Implementation of Heart Rate Measurement Device

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***Abstract*—** A prominent position is held by the biomedical instrumentation within medicine. Heart rate varies when necessity of body to absorb oxygen and excrete carbon dioxide changes while doing exercise or sleep. The diagnosis and tracking of medical conditions can be achieved by measuring heart rate. The heart rate measurement device can be used anywhere to measure the heart rate of a person. The approach to design a cheap and reliable device is demonstrated by this paper. In this paper we learn that heart rate signal can be found using fingertip sensor. Signal is amplified with the help of amplifier because signal is having low amplitude. Counter counts the amplified signal. RF transmitter transmits the signal. RF receiver receives the signal and then16X2 LCD display will show the heart rate of the person.

Keywords*-sensor,microcontroller,RF module.*

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I. INTRODUCTION

Heartbeats per unit of time is reffered as Heart Rate, which is expressed as beats per minute (bpm). Tthe number of contractions of the heart per unit of time measures the Heart Rate . The Idea behind variation in heart rate according to the body's physical needs, including the need to absorb oxygen and excrete carbon dioxide. It is usually equal or close to the pulse measured at any peripheral point. Activities that can provoke change include physical exercise, sleep, anxiety, stress, illness, ingesting, and drugs. Medical professionals use the measurement of heart rate to assist in the diagnosis and tracking of medical conditions. The very important parameters of the human cardiovascular system is heart rate measurement . Electro-cardiogram (ECG) is excellent method for measuring the heart rate.ECG is an expensive device and its use for the measurement of heart rate only is not economical. Wrist watches are also available for instantaneous measurement of heart rate but their cost is high making them uneconomical.

The design of a very cheap device which measures the heart rate of subject by keeping the fingertip on fingertip sensor and then text based LCD displays the result on itself is described by this paper. The device has the benifit that it is microcontroller based and thus can be programmed to display various quantities, such as the average, maximum and minimum rates over a period of time and so on. Another advantage of such a design is that it can be expanded and can easily be connected to a recording device or a PC to collect and analyses the data for over a period of time.

II. BLOCK DIAGRAM

With the help of fingertip sensor heart rate signal is found. Signal is having low amplitude hence it is amplified using amplifier.Then the amplified signal is counted using microcontroller. Rf transmitter transmits the signal. The block diagram of proposed design.is shown by Figure 1.

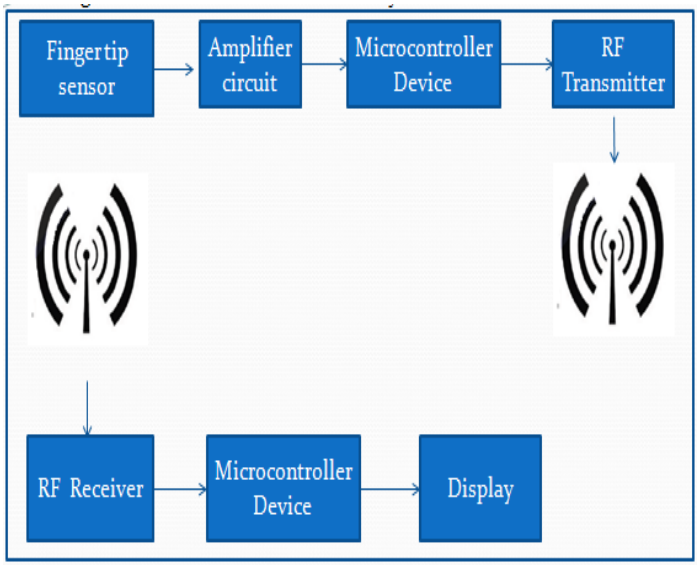

Figure 1: Block diagram of Heart rate measurement System

The heartbeat signal which has been transmitted by RF transmitter, it will be reacieved by RF receiver. 16X2 LCD display will show the signal.

III. CIRCUIT DESIGN

The heart rate measurement circuit is having two parts. Those are the transmitting circuit and receiving circuit.

A. Transmitting Part

Pulse Sensor, ATmega8, RF transmitter are consisted by transmitter circuit.

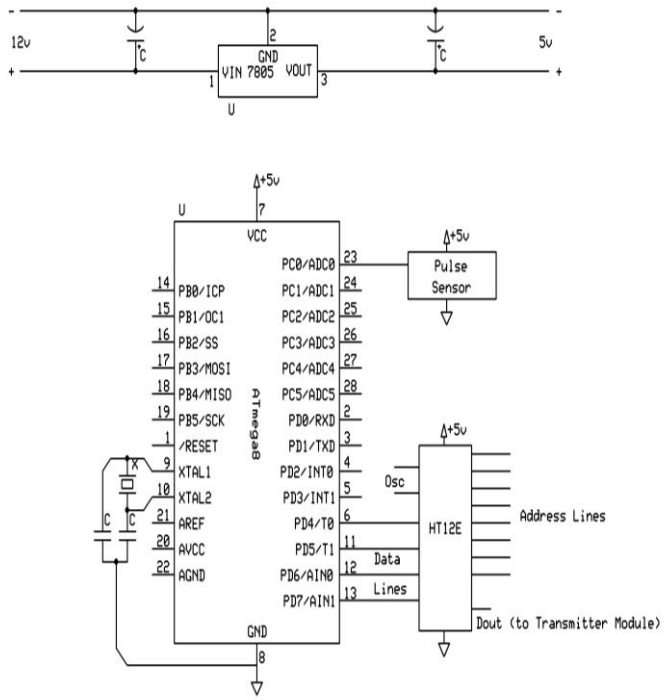

Figure 2: Schematic of heart rate measurement and transmitting circuit

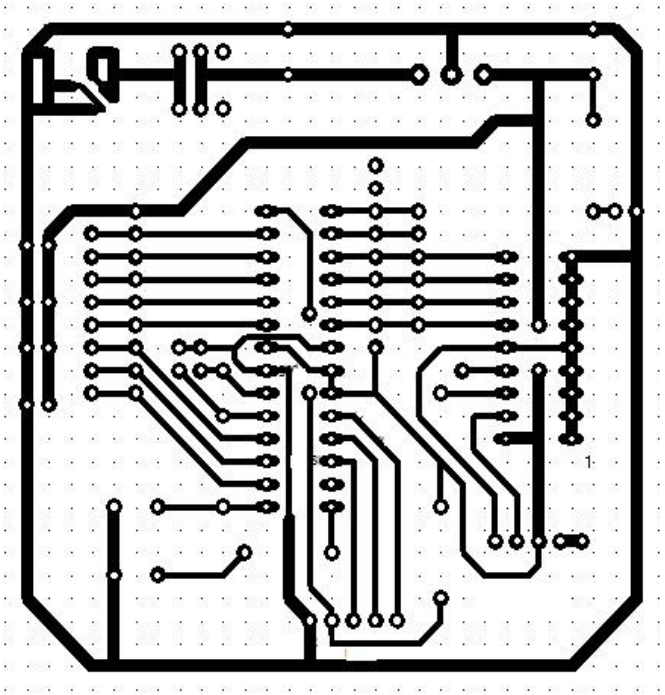

Figure 3: PCB layout (Transmitting Circuit)

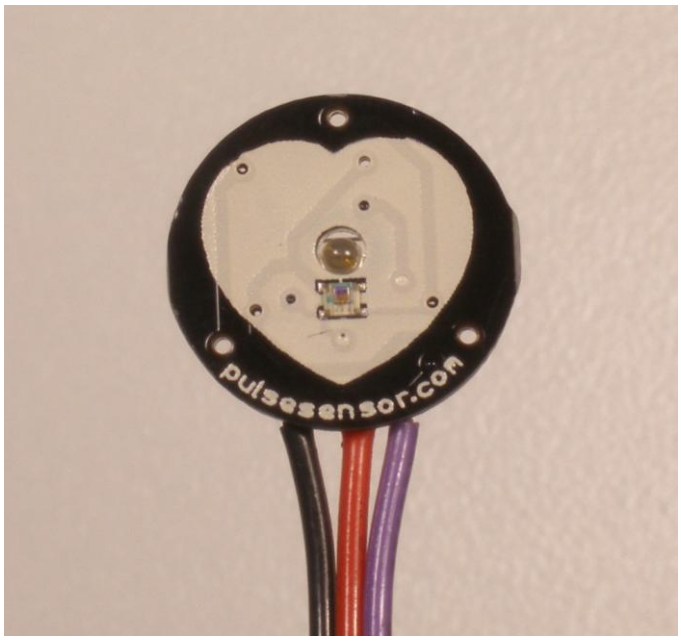

Figure 4: Pulse sensor

Consider figure 4, The Heart logo is on the front side of the sensor. contact with the skin is made by front side. On the front you see a small round hole, which is where the LED shines through from the back, and there is also a little square just under the LED. The square is an ambient light sensor, exactly like the one used in cell phones, tablets, and laptops, to adjust the screen brightness in different light conditions. The LED shines light into the fingertip or earlobe, or other capillary tissue, and sensor reads the light that bounces back. The back of the sensor is where the rest of the parts are mounted. We put them there so they would not get in the way of the of the sensor on the front. Even the LED we are using is a reverse mount LED.

The cable is a 24” flat color coded ribbon cable with 3 male header connectors.
RED wire = +3V to +5V, BLACK wire = GND
PURPLE wire = Signal.

B. Receiving Part

There are receiving RF receiver, ATMEGA8 and a LCD display on the receiver side. The receiving circuit is shown by Figure 5. Internal oscillator requires 8.0 MHz Frequency to run the ATMEGA8. 15 seconds are required to complete the measurement and receiver transmits the result and 16*2 LCD Display shows the result.

 ISSN: 2321-8169
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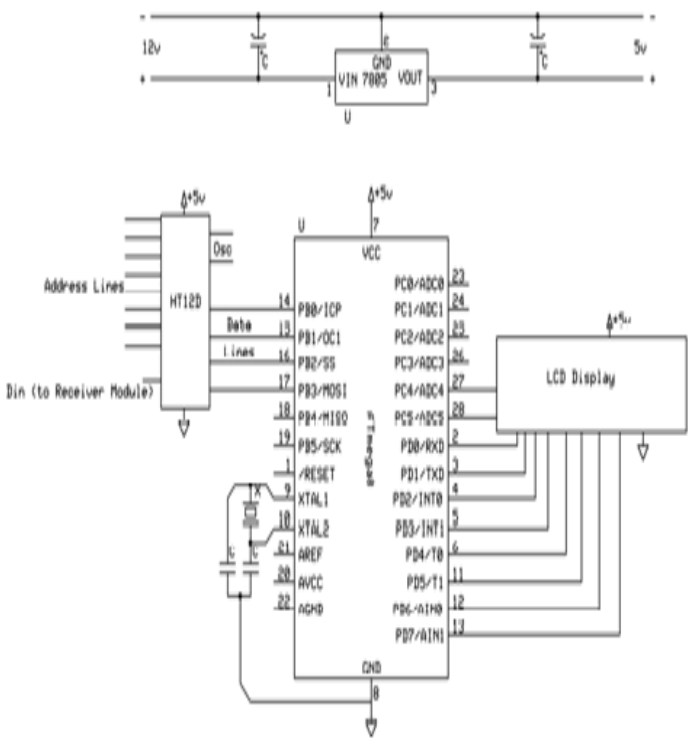

Figure 5: Schematic of the signal receiving circuit

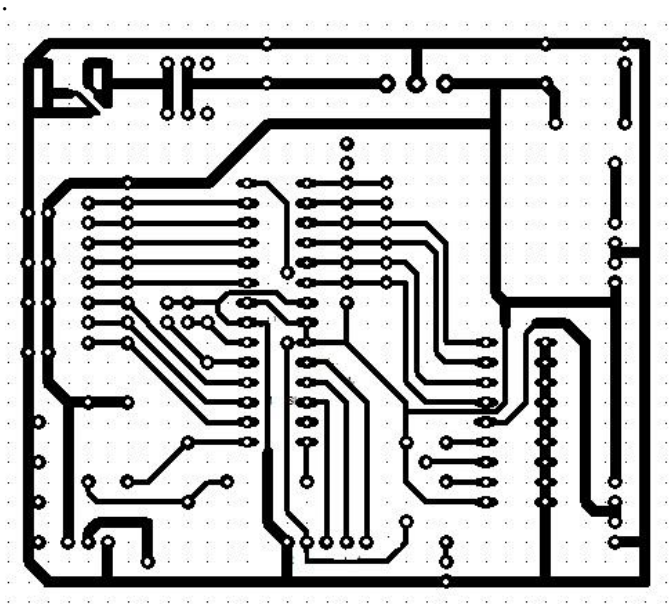

Figure 6: PCB layout (Receiving Circuit)

IV. HARDWARE IMPLEMENTATION OF HEART RATE MEASUREMENT SYSTEM

Printed Circuit Board (PCB) fabricates the microcontroller based wireless heart bit rate measurement device.

A. Hardware design of transmitting Part

Consider the figure 7; Powersupply is obtained by on-off switch above the microcontroller.

The users are having push to on switches. The microcontroller we are using is on the left side of the PCB. In this PCB it is ATMEGA8. Transmitter and antenna are on the left side.

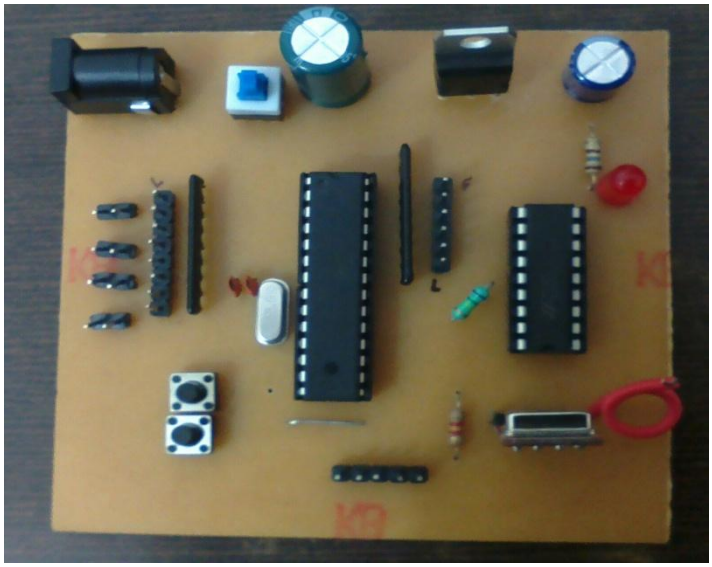

Figure 7: Hardware implementation of heart rate measurement device (Transmitting part)

B. Hardware design of receiving Part

Another ATMEGA8 microcontroller is used on the left side of PCB.LCD where the output result will be shown is in the below of figure .

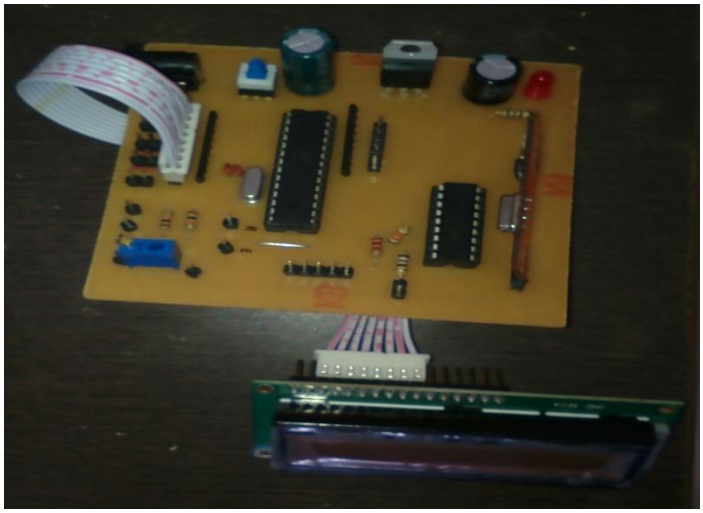

Figure 8: Hardware implementation of heart rate measurement device (Receiving part)

V. CONCLUSION

The Heart Rate Measurement Device is Portable. This type of Doctor uses this type of technology from any remote place like villages.This type of device can also be operated by any non professional educated person. So this paper represents the

device which is having low cost and it is also easy to understand.

VI. References

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