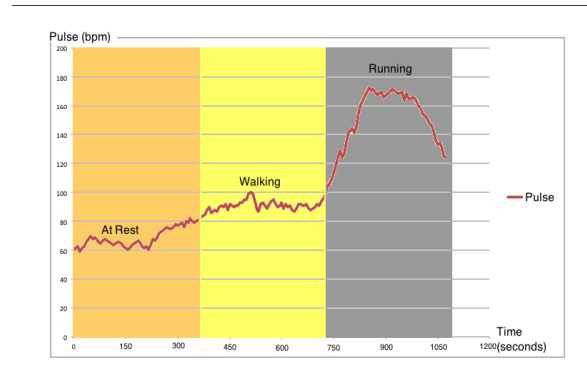
9. EXPERIMENTAL RESULTS:

In this setup the health parameters under observations are body temperature, heartbeat rate and motion of patient with the help of camera is measured. Our system successfully generated the relevant data and the SMS from the medical server to alert the concern physician.

10.RESULT OF TEMPERATURE SENSOR:



11. RESULT OF PULSE(HEARTBEAT SENSOR):-



12. CONCLUSION:

WBANFRHC based HMS monitor vital signs and provide ubiquitous and affordable health monitoring for rural people. In this paper we have presented design and implementation at patients' terminal and at medical server and also the scheme of working for overall system. An unobtrusive and continual communication between patients' terminal and medical server is achieved using GSM/RF wireless communication technology.

13. REFERENCES:

- [1] Design and Implementation of Wireless Body Area Sensor Network Based Health Monitoring System S. M. Mahalle¹, P. V. Ingole² *Department of Electronics & Telecommunication G.H. Raisoni College of Engineering and Management, Amravati* Vol. 2 Issue 6, June - 2013
- [2] Royal College of Physicians,—National Early Warning Score (NEWS): Standardising the assessment of acute illness severity in the NHS, Report of a working party. London: RCP, pp 1-29, 2012.
- [3] Qi an g Fang, Shuenn-Yuh Lee, Hans Permana, Ghorbani, and Irena Cosic —Developing A Wireless Implantable Body Sensor Network In MICS Band, IEEE Transactions on Information Technology in Biomedicine, Vol. 15, No. 4, pp 567-576 , July 2011
- [4] S. Josephine Selvarani , —Online Health Monitoring System Using Zigbee, International Journal on Computer Science and Engineering (IJCSSE), Vol. 3 No. 4, pp 1578-1583, Apr 2011
- [5] Alexandros Pantelopoulos and Nikolaos G. Bourbakis, —A Survey on Wearable Sensor-Based Systems for Health Monitoring and Prognosis, IEEE Transactions on Systems, Man, and Cybernetics—Part C: Applications And Reviews, Vol. 40, No. 1, pp 1-12 January 2010
- [6] Chung-Chih Lin, Ren-Guey Leeb, Chun-Chieh Hsiaoc, —A pervasive health monitoring service system based on ubiquitous network

- technology, *International Journal of Medical Informatics* 77, pp 461-469, (2008)
- [7] Chris Otto, Aleksandar Milenković, Corey Sanders, Emil Jovanov —System Architecture Of A Wireless Body Area Sensor Network For Ubiquitous Health Monitoring, *Journal of Mobile Multimedia*, Vol. 1, No.4, pp 307-326, (2006)
- [8] Emil Jovanov, —Wireless Technology and System Integration in Body Area Networks for M-Health Applications, *Engineering in Medicine and Biology Society, 2005. IEEE-EMBS 2005, Conference Publications*, pp7158– 7160, 17- 18 Jan. 2006
- [9] Aleksandar Milenkovic, Chris Otto, Emil Jovanov, —Wireless sensor networks for personal health monitoring: Issues and implementation, *Computer Comm.* 29, pp2521–2533, (2006)
- [10] R.S.H. Istepanian, E. Jovanov, Y.T. Zhang, —Guest Editorial Introduction to the Special Section M-Health: Beyond Seamless Mobility and Global Wireless Health-Care Connectivity, *IEEE Transactions on information technology in biomedicine*, vol. 8, no. 4, pp 405-414 December 2004
- [11] Wireless Body Area Networks for Healthcare : the MobiHealth Project Aart VAN HALTEREN, Richard BULTS, Katarzyna WAC, Nicolai DOKOVSKY, George KOPRINKOV, Ing WIDYA, Dimitri KONSTANTAS, Val JONES University of Twente, EWI/CTIT P.O.Box 217, NL-7500 AE Enschede, The Netherlands
- [12] Implementation of a Wireless Body Area Network for Healthcare Monitoring Aime V. Mbakop, Ashenafi Lambebo , Lalindra Jayatilleke and Sasan Haghani University of the District of Columbia 4200 Connecticut Ave, Washington, DC, 20008
- [13] I. Widya, A. van Halteren, V. Jones, R. Bults, D. Konstantas, P. Vierhout, J. Peuscher, "Telematic Requirements for a Mobile and Wireless Healthcare System derived from Enterprise Models" in proceedings of ConTEL'03 (7th International Conference on Telecommunications), 11-13 June 2003, Zagreb, Croatia.