Wireless sensor network for physician to monitor effectively health parameter of a patient

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***Abstract*— Now days due to increasing age population, health cost, and mobile life. Thus present a type of sensor network architecture for Health Care Monitoring. This network named Health Care Monitoring Net. This network isolated wireless sensor networks (WSNs) into internet. Node of each WSN composed of health care sensors and RF transreceiver which send data to back end sever. Sensors can choose in the range of WSNs, while RF transreceiver is implemented as a coordinator which manages WSN other than forwards data. The sensing data of each patient are stored in back-end server with each having its own ID. The data analysis, database inquiry, data manning and the system management are processed on the web page of server. A test bed is constructed with wearable sensor and RF transmitter. This paper provides less cost, continuous health monitoring to patients and its relative. We implement a system for wireless health monitoring by using Wireless Sensor Network (WSN).It is useful to associate relative of patient and doctors for continuous health monitoring of patient. In this paper we review the objectives, status, advantages and design of current health monitoring. This paper provides new ideas for low-cost, implementation of WSNs for a good quality of medical health care monitoring.**

Keywords— Health Care; Wireless Sensor Network; GSM

I. INTRODUCTION

A Health Care Monitoring network named HCMNet for pervasive, adaptive healthcare in communities where residents or patients have diverse health care demands. HCMNet is a distributed system which combines mobile ad-hoc WSNs with conventional internet, and integrates embedded devices, back-end server, online analysis, and user interfaces. Service oriented Architecture (SOA) Technology is utilized to program the software that administrates the distributed system. The software service modules and their integration in SOA are introduced in another paper. This paper focuses on the design and implementation of HCMNet. HCMNet have several benefits: flexible monitoring, mobility, cost effective and improving services quality.[2] The advantages of a WSN are numerous for smart health- care, as it provides the following important properties:

1. **Portability Unobtrusiveness**. WSN operate with minimal patient input and send data through wireless communication to sever. They may be placed on the body of patient. WSN are not noticeable which helps to patient acceptance and minimizes errors with WSN.
2. **Easy to implement and scalability**. WSN can be implementing with less cost and complexity compared to wired networks. Current health monitoring structure implemented with a WSN network instead of wired installations which is expensive and complex. WSN are placed on patient body and turned on, calibrating automatically and self-organizing.
3. **Real-time and accurate measurement and continuous**. Physical data of patient can be monitor continuously & allowing real-time response for emergency or healthcare workers. The data collected from a patient is stored RAM of microcontroller and send to sever and which help for maintain patient history. WSN will monitor data continuously sensors still on though power management and on demand activation.
4. **Reconfiguration and self-organization**. WSN are flexible installation adding and removing sensors easily done in the network. Each WSN can use for another patient with only removing of sensor from network. All sensors in network are self-organize to form routing paths.

II. ARCHITECTURE OF HEALTH MONITORING

Architecture of health monitoring shown in fig 1 which consist of two different node with sensing parameter such as BP & heart rate monitor, ECG, temperature, SPO2 sensor

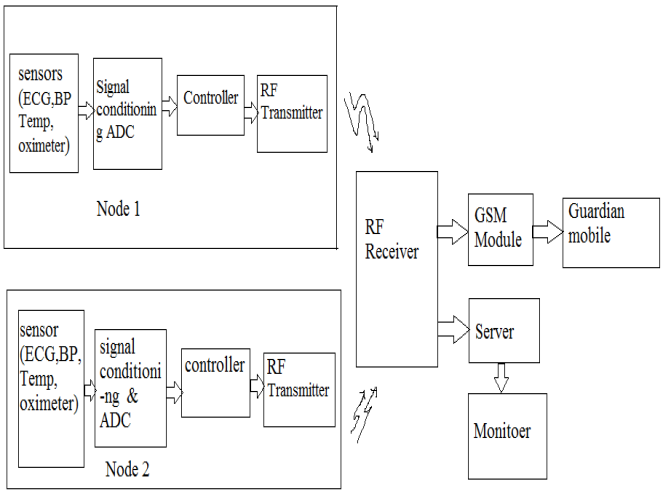

Fig1. Architecture of health monitoring using WSN

A. Wireless sensor network

- ECG Sensor: ECG sensor used to monitor appearance of waves and sprockets, duration of waves, sprockets, segments and intervals, amplitude of waves and sprockets, Rhythm of heart cycles, Un/presence of waves or sprockets View plot or process ECG signals from output of sensor.[6]Two thumbs hold on the board and start

getting output in pulse output. The optocupler used to isolate ECG signal from sensor get clean ECG signal.[5]

- SPO2 Sensor: SPO2 sensor used to monitor Pulse Oximeter, Heart Rate Meter, Plethysmograph used for such parameter measurement.LED and LDR combination is used for obtained the Heart Beat signal. Blood flow though hands interrupts the Light reaching the LDR and this signal is converted into digital by ACD which then read by microcontroller these RF signal is transmitted by RF transmitter.[5]
- BP sensor**:** BP sensor used to measure the blood pressure which is pressure on wall of arteries when heart contract and relax. The systolic is high blood pressure on wall of arteries when heart is contract and diastolic is low blood pressure when heart is relax. [5]Use the correct cuff size for accurate reading. The Wireless Blood Pressure Monitor includes a Medium cuff. If cuff size is too large***G*** then output is lower than the correct blood pressure and if cuff size is too small then output is higher than the correct blood pressure**.**
- Temperature sensor: **I**n critical condition of patient to measure temperature of patient temperature sensor required [5]
- Signal conditioning & ADC: All sensor collect data from patient body data is in analog form and very small in strength so that there is need to signal conditioning block that used amplifier and filter that remove the noise added in signal.[5] These signal converted into digital form by high precision analog to digital converter which has minimum 8 simultaneous channel. We cannot used the ADC in microcontrollers because all signal from patient body area very small strength thus high precisions is required.[5]
- Microcontroller: The data from ADC is sent to microcontroller for process. The amplified and conditioned Heart Rate signal is fed to input port of the microcontroller. The microcontroller reads the BP, ECG, heart rate and temperature sample stored in the RAM of the through the ADC. It is then converted and stored in the memory as two 8-bit unsigned integers (0-255).[5]The microcontroller constructs the SMS messages and packs the data samples after completion of signals acquisition, then communicates with the mobile phone using at-commands on its GSM modem port to send the message(s).

B. CC2500 RF Module

CC2500 RF Module is a transreceiver module which provides RF communication at 2.4 GHz. CC2500 RF Module used to transmit and receive data at 9600 baud rates. This module not required extra hardware and no extra coding to. This module provides simply direct replacement for serial communication. The mode of operation of this module is Half Duplex mode. The low noise amplifier (LNA) used to amplify received RF signal and down-converted to the intermediate frequency. I/Q signals are converted into digital by analog to digital converter. The transmitter is operated on principle synthesis of the RF frequency.

C. sever:

The back-end server is programmed as a web server which delivers a webpage when requested by a web browser. Both the data collected by sensors and the software of the system administration, data processing and analyzing, are stored on the server. Administrator can manage the whole system by accessing the web page on server. Back-end users, such as doctors, health care advisors or relatives of patients can also inquire the health care monitoring data on the web page [3]

D. Back End Computer and human interface

Two sensor nodes connected to the backend computer for continuously data mining and data archiving of patient. Patient's relatives and doctors are interface with the network using PCs. The PCs are used for data management and configuration depending on health monitoring for patient. There should be minimum interactions supported with body sensors and control unit. These health monitoring may provide memory for patient history, alerts, and emergency communication channel. Real-time interfaces provided by PDAs and PCs. Backend computer useful for doctor understood condition of patient in emergency

E. GSM module (SIM900)

The SIM900 is a complete Quad-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. SIM900 delivers GSM/GPRS 850/900/1800/1900MHz performance for voice, SMS, Data, and Fax in a small form factor with low power consumption. SIM900 can fit in small space requirements such as M2M application due to its slim and compact demand of design. GSM module is designed by SIMCom use for global market. SIM900 is quad-band GSM/GPRS module that operates on frequency GSM 850MHz. SIM900 small size and meet all requirements of user's.

III. CONCLUSION

This paper kind of network architecture named Health monitoring network which integrates WSNs into internet. Each WSN is organized as a mobile ad-hoc network with one allocated mesh router connecting with internet. The healthcare data collected by sensor node are all transmitted to mesh router, then forwarded to back-end web server through internet. The whole network administration including working mode setting for sensor node, sensing data managing and analyzing are processed on back-end server. A test bed is constructed to test the performance of Health Care Monitoring Net, where sensor node measures blood pressure, ECG, heart rate, temperature parameter of a patient. In project the measuring cycle can be flexibly set on the various requirements of patients

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