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# Analysis of Pulse Rate of the Patient Using Wireless Communication System

**Sairam Ankhathi**
**M.Tech(VLSI & Embedded Systems),**
**Siddhartha Institute of Engineering and Technology.**

**E.Swetha**
**M.Tech(Embedded Systems),**
**Siddhartha Institute of Engineering and Technology.**

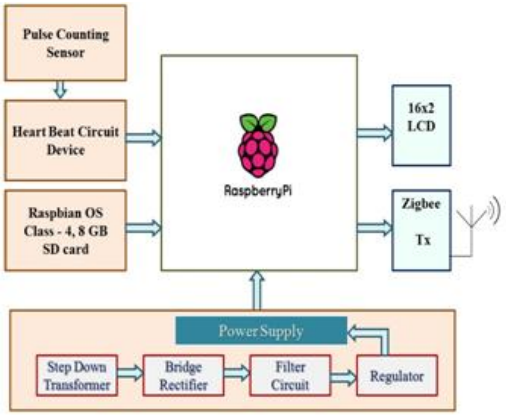
## ABSTRACT:

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 [6] 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[7]. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier[8] is used to rectify the ac output of secondary of 230/12V step down transformer.

### Transmitter:




### Receiver:


**Fig: Block Diagram of Transmitter and Receiver**

## II . Hardware Requirement:

### A . RASPBERRY-PI 2, Model B

**Fig : Raspberry Pi 2 [9]**

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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

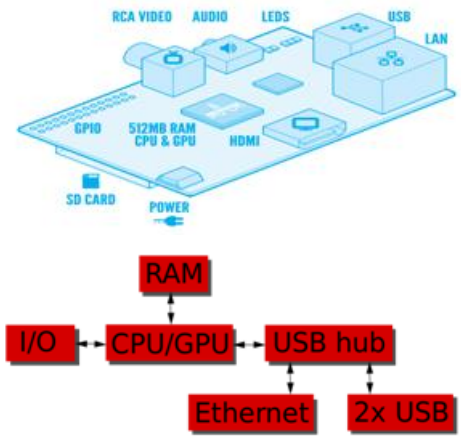
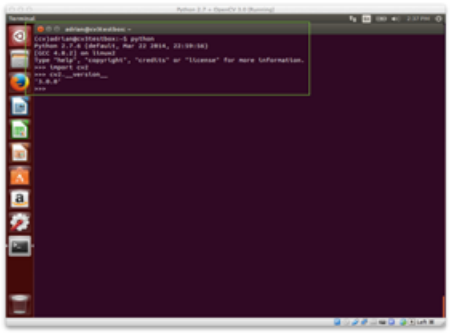



**Fig : Basic Hardware of Raspberry Pi [10]**

**OS used in Raspberry pi is Linux (Raspbian)**

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



### B . Zigbee


**Fig : Zigbee [5]**

It is the wireless device for transmitting and receiving purpose or simply it called as Transceiver. Zigbee[5] 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.

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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 [6]**

### C. Pulse counting sensor:

The heart beat sensor [4] consists of a light emitting diode and a detector like a light detecting resistor or a photodiode. The heart beat pulses causes a variation in the flow of blood to different regions of the body. When a tissue is illuminated with the light source, i.e. light emitted by the led, it either reflects (a finger tissue) or transmits the light (earlobe). Some of the light is absorbed by the blood and the transmitted or the reflected light is received by the light detector. The amount of light absorbed depends on the blood volume in that tissue. The detector output is in form of electrical signal and is proportional to the heart beat rate. This signal is actually a DC signal relating to the tissues and the blood volume and the AC component synchronous with the heart beat and caused by pulsatile changes in arterial blood volume is superimposed on the DC signal. Thus the major requirement is to isolate that AC component as it is of prime importance.

**Fig : Harware circuit of pulse rate**

To achieve the task of getting the AC signal, the output from the detector is first filtered using a 2 stage High Pass-Low Pass circuit and is then converted to digital pulses using a comparator circuit or using simple ADC.

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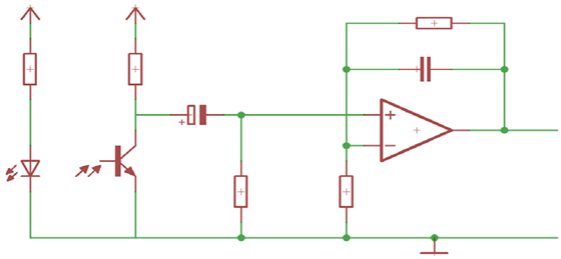

**Fig : Heart Beat Circuit [4]**

The digital pulses are given to a Raspberry controller for calculating the heat beat rate, given by the formula: BPM (Beats per minute) = 60*f. The measured value is displayed on the LCD display as well as Transmitted and Received by using Zibgee technology.

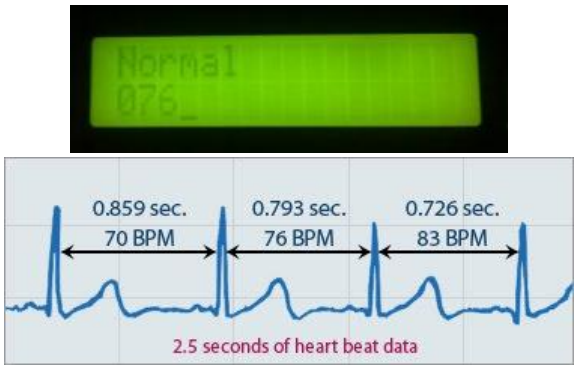


**Fig : Analysis of pulse rate of the patient**

## 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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## BIOGRAPHY:

**Sairam Ankhathi** is a M.Tech (VLSI & Embedded systems) student in Department of Electronics and Communication from Siddhartha Institute of Engineering and Technology, Ibrahimpatnam, Hyderabad. His interests of field in Embedded systems, Robotics and communication systems.

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**E. Swetha** is a M.Tech (Embedded Systems) Assistant Professor in Department of Electronics and Communication from Siddhartha Institute of Engineering and Technology, Ibrahimpatnam, Hyderabad. Her interests of field in Embedded systems, communication and networking systems.

**Dr. D Subba Rao**,

is a proficient Ph.D person in the research area of Image Processing from Vel-Tech University, Chennai along with initial degrees of Bachelor of Technology in Electronics and Communication Engineering (ECE) from Dr. S G I E T, Markapur and Master of Technology in Embedded Systems from SRM University, Chennai. He has 13 years of teaching experience and has published 12 Papers in International Journals, 2 Papers in National Journals and has been noted under 4 International Conferences. He has a fellowship of The Institution of Electronics and Telecommunication Engineers (IETE) along with a Life time membership of Indian Society for Technical Education (ISTE). He is currently bounded as an Associate Professor and is being chaired as Head of the Department for Electronics and Communication Engineering discipline at Siddhartha Institute of Engineering and Technology, Ibrahimpatnam, Hyderabad.