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WIRELESS BASED HEALTH MONITORING SYSTEM FOR HUMAN BEING

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Abstract— A human being health monitoring system for monitoring the physiological parameters such as body temperature, cough, heart rate and virus. The IEEE standards based sensor module has been designed successfully. The zigbee devices are used in the implementation of sensor module. Our project is designed in order to monitor the attendees of patient affected by fever such as swine flu. The patient's attendees are providing with a wrist worn device in order to monitor their health. The parameters are continuously measured and is transmitted wirelessly using ZigBee so that the doctor can get information if the attendees of the patient is infected or not. With the help of this device medical staff and doctors can easily predict the spreading of virus which causes fever such as swine flu in human being and provide treatment on time to save their lives.

Keywords— Zigbee, sensors, wireless transmission, health parameters, temperature.

I. INTRODUCTION

Wireless sensor networks (WSN) are used in a huge variety of sectors and industries, one of the important fields of application being expressed by WSN for human health monitoring including temperature, vibration of the body but also the concentration of the heart rate such as presented in [1]. Additionally the WSN are used in agriculture related to the irrigation and crop monitoring, and also in healthcare as part of cardiac and respiratory activity monitoring nodes.

The majority of attendees in the hospital have the possibility of being exposed to certain diseases, and thus, they are well suited to be monitored using wearable sensors for the purposes of predictive care. The goal of such systems is to provide early warning of physiological deterioration such that preventative clinical action may be taken so that the patient's caretakers will also be safe. A WBASN for health monitoring consists of multiple sensor nodes. Each node is typically capable of (i) sensing one or more physiological signals, (ii) processing these signals (e. g. filtering, feature extraction, and feature recognition), (iii) storing the processed data, and (iv) transmitting the data to other nodes and/or a WBASN server. "Intelligent," online processing of these large datasets is, therefore, required for predictive monitoring, the results of which should then focus the limited resources of human experts to those who are along with the patients deemed to be most at risk of being physiologically unstable, and who are in need of continuous monitoring to detect any susceptible to the infectant. In this paper the as heart rate, blood pressure, temperature, and respiration, virus contains of the attendees is measured.
The present monitoring system sensor is placed on the wrist of the human, which have care for the patient's. But in modern system we used wireless network and wireless devices which take off the limitation of patient's attendees. Wireless sensor networks (WSNs) are an emerging technology and have the potential to transform the way of human life. A wireless sensor is the smallest unit of a network that has unique features. It supports large scale deployment, mobility, reliability; etc Body sensor

network systems can help people by providing healthcare services with the health care provider in emergency situations through the SMS or GPRS [2]. Also, these systems provide useful methods to remotely acquire and monitor the physiological signals without the of interruption of the patient's attendees normal life.

Focusing on web based information system that process and publish the data received from air quality WSN the developed system prototype that can be used to help medical researchers to analyze extended amount of experimental data contributing to limit the attendees health issue spreading and attack occurrences based on measurement of the patient and attendees health conditions. Activities such physiotherapy that are commonly performed in indoor with people characterized by limited health can be well organized by personalized air conditions that can contribute to reduce the recovery times.

This article is composed by five sections, wherein the first will focus on the implemented sensor network, referring to the hardware. The second refers the embedded software for the sensor nodes. Elements about the developed software are reported including the WSN data. Finally are presented preliminary experimental results the conclusion produced and the future work.

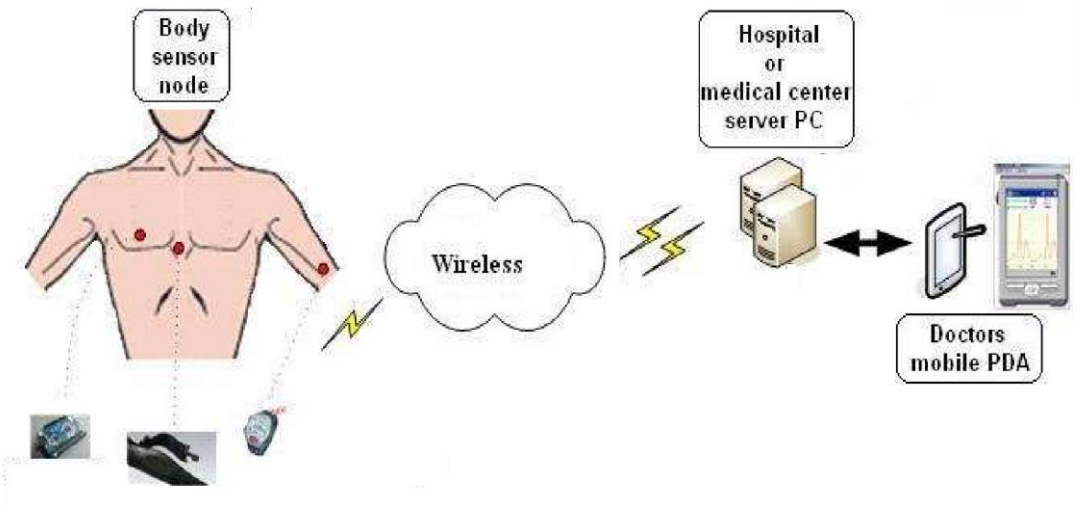

Figure.1. Proposed System Model

II. II.LITERATURE REVIEW

Wireless health monitoring system (WHMS) has drawn considerable attentions from the research community as well as industry during the last decade. Numerous and yearly increasing research and development efforts have been posted in the literatures. We have limited this effort to include only some of the very recent related works.

Real time mobile health care system for monitoring the patient's are developed [3].In this system biological sensor and smart phones are used and the output is transmitted to the server via GPRS/UMTS network.

A shirt type health monitoring system had been designed [4].The shirt consists of sensors and conductive fabrics. The output of the measured signal is transmitted to a base station of PC.

A mobile healthcare system to detect Alzheimer's diseases had been developed [5].The output of the system is tested and the result is very effective.

A ubiquitous based health care system had been developed [6]. The system provides the real time data of the patient. In this system LABVIEW program is used to provide the conductivity

In this proposed system we minimize the hardware transmitter, receiver, and local monitoring unit in one device. The prime objectives of this system are as follows: (a) it provides the attendees with an opportunity to save their lives by sending them critical alarm message, and (b) it also assists the healthcare professionals and relatives to monitor them from a remote location and gives them the initial treatments, We implement this work by using hardware and software in such a way so that it can be easily accessed by different systems and devices. We made the system flexible enough to accommodate more options as per user demand in future.

III. WIRELESS SENSOR NETWORK

In order to give a better perception of the implemented architecture for air quality monitoring, in Figure 1 are presented the main hardware and software elements. In Figure.1 represented body sensor network working as the smart coordinator, which transmits frames within IEEE802.15.4 frames and forward them through monitoring server. The smart coordinator architecture expressed by PIC16F877A and Zigbee coordinator of sensor network is expressed.

For this architecture the WSN coordinator data is accessed by the border router through wireless connection. To increase the flexibility and interoperability of the implemented architecture a smart coordinator based on embedded PC expressed by a PIC controller was considered. The embedded PC assures the hardware support for the client side application, and at the same time provides wireless connectivity. The embedded PC to WSN Zigbee coordinator [7] communication is based on a RS232 serial communication protocol.

IV. SENSING NODE

The implemented network characterized by temperature, heart rate and vibration measurement and virus capability through the usage of patients and attendees. The analog inputs of each node are used to acquire the values from air quality index sensors. For each wireless sensor node the sampling rate associated with analog channel is programmed in order to assure good accuracy of health parameter calculation, also following guidelines of health monitoring index which defines the minimum number of samples needed to an efficient calculation.

The choice of the sampling rate is performed considering also the general requirements of higher autonomy for WSN nodes. Referring to the communication between sensor nodes and coordinator, in the first approach it is based on 6LoWPAN. Messages are sent between the wireless network of a 6LoWPAN system as packets which are compressed and embedded in IEEE 802.15.4 frames. An important issue is whether the compressed packet is still too large; 6LoWPAN fragments the compressed packet for transportation in two or more frames. The layer also decompresses the packet extracted from a received frame. Alternatively, in the second approach the communication protocol (RS232) uses frames.

A) Temperature sensor:

The LM35 series are integrated circuit device with an output voltage equal to Celsius temperature. The sensor circuitry is sealed and not subject to the oxidation. The LM35 generated the higher output voltage then thermocouples and may not be required that the output voltage be amplified. As the LM35 device draws only 60 µA from the supply, it has very low self-heating of less than 0.1°C in still air. The LM35 device is rated to operate over a −55°C to 150°C temperature range, while the LM35C device is rated for a −40°C to 110°C range (−10° with improved accuracy). The normal body temperature of a

person varies depending on gender, recent activity, food and fluid consumption, time of day, and, in women, the stage of the menstrual cycle. Normal body temperature can range from 97.8 degrees F (or Fahrenheit, equivalent to 36.5 degrees C, or Celsius) to 99 degrees F (37.2 degrees C) for a healthy adult.

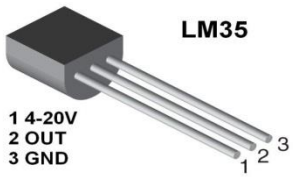

Figure .2.Temperature sensor

B) ECG Sensor (Heart Beat):

The PS25205B is an ultra high impedance solid state electrocardiograph sensor [8]. It can be used as a dry contact ECG sensor without the need for potentially dangerous low impedance circuits across the heart. The device uses active feedback techniques to both lower the effective input capacitance of the sensing element (Cin) and boost the input resistance (Rin). These techniques are used to realize a sensor with a frequency response suitable for both diagnostic and monitoring ECG applications.

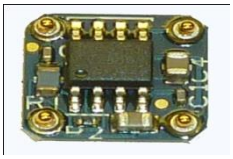

Figure.3.PS25205B ECG sensor

C) Piezoelectric Vibration sensor:

The piezoelectric vibration sensor that features more sensitivity [9]. A vibration sensor is a device that corresponds to the auditory and tactile organs of the human body. It functions in a wide frequency band of 10-15 kHz. The device can detect an oscillation of only 0.0001G 1/10,000 that of the gravity oscillation of the earth

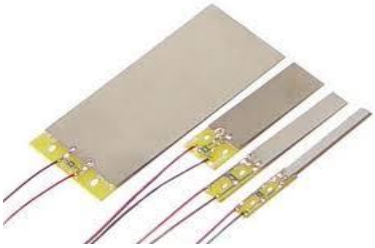

Figure .4.vibration sensor

D) Nano bio sensor:

The biggest threat in the world today is spreading unknown disease due to certain pathogen especially viruses. It is very significant to detect a virus, so that thousands of lives could to saved from As Charles lieber says "We want to find a single virus before it finds you". It has been found recently that unimaginable thin nanowires are used to sense virus causing flu's, measles and eye infections. [10]
A two inch square silicon and metal chip with an array of nanowires embedded in to it and with two pinhead-size entry ports through which blood, saliva of other blood fluids enter. The output of detect samples can be viewed using MPLAB.

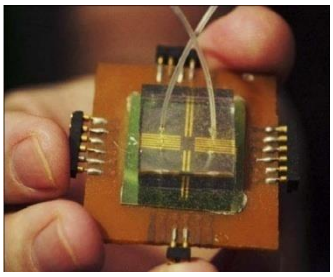

Figure.5.Nano bio sensor

E) PIC16F877A Microcontroller

The PIC16F877A microcontroller is used due to CMOS 8-bit microcontroller and high density non memory technology. The Flash Program memory can be reprogrammed In-System through an SPI (serial port interface), by a conventional nonprogrammer, or by an On-chip boot program running on the RISC core. The data from the microcontroller is also sent to the Zigbee

F) Zigbee Module

The Zigbee which consist of 2.4 GHz IEEE Std. 802.15.4 RF Transceiver Module. The dimension of the Zigbee is 17.8 mm x 27.9 mm, surface mountable and up to 100m range. This module interfaces with the microcontroller via serial SPI interface. The values of the sensors are noted and the information is broadcasted in the network.

V. SYSTEM DESIGN

In this process, design and implementation of Health Monitoring Using Wireless Body Area Sensor Network is done with modules of data sensing, data processing and data communication as shown in Fig. 6. Three sensors are contained in data sensing module such as temperature sensor, heart rate sensor and vibration sensor. Temperature sensor is used to measure the body through external skin. Heartbeat sensor is used to measure the function of heart by blood flow through Finger. Pressure sensor is used to measure the blood pressure of human being. The output of each sensor is interfaced with Analog to Digital circuit (ADC) pins of microcontroller. Data processing module consists of Microcontroller which is a high and needed to communicate the PC data communication module for health information, LCD is used as a display unit in connection with microcontroller displaying the current details of physiological parameters.

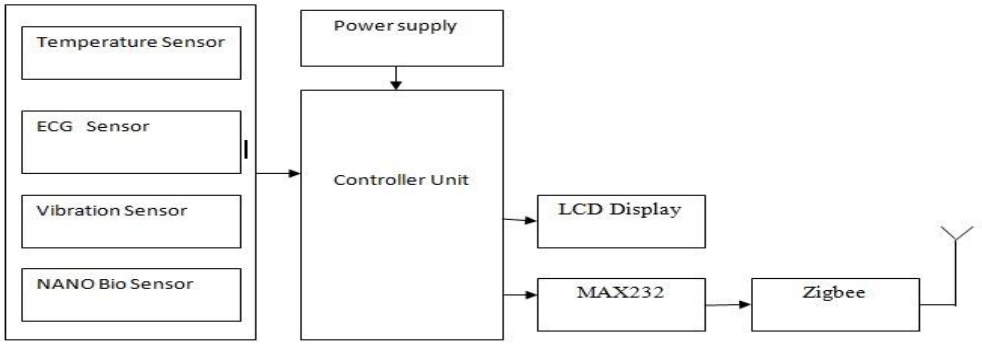

Fig.6 Sensor Node

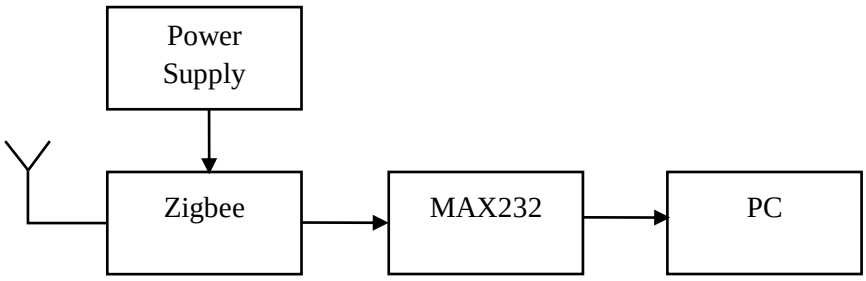

Fig.7.Receiver Node

VI. RESULTS AND DISCUSSIONS

With the help of Healthcare Monitoring System using WNS with Zigbee we monitor the ECG, Temperature, Pulse and the virus in the body,which is displayed on a monitoring board,so that if an attendee gets affected it will be known at an early stage and necessary precutions can be taken.

The heart of the project is micro controller PIC16F877A. The project is divided into different block. The heart beat is sensed by the clamp type sensor. Where the signal is achieved from clip type sensor is very low will be in micro volt. The maximum differential signal from the sensor at R wave is up to 1.2mv. Hence the signal should be applied to the instrumentation amplifier for the faithful amplification and S/N level improvement. The suitable gain of the amplifier is decided by the resistance used in the circuit.

The primary objective of this project is to develop a reliable, efficient and easily deployable remote health monitoring system for the attendees of the patient that can play a vital role in providing basic health services to the remote population. This project enables transmission of the system body parameters which is sensed from remote patient to the server PC by using wireless transmission technology

VII. SOFTWARE DESCRIPTION

Software is a basic building block for the every system which designs the processing and operations. Following are the software's used in designing of the proposed system. For programming of PIC16F877A, embedded c language using MPLAB IDE software is used. The new MPLAB X IDE has been designed to enhance developer's productivity, also enabling faster and more efficient program development. MPLAB IDE introduces a flexible window management system, enables us to drag and drop individual windows anywhere on the visual surface including support for Multiple Monitors.

To display the data received by Zigbee on servers PC, a PL-2303 driver for USB-to-Serial adapter has installed on that PC. This driver helps to access the data on PC, through USB adapter of Zigbee transceiver. To designing the schematic circuit diagram and PCB Layout, Proteus software is used. This software is less complex, easy to learn and helps to design circuit diagram in professional manner.

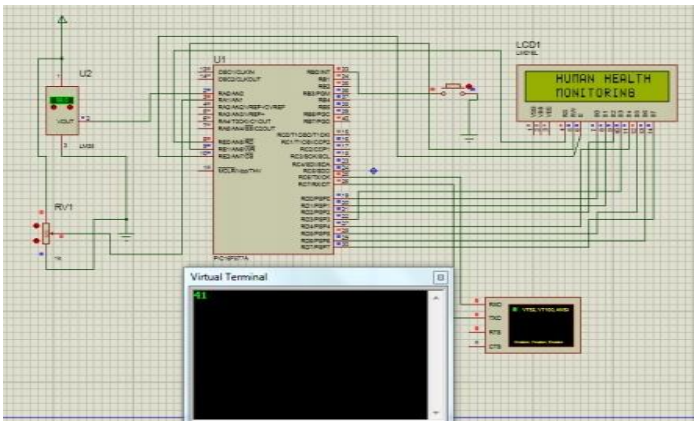

Figure.8.Schematic diagram of the system

Figure.9.Level of parameters

VIII. CONCLUSION

Thus the system successfully develops a wireless architecture for continuous monitoring the human health. The system to get the solution for collecting sensor values is interfaced with the microcontroller and the data is transmitted wirelessly to the server. This system provides reliability and security for independent-living residents with comfort. In this project used to technology a wide range of benefits to patient's attendee's medical personnel, and society through continuous monitor the ambulatory setting and early detection of abnormal conditions. As the future work is mentioned and extension of the wireless sensor network, thus new nodes characterized by new capabilities health concentration measurements as so as new capabilities on respiration activity monitoring Referring to the information system side, in order to provide a more efficient alert system, the warnings can be sent as a SMS to cell phone of users, or by email.

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