Real Time Heartbeat Transmission using Antenna

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Abstract— A ZigBee sensor network for data acquisition and monitoring is presented in this paper. A ZigBee module is connected via a USB interface to a Microsoft Windows PC, which works as a base station in the network. Data collected by sensor devices are sent to the base station PC, which is set as Wireless sensor Network (WSN). ZigBee is low power consumption, built-in security method and ratified specifications make it very suitable to be used with medical sensor devices. This application of Zigbee based network consists of a transmitter section and a receiver section. Transmitter section consists of heartbeat sensor, body temperature sensor, microcontroller, Zigbee and LCD module. In the proposed system the patient's health is continuously monitored and the acquired data is analyzed at a personal computer using Graphical User Interface(GUI). If a particular patient's health parameter is higher or lower the threshold values, an alarm system is used to alert the doctor. The aim of this system is to know the condition of patient's health by the doctor immediately and to reduce the load of the staff taking care of the patient in the hospitals.

Key words: Zigbee, Heartbeat sensor, Tempreture Sensor, 89S52Microcontroller

I. INTRODUCTION

Patient monitoring system become an important topic and research field today. Research on health monitoring were developed for many applications such as military, homecare unit, hospital, sports training and emergency monitoring system. Patient monitoring systems are gaining their importance as the fast-growing global elderly population increases demands for caretaking. These systems use wireless technologies to transmit vital signs for medical evaluation. Patient monitoring refers to the continuous observation of repeating events of physiologic function to guide therapy or to monitor the effectiveness of interventions and is used primarily in the intensive care unit and operating room. At least in India there is no system which continuously monitors the patient when patient is on move. And this motivated us to work in this area.

II. HARDWARE DESIGN

In this paper hardware used is Zigbee, LCD, microcontroller 16F887, heartbeat sensor and temperature sensor. Fig. 1 shows the functional block diagram of the system hardware. The system has been designed to take two inputs to measure physiological parameters of human body such as temperature and heartbeat. The inputs from the sensors are integrated and processed. LCD shows the patient's data. In this system, we used two Zigbee modules, one for transmitter and one for receiver. By using Zigbee modules, the data are sent to the doctor's computer. The data can be monitored on the computer usingGUI. By using Zigbee baseboard, it is easy to connect Zigbee module and computer with USB port.

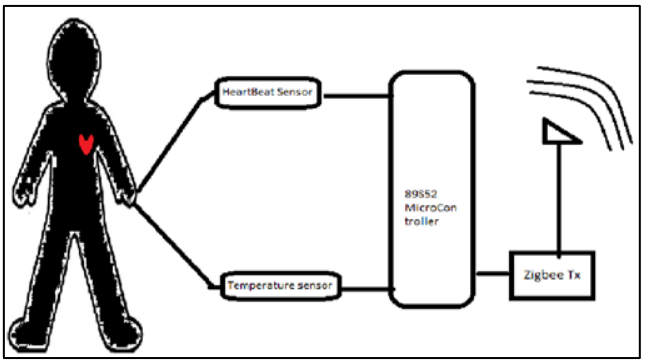

Fig. 1: Block diagram

A. ZIGBEE:

ZigBee (IEEE 802.15.4) is a low-cost, low-power, Powerful Instructions – Most Single-clock Cycle wireless mesh networking proprietary standard. The Execution, Up to 16 MIPS Throughput at 16 MHz,16 low cost allows the technology to be widely deployed Kbytes of In-System Self-programmable Flash in wireless control and monitoring applications, the program memory,512 Bytes EEPROM,8-channel, 10low power-usage allows longer life with smaller bit ADC , Programmable Serial USART, Operating batteries, and the mesh networking provides high Voltages 4.5V - 5.5V for ATmega16 reliability and larger range. Range of Zigbee is from 30 meters-1km ZigBee devices are actively limited to a through rate of 250Kbps.

IEEE 802.15.4:

IEEE 802.15.4 is a standard which specifies the physical layer and media access control for low-rate wireless personal area networks It is maintained by the IEEE 802.15 working group. Its license free frequency bands are:

1) Transmitter Module:

1) 2.4 GHz (16 channels with baud rate of 250 kbps)
2) 902 MHz – 928 MHz (10 channels with baud rate of 40 kbps)
3) 868 MHz- 870 MHz (1 channel with baud rate of 10 kbps)

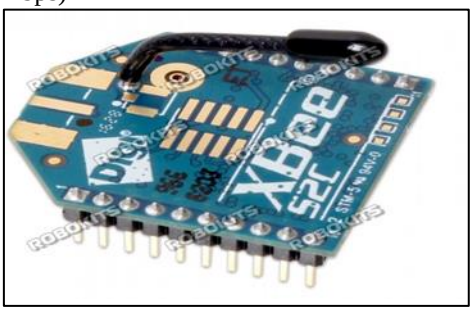

Fig. 2: Transmitter

B. Liquid Crystal Display (LCD):

The LCD is used to visualize the output of the application. It isused to check the output of different modules interfaced with the microcontroller. Thus LCD plays a vital role to see

the output and to debug the system module wise in case of system failure in order to rectify the problem.

C. Heartbeat Sensor:

Heart rate measurement indicates the soundness of the human cardiovascular system. A technique to measure the heart rate by sensing the change in blood volume in a finger artery while the heart is pumping the blood. It consists of an infrared LED that transmits an IR signal through the fingertip of the subject, a part of which is reflected by the blood cells. The reflected signal is detected by a photo diode sensor. The changing blood volume with heartbeat results in a train of pulses at the output of the photo diode, the magnitude of which is too small to be detected directly by a microcontroller. Therefore, a two-stage high gain, active low pass filter is designed using two Operational Amplifiers (OpAmps) to filter and amplify the signal to appropriate voltage level so that the pulses can be counted by a microcontroller. Measuring time for heartbeat is about 15 seconds.

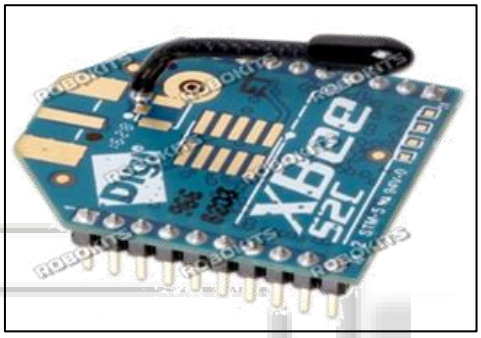

Fig. 3: Receiver

D. Temperature Sensor:

The DS18B20 digital thermometer provides 9-bit to 12-bit Celsius temperature measurement. The DS18B20 communicates over a 1-Wire bus that by definition requires only one data line for communication with a microcontroller. It has an operating temperature range of -55°C to +125°C and is accurate to ±0.5°C over the range of -10°C to +85°C.Each DS18B20 has a unique 64-bit serial code, which allows multiple DS18B20s to function on the same 1Wire bus. Thus, it is simple to use one microcontroller to control many DS18B20s distributed over a large area. Applications that can benefit from this feature include temperature monitoring systems inside buildings, equipment, or machinery, and process monitoring and control systems.

E. 89s52 MicroController:

The 89S52 has 4 different ports, each one having 8 Input/output lines providing a total of 32 I/O lines. Those ports can be used to output DATA and orders do other devices, or to read the state of a sensor, or a switch. Most of the ports of the 89S52 have 'dual function' meaning that they can be used for two different functions.512 bytes EPROM,1 Kbyte SRAM

- 32 general purpose I/O lines
- 32 general purpose working registers
- 512 bytes EEPROM
- Upto 16 MIPS throughput at 16Mhz

The first one is to perform input/output operations and the second one is used to implement special features of the microcontroller like counting external pulses, interrupting the execution of the program according to external events, performing serial data transfer or connecting the chip to a computer to update the software. Each port has 8 pins, and will be treated from the software point of view as an 8-bit variable called 'register', each bit being connected to a different Input/Output pin

There are two different memory types: RAM and EEPROM. Shortly, RAM is used to store variable during program execution, while the EEPROM memory is used to store the program itself, that's why it is often referred to as the 'program memory'. It is clear that the CPU (Central Processing Unit) is the heart of the micro controllers. It is the CPU that will Read the program from the FLASH memory and Execute it by interacting with the different peripherals

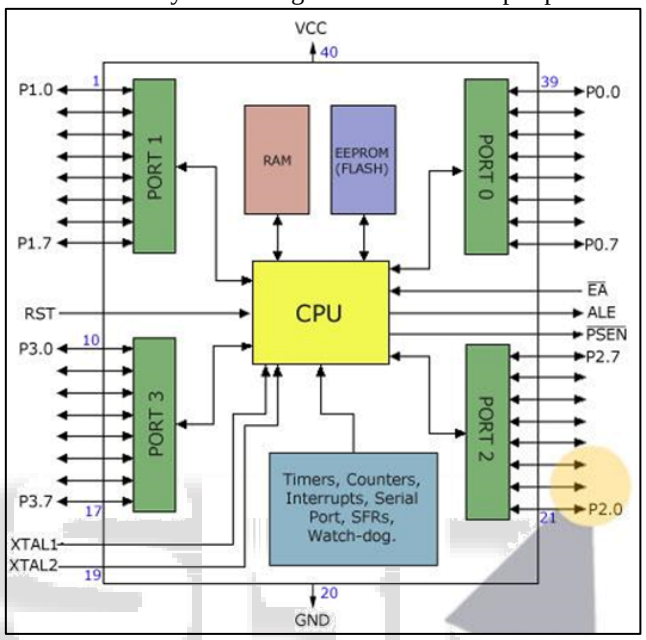

Fig. 4: Internal Configuration

Diagram below shows the pin configuration of the 89S52, where the function of each pin is written next to it, and, if it exists, the dual function is written between brackets. Note that the pins that have dual functions can still be used normally as an input/output pin. Unless the program uses their dual functions, all the 32 I/O pins of the microcontroller are configured as input/output pins.

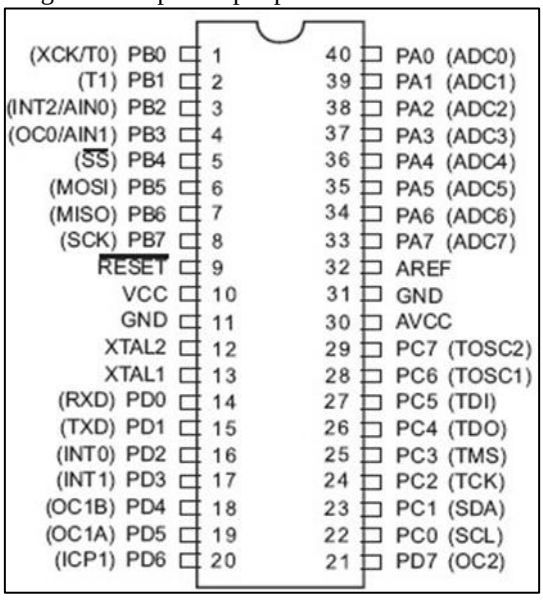

Fig. 5: Pin Configuration

III. CIRCUIT DIAGRAM

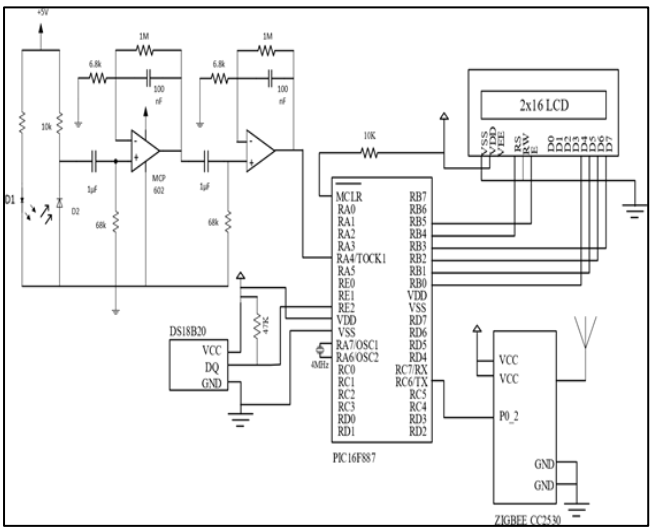

Fig. 6: Basic Circuit Diagram

IV. SOFTWARE

For this project we are using sdcc for programming. SDCC stands for small device c compiler

The Small Device C Compiler (SDCC) is a free-software, partially retargetable[1] C compiler for microcontrollers. It is distributed under the GNU General Public License. The package also contains a linker, assembler, simulator and debugger. As of March 2007, SDCC is the only open-source C compiler for Intel 8051-compatible microcontrollers.[2][3][4][citation needed] In 2011 the compiler was downloaded on average more than 200 times per day.[5]

The SDCC compiler was used by the FreeRTOS project to port its real-time operating system to the 8051-based Silabs (formerly Cygnal) series of microcontrollers.

On contrary we can also use kiel to program the IC But as the program is purchase only and free version is limited to features we are using sdcc as it being open source.

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