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ARM Based Smart Health Monitoring Using GSM Technology

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Abstract— Health is the most important factor in every living life. This paper proposes smart health monitoring based on GSM which uses ARM7LPC2148 controller. There are many parameters that are to be monitored. Here three parameters are taken for consideration, namely Heart rate, BP and Body temperature. The sensed data will be notified through SMS using GSM and displayed through LCD and also by Buzzer.

Keywords— GSM, ARM 7 LPC2148, TCRT1000, LM35, LCD

I. INTRODUCTION

This paper mainly aims at rural people and remote areas. GSM is a trending technology which is used to send SMS notifications. In this paper body temperature, BP and Heart rate is measured using sensors and if there is any variation found then the message will be sent to the particular doctor and to the particular caretaker. There are numerous types in health monitoring [1]. Message should be sent only to the concerned care taker and to one particular doctor. But this was the drawback [2] where the message is sent to all the registered doctors. This paper uses sensors for measuring the parameters and these data are given to the controller ARM 7 LPC2148. Body temperature, BP and HR are measured and if the variation is found above or below certain limit then the message is sent to both doctor and to nurse or person who is taking care. The message will be displayed on the LCD screen and beep sound of buzzer is on. Every status of the patient is sent to the particular doctor and to the particular person.

II. METHODOLOGY

The block diagram shown in figure 1 consists of ARM 7LPC2148, LM35, TCRT1000, BP sensor, LCD display, GSM and buzzer.

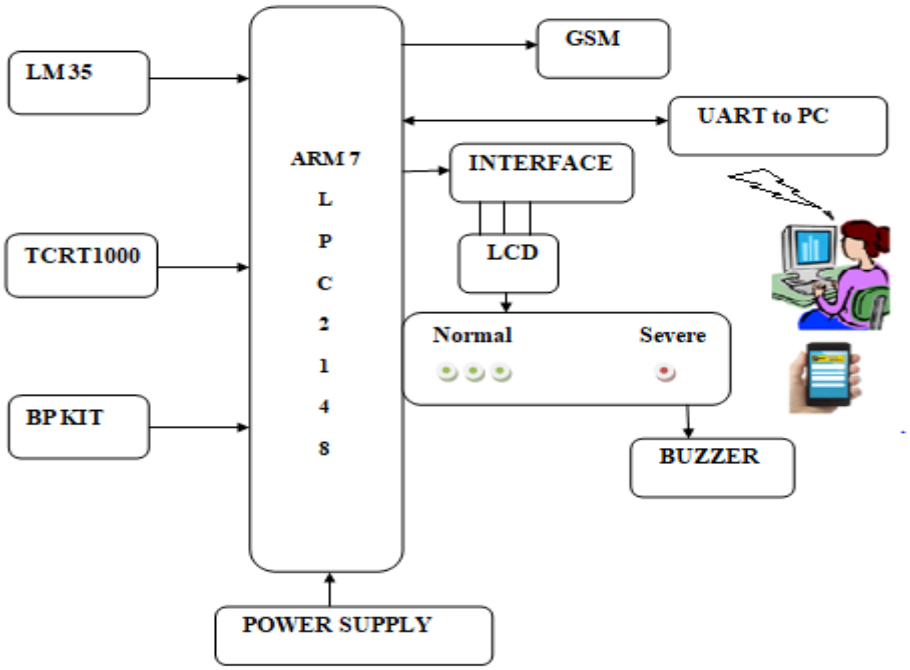

Fig 1: Block diagram

A. ARM 7 LPC2148

ARM 7 controller which is 16/32 bit microcontroller is used in this system because of its RISC architecture and also it found effective when compared with 8051.

B. LM 35 sensor

Temperature sensor is device which is designed specifically to measure the hotness or coldness of an object. Here LM35 temperature sensor is used because it measure more accurately than with a thermostat.

C. TCRT1000 Sensor

Heart beat sensor used here is TCRT1000 which finds the pulse rate. TCRT1000 simplifies the sensor because both infrared light emitter diode and detector are arranged side by side in a leaded package which blocks the surrounding ambient light which may affect the sensor performance.

D. BP KIT

BP kit is used for measuring BP of the patient. The measured data is displayed on the LCD which gives systolic and diastolic pressure.

E. GSM

GSM works with AT commands. GSM 900 is used in this system foe sending message notification. If the GSM is verified and tested then it responds OK for the AT command. This system is based on GSM technology.

F. 16X2 LCD display

To display any alpha numeric data lcd display is used. It is a 16 pin device. Here the live data are displayed on LCD.

G. BUZZER

Piezo electric buzzer is used in this system for audio alert. When the patient data like temperature, BP or HR goes below or high then this beep audio will on as alert.

H. UART

For serial communication purpose this protocol is used.

I. Flash magic

This tool is used for dumping the written code.

J. Keil u Vision 4

This platform is used for writing the code.

K. Embedded C

The code is written using Embedded C language.

III. IMPLEMENTATION

A. *ALGORITHM*

1. Initialization of LCD
2. Initialization of GSM
3. Initialization of GPIO of microcontroller
4. Different sensors measures different data and send it to the microcontroller.
5. Microcontroller reads the data and displays it on LCD.
6. If the reading is above or below the limit, message is displayed on LCD, SMS is sent and BEEP audio is on.

When power supply is given to the system, the system is turned on. LCD has to be initialized when the system is on. After this initialization GSM has to be initialized followed by GPIO of microcontroller. The sensors will be sensing the data when the system is on, these sensed data are given to the controller. LCD will display this data. As this system uses GSM technology, message has to be sent to the doctor and to the care taker. So whatever the sensed data is collected is sent as SMS. If there is any emergency one can take soon action by hearing beep sound of buzzer. By this danger that can be caused to a patient can be avoided.

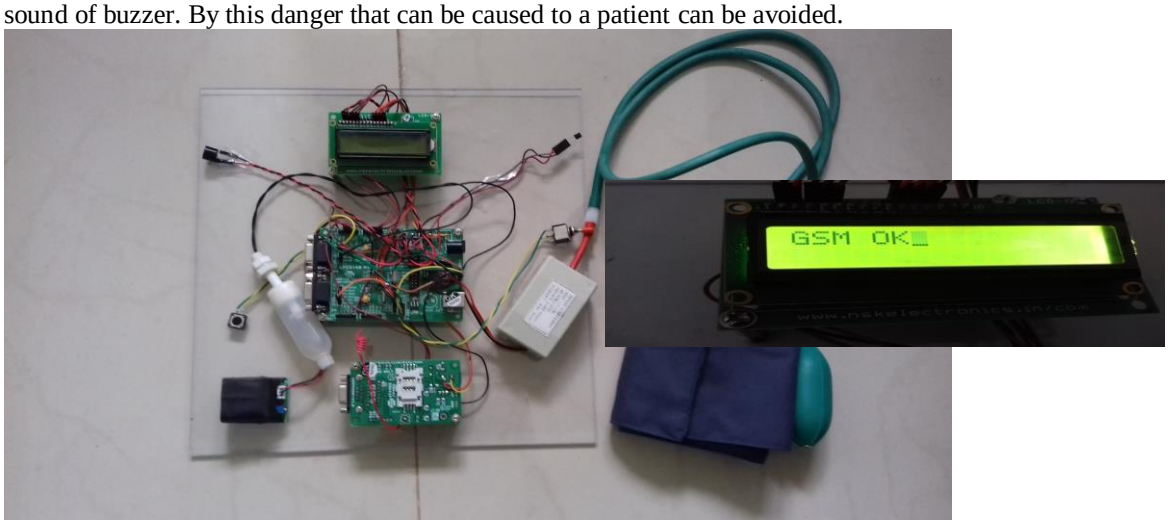

Fig 2: Proposed System

LM35 sensor senses the body temperature and if the temperatures is below or above the limit SMS is sent displayed and buzzer is indicated. TCRT1000 measures HR of patients. It consists of LED and conductor. When the finger is inserted in the sensor it measures the HR and gives the output which can be observed on LCD and also in SMS. BP is measured by using BP kit. There are two types of Blood pressure, Systolic and diastolic BP. If there is any variation in BP one can take necessary actions with the help of SMS, LCD and Buzzer alert. By this system number of death rates, danger that can cause to a patient can be reduced.

IV. EXPERIMENTAL RESULTS

A. LCD results

Fig 3: LCD display results

Fig 3 shows the 16X2 LCD output when power supply is given to the system. It starts searching for the GSM signal soon when the system is on, GSM works mainly on AT commands. If the GSM is working, then it responds to the AT command.

Fig 4: LM35 and TCRT1000 results

Body temperature of the patient is found with the help of LM 35 sensor. It measures the current temperature and gives the output as shown in figure 4. TCRT 1000 calculates HR and displays the result as shown in figure 4. If there is any decrease or increase in the temperature or the HR then necessary actions can be taken to avoid danger.

Fig 5(a): BP kit result if BP is high

Fig 5(b): Diastolic BP result

After when the BP is measured its data is displayed on LCD as shown in figure 5(a) and 5(b). If BP increases its limit then LCD will display as shown in figure 5(a). And at this time buzzer will give the alert. Figure 5(b) shows the diastolic pressure.

B. Flash magic Output

When the sensor senses the data, the output will be displayed on the pc window too. Flash magic is used for this displaying of data on PC with baud rate of 9600 and COM 4 port is used. The figure 5 shows the yield obtained from flash magic tool.

Fig 6: Flash Magic tool output

C. SMS Output

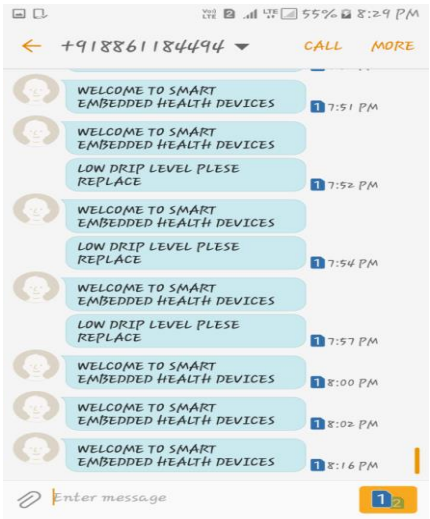

Fig 7: SMS output

As this system is mainly on GSM technology, the SMS which are sent as notifications are shown in figure 7. This message alert helps to take care of patients by providing proper assistance. Doctors also can provide proper assistance in case of emergency.

D. Comparative Results

The obtained results from the proposed system are compared with the values obtained from hospital monitoring. Since in hospitals various other devices are used for measuring the above mentioned parameters, this comparison is made.

It is observed from the hospital measurement is that body temperature gives variation of 1 to 3°C. In hospitals thermometer is used and here LM35 is used.

HR varies upto 5BPM. In hospitals HR is calculated by Beats Per Minute and here by using sensor. This variation may occur due to improper insertion of the finger. And also if the LED is week then the sensor cannot detect pulses and hence the variation.

BP is measured using mercury sphygmomanometer in hospitals and here by using BP kit and it varies upto 10mmhg.

V. CONCLUSIONS

The proposed system is mainly designed for people who cannot afford routine checkups. The results obtained are found appreciable when made comparison with literature. This system helps in reducing number of death rates and helps in providing proper treatment at proper time. By observing the result it concludes that the system is helpful for taking care of patients who are at remote area and the obtained results are found appreciable. In future other parameters can be calculated by other sensors.

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