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

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Abstract-In this project we present a 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 aged people who are staying at home alone and those people who are stayingat Old age home. The system works when there is an emergency by using wireless technology. We have designed a system using dual ARM processor with GPRS technology which brings a real time health monitoring system. It sendsthe information regarding patient's health and enables the doctors to monitor using html and it also enables the family and friends to monitor the patient's condition. During an emergency it also sends the information to the emergency services so they can take necessary action immediately. This Health monitoring system is used to collect and transfer information from patient to the health care centers. Here we are using a combination of zigbee and GPRS. These two wireless technologies are used to support continuous biosensor monitoring. All the outputted data from the medical devices are transferred within the wireless network and it will be sent to the healthcare centers. The main goal of this project is to develop a solution towards patient monitoring system considering the aspects of technology of today.

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

I.INTRODUCTION

Health monitoring System (HMS) plays a very important role in Human life, it isused to help the patient to find health status of different organs of the patient body at early stage and treat them effectively. A patient is any person who receives medical attention, care, or treatment. The person ismost often ill or injured and in need treatment by physician. Health monitoring system is a clinical use electronic machine designed to display and minimally interprets a person's vital signs. 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 and those people who are staying at Old age 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.EXISTING SYSTEMS

There are also Health monitoring systems developed using GPRS based on single processor which can monitor only single patient. If we need to monitor more number of patients it will be difficult using single processor. To overcome such problems we are using GPRS based Health Monitoring System using Dual ARM processor where we can monitor many patients at a time by creating a website for particular patient. So that information of particular patients can be received by the doctors, family members and even emergency service when the data exceeds the set point.

III.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.
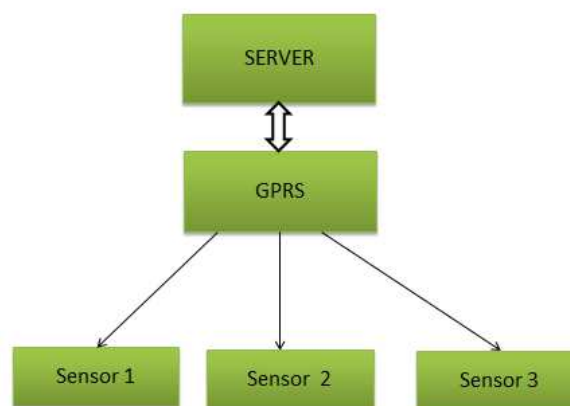

Fig1. System Structure

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 upwireless communication system that makes low cost, easy

maintenance and expansion, high reliability. Sensor devices connect to 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
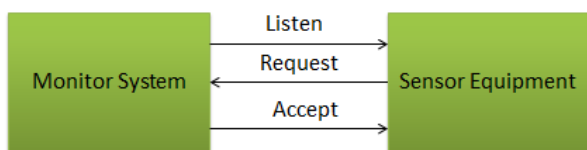

Fig2.Monitor System

IV. HEALTH MONITORING SYSTEM

GPRS based Health monitoring system is proposed here. Earlier people were falling ill and there were no proper hospitals nearby and they wanted to travel for long distanceand hospitals with no proper monitoring of patients. Monitoring was also carrying out manually which requires lot of time and quick actions cannot be taken. But presently we do not have such problems as many health monitoring systems have been developed. Health monitoring has created new health and wellness dimensions with a holistic approach to life. Modern medicine being the most prevalent and widely practiced is restricted only to primary, secondary and tertiary preventions. However HMS aims to treat symptoms before they could reach the above surface and hence prevent illness. The development of health monitoring systems has been motivated mainly by increasing health care costs and by the fact that the world population is ageing.
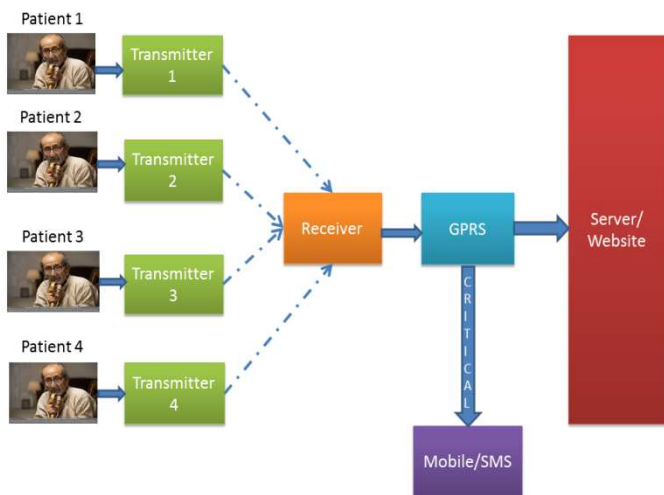

Fig3. Overview of the monitoring System

V. PATIENT SIDE

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 collects the information from patient which will be in analog form. These information will be converted to digital by using inbuilt ADC present in ARM7, then the sensor information will be displayed on the LCD and are transmitted to the receiver module through Zigbee. This is shown in fig 4.
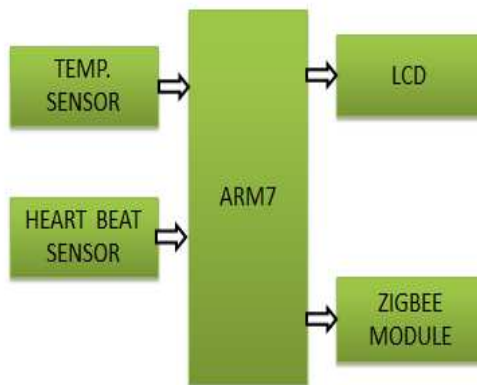

Fig4 (a).Transmitter Section (data acquisition unit)

2) Communication Module

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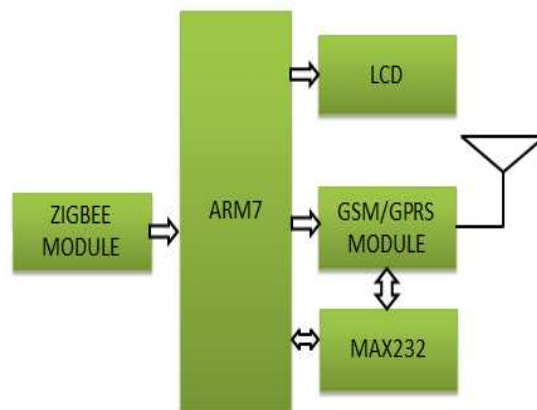

Fig4(b)Receiver Section (Communication Module)

VI .HARDWARE 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*

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
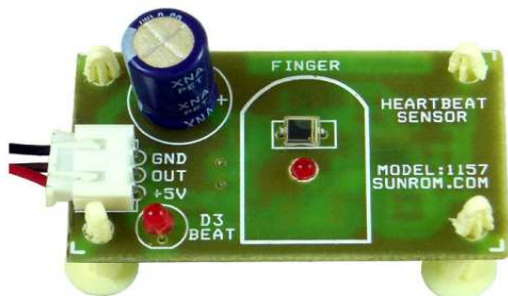

Fig5. Heart Beat Sensor

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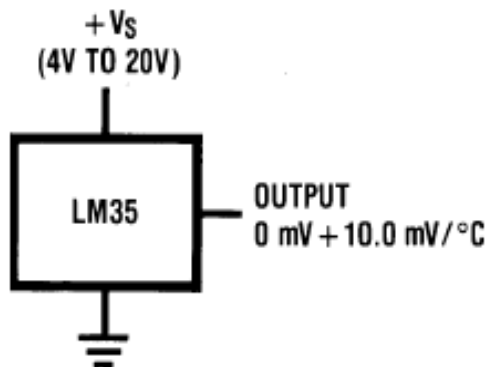
3) *Temperature Sensor*

Fig6. 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.
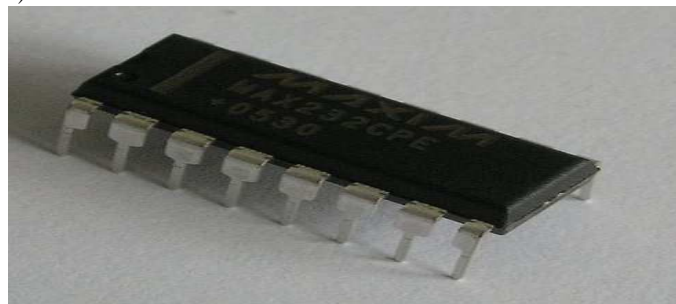
6) MAX232

Fig7. 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

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module supports an extended set of AT commands. This facilitates tasks like reading, writing, deleting SMS messages and sending messages.

VII. HARDARE IMPLEMENTATION

1) Transmitter Section

Fig8. Data acquisition unit

2) Receiver section

Fig9. Communication unit

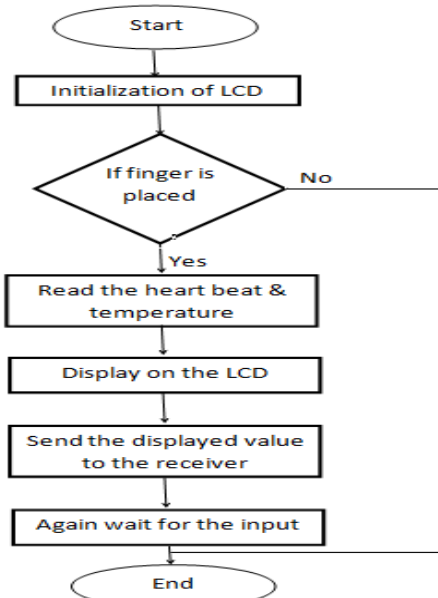## VIII. FLOW CHARTS

1) Transmitter side

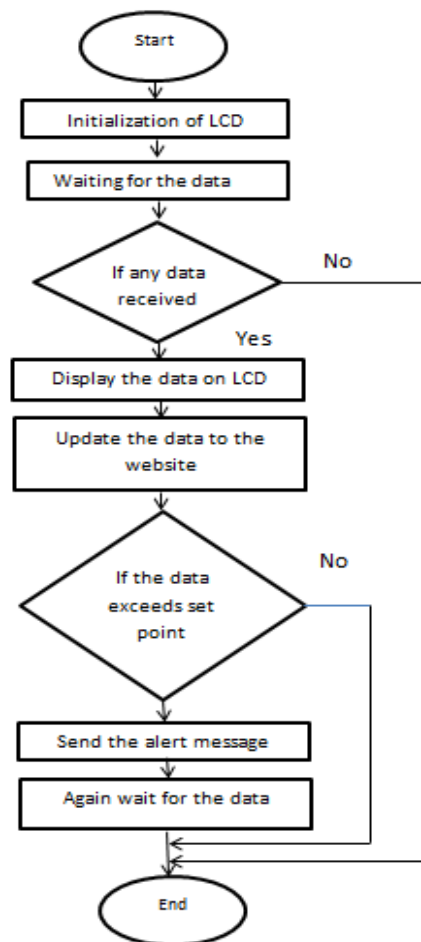

Fig10. Transmitter side

2) Receiver side

Fig11. Receiver side

IX.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.

Fig12. Output on LCD

Date	Time	Temp	Heart Beat
3/5/2014	07:27 AM	85 °F	68 BPM
10/5/2014	01:15 PM	95 °F	104 BPM
15/5/2014	03:05 PM	60 °F	76 BPM
16/5/2014	10:16 PM	70 °F	85 BPM
17/5/2014	03:05 AM	50 °F	144 BPM

Table 1. Patient information on Website

X .CONCLUSION

We describe the design process of health monitoring system based on GPRS, the functional modules composing the monitor system, communication of monitor system and test results of system. The monitor system is use of the advantages of GPRS, monitors operational status of equipment real time and achieves the collected data. It helps equipment's maintenance and the sensor equipment's improve the work efficiency. From this project we concluded that we can 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.

In this project, wireless health monitoring and clinical system is performed. Human's body temperature and heart rate information are acquired and sent to website using GPRS. If an emergency situation occurs, it also sends the information to the emergency services server using GSM/GPRS wireless technology. GPRS is a best effort service, implying variable throughput and latency that depend on the number of other users sharing service concurrently.

XI. ADVANTAGES

1) We can monitor the health in real-time.
2) A sensor network based health monitoring system that is dependable and safe.
3) Automated and continuous monitoring of patients can be reveal problems at an early stage leading to better control.
4) Utilizing medical facilities if only condition very serious.
5) The system has high performance, high reliability and low power consumption.

REFERENCES

[1]. "The Design and Implementation of Remote real Timemonitor System for Embedded Devices Based on GPRS"ZexinZang, WanmingLuo, 2012
[2]. "Wireless Sensor Based Remote Monitoring System for Agriculture Using ZigBeeand GPS" (CAC2S 2013)
[3]. "Real-time breath rate monitor based health security system using non-invasive biosensor" Bose, S. Dept. of Electron. &Commun. Eng., Nat. Inst. of Technol., Trichy, India Prabu, K. Kumar.2012
[4]. "Real Time Tracking & Health Monitoring System ofRemote Soldier Using Arm"IJETT 2013
[5]. "Driver fatigue and drowsiness monitoring system with embedded electrocardiogram sensor on steering wheel" Heung-Sub Shin and Wan-Young Chung, Dept of Electronics Enginering, Pukyong Nat. University, South Korea 2011
[6]. "Research on Kiln Body Health Monitoring of Ceramic Roller Kiln with Oxygen-Enriched and Pure Oxygen Combustion", Chen Jing, Yuan Youxin and Huang Bihui, coll. Of Autom, Wuhan Univ. of Technol., Wuhan 2012
[7]. "Health monitoring systems for massive emergency situations" Yue Wang ,Xi Li, Zehuang Chen and Tang, Dept.ofElectr.&Comput Eng., Stony Brook Univ., Stony Brook NY 2012
[8]. "Embedded real-time damage detection and identification algorithms in wireless health monitoring system for smart structures" Zhonghui Chen, Xiaojuan Yu, Qian Zhang, Xiangyun Liu, Sch. Of Mech& Civil Eng., China Univ. of Min. & Technol., Beijing, China 2012

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