Heart Rate Monitor System Using 8051 Microcontroller

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ABSTRACT

The heart rate is one of the important parameters of human cardiovascular system. Heart rate is the number of times the heart beats per minute. The readings of heart rate helps us to know various states of the body such as stress, concentration, drowsiness and the active state of the autonomic nervous system. This paper highlights on the design of heart rate monitor system using 8051 microcontroller. It is designed in such a way that the heart rate is measured at the finger tip based on the change in blood volume. Thus, monitoring of heart rate plays a vital role in providing the status of the health.

Keywords: Cardiovascular system, microcontroller, Heart rate

I INTRODUCTION

The Heart Rate monitor device is personal monitoring device that allows to measure the heart rate in real time or to save the readings of heart rate for later references. Heart rate measurement is one of the very important parameters of the human cardiovascular system. The heart rate of a healthy adult at rest is around 72 beats per minute. Athletes normally have lower rates than less active people. Babies have a higher rate at around 120bpm. The readings rises gradually during exercises and returns slowly to the normal value after exercise. The rate at which the pulse returns to the normal value will indicate the fitness of the person. There is a scientific word known as Bradycardia which means the condition where lower than the normal heart rate is present and higher than the normal heart rate is known as tachycardia. More than 2 million people are at risk of heart attack. It would be helpful if these people can check their heart rate easily.

Especially for cardiac patients, online long-term monitoring plays a pivotal role. It provides critical information for long-term assessment and preventive diagnosis for which long-term trends and signal patterns are of special importance. Such trends and patterns can hardly be identified by traditional examinations. Those cardiac problems that occur frequently during normal daily activities may disappear the moment the patient is hospitalized, causing diagnostic difficulties and consequently possible therapeutic errors.

It is true that costly medical instruments provide very satisfactory service to the patients related to the diagnosis and treatment point of view. Again, it is a fact that many people could not access such costly service due to socioeconomic structure of the country. Hence, design and development of low cost device using latest technology should be given priority to facilitate the access for every patient to have satisfactory service.

This device consists of Heart-beat sensor, an Amplifier, 8051 Microcontroller, 16X2 LCD display. Sensor is used to sense the heart rate which is tconverted into digits using n amplifier which increases the low power heart rate signals from the sensor and sends those signals to microcontroller, where the timers and counters are used in the program to calculate the number of beats per minute.

II RELATED WORK

Several methods have already been proposed and implemented regarding the design and development of devices for heart rate monitoring

1.1   Development of precision digital instrument for calculation of heart rate , a beat-to-beat heart rate meter and heart rate meter based on frequency grading have been proposed .Nakajima et al. described photo-plethysmographic measurement of heart and respiratory rates using digital filters.

1.2   Yokoyama et al. and A. Wrong et al. stressed on the measurement of heart rate based on musical data and current steering technique respectively.

1.3   Kang et al. have proposed an electrocardiogram (ECG) and photoplethysmography (PPG) monitoring device worn on wrist. The idea of using the human face for physiological measurements was first introduced by pavlidis and associates in 2007.

III PROPOSED WORK

Working of the device

The heart-rate monitor system mainly consists of AT89S52 microcontroller. The main feature of that is it is a low-power consuming, CMOS 8-bit microcontroller. It has an in-system programmable flash memory. This we use to involve the counters, timers and clock that help us calculate the approximate value of the pulse rate. Another important block of this circuit is the sensor that helps us to sense the pulse depending upon the volume of the blood at the finger tip. The volume of blood at the tip is the same as the pulse rate. LED is used to help an individual know that the pulse is being detected. It consumes less DC power of 5V. Next is the buzzer which alerts the person in case of abnormal heart-rate. An adult can have pulse rate between 70-100 BPM.Lcd display displays the pulse rate readings on the screen. It has digital numbers that is displayed. The user can decide the next step by knowing the readings.
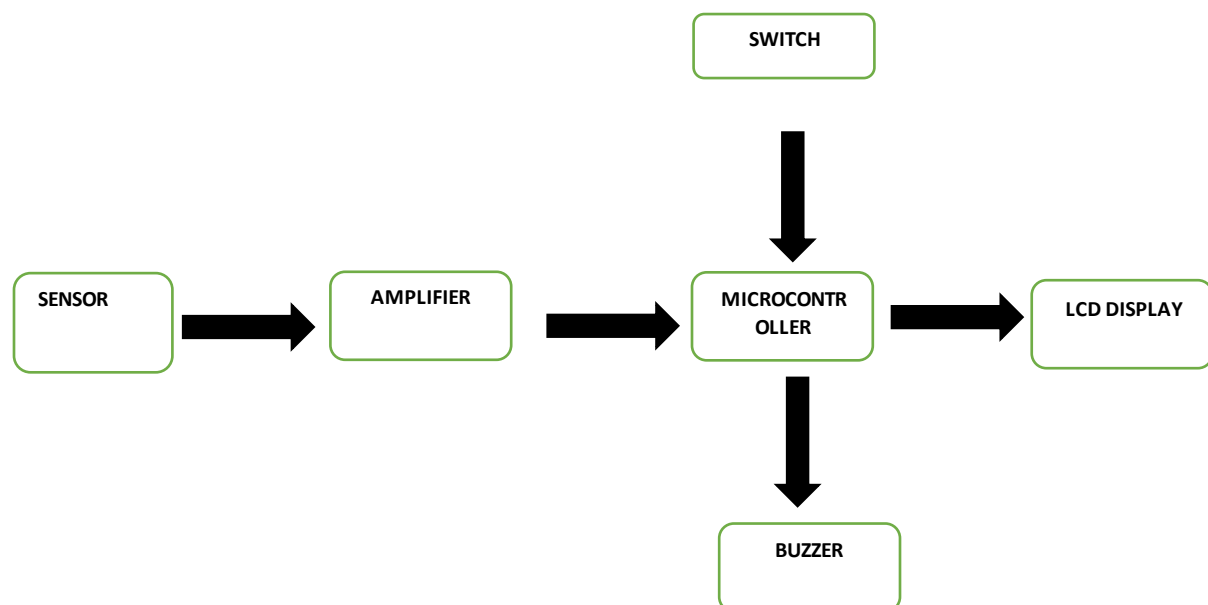

Fig 3.1 Block diagram of heart-rate monitor system

Software Description

Keil software is used in heart-rate monitor system. This software was introduced in 1992 by two people Gunter and Reinhard Keil. This tool is used to compile and this being helpful in programming assembly code for 8051-Microcontroller. It consists of ANSI C compiler, macro assembler, debuggers, simulators, linkers.

ISP- In system programming

Also called as in-circuit serial programming. It allows to involve both programming and testing in a single phase and helps reduce the cost. It helps one to change the program as required by the user than getting already programmed chips that does not have an advantage of editing them.
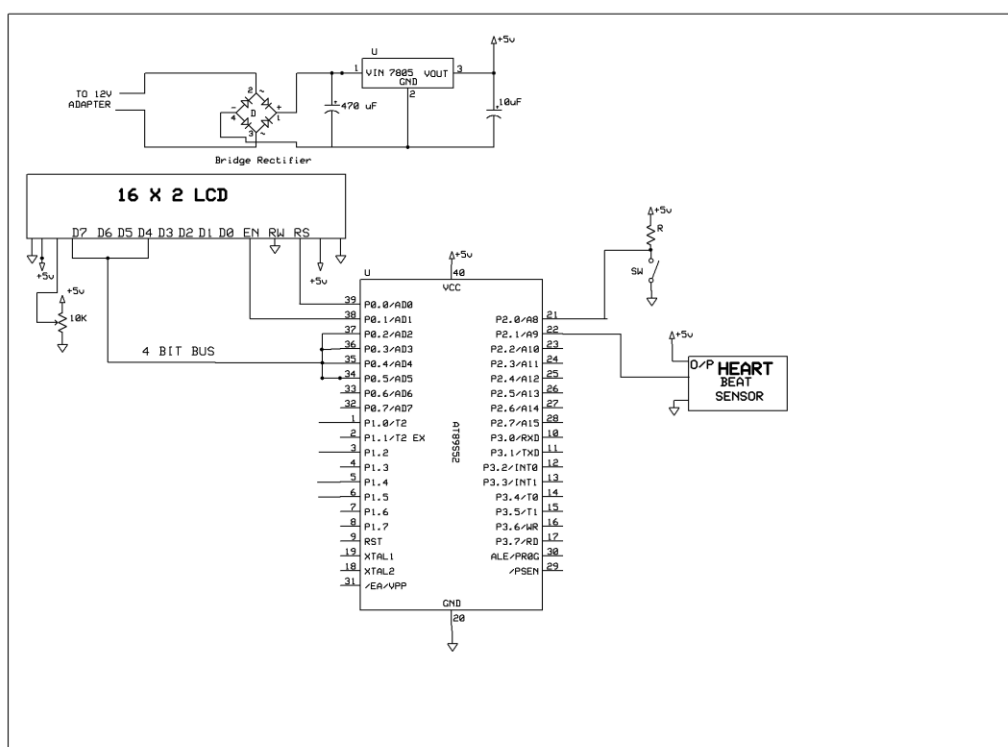
The Hardware Setup

Fig 3.3 Hardware setup of heart rate monitor system

The above figure 3.3 shows the circuit digram of the heart rate monitor system using 8051 microcontroller.

IV HARDWARE AND SOFTWARE REQUIREMENTS

Table 4.1 hardware and Software requirements

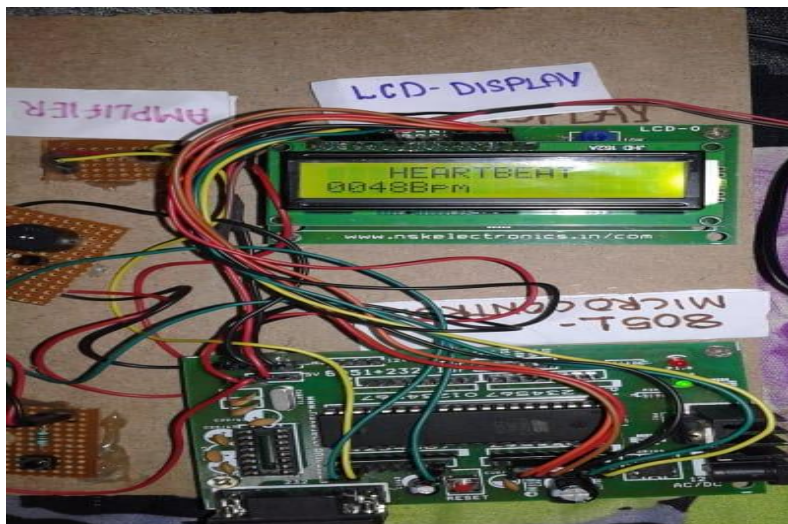| Hardware Requirements	Software Requirements
Heart beat sensor	1.AT89S52 Microcontroller
Buzzer	2. ISP
12 V Adapter	
16X2 LCD Display	
Switch	
10K Resistor	
10μF, 470μF Capacitors	

V RESULTS

Fig 5.1 Result of the monitoring system

In the above figure 5.1 the reading of the system is displayed as 48BPM which is an abnormal reading of an individual. This alerts the user that there is some issues in health and immediate action is to be taken.
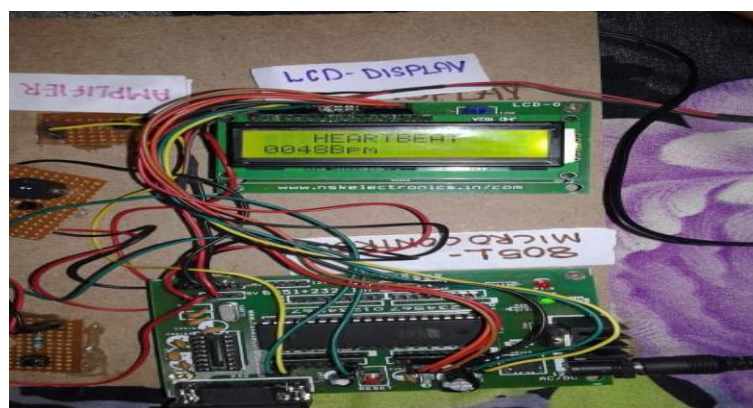

Fig 5.2 normal result of the system

In the above fig 5.2 the reading displayed on the LCD screen is normal which confirms that There is no health issue related to cardiovascular system.

VI CONCLUSION

From the above study, it can be concluded that the designed low-cost heart rate monitor system can function efficiently by producing the approximate readings as that of standard device. Due to absence of complex features, the designed device can also be handled by any non-medical professionals also. Thus it can be used anywhere, it is portable, lightweight device. But, it must be noted that the proper placement of finger tip over the sensor is very important to get accurate results. The device can be further improved using latest technology such as Arduino and Raspberry pi.

VII ACKNOWLEDGEMENT

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