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GSM BASED PATIENT MONITORING SYSTEM

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ABSTRACT

Today world is fastest growing in science technology as well population increases drastically with this increasing population there is drastic changes in environment and it hearts human's like B.P problems, heart attack problem ,In severe cases patient need to be in continuous observation and it is impossible by the human being to observe patients health parameters continuously. In this paper, an attempt has been made to make a system that continuously observes the patient health parameter. The cost of this system is cheaper, it is using microcontroller and GSM based advance patient monitoring system. This system continuously measure intensive parameter of patient, if any abnormal condition occur with patient health parameter system inform to the person or doctor whose number is stored in the patient health parameter .Due to these parameter we can take fast treatment to the patient without waiting time, this system is advantageous in big cities where huge number of patient are admitted. we can add many more function in this system, like video monitoring ECG etc.

Index Terms:- patient monitoring, health parameters

I. INTRODUCTION

In this fast age of life it is impossible to stay near to our dear ones who is suffering from any physical disorder or any disease ,also constant monitoring of the patients body parameter such as temperature, pulse rate sugar level etc becomes difficult. Also in intensive care unit it is necessary to monitor patient's health parameters continuously and keep their record. And there is a possibility of human errors. Hence to remove human errors and minimize excessive burden of continuously monitoring patient's health from doctor's head, we are proposing the patient monitoring system using GSM. This paper suggest the integration of wireless communication to the medical application.

This system continuously observe patient and in the event of emergency it sending signs to doctor and patient relatives. main aim of this system is to have continuous monitoring of important physiological parameters of human body during critical condition. the System used for continuously measuring the value of the patient's important physiological parameters such as blood pressure, body temperature pulse rate, respiration rate and other health-related criteria automatically. this system is highly portable and can be used at home also.

II. SYSTEM DEVELOPMENT

In the proposed system microcontroller is used, the cost of the system will very less. For transmission of message GSM technique of messaging can be used, due to This message can be any time any were in the network. So the proposed system is very cost effective and the vital parameters are measured and sent accurately to the numbers which are already store in the system. So the efficiency of hospital and doctors can be increased by the proposed system. The programming is in assembly language and AT commands of GSM is used for the transmission of message.

The O/P of signal is very weak; to produce this signal we need to amplify it to desired level with the help of signal conditioner and instrumentation amplifier. The output of instrumentation amplifier is given to analog to digital converter. These converted signals are then fed to microcontroller 89S52 microcontroller display these respective values on LCD display. Microcontroller then compares this value with the hard codes values given to microcontroller by user through keypad. These values are stored in memory of microcontroller. If measured values cross the limit of reference values then microcontroller will active relay which is connected to alarm circuit. It also send SMS to two mobile numbers stored in memory trough GSM modem. Microcontroller continuously displays these variables on the LCD Display. Microcontroller continuously does this work thus providing a real time monitoring of temperature heart rate and blood pressure of patient.

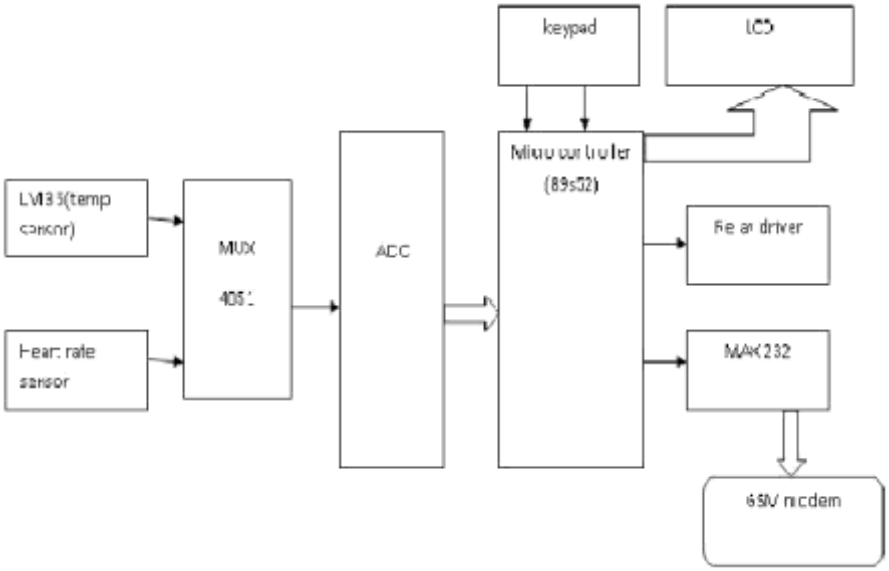

Fig 1.1 System Development

Heart rate sensor design:- development system heart beat measurement sensor is developed using different OPAMPS such as LM 358, OPAMPS 07 and other IC's MCT2E IC 4538 etc. This sensor is based on the concept of ECG. In the developed system three electrodes are used as ECG leads. Two of them were connected on the body and the third one was used as ground. The circuit diagram of developed heart rate measurement sensor is as shown in the cost of sensor which measured heart beat is very high to reduce the developed system chest sensors are used for sensing ECG signal.

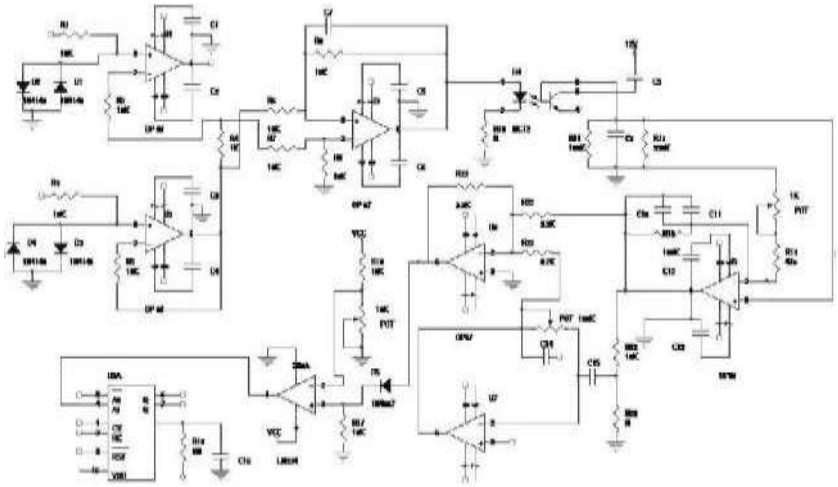

Figure 1.2 :- circuit diagram of heart rate sensor

Range of this ECG signal is in mV but the output required for ADC is near about 2.5 volts hence the gain of overall system is set to 1000 output of the ECG sensor is then given to instrumentation amplifier. All the resisters connected to instrumentation amplifier are of 20 kΩ and variable resister is of 1 kΩ, hence the gain of instrumentation amplifier is calculated as,

$$G1 = 1 + \frac{R2}{R1}$$

$$=1+\frac{2 * 10 * 108}{1 * 108}=21$$

IC 620 is used as instrumentation amplifier in the developed system. Output of instrumentation amplifier is given to the opto coupler MCT2 and then it is given to next processing circuit.ECG signal used for diagnostic purpose is in the range of 0.05 Hz to 100 Hz, but the required signal for the system is from 0.5 to 30 Hz, hence design a high pass filter having cut off frequency 0.5 Hz

$$Fc=\frac{1}{2\Box RC}$$

Take R=330KΩ

$$0.5=\frac{1}{2\Box * 330 * 103*C}$$

C = 9.64 * 10-7

Output of this high pass filter is now given to single amplifier whose gain is set 1000/21= 47.61 the gain of this amplifier is adjust to 47.61 so that overall gain of the system is 1000.

Gain of this amplifier is given by

$$G2= 1+\frac{Rf}{R1}$$

Select value of Rf= 100KΩ

$$47.61 = 1+100k\_\_ R1$$

$$R1=2.14K\Omega$$

2.14 Ω is not standard resistor value, so fix resistor of 1.8 KΩ and pot of 1 KΩ is used to adjust the value of 2.14 KΩ the notch filter is used to eliminate the 50 Hz frequency signal. It is narrow band reject filter. Notch out frequency at which maximum attenuation occurs.

$$fn=\frac{1}{2\Box RC}$$

In notch filter designC < 1μF hence C=0.068μF

$$\Box\ R=46.81K\Omega$$

Hence taking standard value

$$R=47K\Omega$$

The output of notch filter is given to the DC offset null circuit. The DC offset presents in the system may vary from to 25 mV. This circuit is used to remove this offset present in the system. From data sheet maximum input DC offset for P07 is 25μV. The gain of system is 1000 hence the maximum DC offset is 25mV.

The maximum possible output voltage V00

is $V_{00} = V_{i0} * A_{00}$

Where $A_{oo} = 1 + \frac{R_f}{R + R_{23}}$

Where $R_f = 3.9K\Omega$, $R_{23} = 8.2\ K\Omega$ $R_a = 100\ K\Omega$

$\Rightarrow A_{oo} = 1.117$

Therefore maximum DC offset that can be removed by this circuit is $V_{oo} = 27.952mV$

After removing DC offset the signal is given to comparator LM324. It compares this signal with the reference signal and gives compared output. For comparator reference voltage is obtained from voltage divider arrangement of 10 KΩ resistors and 10 KΩ pot at the inverting terminal and input signal is given at non inverting terminal. The signal from comparator is given to the multi vibrator 4538 which gives square pulses according to compared signal these pulses later on given to microcontroller.

Working principle:-In the developed system LM35 is used as temperature sensor. It gives analog, which changes 10mV per degree Celsius. This sensor output is given to the ADC 808. The ADC808 gives digital count corresponding to the input voltage applied to it. Input voltage in range of 0V to 2.5V is given for each sensor. The corresponding digital output will be 0 to 255. The output of the voltage divider circuit is connected to the ADC808 which converts it to the digital count. In the developed system chest sensor are used and circuit is designer for sensing heart signal.The output of the ADC is hex format. The microcontroller will convert it in to BCD format and then in to ASCII format to display different readings of different parameters on LCD. The data lines D0-D7 of LCD are connected to port 0 of microcontroller. The controller lines RS (resister select) R-W(read/write)and enable of LCD are connected to port pins P3,5,P3,6,3,7 of microcontroller respectively.

Whenever temperature heart rate or many parameters exceeds there selecting range at that time message will be sent trough GSM port which is connected trough MAX232

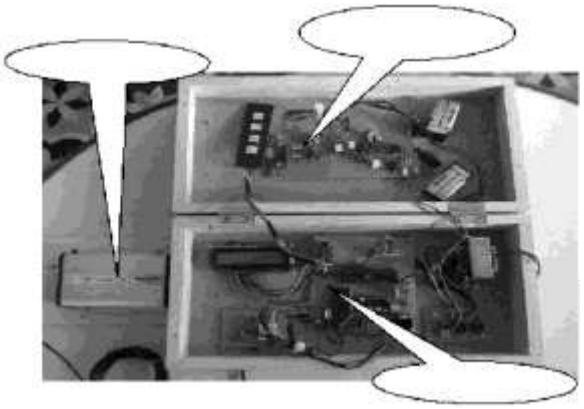

Figure 1.3:- hardware of implemented system

The different physiological variables to be monitored & controlled remotely are sensed & converted into analogous from i.e. digital form. Here microcontroller performs various operation & gives desired output. We have partially implemented the project to monitor temperature heart rate and blood pressure of the patient remotely.

III. RESULT ANALYSIS

For testing system following steps will perform

1. By using keypad enter mobile no to witch message is to be sent.
2. Enter second mobile no to witch message is to be sent.
3. Set time after witch message is to be sent.
4. Set temperature limits using keypad.
5. Set heart rate limits using keypad.
6. Set blood pressure limits using keypad.

Table 1.1:Testing result

Set Temp	Set Heart Rate	Set Bp	Temp On LCD	HR On LCD	BP On LCD	Temp On Therm	Manual HR measu	Msg Sent
20-40	60-90	80-90	27	87	85	27	86	Temp- 27 HR-87 BP-85
20-40	60-90	80-90	30	83	85	30	83	Temp- 80 Hr-83 BP-85

Table 1.2: Test result when temp exceeds limits

Set Temp	Set Heart Rate	Set Bp	Temp On LCD	HR On LCD	BP On LCD	Temp On Therm	Manual HR measu	Msg Sent
10-20	60-90	80-90	21	76	85	21	76	Exceed Temp-21
10-20	60-90	80-90	21	79	85	21	79	Exceed Temp- 21
10-20	60-90	80-90	21	79	85	21	78	Exceed Temp-21

IV. CONCLUSION :

After successful completion of this research work it can be concluded that the microcontroller based system can be effectively used as communication medium in conjunction with GSM. Sensor designed in the developed system gives accurate reading so it can be said that the developed system is very cost effective and accurate. The accuracy of the system is up to 99%. paper proposes an effective method of patient monitoring System development using GSM.

V. REFERENCES

[1]. Cyber-Physical Medical and Medication Systems by Albert M. K. Cheng, 2008.
[2]. Wireless Transfusion Supervision and Analysis Using Embedded System Nivedita Daimiwal, DipaliRamdasi, RevathiShriram, AsmitaWakankar, 2010.
[3]. International Journal of Embedded Systems and Applications (IJESA) Vol.1, No.2, December 2011
[4]. A low cost model for patient monitoring in Intensive care unit using a micro web-server by JoãoBosco da MotaAlver Juarez Bento da Silva ,SuenoniPaladini.
[5]. Steve Heath, 'Embedded system and design' butterworth-heinemann publications, New Delhi, first edition, 1997.
[6]. Microchip company, 'EmbeddedSolutions', microchip publications, first edition, 1999.
[7]. TammyNoergaArdewnes, 'EmbeddedSystems Architecture', first edition 1999.
[8]. Paul Sherriff, 'visual basic 6', prenticehall publication, New Delhi, first edition1999.
[9]. Arnold Berger,' Embedded System Design', first edition 1997.
[10]. http://www.microchip.com[pic microcontroller]
[11]. http://www.gnokii.org [mobile interface]