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## Implementation of Health Monitoring System for Heart Pulse Using Pletysmographic Sensor and Temperature Detection Using Wireless Communication

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#### **ABSTRACT:**

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). The Temperature Sensor measures the temperature of body and displays on LCD through Zigbee and Sends the SMS using GSM Module.

#### **INTRODUCTION:**

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 health monitoring system.

This instrument employs a simple Opto 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:**

#### **Transmitter:**









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#### Receiver



#### Fig 2 Receiver section

The LPC2148 are based on a 16/32 bit ARM7TDMI-S™ CPU with real-time emulation and embedded trace support, together with 128/512 kilobytes of embedded high speed flash memory. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at maximum clock rate. For critical code size applications, the alternative 16-bit Thumb Mode reduces code by more than 30% with minimal performance penalty. With their compact 64 pin package, low power consumption, various 32-bit timers, 4- channel 10-bit ADC, USB PORT, PWM channels and 46 GPIO lines with up to 9 external interrupt pins these microcontrollers are particularly suitable for industrial control, medical systems, access control and point-of-sale. With a wide range of serial communications interfaces, they are also very well suited for communication gateways, protocol converters and embedded soft modems as well as many other general-purpose applications.



Fig 3 ARM7TDMI

This project uses regulated 3.3V, 500mA power supply. Unregulated 12V DC is used for relay. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac out put of secondary of 230/12V step down transformer.

#### **ARM PROCESSOR**



Fig 4 ARM processor

#### **ARM7TDMI Processor Core**

• Current low-end ARM core for applications like digital mobile phones

- •TDMI
- oT: Thumb, 16-bit compressed instruction set

oD: on-chip Debug support, enabling the processor to halt in response to a debug request

oM: enhanced Multiplier, yield a full 64-bit result, high performance

ol: Embedded ICE hardware

• Von Neumann architecture

#### AT89S52 MICROCONTROLLER

Fig 5 AT89S52



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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: o 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

#### **ZIGBEE:**



Fig 6. Zigbee network

It is the wireless device for transmitting and receiving purpose or simply it called as Transceiver. Zigbee is based on the IEEE802.15.4 protocol. The range of the Zigbee is covered as 100m. It range is 10 times better than bluetooth device so it can be more preferable one in wireless device. The data rate is very low for transmission while using this device.



Fig 7.zigbee module

Zigbee is a PAN technology based on the IEEE 802.15.4 standard. Unlike Bluetooth or wireless USB devices, ZigBee devices have the ability to form a mesh network between nodes. Meshing is a type of daisy chaining from one device to another. This technique allows the short range of an individual node to be expanded and multiplied, covering a much larger area.

#### **Technical Specifications of Zigbee**

- Frequency band2.400 2.483 GHz
- Number of channels16
- Data rate250 kbps
- Supply voltage1.8 3.6 V
- Flash memory128 KB
- RAM8 KB
- EEPROM4 Kb Operating
- •Temperature-40 +85 °C

# Global System for Mobile Communication (GSM)

#### **Definition:**

GSM, which stands for Global System for Mobile communications, reigns (important) as the world's most widely used cell phone technology.

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Cell phones use a cell phone service carrier's GSM network by searching for cell phone towers in the nearby area. Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication.GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz. It is estimated that many countries outside of Europe will join the GSM partnership.



Fig 8.GSM module

#### **MODEM SPECIFICATIONS:**

The SIM300 is a complete Tri-band GSM solution in a compact plug-in module. Featuring an industry-standard interface, the SIM300 delivers GSM /GPRS900/ 1800/ 1900MHz performance for voice, SMS, data and Fax in a small form factor and with low power consumption.The leading features of SIM300 make it deal fir virtually unlimited application, such as WLL applications (Fixed Cellular Terminal), M2M application, handheld devices and much more.

1.Tri-band GSM/GPRS module with a size of 40x33x2.85

- 2.Customized MMI and keypad/LCD support
- 3.An embedded powerful TCP/IP protocol stack

4.Based upon mature and field proven platform, backed up by our support service, from definition to design and production.

General Features:

• Tri-band GSM/GPRS900/1800/1900Mhz

- GPRS multi-slot class 10
- GPRS mobile station class –B
- Complaint to GSM phase 2/2+
- i.-class 4(2W @900MHz)

ii.-class 1(1W @/18001900MHz)

- Dimensions: 40x33x2.85 mm
- Weight: 8gm
- 7. Control via AT commands

•(GSM 07.07, 07.05 and SIMCOM enhanced AT commands)

- SIM application tool kit
- supply voltage range 3.5......4.5 v
- Low power consumption
- Normal operation temperature: -20 'C to +55 'C
- Restricted operation temperature : -20 'C to -25 'C and +55 'C to +70 'C
- storage temperature: -40 'C to +80 'C



#### Fig9. GSM operation PLETYSMOGRAPHIC SENSOR

Heart rate is the speed of people's emotional state, exercise intensity and objective indicator of cardiac function. Heart rate of the subject is measured from the thumb finger using IRD (Infra Red Device sensors)



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But most people are very difficult to accurately measure the time and his heart rate values. If the heart rate monitor with me, heart ECG electrodes will be detected by monitoring the signal processing device, the user can at any time that your heart rate changes, changes in heart rate, self-monitoring status.



Fig 10 Pletysmographic sensor

Heart rate monitor for heart rate range (60 ~ 160)/min. Circuit by adjusting the relevant components, in the (60 ~ 160)/min within the audible alarm can change the heart rate range. This heart rate range the width of the design center values  $\pm 20\%$  range. If central values such as emphasis on the 100 / exceptionally, the heart rate signal range (80 ~ 120)/min, if the heart rate exceeds this range, the lower limit, the instrument does not sound, if the heart rate in the range of the instrument ECG is the sound issue.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 Zigbee communication. Alpha numeric LCD is provided on receiver end to display the heart rate measurement.

#### LM35

#### FEATURES DESCRIPTION

- Calibrated Directly in ° Celsius (Centigrade)
- Linear + 10 mV/°C Scale Factor 0.5°C Ensured Accuracy (at +25°C) Rated for Full -55°C to +150°C Range
- Suitable for Remote Applications
- Low Cost Due to Wafer-Level Trimming
- Operates from 4 to 30 V
- Less than 60-µA Current Drain
- Low Self-Heating, 0.08°C in Still Air
- Nonlinearity Only ±¼°C Typical

- Low Impedance Output, 0.1  $\Omega$  for 1 mA Load



#### **WORKING PROCEDURE :**

• This project uses regulated 5V, 750mA power supply.

• 7805 three terminal voltage regulator is used for voltage regulation.

• Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer

• Heart rate and temperature are continuously monitored using the AT89S52 at the patient.

• Heart rate will be monitored using Pletysmographic sensor, Heart rate of the subject is measured from the thumb finger using IRD (Infra Red Device sensors and the rate is then averaged and displayed on a text based LCD).

- Temperature can be detected by the LM35 device.
- These values can be sent to ADC 0808.
- ADc will convert all these signals from analog data to digital form and then forward it to AT89S52 controller.
- The values are sent to the other place using Zigbee interfaced to the controller.



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•At other place the zigbee receiver receives the values.

• The LPC2148 controller verifies and sends a SMS to the pre-stored mobile number through GSM modem.

 $\bullet$  This GSM modem is connected to it LPC2148 controller.

• The verified signals will also display in the LCD.

#### Advantages:

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

#### **Applications:**

- Hospitals
- Remote heart rate monitoring applications
- Body temperature Monitoring
- Local monitoring applications
- Designed for Home and Clinical Applications

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