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Patient Health Monitoring Using Wireless Body Area Sensor Network

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Abstract-Wireless Body Area Sensor Network is one of the main application areas for ubiquitous computing. The potential for ubiquitous computing is evident in almost every aspect of our lives including the hospital, mergency and critical situations. The Wireless Body Area Sensor networks (WBASNs) is a wireless networks have enabled the design of low-cost, intelligent, tiny, and lightweight medical sensor nodes that can be placed on human body to monitor various physiological vital signs of patient for a long period of time and providing real-time feedback to the user and medical staff. In this paper,* Developing a hardware which will sense heart rate, blood pressure, temperature of a person, and respiration of the person using gsm modem all information lively transmitted to gsm mobile. *The attached sensors on patient's body and they are able to sense the various heath parameters of patient such as heart rate,* blood pressure, temperature, and respiration contains. *These health parameters are then communicated to physician's server. The physician holds various threshold values of the health parameters for each and every patient. This system can detect the abnormal conditions, issue an alarm to the patient and send a SMS to the physician.

Keyword: Wireless body area sensor network, GSM modem, Microcontroller, heartbeat sensor, pressure, temperature, respiration sensors.

I.INTRODUCTION

The majority of patients in the hospital are ambulatory, 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 to improve patient outcomes. 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 subsets of patients who are deemed to be most at risk of being physiologically unstable, and who are in need of expert review. In this paper the patient as heart rate, blood pressure, temperature, and respiration contains is measure.

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However, clinically validated devices compare physiological data to heuristically determined, univariate thresholds and generate an alert if those thresholds are exceeded (e.g., "alert if heart rate (HR) exceeds 130 beats/min"). When the thresholds are exceeded it sent the message on doctor mobile with the patients measuring data. So doctor after watching the measuring data can send/ call the patient.

II.SYSTEM ARCHITECTURE

The personal server, implemented on a personal digital assistant (PDA), cell phone, or home personal computer, sets up and controls the WBAN, provides graphical or audio interface to the user, and transfers the information about health status to the medical server through the Internet or mobile telephone networks (e.g. GPRS, 3G). The medical server keeps electronic medical records of registered users and provides various services to the users, medical personnel, and informal caregivers. It is the responsibility of the medical server to authenticate users, accept health monitoring session uploads, format and insert this session data into corresponding medical records, analyse the data patterns, recognize serious health anomalies in order to contact emergency care givers, and forward new instructions to the users, such as physician prescribed exercises. The patient's physician can access the data from his/her office via the Internet and examine it to ensure the patient is within expected health metrics (heart rate, blood pressure, activity), ensure that the patient is responding to a given treatment or that a patient has been performing the given exercises. The proposed wireless body area sensor network for health monitoring the patient wear a wearable device Body Sensor Node on the body which send the patient data to the Patient PDA through wireless. From patient wireless the data is send to the medical center through which data is send to the Doctor's PDA. Fig 1 The Doctor can check the data on its PDA in which the data from patient body is collect. The treatment depends on the when the thresholds are exceeded it sent the message on doctor mobile with the patients measuring data to the Doctor to take appropriate step.

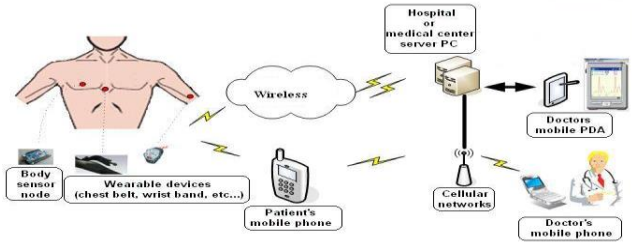

Fig. 1: Patient Health Monitoring in WBASN

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III.HARDWARE IMPLEMENTATION

1) Temperature sensor:

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.

2) Heart beat sensor:

For a human aged 18 or more years, a normal resting heart rate can be anything between 60 and 100 beats per minute. Usually the healthier or fitter you are, the lower your rate. A competitive athlete may have a resting heart rate as low as 40 beats per minute. According to the National Health Service, UK, the following are ideal normal pulse rates at rest, in bpm (beats per minute):Newborn baby - 120 to 160
· Baby aged from 1 to 12 months - 80 to 140 Baby/toddler aged from 1 to 2 years - 80 to Toddler/young child aged 2 to 6 years - 75 to · 120
· Child aged 7 to 12 years - 75 to 110
· Adult aged 18+ years - 60 to 100
· Adult athlete - 40 to 60

3) Pressure sensor:

Pressure sensor made up of silicon measures the pressure level in blood. It is used in many health monitoring applications particularly with a microcontroller or microprocessor where analog signal are measured and converted into digital value. In sensor, micromachining techniques and metallization of thin-film are combined by transducers and bipolar processing provides an accurate analog output signal which is proportional to the applied pressure.

4) Respiration Sensor:

The respiration rate is the number of breaths a person takes per minute. The human body normally respiration rate will be low or high .At the time measures human breath. The rate low or high means sum disease occur in body.

Normal respiration rates for an adult person at rest range from 12 to 16 breaths per minute.

Normal respiration rates for an adult person at rest range from 12 to 16 breaths per minute

- birth to 6 weeks: 30–60 breaths per minute
- 6 months: 25–40 breaths per minute
- 3 years: 20–30 breaths per minute
- 6 years: 18–25 breaths per minute
- 10 years: 15–20 breaths per minute

5) ATmega8 Microcontroller

The ATmega8 microcontroller is used due to a low-power CMOS 8-bit microcontroller and high density non-volatile memory technology. The Flash Program memory can be reprogrammed In-System through an SPI (serial port interface), by a conventional non-volatile memory programmer, or by an On-chip boot program running on the AVR core. The data from the microcontroller is also sent to the GSM

6) GSM Modem

GSM modem is a global system for mobile communication provides short message services. The 160 alphanumeric characters can be send in a message. If there is a power off of subscribers v unit or the network coverage area is left, the message can be stored, retrieved and sent when entered the network.. The GSM Modem supports popular "AT" command by which user can able to develop application quickly. The product SIM-300S module is used which has SIM card and used with respective number for sending emergency messages about the condition of patient to doctor.

IV.SYSTEM DESIGN

In this process, design and implementation of “Patient Health Monitoring Using Wireless Body Area Sensor Network” is done with modules of data sensing, data processing and data communication as shown in Fig. 2. Three sensors are contained in data sensing module such as temperature sensor, heart rate sensor and pressure sensor. Temperature sensor is used to measure the body temperature 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 Atmel AVR 8-bit Microcontroller which is a high-performance RISC CPU and needed to communicate the PC and mobile of data communication module for prescribing medicine through VB and sending SMS through information gateway, LCD is used as a display unit in connection with microcontroller for displaying the current details of physiological parameters.

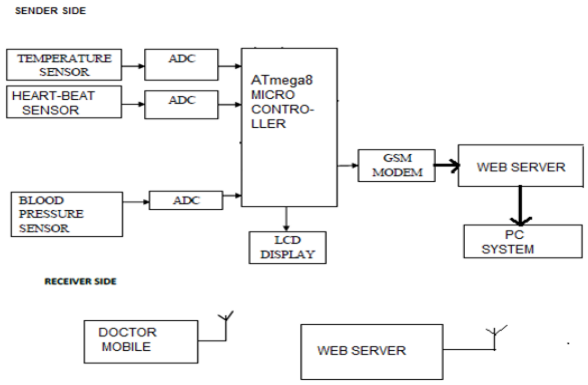

Fig. 2: Overall System Design

V.RESULTS

Currently, the wireless body area sensor network for heart rate, pressure, temperature, respiration monitoring system is successfully designed for applications using GSM.

1. Heartbeat sensor
2. Temperature sensor
3. Respiration sensor
4. Blood pressure sensor

The “Patient Health Monitoring Using Wireless Body Area Sensor Network” detects various parameters of people and assists them to overcome the critical health condition. The various parameter of the patient is shown in Fig. 3.

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VI.CONCLUSION

The primary objective of this project is to develop a reliable, efficient and easily deployable remote patient monitoring system that can play a vital role in providing basic health services to the remote population and elderly patients. This project enables transmission of the system body parameters which is sensed from remote patient to the server PC by using wireless transmission technology - GSM. Using GSM, the doctor is notified and he will receive SMS on his mobile phone in case any parameter goes beyond the normal specified range. The main focus of this system is that the people can overcome the critical situation and be cautious of their health condition.

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Fig. 3: Output of patient health monitoring

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