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Analysis of Pulse Rate of the Patient Using Wireless Communication System

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Abstract

This paper 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) and the rate is then averaged and generates reading.

This instrument employs a simple Opto electronic sensor, conveniently strapped on the finger, to give continuous indication of the pulse digits. This information is required to telemeter to doctor away from the patient. This being carried out using Zibgee based wireless system.

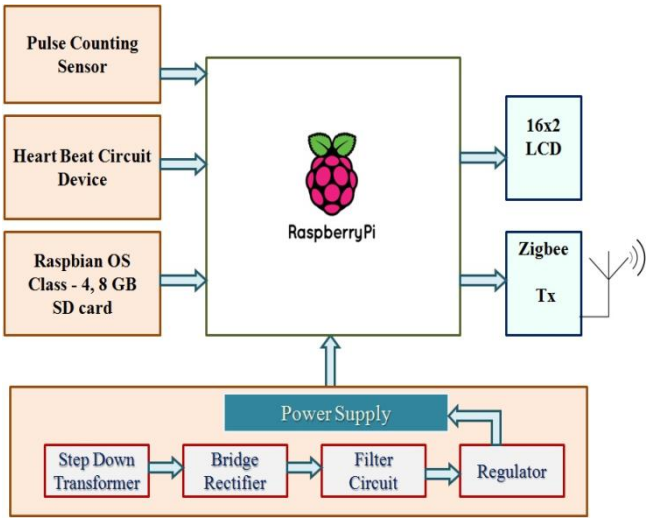
I. Introduction

Here we are using Zigbee communication[5] to transmit all the details of the patient. This project uses Raspberry pi as its controller in the transmitter section.

By reading all the values of heart rate, those will be sent to the receiver. At the receiver all the details will be received through Zigbee and displayed on PC.

This project uses regulated 3.3V, 500mA power supply[6]. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier[7] is used to rectify the ac out put of secondary of 230/12V step down transformer.

Transmitter:



Receiver:

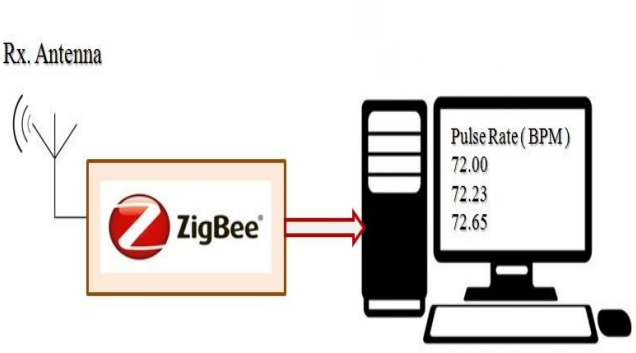


Fig: Block Diagram of Transmitter and Receiver

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II . Hardware Requirement:

A . RASPBERRY-PI 2, Model B

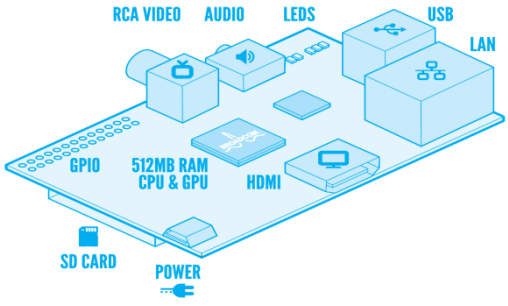
Fig : Raspberry Pi 2 [8]

The Raspberry Pi 2[8] delivers 6 times the processing capacity of previous models. This second generation Raspberry Pi has an upgraded Broadcom BCM2836 processor, which is a powerful ARM Cortex-A7 based quad-core processor that runs at 900MHz. The board also features an increase in memory capacity to 1Gbyte.

Features

- System Memory – 1GB LPDDR2
- Storage – micro SD card slot (push release type)
- Video & Audio Output – HDMI and AV via 3.5mm jack.
- Connectivity – 10/100M Ethernet
- USB – 4x USB 2.0 ports, 1x micro USB for power
- Expansion 2×20 pin header for GPIOs Camera header Display header
- Power – 5V via micro USB port.
- Dimensions – 85 x 56 mm

Basic Hardware of Raspberry-PI



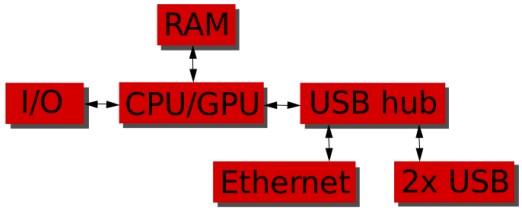
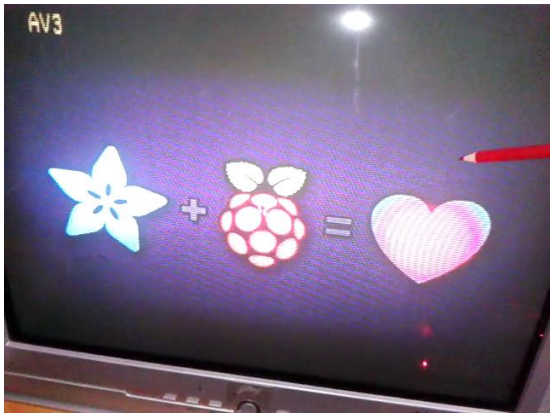
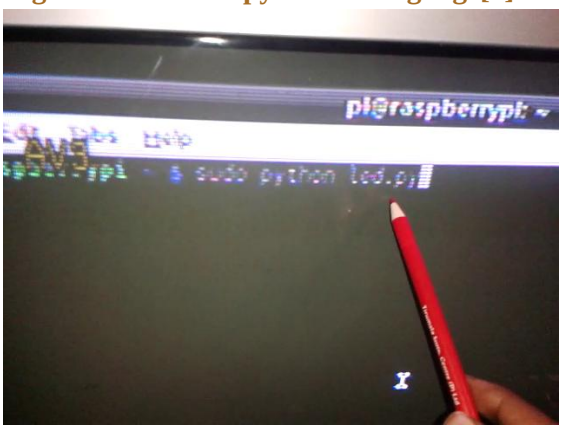


Fig : Basic Hardware of Raspberry Pi [9]

OS used in Raspberry pi is Linux (Raspbian)



Coding will be done in python/C language[9]



B . Zigbee

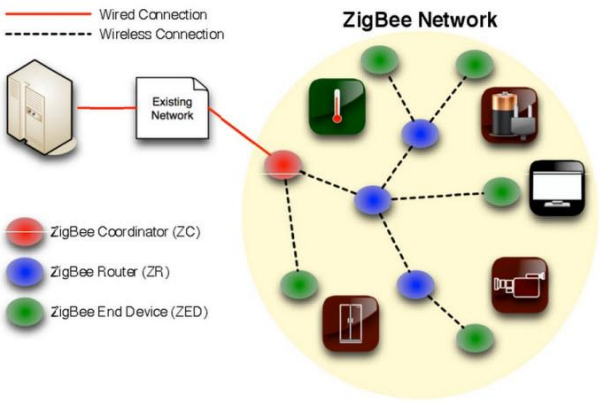


Fig : Zigbee [4]

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It is the wireless device for transmitting and receiving purpose or simply it called as Transceiver. Zigbee[4] 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.

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.

Zigbee offers full wireless mesh networking and supports approximately 65,000 devices on one network. It can connect the very large range of devices in an industry into a single network.

Technical Specifications of Zigbee

- Frequency band 2.400 — 2.483 GHz
- Number of channels 16
- Data rate 250 kbps
- Supply voltage 1.8 – 3.6 V
- Flash memory 128 kB
- RAM 8 kB
- EEPROM 4 kB Operating
- Temperature -40 — +85 °C

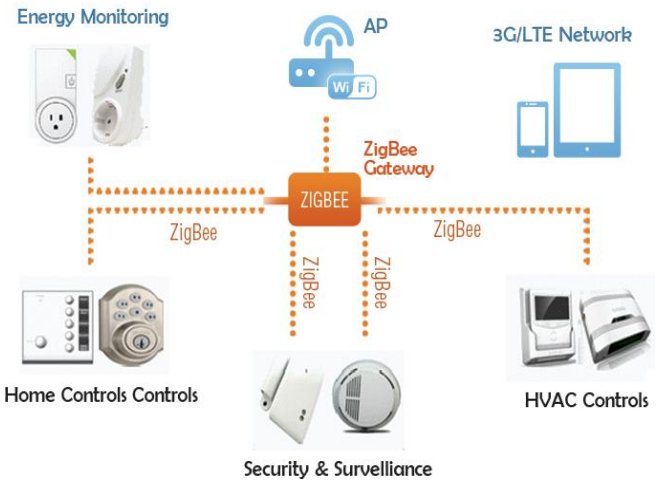

Fig : Zigbee [5]

C. Pulse counting sensor

Heart rate[1] is the speed of people's emotional state, exercise intensity and objective indicator of cardiac function. 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[2] 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 monitoringsystem.

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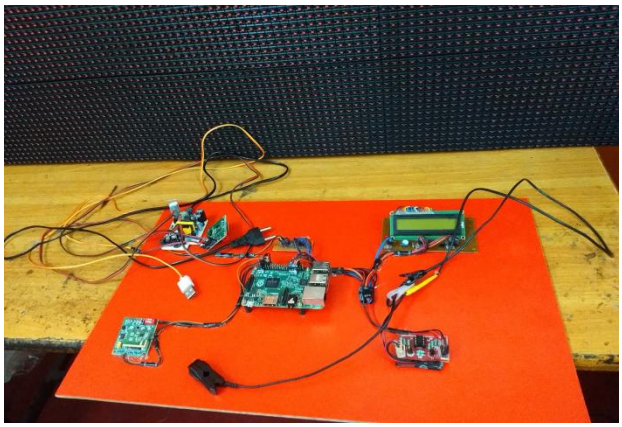

Fig : Harware circuit of pulse rate

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 ± 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.

Fig : Analysis of pulse rate of the patient

Advantages

- Ease of operation and understanding.
- Low maintenance cost and handling.
- Fit and forget device
- No wastage of time
- Durability
- Accuracy

Applications

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

III . Conclusion

This paper was successfully implemented and the output displayed was on LCD and Heart rate is counted by microcontroller for one minute and displayed at distant place through Zigbee communication. This device and technology can be used by a doctor from any remote place. A normal person can also operate this device. So this heart rate measurement device is cheap and easier to understand.

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