Android Based Health Monitoring

Ashwini R. Jadhav
Department of E& TC, MITCOE,
Pune, Kothrud,
india.ashwinij_etc@yahoo.com

Prof. Dr. Virendra V. Shete
Department of E&TC, MITCOE,
Pune, Kothrud,
india.vvshete100@gmail.com

Abstract- The aim of this project is to use embedded technology and mobile communication for health care. In intensive care units patient's heart beats, temperatures, blood pressure etc. are continuously monitored. When patients gets well and come back to home from hospital might get infected with a new disease this may cause his death. So in many cases, patients are released from hospital but still they are strongly advised to be under rest and observation for some period of time. These devices eliminate the need for the patient to visit a doctor. Remote collection of patient's data sending through SIM 300 modem is possible. These devices also allow the doctor to communicate feedback to the patient remotely, using SMS alerts. In this system we take vital physiological data of a user and send the data together to an android O.S based mobile for processing and may trigger necessary SMS action.

*Keywords***:** *LPC2148 (ARM7), Keil 4, Flash magic, SIM 300 GSM Modem, Eclipse SDK, JAVA***.**

*****

I. INTRODUCTION

To implement the remote health monitoring system using android operating system. After discharged from ICU patient has to make frequent visits to their doctor to get their vital signs measured. Regular monitoring of vital signs is essential as they are primary indicators of an individual's physical well-being.

In this system physiological data of a patient is taken and through SMS it is sent to a Android based mobile for processing. In this application written on android based mobile will send back SMS to patient on the unit where SIM 300 is connected. This system gives great freedom to users. Here SIM 300 GPRS/GSM modem is used for sending data and receiving data via SMS. Android operating system is an open platform and hence the cost of the mobile monitoring system becomes less.

II.PATIENT SIDE UNIT

A. LPC2148 ARM CONTROLLER

We are using LPC2148 which is an Advanced RISC Machine. It is a 32 bit controller which is having Von Neumann architecture. It has a 3 stage pipelining and a memory of 4GB along with two UARTs. It operates at a speed of 60 MHz and also due to its interrupt priority feature. It consumes less power and is used in applications were miniaturization is of paramount importance. A real-time clock which operates at 32 KHz is in-built in the controller.
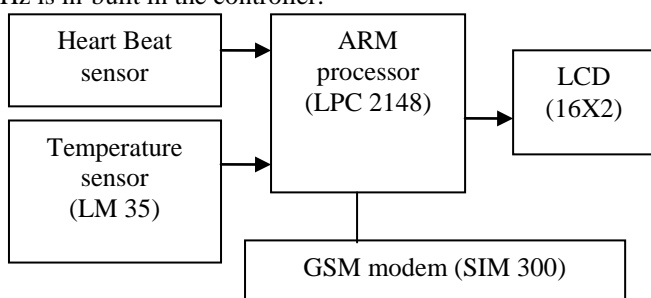

Fig 1. Configuration of patient-side device

B. BODY TEMPERATURE

The LM35 is precision integrated-circuit whose output is linearly proportional to the Celsius temperature. The scale factor is +10.0mv/°c. Hence temperature is equal to Vout*(100°C/V).The voltage from LM 35 is converted to digital format using ADC of ARM controller. This digital value is used to send via SMS after proper conversion.

C. HEART BEAT

The sensor consists of a super bright red LED and light detector. The LED should be super bright as the maximum light must pass spread in finger and detected by detector. When the heart pumps a pulse of blood through the blood vessels, the finger becomes slightly more opaque and so less light reached the detector. With each heart pulse the detector signal varies. This variation is converted to electrical pulse. This signal is amplified and triggered through an amplifier which outputs +5V logic level signal. The output signal is indicated by a LED also which blinks on each heart beat.

For a 25-year old, heart beat is about 140-170 beats per minute while for a 60-year old it is typically between 115 and 140 beats per minute.

When a finger is put in the sensor, it displays the beats per minute (BPM) rate.
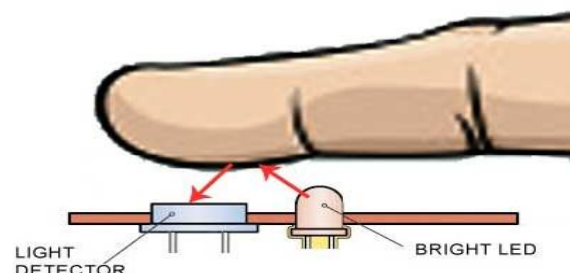

Fig 2. Heart beat measurement

If the pulse rate is 60 BPM (beats per minute) there will be a pulse every second. The duration of one heart beat is one

1429

seconds or 1000 x 1ms. Dividing 60,000 by 1000 will give the correct result of 60.

D. LCD:

LCD is a flat electronic visual display. Liquid Crystal Displays (LCD) have materials, which combine the properties of both liquids and crystals. Light modulating properties of liquid crystals are being used for the video display in the LCD. An LCD consists of two glass panels, with the liquid crystal materials sand witched between them LCD are more reliable and energy efficient. Its low power energy consumption makes it to be used in battery powered electronic devices.

LCD display is used to display the message after receiving SMS from doctor.

E. GSM MODEM:

SIM 300 GSM modem is a wireless modem that works with a GSM wireless network. A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. These GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages. We have used SIM300 GSM module. It is an Advanced Low cost modem for wireless GSM communications which includes sending and receiving text messages.

An external GSM modem is connected to ARM board through a serial cable on a UART0.Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate.

As mentioned in earlier computers use AT commands to control modems. Both GSM modems and dial-up modems support a common set of standard AT commands.

III. DOCTOR SIDE UNIT

A. ANDROID

Android is a Linux-based operating system for mobile devices such as smart phones and tablet computers. It is developed by the Open Handset Alliance led by Google. Google releases the Android code as open-source, under the Apache License. The Android Open Source Project (AOSP) is tasked with the maintenance and further development of Android. The version used here is Android 2.2 Froyo was released, based on Linux kernel 2.6.32 is used to carry out our project work.

Here smart-phone used is the Android 2.3 Micromax's Ninja. The application software is developed for android using Eclipse software and java programming language. The software decodes each SMS originating mobile number, and the transmitted patient's temperature and heart beat rate. On click the data is compared with reference level of temperature and heart beat then back SMS is sent to the patient that his health is OK or NOT. The written android application is responsible for analyzing the data and triggering actions appropriately.

IV. HADWARE & SOFTWARE SPECIFICATIONS

A. Software
Keil 4 and Flash magic
Application software: Eclipse
Mobile OS: Android

Computer OS: Window XP
Languages:
    Embedded C for ARM
    Java for android O.S application.

B. Hardware
Android O.S based 1 mobile, SIM 300 GSM/GPRS Modem, Temperature sensor, heart beat detection sensor, LCD display,ARM7 processor.

V. TESTING AND RESULTS

A. TESTING OF SENSORS:

Fig 3. Testing of sensors

For testing temperature sensor and heart beat sensor the reading is displayed on LCD display.

B. TESTING OF SIM 300:

SIM 300 modem is tested by connecting the hardware to PC via RS-232 cable.

The AT commands are used to test modem if modem gives result OK this indicates hardware is working properly.

C. TESTING OF SMS PROGRAM FOR ANDROID O.S.:

SMS sending and SMS receiving programs are working properly are checked on Eclipse software by using AVD manager.

RESULT:

Fig 4.Working hardware

Fig 4. shows the working hardware and output for patient is his health is O.K.

The hardware is successfully implemented for remote health monitoring. The message in Fig 4.shows for the heart beat of 150 BPM and temperature of 37°C.

VI. CONCLUSION

In this project the system allows taking data of patients sending it through SIM 300 to the doctor who moves around with Android operating system in mobile. This system permits great freedom to patient and gives them confidence that medical services can be delivered in time at right spot. It is also easy to use and provides accurate measurements with low cost.

REFERENCES

[1] Design of Medical Remote Monitoring System Base on Embedded Linux.The IEEE International Conference on Information and Automation, June 2011.

[2] Android on mobile devices: An Energy perspective, 10th IEEE International Conference on Computer and Information Technology 2010.

[3] Analysis of Android Applications' Permissions, IEEE Sixth International Conference on Software Security and Reliability Companion, 2012.

[4] Smart Elderly Home Monitoring System with an Android Phone, International Journal of Smart Home Vol. 7, No. 3, May, 2013.

[5] A Health Monitoring System Using Smart Phones and Wearable Sensors, International Journal of ARM, VOL. 8, NO. 2, June 2007.

[6] Patient monitoring system using android technology.IJCSMC, Vol. 2, Issue. 5, May 2013, pg.191 – 201.

[7] Research on Development of Android Applications, Fourth International Conference on Intelligent Networks and Intelligent Systems, 2011.

[8] J.F. DiMarzio, Android A Programmer's Guide, Chicago:McGraw-Hill,Jul. 2008.

[9] Android developer, http://developer.android.com/intl/es/sdk/index.html, Accessed May 26, 2009.

[10] D. Seal, ARM Architecture Reference Manual, 2nd edition-Wesley, 2001. http://www.androidin.com.

[11] T. Gao, D. Greenspan, M. Welsh, R. R. Juang, and A. Alm. Vital Signs Monitoring and Patient Tracking Over a Wireless Network. IEEE Engineering in Medicine and Biology 27th Annual Conference, Shanghai, China, September 2005.

[12] Develope Patient Monitoring and Support System Using Mobile Communication and Intelligent Reasoning, Proceedings of the 2009

[13] IEEE International Conference on Systems, Man, and Cybernetics

[14] San Antonio, TX, USA - October 2009.

[15] Intelligent Mobile Health Monitoring System (IMHMS), International

[16] Journal of Control and Automation,Vol.2, No.3, September 2009.