The Design and Implementation of GPRS based Real Time Health Monitoring System Using ARM

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Abstract- **In this paper; we present an innovating real time health monitoring system using the new advances in biosensors, GPRS, mobile devices and wireless technologies. The aim of this system is to monitor the health of the elder people who are staying in a home alone without having to be hospitalized. The system works when there is a emergency by using wireless technologies. We have designed, developed a reliable, energy efficient real time health monitoring system. It is able to send the parameters of patient in real time. It enables the doctors to monitor patient parameters in real time using html and it also enables the family and friends to monitor the patient condition. In the critical condition it also sends the information to the emergencyservices.**

*Keywords-***GPRS; remote monitoring; sensor devices; ARM7; Zigbee**

I.INTRODUCTION

Modern technology enables better quality of life of sick and disabled persons. One of such area is health monitoring of elder persons who are staying alone in a home. Currently there are number of health monitoring systems available for the patients who are admitted in hospitals.In order to monitor the patients who are staying in a home we have proposed a system. The system is able to transmit the parameter of a patient continuously not only to the doctors; it also sends the information of a patient to their respective family and friends. In case of emergency it sends the information to the emergency services. The system is able to transmit the parameter of a patient continuously and overlong distance by establishing HTTP connection through GPRS.

II.PROPOSED SYSTEM

System architecture is shown in Fig.1. System uses the C/S Mode, server communicate with sensor via GPRS and Internet, Using Socket technology for communication between Applications. Wireless sensor nodes initiated socket link. According the parameters, the server listens to the link and accepts the link, forming a communication link between the client and serve to send and receive data.
GPRS is a mobile data service that is developed on the basis of GSM, transmitting data in encapsulation way. It has lots of advantages: super speed transmission, always on-line and charging according to rate of flow. We use GPRS to set up wireless communication system that makes low cost, easy maintenance and expansion, high reliability. Sensor devices connect to China Mobile's GPRS network through GPRS module, then GPRS network connects to Internet and on-site environmental data collected are sent to remote server with a

public IP address. In order to ensure reliability of data transmission, the system uses stream sockets way with sensor equipment for data transmission. Stream socket using TCP protocol, provides connection-oriented, two-way and orderly flow of data services. Connect of stream socket is shown in Fig. 2
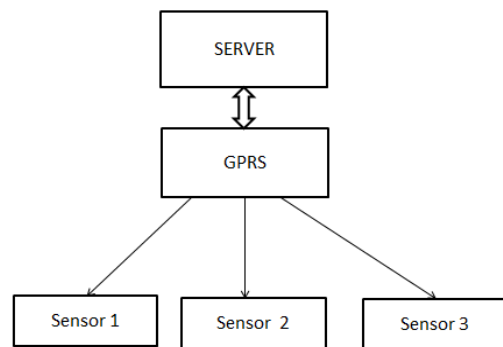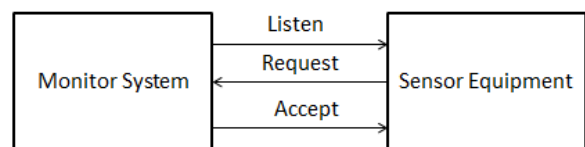

Fig 1. System Structure

Fig 2.Monitor System

III.SYSTEM HARDWARE STRUCTURE DESIGN

The overview of the monitoring system is shown in fig 3.It consist of two different sections, one is at patient side who is staying alone in home and other is at receiver side who cares about the patient. At the patient side the temperature and heart beat readings is displayed at the LCD and whenever the sensor's information crosses its set point then at that time sensor's data is updated to the Website using GPRS technology and also message will be sent to the particular person. Since it is GPRS so we cannot demonstrate in LAN.So we will go for Google App engine in which we can have free space. The data will be stored in the app engine data store. And our server pages will be made using HTML and Java. The sensors board will send the information to our URL, and one servlet in the server will be responsible to receive the data
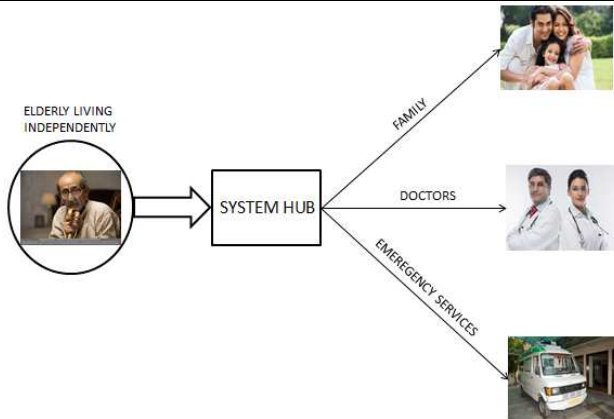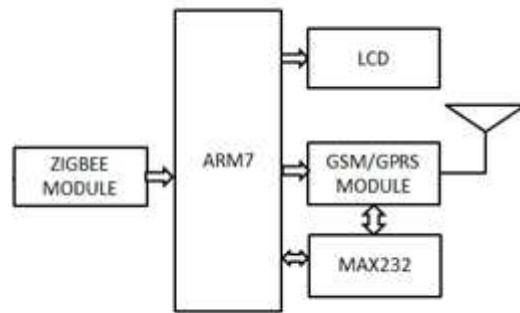
Fig 3. Overview of the monitoring System

and store it in the data store along with date, time and IP address from which the data is received. When we need to see the report, we have to use internet to open an html/ jsp page of our server and the data will be fetched from the data store formatted and presented to us.

IV. PATIENT HOME

The patient at home side consists of two modules which are Data acquisition unit and communication module for transmitting data between the base station and server. The system hardware structure is shown in figure 4.

1) Data Acquisition Unit

The data acquisition unit consists of sensors that are used to collect the information from patient which is in analog form that is given to ARM7 which has on chip ADC which converts the information in to digital form, then the sensor information is displayed on the LCD.Then the sensor readings are transmitted to the receiver module through Zigbeemodule. This is shown in fig 4.
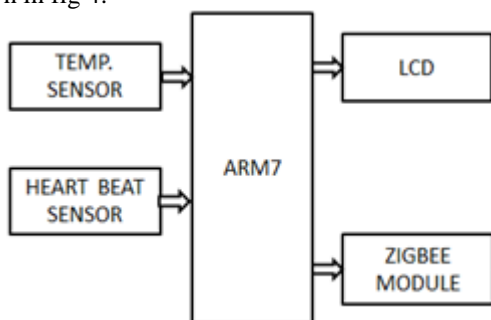

Fig4 (a).Transmitter Section (data acquisition unit)

2) Communication Module

In this communication module the data which has been displayed on LCD is received at the receiver side through Zigbee then this data will be sent to the server through GPRS and sends the information to the particular persons through GSM message service. The communication module is shown in Fig 4(b).

Fig 4 (b).Receiver Section

V.DESIG4N DESCRIPTION

All the design of proposed system shown in fig 4 are described below

1ARM7)

The heart of the system is microcontroller which will access the data . In our project ARM7 is used.

The ARM7 which we used for our project is LPC2148 (PHILLIPS)ARM7 is high-performance, low-cost, low power consumption RISC processor. For a variety of areas, such as embedded control, multimedia, DSP and mobile applications, ARM architecture is the first RISC microprocessor designed for low-budget market. The embedded operating system will be subject to certain restrictions. But because of its low price, reliability and other factors, it is widely used in various industrial controllers.

2) Heart Beat sensor

Fig 5. Heart Beat Sensor

Heart beat sensor is designed to give digital output of heart beat when a finger is placed on it. When the heart beat detector is working, the beat LED flashes in unison with each heart beat . This digital output can be connected to ARM7 directly to measure the Beats Per Minute (BPM) rate .It works on the principle of light modulation by blood flow through finger at each pulse. It works at +5V voltage.

Fig 6 shows target pulse rates for people aged between 20 and 70. The target range is the pulse rate needed in order to provide suitable exercise for the heart. For 25-year old, this range is about 140-170 Beats Per Minute for a 60-year old it is typically between 115 and 140 Beats Per Minute.
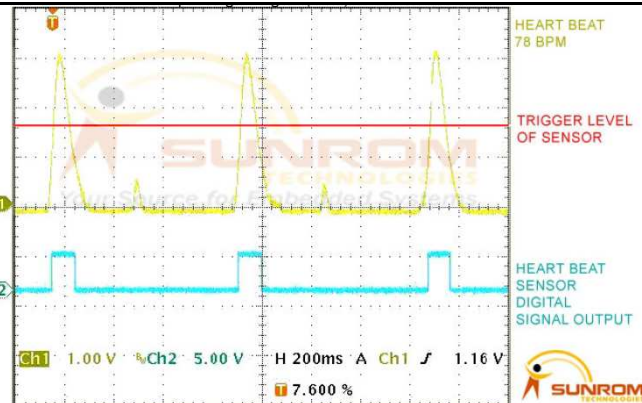
Fig 6. Heart Beat Signal
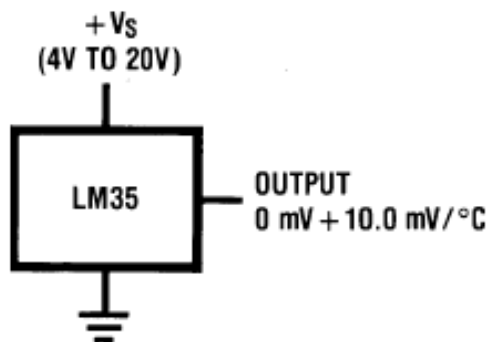
3) *Temperature Sensor*

Fig 7. Basic Centigrade Temperature Sensor

The LM35 is an integrated-circuit temperature sensor whose output voltage is linearly proportional to the Celsius(Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensor calibrated in Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient centigrade scaling. The Lm35 does not require any external calibration or trimming to provide typical to accuracies of $\pm 1/4^0$C at room temperature and $\pm 3/4^0$Cover a full -55 to +150^{0}C temp range.

4) *LCD*

A Liquid crystal display (LCD) is a low cost, low power device capable of displaying text and images. LCDs are extremely common in embedded systems, since such systems often do not have video monitors like those that come standard with desktop systems. LCDs can be found in numerous common devices like watches, fax and copy machines, and calculators.

The LCD controller provides a relatively simple interface between a processor and an LCD. LCDs can be added quite easily to an application and use as few as three digital output pins for control.

In our project we used 16x2 LCD to display the heart beat rate and temperature readings.

5)*Zigbee*

Zigbee is a low power, low cost wireless network communication protocol based on the standard IEEE 802.15.4.Zigbee is targeted for low power, low data rate and secure application for Wireless Personal Area networking. Zigbee operates at the unlicensed bands of Radio spectrum, mainly at 2.400 to 2.484 GHz, 902 to 980 MHz .Supports an operating distance up to 100 meters.

6) *MAX232*

Fig 8. MAX232

The MAX 232 is an IChat converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. It is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals.

7) *GSM/GPRS MODULE*

General Packet Radio Service(GPRS) is a packet oriented mobile service on the 2G and 3G cellular communication system's Global System for Mobile communications(GSM).This module is chosen for transmission of voice, data, and images. Selection of standard module depends upon the service provider. This is connected to the ARM through MAX232 with a connection speedup to 19,200bps.In addition to the standard AT commands; the module supports an extended set of AT commands. This facilitates tasks like reading, writing, deleting SMS messages and sending messages.

VI.RESULTS

From the above project we can send the data from the patient side which has been displayed on LCD through the GPRS to the server. In the server by using Google app engine we can see the results by creating one IP address. And also we can send the information of a patient through the GSM to a particular person.

VII.CONCLUSION

We describe the design process of sensor monitor system based on GPRS, from this project we concluded that we are able to transmit the data which is sensed from patient to the server by using wireless transmission technology GSM. It is completely integrated so that it is possible to track anytime from anywhere .It has a real time capability.

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