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Android Based Digital Heart Beat Rate and Monitoring System

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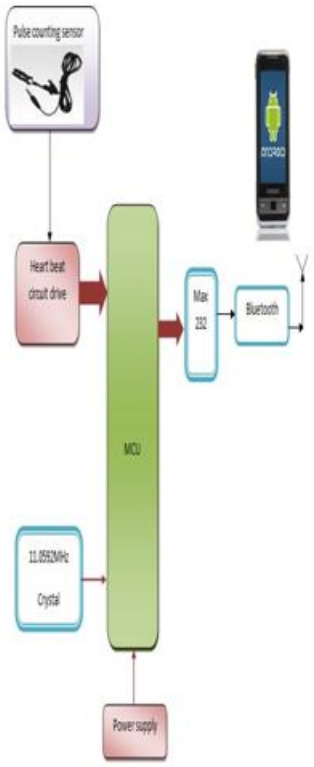
Abstract:

Nowadays, the biomedical instrumentation holds a prominent position within medicine. Following this trend, the BPM (beat per minute) has become an important tool to elucidate about the functioning of the organism and wakeup for anomalies by monitoring the heartbeat in the human body. These devices are mostly used in hospitals and clinics but are gradually finding their way into domestic use. This paper demonstrates on an approach to design a cheap, accurate and reliable device which can easily measure the heart rate of a human body.

This project describes the design of a simple, low-cost controller based patient health monitoring system. Heart rate of the subject is measured from the thumb finger using IRD (Infra Red Device sensors) this instrument employs a simple Op to electronic sensor, conveniently strapped on the finger, to give continuous indication of the pulse digits. The Pulse monitor works both on battery or mains supply. It is ideal for continuous monitoring in operation theatres, I.C. units, biomedical/human engineering studies and sports medicine.

By reading pulse values continuously from pulse count sensor placed to the fore finger of patient. These values are encoded and sent to remote station using Bluetooth communication. We can easily get the details to the connected android system. This project uses regulated 5V, 750mA power supply. 7805 three terminal voltage regulator. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer.

Block diagram:



Existing system

This system describes the design of a simple, low-cost microcontroller based heart rate with LCD output. Heart rate of the subject is measured using the thumb finger with the help of IRD (Infra Red Device sensors and the rate is then averaged and displayed on a text based LCD). This device is used for displaying the heart beat rate and counting values through sending pulses from the sensor. This instrument employs a simple Op to electronic sensor, conveniently strapped on the finger, to give continuous indication of the pulse digits. The Pulse monitor works both on battery or mains supply. It is ideal for continuous monitoring in operation theatres, I.C. units, biomedical/human engineering studies and sports medicine.

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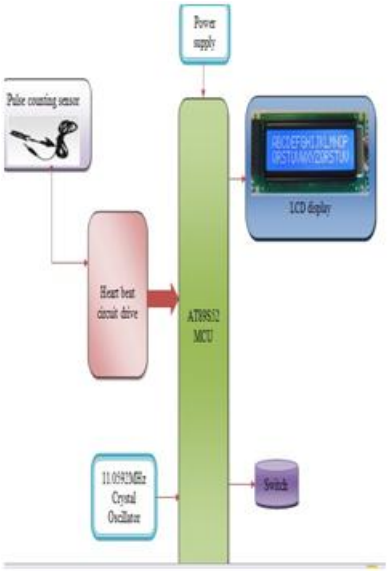
Block Diagram



Drawback:

In this system the patient heart rate is monitored only on LCD no wireless communication is used for intimating to the concerned person.

PULSE COUNTING SENSOR:

The Point Sensor Pulse Counter 900 wireless transmitter is a battery operated digital counter with a microprocessor controlled 900 MHz. FCC certified radio transmitter. The Point Sensor Pulse Counter 900 has an on board time of day clock that allows it to spend most of the time in a low power quiescent state. At predetermined time intervals the clock will wake up the onboard microprocessor. Unique serial number information is read from a Dallas Semiconductor 1-wire digital device and counter data is read from a 24-bit internal counter register. This information is combined with a CRC-16 error check and transmitted in a very short data packet that results in a very short transmitter on-time. This architecture allows the Point Sensor Pulse Counter 900 to consume very little energy and a battery life of up to 5 years. The Point Sensor Pulse Counter 900 electronics are coated with a conformal material that provides a moisture barrier against condensation. Submersion in water is not recommended. An internal reed switch permits a user to activate the service switch with a magnet.

The Sensor is shipped with the transmitter turned off (anytime the Sensor is to be shipped the transmitter should be turned off or must be placed in a shielded container to prevent interference that might cause shipping problems). Start the Sensor by momentarily placing the magnet next to the reed switch as indicated on the product label. When you perform this operation, a data transmission occurs immediately and a special mark is introduced in the ID field of the transmitted data packet to indicate which sensor is in service or installation. The reed switch with magnet is also used to put the Sensor in a quiescent mode (no transmissions and very low power consumption). This is the state the Sensor is in when you receive it from the manufacturer. Place the magnet near the reed switch for 5 seconds or more to enter this powered down state.

AT89S52 MICROCONTROLLER

The Intel 8052 is Harvard architecture, single chip microcontroller (µC) which was developed by Intel in 1980 for use in embedded systems. It was popular in the 1980s and early 1990s, but today it has largely been superseded by a vast range of enhanced devices with 8052-compatible processor cores that are manufactured by more than 20 independent manufacturers including Atmel, Infineon Technologies and Maxim Integrated Products. 8052 is an 8-bit processor, meaning that the CPU can work on only 8 bits of data at a time. Data larger than 8 bits has to be broken into 8-bit pieces to be processed by the CPU. 8052 is available in different memory types such as UV-EPROM, Flash and NV-RAM. The present project is implemented on Keil uVision. In order to program the device, proload tool has been used to burn the program onto the microcontroller. The features, pin description of the microcontroller and the software tools used are discussed in the following sections.

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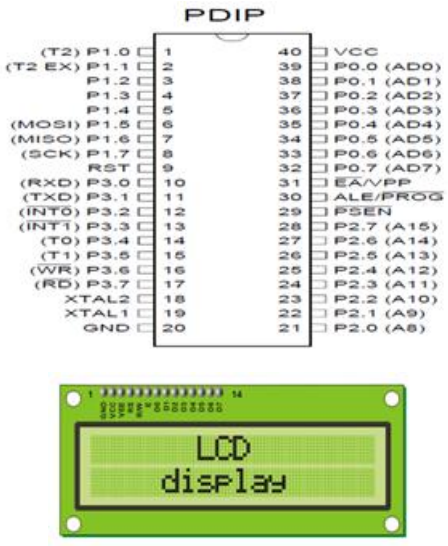
FEATURES

- Compatible with MCS-51® Products
- 8K Bytes of In-System Programmable (ISP) Flash Memory
  - – Endurance: 1000 Write/Erase Cycles
- 4.0V to 5.5V Operating Range
- Fully Static Operation: 0 Hz to 33 MHz
- Three-level Program Memory Lock
- 256 x 8-bit Internal RAM
- 32 Programmable I/O Lines
- Three 16-bit Timer/Counters
- Eight Interrupt Sources
- Full Duplex UART Serial Channel
- Low-power Idle and Power-down Modes
- Interrupt Recovery from Power-down Mode
- Watchdog Timer
- Dual Data Pointer
- Power-off Flag

DESCRIPTION:



The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory Technology and is compatible with the industry- standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in- system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

LIQUID CRYSTAL DISPLAY:

LCD stands for Liquid Crystal Display. LCD is finding wide spread use replacing LEDs (seven segment LEDs or other multi segment LEDs) because of the following reasons:

1. The declining prices of LCDs.
2. The ability to display numbers, characters and graphics. This is in contrast to LEDs, which are limited to numbers and a few characters.
3. Incorporation of a refreshing controller into the LCD, thereby relieving the CPU of the task of refreshing the LCD. In contrast, the LED must be refreshed by the CPU to keep displaying the data.
4. Ease of programming for characters and graphics.

These components are "specialized" for being used with the microcontrollers, which means that they cannot be activated by standard IC circuits. They are used for writing different messages on a miniature LCD. A model described here is for its low price and great possibilities most frequently used in practice. It is based on the HD44780 microcontroller (Hitachi) and can display messages in two lines with 16 characters each. It displays all the alphabets, Greek letters, punctuation marks, mathematical symbols etc.

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In addition, it is possible to display symbols that user makes up on its own. Automatic shifting message on display (shift left and right), appearance of the pointer, backlight etc. are considered as useful characteristics.

BLUETOOTH

Bluetooth is a wireless technology standard for exchanging data over short distances (using short-wavelength radio transmissions in the ISM band from 2400–2480 MHz) from fixed and mobile devices, creating personal area networks (PANs) with high levels of security. Created by telecom vendor Ericsson in 1994, it was originally conceived as a wireless alternative to RS-232 data cables. It can connect several devices, overcoming problems of synchronization. Bluetooth dongle is simply defined as an accessory to the computer. By using a Bluetooth dongle a computer can be wirelessly linked to other devices. By using these dongles one can easily connect a computer with any other computer, printer, digital cameras or cellular devices. Actually Bluetooth dongle possesses a small microchip, which makes it capable of connecting and exchanging the data with all other devices which contain such microchips and with all other dongle devices. USB ports are used to connect a Bluetooth dongle with the computer. Just like other USB attachments these dongles also get powered from computers itself. Once we disconnect a Bluetooth dongle it gets deactivated on its own.

ANDROID APPLICATION:

The android application is connected to the hardware via Bluetooth device. The data is received from hardware. Data received displayed on application i.e. temperature and heart rate pulse.

This data is analysed for predicting heart attack. For prediction of heart attack threshold values for heart rate and temperature is set. When the temperature and heart rate will be below or upper the threshold value SMS is sent to patient's relatives, doctor's and hospital's registered number. The SMS contains patient's heart attack parameters and location. Location is track via GPS. The application contains the IP address of server to which we wants to send the data for graph plotting. Server contains database also doctor can check graph of heart rate for their convenience. Server also contain database for telemedicine part.

Advantages:

- Ease of operation
- Low maintenance cost
- Fit and forget system
- No wastage of time
- Durability
- Accuracy

Applications:

- Hospitals
- Remote heart rate monitoring applications
- Local monitoring applications
- Designed for Home and Clinical applications

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