



Design and Development of Embedded System based Heart Beat Sensor Using Raspberry Pi 2

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ABSTRACT: Raspberry Pi Processor based system is developed to measure voltage level for heart beat. To know the heart pumping condition, measurement of heart pulses are essential. In this paper, the heart beat sensor is used to measure voltage of heart pulses. This work relates to the implementation of simple heart rate pulse system based on Raspberry Pi 2 board which displays the output on a VNC (Virtual Network Connections) server and transmitting the data to a smart phone. There is usually need to entry heart rate measuring which deliver precise and fast readings of patients. Patient can test himself without Doctor the condition of heart pulses with good accuracy by Raspberry Pi 2 board system. The sensor then can detect the heart pulses accurately and this is applied to Raspberry Pi 2 as in input. The Raspberry Pi 2 then read the pulses are send to the output screen.

KEYWORDS: Raspberry pi 2, MCP 3204IC (ADC), Heart Beat sensor and Ethernet.

I.INTRODUCTION

Physics, medicine, Psychology and many other fields are very important parameters in heart beat. Heart rate is the number of heart beats per unit of time, naturally expressed as beats per minute (bpm). The heart rate of a healthy adult at rest is around 72 beats per minute (bpm). Athletes normally had lower heart rates than less active people. The old persons have heart rates at roughly 90 bpm and babies have a much higher heart rate at roughly 120 bpm. Heart rate in medical is divided into two types, they are bradycardia and tachycardia. The bradycardia is a lower than normal heart rates and the tachycardia is a higher than normal heart rate. The heart beat rises continuously during the heart movements and rest value exercises before to return slowly. The rate pulses return to normal indication of the health of the person [1, 2]

Today many persons are suffering with cardiac problem and four of the main causes of death in many countries disease in cardiovascular. The entry worldwide of 16 million member's death in cardiac. The first indication of any cardiac condition in some time and call to medical aid has a large change among variant patients and can have deadly effect. The condemnatory deduction drawn from epidemiological data is that improvement of resources for early demodulation and treatment of heart ailment has a high potential of reducing fate associated with cardiac disease than implement in hospitals. This one to reduce the time before treatment [3].

Monitoring is employed in various heart beat sensor, which includes pulse rate of the heart. The block diagram of experimental setup as shown in figure1, is used to monitor and controlling the voltage of heart beat continuously. Raspberry Pi processor is used in this work for Heart Beat pulses. The system can be instert at different persons. The system (experimental setup) is very simple and it is portable. In this system one sensor is used which is the Heart Beat sensor of Heart pulses. These sensor is connected to MCP 3008IC and Raspberry Pi 2. The MCP 3008IC is SPI based analog to digital converter which is required in this work because Raspberry Pi 2 MCU accepts only digital values. This work is cost efficient and low cost of the sensors, portable and compatible[4].

II. GENERAL DESCRIPTION OF THE HARDWARE AND SOFTWARE

A. Hardware

Block Diagram:

The experimental setup of the hardware is shown in figure 1 which consists of Raspberry Pi 2, MCP 3008 IC (SPI protocol), Heart Beat Sensor.

Heart Beat Sensor to count the pulse of the person. The outputs of Heart Beat Sensor connected to MCP3008 IC is (Analog to digital converter). The channels of MCP3008IC are connected to Raspberry pi 2 embedded systems. The python code is developed in Raspberry pi for data processing after receiving the required data from sensor. The power supply for Raspberry Pi 2 is 5v battery. Ethernet is used to accept the USB Hub in Raspberry pi 2. It works good condition, cost effective and portable [5].

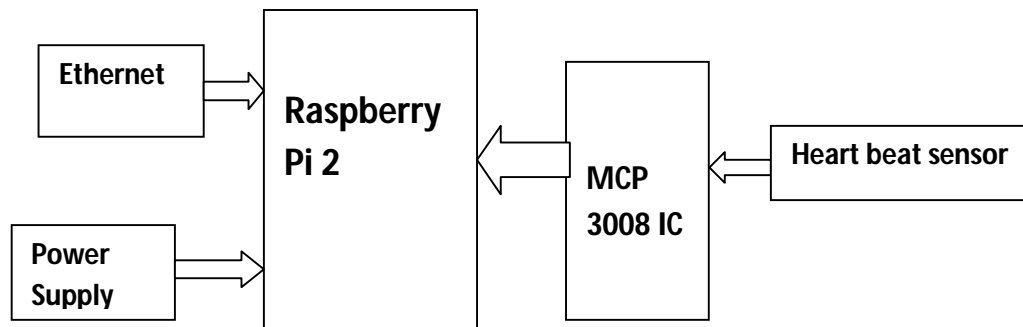


Figure 1: Experimental setup of Embedded based system.

A.1 Raspberry Pi 2

Raspberry Pi 2 Model B is used to monitor dissimilar parameter as shown in figure 2. It is a 40 GPIO pins. The raspberry Pi is a credit-card sized board computer. The Raspberry Pi 2(2835) consists of a model B. The Raspberry Pi has been experienced with various applications and relation with normal instruments. It shows nice acknowledging with normal instrument results. It can be masked anywhere, behind television sets, within walls. It produces high interpretation. It provides basic computer functions like word processing, web browsing. [7, 6, 11].



Figure 2: Raspberry Pi 2 board

A.2.MCP 3008 IC

The Microchip Technology Inc. MCP 3008 devices are successive approximation 10-bit Analog to Digital converters with the on-board sample and hold circuit. The MCP3008 is programmable to grant two pseudo-differential

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

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Vol. 6, Issue 3, March 2017

input pairs or four single-ended inputs. The MCP3008 strategy runs over a board voltage range (2.7V-5.5V). Fewer the current designs allow work with the classic place by currents of the only 5nA and commonly dynamic currents of 320ua. It is not expensive, easy to attach and doesn't need any extra mechanism. It uses the SPI bus protocol which is supported by the Raspberry Pi's GPIO header [9]. The pin diagram of MCP3008 is as shown in figure 3.

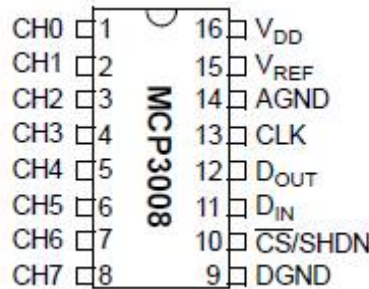


Figure 3: Pin diagram of MCP 3008IC

A.3. Heart Beat Sensor:

Heart Beat Sensor is to measure the Heart Beat Pulses. It entire range of power supply is 3-5V. Pulses rate sensor is used to detect heartbeats. It can be wore on the finger or earlobe and connected to Raspberry Pi via MCP 3008. It also carries an open-source program to display heart rate via diagrams in real time. It is an optical heart rate sensor integrated with amplifying circuit and noise-cancellation circuit [3].

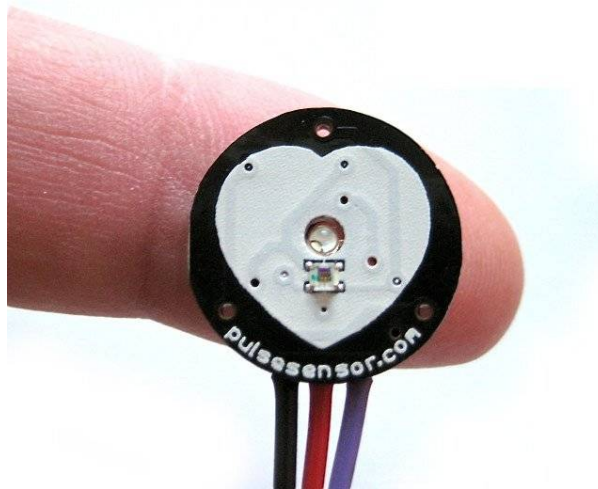


Figure 4: Heart Beat Sensor

A.4. Ethernet with Raspberry Pi

A direct Ethernet relation is much earlier and a more established. By concerning to our Pi in a straight line from our laptop or desktop with an Ethernet cable our and is bypassing our local network, and our aren't distribution bandwidth with other computers on our network. It also allows to relation to our Pi when our of our home network. If the undergo slow affinity and network breather with current set up, need to crack this. All we need to agreed on it up is an Ethernet cable and a plan to contact the Raspberry Pi command prompt. We've author a static IP address that we can way to connect the Raspberry Pi precisely with a laptop or desktop computer. We will care a lot improvement in velocity and establishment correlated to associating with Wi-Fi. Leave Pi associated as long as we wish without getting detached or getting network breather [7, 11].

b. Software Description

Raspberry Pi is a new Processor. It has a number of languages to write a program is C, C++, Java, python2 and python3. In this work python2 is used. It is a new language.



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Vol. 6, Issue 3, March 2017

Python: Python was developed in 1985-1990 by Guido van Rossum. It is a general purpose interpreted, object oriented, high-level programming language and interactive. Python source code available under the General Public license (GPL). It is easy to enlarge with new functions and data types achieve in either C or C++ [12]. There is no header files is the main advantage of python compare other language.

Flow chart:

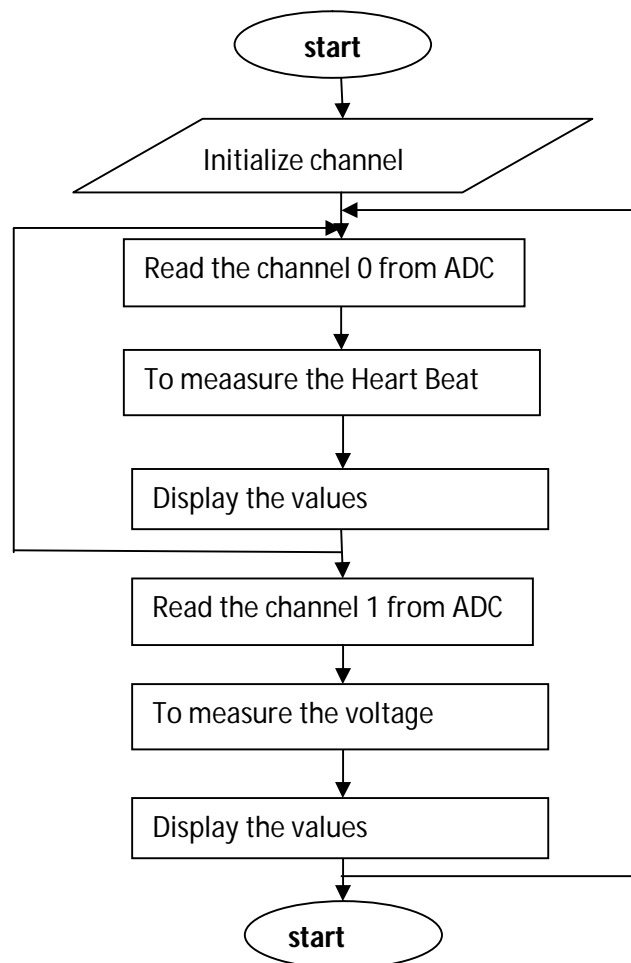


Figure 5: Flow chart

III. WORKING AND PRINCIPLE

The circuit has divided into three parts:-

- Achieve the sensors to analog values
 - Reorganize analog values to digital values using Mcp3008Ic
 - Display the values on the laptop screen
- a) **Achieve the sensors to analog values:-**

Heart Beat Sensor is a monitoring machine that allows one to measure person heart rate in real time for later study.



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Vol. 6, Issue 3, March 2017

b) Reorganize analog values to digital values using Mcp3204IC:-

The voltage is sent by the MCP3008IC then converted into analog value with comparable digital values. The digital values are transformed into their various data's by the python program. The Heart beat sensor output voltage is precisely transformed to a temperature in degree Celsius through python programming. Since analog values have a minor change at each one point, 120 samples of several of the voltages in 120 variables are achieved. The achieved samples are prevented and achieve into its comparable values of Heart rate. This operation is compassed by software programming using python programming language and it diminishes the failure from energy.

c) Display the values on the laptop screen:-

This system design the award recognized of the whole work. The arrange values are saved each in a desperate variable and display willingly at a daily intermission of 10 seconds. So, this complies one cycle and these cycles will advance boundlessly safe power is off [3, 4, 11].

IV. EXPERIENTIAL RESULTS

We have achieved this work model on a set of rules of a board to most extend its alive. We proved it's an efficiency at different places and leading the values at outsides and indoors. Graphs are also conspired for the comparable review for good compassionate of the review. This work is strongly achieved and the outputs access is efficiency with a simple user alloy.

Results obtained from the developed system Raspberry Pi systems are shown in table 1. Voltage simultaneously with hardware developed in the present study at the laboratory, Dept of Electronics, S. K. University, Anantapur, Andhra Pradesh The values are graphically presented at different times using origin software.

TABLE I. Values of light and temperature of LDR

Analog Values (MCP 3008)	Voltage (Volts)
0	0
170	5.4
5	1.6
11	3.5
156	5
164	5.2
0	0
11	3.5
155	5
157	5
0	0

Plots for voltage and time are shown in figures 9 respectively.

In the present work the monitoring voltage of Heart Beat Sensor using Raspberry Pi

The voltage measurement system is shown in figure 5 as a screen shot.

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Vol. 6, Issue 3, March 2017

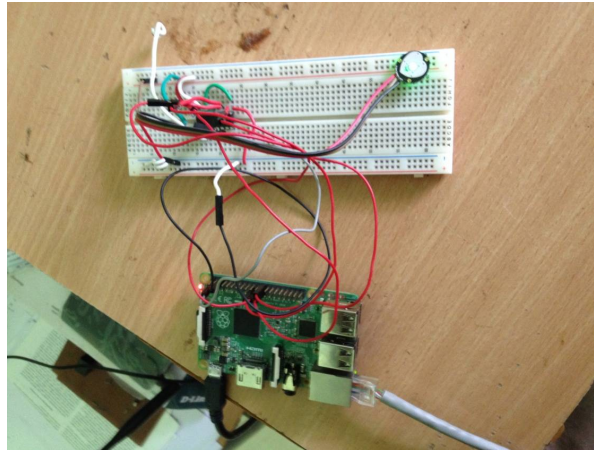
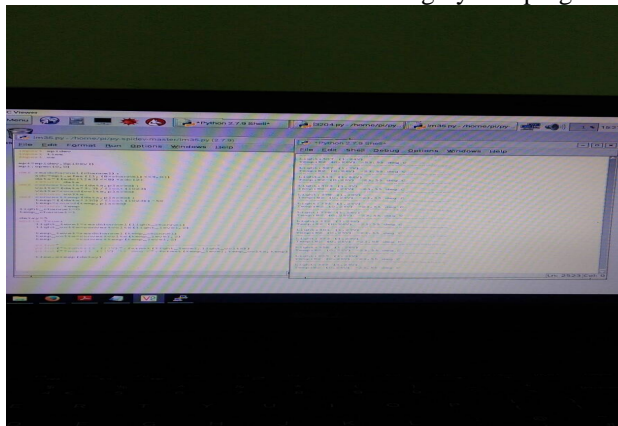


Figure.6. Photograph of the Heart Beat Sensor using Raspberry Pi and MCP3008IC

The Result of the voltage values and Program in python is shown in figure 7 as a screen shot.

Figure 7 Data acquisition and shows the results on VNC server using Python program.



The overall of the work is shown in figure 8 as a screen shot

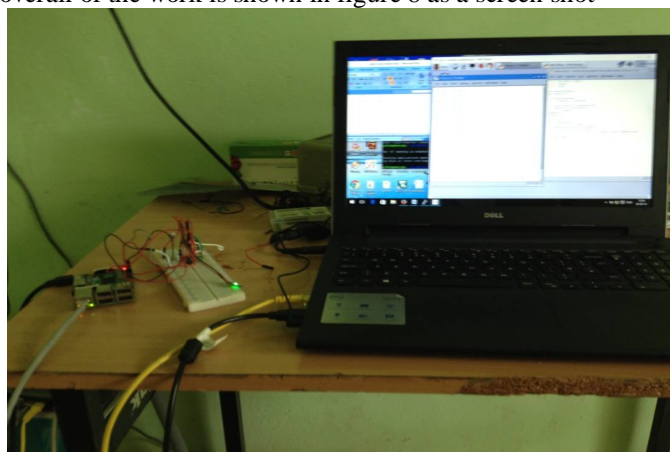


Figure.8. Photograph of total experimental setup



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Vol. 6, Issue 3, March 2017

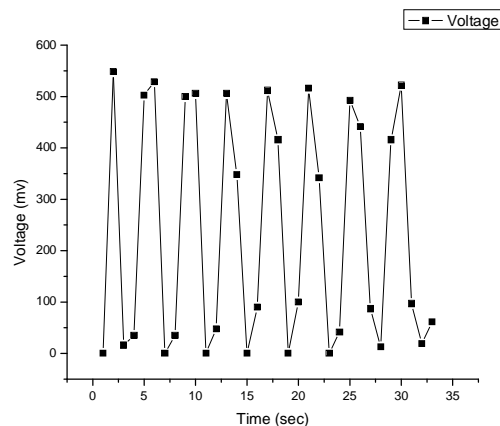


Figure 9. Graph of the voltage and time

IV. CONCLUSION

This paper propose and focus on the Heart beat monitoring and alert system that is able to monitor the heart beat rate condition of patient using Raspberry Pi through graphical presentation. By this the patient can be monitored correctly and alerts the patient as well as the family members to take precautions. The system is cost effective, easy to handle and every one can operate easily.

REFERENCES

1. Souvik Das, "The Development of a Microcontroller Based Low-Cost Heart Rate Counter for Health Care Systems", International journal of Engineering Trends and Technology-Volume4, Issue2-2013.
2. Bandana Mallick , et.al, "Heart Rate Monitoring System using Finger Tip Through Arduino and Processing Software", IJSETR, Volume 5, Issue 1, January 2016.
3. Ufoaroh S.U, "Heart Beat Monitoring and Alert System Using GSM Technology", IJERGS, Volume 3, Issue 4, July-August,2015.
4. Prasad Kumari Nisha, et.al, "Heart Rate Monitoring and Data Transmission via Bluetooth", IJIERE, Volume 2, Issue 2, 2015.
5. E. MuthuSundhara Pandiyan, et.al, "Force Sensitive Resistance Based Heart Beat Monitoring For Health Care System", IJIST, Vol.4, No.3, May 2014.
6. Ms.Sejal V.Gawande, et.al, "Raspberry Pi Technology", ISSN:2277 128X, Volume 5, Issue 4, April 2015.
7. K.Saravana Kumar, et.al, "Research Article Suveillance System Based On Raspberry Pi for Monitoring a Location Through A Mobile Device", IJAMR, ISSN:2393-8870.
8. Datasheet of MCP3008.pdf.
9. www.raspbian.org.
10. www.learnpython.org.
11. T.narmada, et.al, "Raspberry Pi 2 Processor Based System for the Measurement of Temperature and Light Monitoring ", ijareeie, Vol. 6, Issue 1, January 2017, ISSN:2320-3765.