International Journal of Advanced Research in

Electronics, Communication & Instrumentation Engineering and Development

Volume: 1 Issue: 3 08-Mar-2014,ISSN_NO: 2347 -7210

TELEMEDICINE CONSULTATION SYSTEM

Rajalakshmi Institute of Technology

Chennai

Mrs. T.Uma Maheshwari (Guide)
ASSOCIATE PROFESSOR/HOD- ECE

Mr.P.Manoj Kiran,
Final Year B.E ECE.,

Mr.N.Karthikeyan
Final Year B.E ECE.,

Mr.R.Gokul,
Final Year B.E ECE.,

Abstract:

In order to solve the medical assurance problem of remote-area patients, this paper studies the telemedicine consultation system and proposes a model with three subsystems which are separately front-end embedded diagnostic system, patients' data information server and hospital monitoring terminal. It emphasizes the software and hardware realization of embedded diagnostic system, analyzes the collection process of temperature, heart rate and blood pressure under the coordination of the ARM system, GPRS module, GPS module and vital signs information collection module. The patient's position system is also analyzed which is aimed at real-time monitoring of vital signs and remote assistant diagnosis and treatment

1.INTRODUCTION

Medical assurance is one of the social focuses nowadays The patients in remote districts often face the situation that they have to be transferred to the high-level hospitals because the local hospitals can not treat their disease. However, there will be two accompanying problems. One of them is that transferring spends time and thereby adversely affects the optimal timing of treatment, the other is the expenses in high level hospital are too high for the patients to endure

To solve the above problems, the telemedicine consultation system is designed to make a large part of the remote patients accept the diagnosis and treatment from the experts of high level hospital through the network and various sensing devices in local hospital. The whole

telemedicine system includes several subsystems such as telemedicine consultation system, telemedicine education system and multimedia health-care consulting system etc. This paper discusses the design of telemedicine consultation system which is the most important part and realizes its partial function in embedded system.

2,SYSTEM ANALYSIS

2.1 Existing System

- Nowadays in remote areas hospitals are not full fledged with equipments
- All initial diagnosis like calculating body temperature, blood pressure, heart rate are done manually
- Even there is lack of man power and so the initial diagnosis is difficult to perform in the absence of manpower
- The patient's information are not been stored in any system and is not available for further use and there is no real time communication between doctor's and patients
- It take time every time when they meet new specialists for the repetition of all test. No proper medical history can be maintained

2.2 Proposed System

- The proposed Telemedicine consultation system has two main functions .
- One of which is establishing the real-time communication between patients and doctors so that remote doctors can diagnose the disease from the information of patients' signs and accordingly propose the treatment.
- The other is real-time monitoring the body health of patients with action disorder sending alarm information when abnormal vital signs appear so that they can be treated in time
- Telemedicine consultation system has two main functions, one of which is establishing the real-time communication between patients and doctors so that remote doctors can diagnose the disease from the information of patients' signs and accordingly propose the treatment. The other is real-time monitoring the body health of patients with action disorder sending alarm information when abnormal vital signs appear so that they can be treated in time
- In order to realize the functions mentioned above, improve the independence, reliability and lower the costs of the system, it is divided into three independent parts, which are front-end embedded diagnostic system, patients' data information server and hospital monitoring terminal. The three parts use the same standard data interfaces. The overall structure is shown in Fig. 1 as follows.

A. Front-end Embedded Diagnostic System

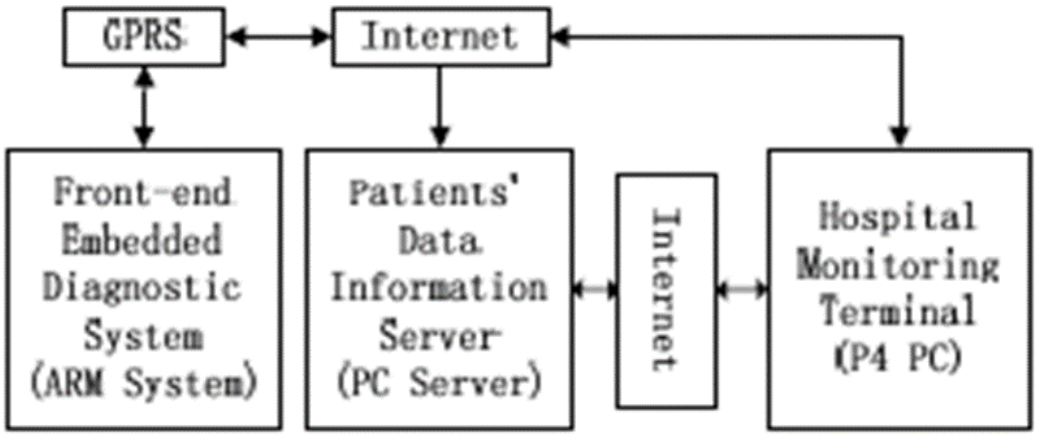
Front-end embedded diagnostic system is directly relative to collecting the patients' signs information and its amount depends on the amount of the patients accepting the remote treatment. Therefore this system must have a low-cost, high reliability and easy-to-operate characteristics

B. Patients' Data Information Server

The patients' signs information collected in the embedded diagnostic system is processed according to the regular format and sent to the patients' data information server through the GPRS (abbr. for General Packet Radio Service) wireless network. Several central hospitals can just set up a server so that the data can be shared at the same time the data independence and security can be ensured and the system costs are lowered. The data server must be stable and high real-time. Limited to the cost of the system, we select an ordinary P4 PC as the patients' data information server.

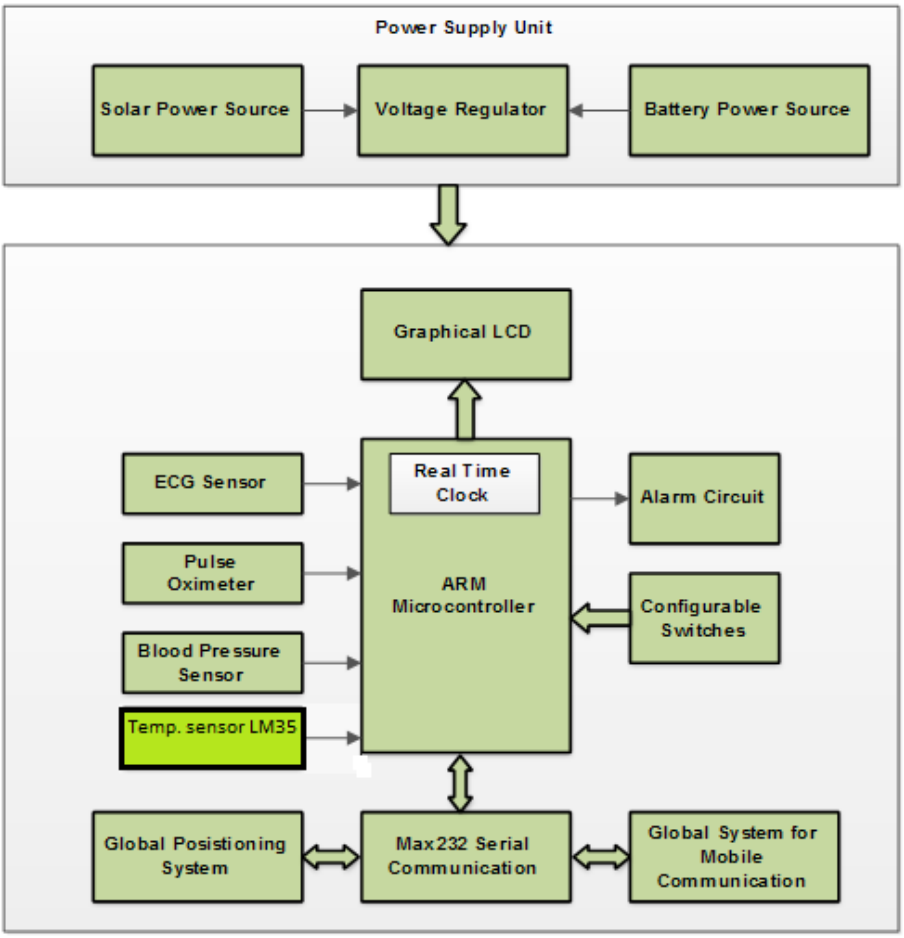
C. Hospital Monitoring Terminal

Doctors use hospital monitoring terminal to read the sign information of special patient from the patients' data information server and supply the instant treatment through the direct real-time communication with the front-end embedded diagnostic system. The terminal can be an ordinary PC installed with visual medical treatment software. In this paper
we use a PC both as a terminal and as a patients' data information server, which are logically independent.



Volume: 1 Issue: 3 08-Mar-2014,ISSN_NO: 2347 -7210

BLOCK DIAGRAM



3.METHODOLOGY

HARDWARE DESIGN OF THE FRONT- END EMBEDDED SYSTEM DIAGNOSTIC SYSTEM

The hardware system is mainly composed of the ARM system, GPRS module, GPS(abbr. for Global Position System) module and signs information collection module. See it in the Fig. 2 below.

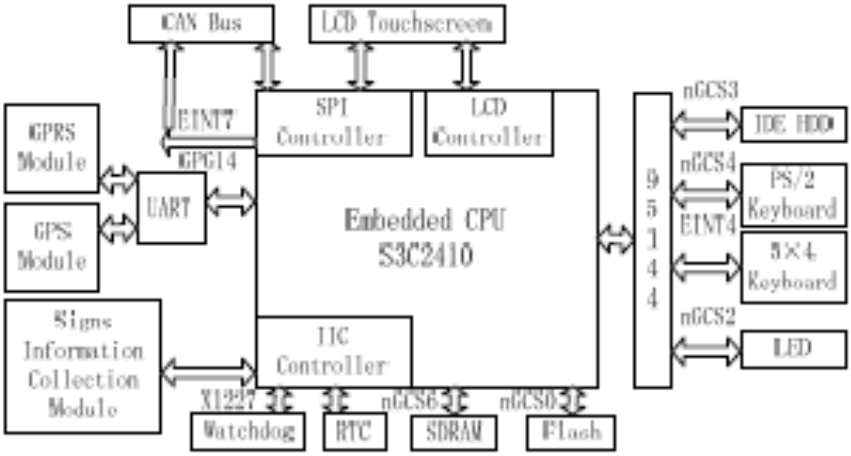


Figure 2. Hardware System of the Front-end Embedded Diagnostic System

A. ARMSystem

ARM system is the operating centre of the whole system, including embedded CPU, memory system, communication interface and I/O interface. Boot Loader is stored in or Flash and installed at Bank0, its physical address being 0 and its logical address 0x01000000 because 2410 address uses circular mapping. The kernel uses the image files of Linux saved at 0x01040000. The root file system Ram disk is installed at 0x01140000. When the ARM system is power-on or reset, Boot Loader is initialized and self-examined. When the self-examination is finished, a jump statement at the end of Boot Loader will load and operate Linux kernel. Then the root file system is loaded and the medical monitoring detection software is automatically operated.

B. GPRS Module and GPS Module

We use ready-made GPRS module and GPS module in order to shorten the design cycle. GPRS module uses MC35T, which is GPRS Class B communication module supporting voice communication, having three data transmission modes such as GPRS, USSD and CSD and two

function gates as SMS and Fax, and using AT commands to control. GPS module uses BT-328 with high precision, all-the-day, high efficiency, multifunctional,
easy to operate, widely used and so on..

C. Signs Information Collection Module

Signs information collection module is designed independently, mainly composed by SCM, temperature sensors, pressure sensors, amplifiers, filters, and ADC converter chips shown in Fig. 3. This module is connected to ARM system via IIC bus. SCM receives the commands from ARM system and starts the corresponding sensor device to collect the signs information which is converted to electric signals. The electric signals are converted to digital information by ADC converts chips after being amplified and filtered. Then the digital information is stored and recognized by SCM and sent to ARM system to process via IIC bus.

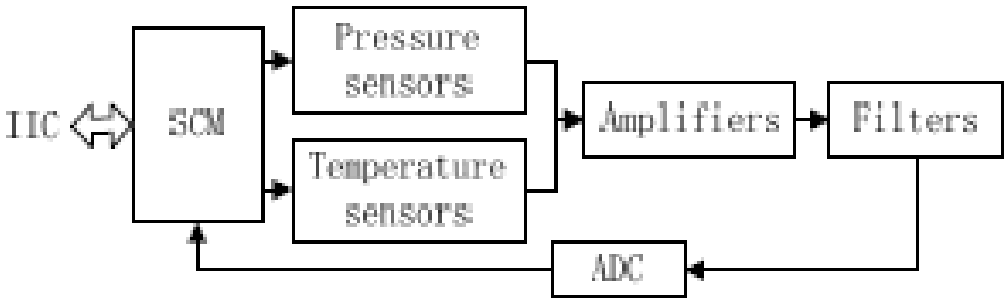


Figure3.Signs Information Collection Module

SOFTWARE DESIGN OF THE FRONT EMBEDDED DIAGNOSTIC SYSTEM

The software design of the front-end embedded diagnostic system is a four-layer architecture, including BootLoader, embedded OS, diagnosis and monitoring system and signs information collection driver. We select Uboot as the BootLoader, Linux2.6 kernel as the embedded OS and the operating platform for diagnosis and monitoring system. In the following the design and realization of diagnosis and monitoring system and signs information collection driver will be emphasized.

A. Diagnosis and Monitoring System

This software operates on Linux installed on ARM system. In order to improve its generality and extensibility, we divide the software into three separate modules: monitoring module, analyzing module, communication and positioning module as shown in Fig. 4.

When ARM system is power-on, the monitoring module is loaded automatically as a background program. In both cases, the monitoring module will activate the whole system. One case is when the patient's sign information data goes beyond the preset threshold value. The other is when GPRS network receives the remote communication commands. In the first case ARM system firstly generates GPS location address information and sends it with patient's sign information to patients' data information server and hospital monitoring terminal. The doctor on

duty is warned of the patient's abnormal vital signs and the patient's current address is displayed so that he or she will be found and treated in time. In the second case ARM system automatically pop up the main interface of diagnostic and monitoring software to warn the patient that the hospital monitoring terminal requires real-time communication in order to fully understand the patient's physical condition

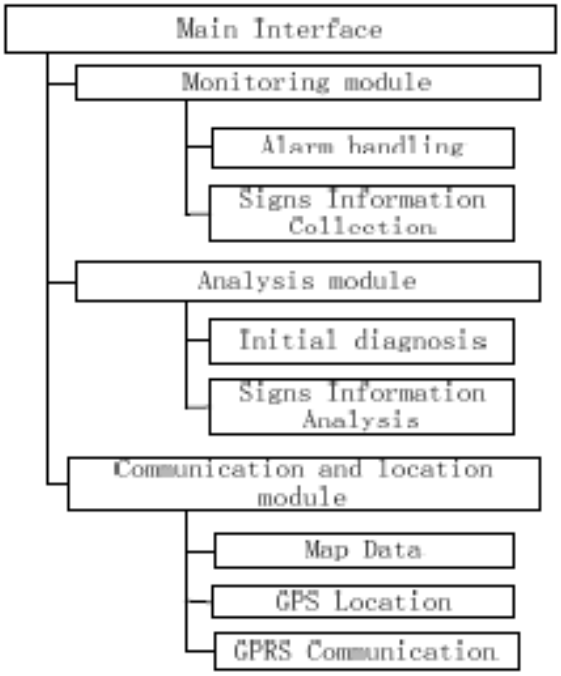


Figure4.Diagnosis and Monitoring System Architecture

. B) Signs Information Collection Driver

The driver is installed in the signs information collection module to receive the control commands from the diagnosis and monitoring system. Operated by SCM, the driver is responsible to obtain the accurate signs information such as body temperature, heart rate and blood pressure

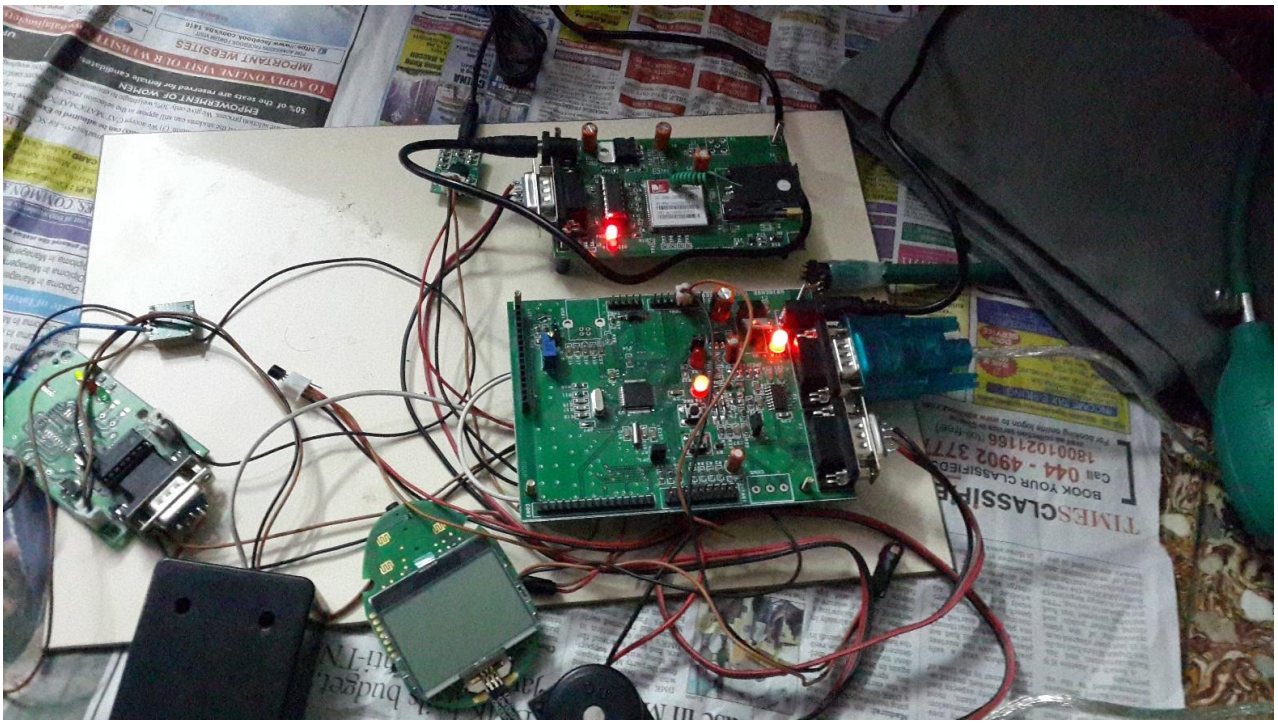
Body temperature is collected by the temperature sensors, the contacts of which should be in close contact with human skin when measuring. Through continuous sampling from the contacts we obtain temperature values and compare the current value with the last value. If the difference is less than the preset threshold which is between 0.01 and 0.05, the sign's value is added to 1. Otherwise, the value is cleared. When the sign's value reaches 3, the current temperature value is regarded as the collected value of the actual temperature.

Volume: 1 Issue: 3 08-Mar-2014,ISSN_NO: 2347 -7210

Heart rate and blood pressure are collected by the pressure sensors. When SCM receives the command from the diagnosis and monitoring system, the aerating pump is started at the same time the exhaust valve is closed and the cuff starts to inflate. In the inflation process the oscillating wave generator can simulate the blood pressure fluctuations, the vibration amplitude ranging from small to large and then descending.

When the pulse is 0, we stop pressure. The sensor Port1 collects a pressure every 10Nms(N ranging from 4 to 6). When the amplitudes of consecutive N times are all more than systolic blood pressure preset threshold, we consider the systolic blood pressure shall be the collected pressure from Port0 at this time and select the average value of consecutive N times collected systolic blood pressures from Port0 in order to accurately sample. In the above process the times of heartbeat is added to 1 at each fluctuation. At the same time the SCM timer works and it stops timing when the times of heartbeat reaches N. The heart rate is equaled to 60 N/t. In order to accurately sample we repeat this process and select the average
of heart rates. Then slowly deflated work begins. When the amplitudes of consecutive two seconds are all less than the preset threshold, we consider the diastolic blood pressure shall be the collected pressure from Port0 at this time and select the average value of consecutive N times collected diastolic blood pressures from Port0 in order to accurately sample. When we obtain systolic blood pressure, heart rate and diastolic blood pressure we begin to rapidly deflate the cuff to atmospheric pressure. Collection process is completed now

IMAGE



CONCLUSION

The telemedicine consultation system has far-reaching significance for improving the medical assurance system. In this paper we design and realize a small telemedicine consultation system based on ARM. The tests show the system can accurately collect the patient's body temperature, heart rate and blood pressure whether locally or through the remote hospital monitoring terminal, provide a basis for the remote diagnoses of patients and realize the monitoring and control function for disorders. Limited to the experimental conditions and research time, the system has not yet realized the complete physical examination, pathologic analysis and other functions, which indicates the research should be further deepened in the future.