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ROUTINE MEASURING OF BIOMEDICAL PARAMETERS

Prof.P. R.Jadhav*, Prajakta Aghadte, Sarika Barhate, Pallavi Ghate
* Associate Professor ENTC Engineering, BCER, Akola, India.
Student, ENTC Engineering, BCER, Akola, India.
Student, ENTC Engineering, BCER, Akola, India.
Student, ENTC Engineering, BCER, Akola, India.

ABSTRACT

In the worlds of automation biomedical field no longer remains aloof. It also made doctors more efficient but also helped them in improving total process of medication. The basic idea behind this paper is that the patient can stay connected with the doctor and can take immediate action if necessary. The purpose of this paper is to measure the heart beat and other parameter like temperature and posture indicated it to the remote location. Also this paper deals with software part through Bluetooth module. But this paper deals with the measuring of human parameters only. This system is more portable and can be used conveniently by the patient. So by this system patient can stay connected with the doctor. This system can be also used in hospitals as monitoring system for human physiological parameters.

KEYWORDS: Biomedical, Atmega8.

INTRODUCTION

Biomedical field serves soon to the human society. In this fast and technological environment people do not get time for themselves and they are deprived of proper treatment on time. So get proper medication to the patient their physiological parameters are measured which will be helpful for primary treatment. [3]Even the person sitting at his her own place will able to measure the basic parameter. previously, there was joint family system hence patients were able to get medical help within time. But nowadays one may lost his life because of not getting proper help within time. For such heart patients this kit gives indication to patient and they immediately get medical help. Whenever beat rate of person exceeds more than 72pulse/min., doctor get immediate indication and help will be sent as fast as can. In this project we are measuring three parameter such as heart rate, temperature and body posture with the help of different type of sensors. And result shown on the display. It measures the heart rate from an index finger using a heart sensor to detect changes. The significance of the heart monitor is that it provides continuous monitoring and accurate means of measuring one's heart rate at his/her convenience.[1]

Methodology

We are measuring biomedical parameter through sensors. that sensors are connected to microcontroller Atmega8. Atmega8 measures signals at every 10 sec. and send to the Bluetooth module and display.

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Block diagram of routine monitoring of biomedical parameters:

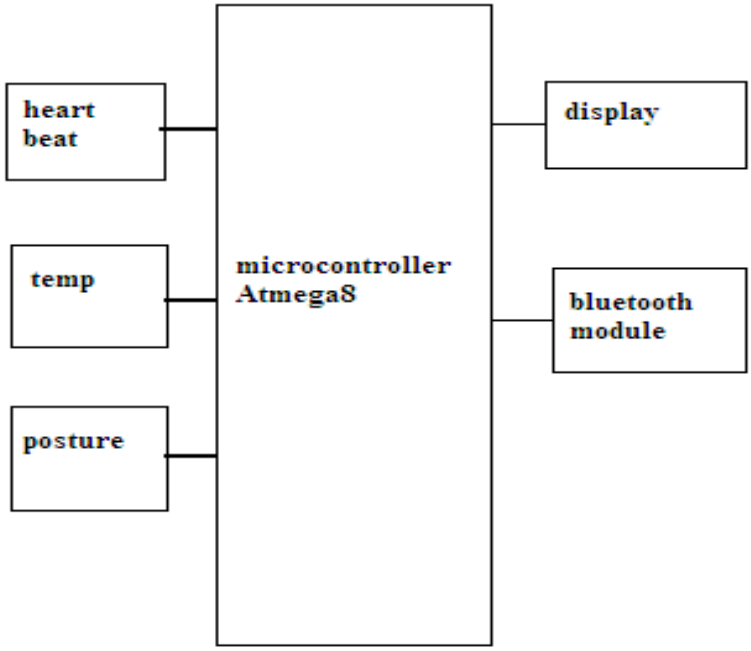

Figure 1

Description of block diagram:

The above figure shows the block diagram of biomedical instrument. here we measuring the heart rate, body temperature and posture of human body with the help of heart sensor, temperature sensor and posture detector respectively , attached to the index figure. It will forward data to the microcontroller atmega8 where it will be compared with the normal value of the body temperature and heart rate. Depending upon the parameters considered by monitor, which readings are calculated by the microcontroller it will send to the 7 segment display and also send to the Bluetooth module. If it finds any parameter disturbed then the result should be send to the doctor or any relative with the help of Bluetooth module. Thus without wasting the time patient can be treated whereas sending the report can be done using Bluetooth module.[1]

The system comprises an implantable medical device that includes a sensor operable to produce an electrical signal representative of heart sounds, a sensor interface circuit coupled to the sensor to produce a heart sound signal, and a controller circuit coupled to the sensor interface circuit. The heart sounds are associated with mechanical activity of patient's heart and the controller circuit is operable to detect a posture of the patient from a heart sound signal. This system is a portable and a best replacement for the old model stethoscope, which is less efficient.[1]

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Circuit diagram:

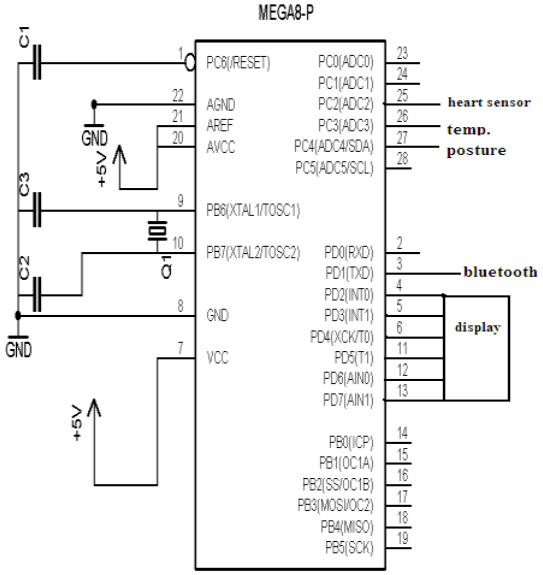

Figure 2

The above circuit shows the working of the routine monitoring of biomedical parameters. Here at pin no. 1, 9 and 10 are connected to 3 capacitors in parallel. A crystal oscillator is placed between pin no. 9 and 10.Pin no.7, 20 and 21 are connected to +5v. The capacitors are connected to GND at one terminal, also pin no. 8 and 22 also to ground.

The output of the microcontroller is given at PORT C from PC2 to PC4 as LM35, Heart Beat Sensor, to posture from Pin no. 25 to 27. The RXD of microcontroller is connected to TXD of Bluetooth module. A voltage regulator is used to regulate the voltage which is supplied form a 9v battery and gives an output of 5v. This gives the entire working of routine monitoring of biomedical parameters.

COMPONENTS OF BLOCK DIAGRAM

- Heart sensor
- Temperature sensor
- Posture detector
- Microcontroller atmega8
- 7 segment display
- Bluetooth module

Heart sensor:

Doctors measure our heart rate manually. By holding our hands they feel the nerve and look at their watch to count our heart beats per minute. Even we also can feel the pulse on our finger when our heart pumps blood into our blood vessels. This pulse is felt due to expansion and contraction of blood vessel when blood enters and leaves it. our heart does this around 72 to 84 times a minute for an healthy person. [11]

Here heart beat sensor works on very basic principle of optoelectronics. All it takes to measure heart rate is a pair of LED and LDR, microcontroller.

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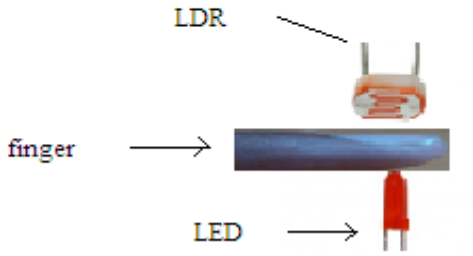
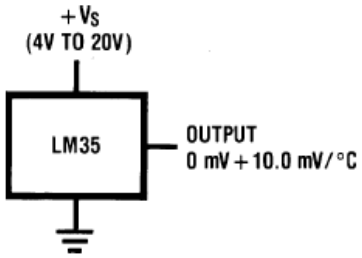


Figure 3

The sensor unit consists of light-emitting-diode (LED) and a photo diode, placed as shown above, and the finger is placed between the sensor assemblies. The LED should bright red and detector is light. LED needs to be more bright as the maximum light pass through finger and detect by the detector. When the heart pumps blood through blood vessels, the finger becomes slightly more opaque and so less light reached to the detector. Means intensity of light changes. With each heart pulse the detector signal varies. This variation is converted into electrical pulse. Then its give to the microcontroller.[7]

temperature sensor:



Basic Centigrade Temperature Sensor
(+2°C to +150°C)
Figure 4

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 µA from its supply, it has very low self-heating, less than 0.1°C in still air. The LM35 is rated to operate over a −55° to +150°C temperature range, while the LM35C is rated for a −40° to +110°C range (−10° with improved accuracy). The LM35 series is available packaged in hermetic TO-46 transistor packages, while the LM35C, LM35CA, and LM35D are also available in the plastic TO-92 transistor package. The LM35D is also available in an 8-lead surface mount small outline package and a plastic TO-220 package.[9]

Features

- Calibrated directly in °Celsius (Centigrade)
- Linear + 10.0 mV/°C scale factor
- 0.5°C accuracy guarantee able (at +25°C)
- Rated for full −55° to +150°C range

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- Suitable for remote applications
- Low cost due to wafer-level trimming
- Operates from 4 to 30 volts
- Less than 60 µA current drain
- Low self-heating, 0.08°C in still air
- Nonlinearity only ±1⁄4°C typical
- Low impedance output, 0.1 W for 1 mA load

Posture detector:
The ADXL103/ADXL203 are high precision, low power, complete single- and dual-axis accelerometers with signal conditioned voltage outputs, all on a single, monolithic IC. The ADXL103/ADXL203 measure acceleration with a full-scale range of ±1.7 *g*. The ADXL103/ADXL203 can measure both dynamic acceleration (for example, vibration) and static acceleration (for example, gravity). The typical noise floor is 110 µ*g*/√Hz, allowing signals below 1 m*g* (0.06° of inclination) to be resolved in tilt sensing applications using narrow bandwidths (<60 Hz). The user selects the bandwidth of the accelerometer using Capacitor CX and Capacitor CY at the XOUT and YOUT pins. Bandwidths of 0.5 Hz to 2.5 kHz may be selected to suit the application. The ADXL103 and ADXL203 are available in 5 mm × 5 mm × 2 mm, 8-pad hermetic LCC packages.[10]

microcontroller atmega8:
The ATmega8 is a low power CMOS 8-bit microcontroller based on the AVR RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega8 achieves throughputs approaching 1MIPS per MHz, allowing the system designer to optimize power consumption versus processing speed.[8]

Pin diagram:
Atmega8 is 28 pin PDIP IC. Which has three port. Each port is 8 bit bi-directional I/O port with internal pull up resister. The ATmega8 features a 10-bit successive approximation ADC. The ADC is connected to an 8-channel Analog Multiplexer which allows eight single-ended voltage inputs constructed from the pins of Port C. The single-ended voltage inputs refer to 0V (GND). The ADC contains a Sample and Hold circuit which ensures that the input voltage to the ADC is held at a constant level during conversion.[8]

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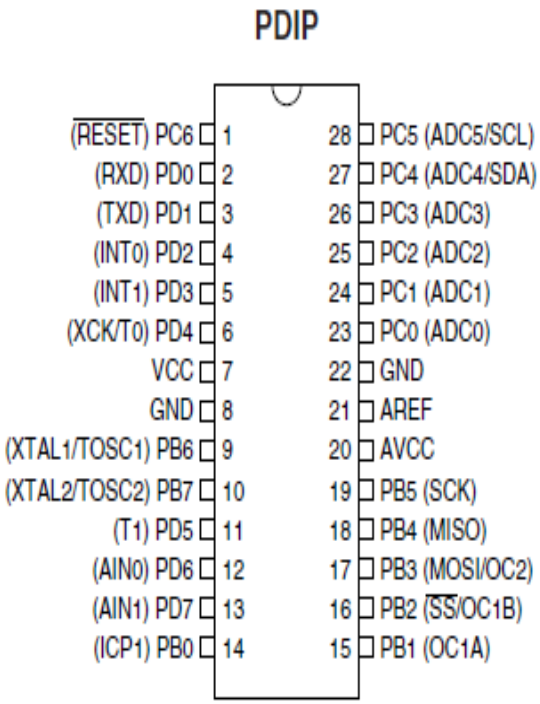

Figure 5

Features of Atmega8

- High performance, Low power AVR 8 bit microcontroller
- Advanced RISC Architecture
- High Endurance Non-volatile Memory segments Peripheral Feature
- Two 8-bit Timer/Counters with Separate Pre-scaler, one Compare Mode
- One 16-bit Timer/Counter with Separate Pre-scaler, Compare Mode, and Capture Mode
- Real Time Counter with Separate Oscillator
- Three PWM Channels
- 8-channel ADC with 10-bit Accuracy
- 6-channel ADC with 10-bit Accuracy
- Byte-oriented Two-wire Serial Interface
- Programmable Serial USART
- External and Internal Interrupt Sources
- Five Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, and
- Power Consumption at 4 Mhz, 3V, 25°C
- Active: 3.6 mA
- Idle Mode: 1.0 mA

Bluetooth module:

For future aspect we use here Bluetooth module. With the help of that we should send the calculated parameter to doctor. The Bluetooth module is HC05. HC-05 embedded Bluetooth serial communication module (can be short for module) has two work modes: order-response work mode and automatic connection work mode. And there are three work roles (Master, Slave and Loopback) at the automatic connection work mode. When the module is at the automatic connection work mode, it will follow the default way set lastly to transmit the data automatically. When the module is at the order-response work mode, user can send the AT command to the module to set the control parameters and sent control order. The work mode of module can be switched by controlling the module PIN (PIO11) input level.[12]

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Specification

1. Chipset CSR BC417143
2. Bluetooth version V2.0+EDR
3. Output power class II
4. Flash 8Mbit
5. Power supply 3.3V
6. Size 26.9mm*13mm*2.2mm

RESULT

In this paper we are measured biomedical parameters like temperature, heart rate and body posture through different type of sensors and signals are displayed by using microcontroller.

CONCLUSION

This paper deals with the measuring of human physiological parameters which will be convenient to the patient. This system can be easily portable and by this system patient can stay connected with the doctor.

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