Remote Patient Health Monitoring System

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Abstract—Cardiovascular disease is one of the Major cause of death. Prior Detection of diseases related to heart and providing treatment has higher potential of reducing fatality. Continuous observation of such patients is one of the possible solutions. This module uses advanced technology to monitor the patient health those who are suffering from heart diseases & physical disorder. The system consists of heart rate sensor and temperature sensor and moisture sensor used for continuous monitoring of patient's body temperature, heart rate and body moisture. Traditional medical instruments such as thermometer, oximeter, etc have been ruled out as the Sensors give almost précised output. If reading varies from the set threshold, message along with readings will be sent to the guardian using GSM modem. This module provides relief to medical advisory for patient monitoring as the module is portable.

Keywords—GSM modem, Heart beat sensor, temperature sensor ,LCD, PIC microcontroller

I. INTRODUCTION

Nowadays, Major cause of death in human beings is the heart diseases , in particular Heart attack immediate treatment after diagnosis, to avoid mortality or further damage as secondary to the mentioned diseases or disorders. Such patients needs to be monitored continuously and can be done only at hospitals or healthcare centers. Module consists of designed heart rate sensor, temperature sensor and moisture sensor which measures the heart rate, body temperature and body moisture. Temporary data is stored in PIC18F452 microcontroller. If there are any problems in the heart beat, body temperature, or body moisture, warning SMS is sent to the guardian regarding the patient’s condition using GSM module. LCD displays all the measured values.

II. PROPOSED SYSTEM

A. Block Diagram

B. Heart Beat Sensor

The sensor which measures heart beat gives analog output of heart rate when a finger is placed closely between IR LED and photodiode. It works on the principle of photoplethography. Heartbeat is calculated by PIC in Beats per minute.
Specifications:
- Input operating voltage is +5V DC regulated.
- Operating current is 100 mA.
- Output data levels are 5V TTL level.
- IR LED of 970nm and photodiode is used in Heart beat Detection.

C. Temperature Sensor

The Temperature of the patient’s body is monitored using LM35 sensor where the output is in the form of voltage which varies linearly with body temperature. Any type of external calibrations is not required for LM35 and operating range is from 4 to 30V and provides low impedance output. It can measure a wide range from −55°C to +150°C. Temperature and voltage change are linear + 10 mV/°C.

D. GSM Modem

GSM (global sytem for mobile) is used for communication between GSM modem and mobile. It requires a power supply of 12V power supply; RS232 provides communication interface and a SIM Card to activate communication with the network. Communication in GSM can be established using the following AT commands.

<table>
<thead>
<tr>
<th>AT-Commands</th>
<th>Description</th>
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<tbody>
<tr>
<td>AT</td>
<td>Enter</td>
</tr>
<tr>
<td>AT+CMGF</td>
<td>Select SMS Message Format</td>
</tr>
<tr>
<td>AT+CMGS</td>
<td>Send SMS Message</td>
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E. LCD Display

Liquid crystal display (LCD) is a 16 pin16*2 LCD display, which means there are 2 lines of 16 characters each & each character is displayed in 5*7 matrix.

E. PIC Microcontroller

The performance of the PIC is very high but consumes very low power. It CMOS 8-bit microcomputer with 2 Kbytes EPROM. The Operating range is between 2 V to 6 V RAM Capacity is of 128x8-Bit. It has 15 Programmable I/O lines, Two 16-Bit Timer/Counter, Six Interrupt Sources, Programmable Serial UART Channel.

III. SOFTWARE DESIGN

A. Software

The software required is developed which is the combination of Basic and Assembler with the help of PIC Simulator. The commands required for the communication through serial port are included in the Simulator. To attain Stability in the software the receiver routine has been written in assembler.
B. Algorithm

Step1: Initialize all the pins of the microcontroller at the transmitter and Initialize ADC.

Step2: Initialize PC communication.

Step3: Heart beat Temperature and moisture sensor values are continuously monitored.

Step4: Display the corresponding readings in LCD.

Step5: Readings are compared with threshold values.

Step6: If the values are abnormal jump to step7 or if it’s normal go to step8

Step7: Message is displayed in LCD and SMS is sent to the guardian.

Step8: Scan DOWNKEY, if pressed start UP/DOWN counter and write to EEPROM go back to step 3.

C. Flowchart

![Flowchart](image)

Fig. 5. Flowchart
IV. EXPERIMENTAL SETUP

A. Hardware Setup

![Hardware Setup](image1)

*Fig. 6. Hardware*

B. Tested Result

![LCD Output](image2)

*Fig. 7. LCD Output*

![Messages](image3)

*Fig. 8. Message received at the receiver*

CONCLUSION

The field of Engineering where the various Engineering principles and Techniques are applied to medical related Concepts is known as Biomedical Engineering. Cardiovascular disease can be one of the major causes of death, and cardiac arrest can be detected by continuously monitoring of patients. Freedom of movement for patients can be achieved through wireless communication. The main focus is on the heartbeat monitoring, temperature monitoring and alert system. The main function of the module designed is to determine the heart beat rate per minute and temperature in Celsius. If the readings are out of threshold, the alert system will send the information in the form of short message service to the medical experts or patient’s family members, or concerned persons. This system is user friendly and cost-effective.
It is a very efficient system and very easy to handle and thus provides great flexibility and serves as a great improvement over other conventional monitoring and alert systems.

References

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