Objectives:

- Implement a heart rate measuring system that will show heartbeat graph & Beats
- Per Minute (BPM) in an LCD display
- To be able to use Arduino UNO in our daily life application
- To be able to learn about 16x2 LCD display & I2C module
- To be able to use a pulse sensor & read input value from it using Arduino UNO
- To be able to convert the analog pulse signal data to BPM & display in the LCD Display

Introduction:

Heartbeat Sensor is an electronic device that is used to measure the heart rate i.e. speed of the heartbeat. Monitoring body temperature, heart rate and blood pressure are the basic things that we do in order to keep us healthy.

In order to measure the body temperature, we use thermometers and a sphygmomanometer to monitor the Arterial Pressure or Blood Pressure.

Heart Rate can be monitored in two ways: one way is to manually check the pulse either at wrists or neck and the other way is to use a Heartbeat Sensor.

In this project, we have designed a Heart Rate Monitor System using Arduino and Heartbeat Sensor. You can find the Principle of Heartbeat Sensor, working of the Heartbeat Sensor and Arduino based Heart Rate Monitoring System using a practical heartbeat Sensor.

Components Required:

- Arduino UNO
- 16 x 2 LCD Display
- 10KΩ Potentiometer
- 330Ω Resistor (Optional – for LCD backlight)
- Push Button
- Heartbeat Sensor Module with Probe (finger based)
- Mini Breadboard
- Connecting Wires

Project Details:

The circuit design of Arduino based Heart rate monitor system using Heart beat Sensor is very simple. First, in order to display the heartbeat readings in bpm, we have to connect a 16×2 LCD Display to the Arduino UNO.

The 4 data pins of the LCD Module (D4, D5, D6 and D7) are connected to Pins 1, 1, 1 and 1 of the Arduino UNO. Also, a 10KΩ Potentiometer is connected to Pin 3 of LCD (contrast adjust pin). The RS and E (Pins 3 and 5) of the LCD are connected to Pins 1 and 1 of the Arduino UNO.

Next, connect the output of the Heartbeat Sensor Module to the Analog Input Pin (Pin 1) of Arduino.

Upload the code to Arduino UNO and Power on the system. The Arduino asks us to place our finger in the sensor and press the switch.

Place any finger (except the Thumb) in the sensor clip and push the switch (button). Based on the data from the sensor, Arduino calculates the heart rate and displays the heartbeat in bpm.

While the sensor is collecting the data, sit down and relax and do not shake the wire as it might result in a faulty value.

After the result is displayed on the LCD, if you want to perform another test, just push the rest button on the Arduino and start the procedure once again.

Circuit Diagram:

The Control Circuit consists of an Op-Amp IC and few other components that help in connecting the signal to a Microcontroller. The working of the Heartbeat Sensor can be understood better if we take a look at its circuit diagram.

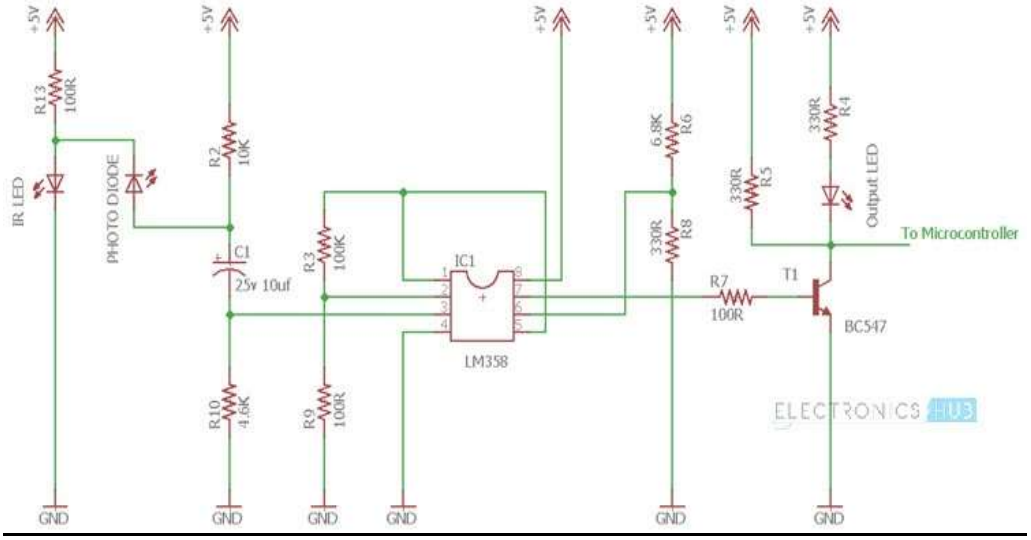

Fig. Finger type heartbeat sensor, which works by detecting the pulses

Every heartbeat will alter the amount of blood in the finger and the light from the IR LED passing through the finger and thus detected by the Photo Diode will also vary.

The output of the photo diode is given to the non – inverting input of the first op – amp through a capacitor, which blocks the DC Components of the signal. The first op – amp cats as a non – inverting amplifier with an amplification factor of 1001.

The output of the first op – amp is given as one of the inputs to the second op – amp, which acts as a comparator. The output of the second op – amp triggers a transistor, from which, the signal is given to a Microcontroller like Arduino.

The Op – amp used in this circuit is LM358. It has two op – amps on the same chip. Also, the transistor used is a BC547. An LED, which is connected to transistor, will blink when the pulse is detected.

The following image shows the circuit diagram of the Arduino based Heart Rate Monitor using Heartbeat Sensor. The sensor has a clip to insert the finger and has three pins coming out of it for connecting VCC, GND and the Data.

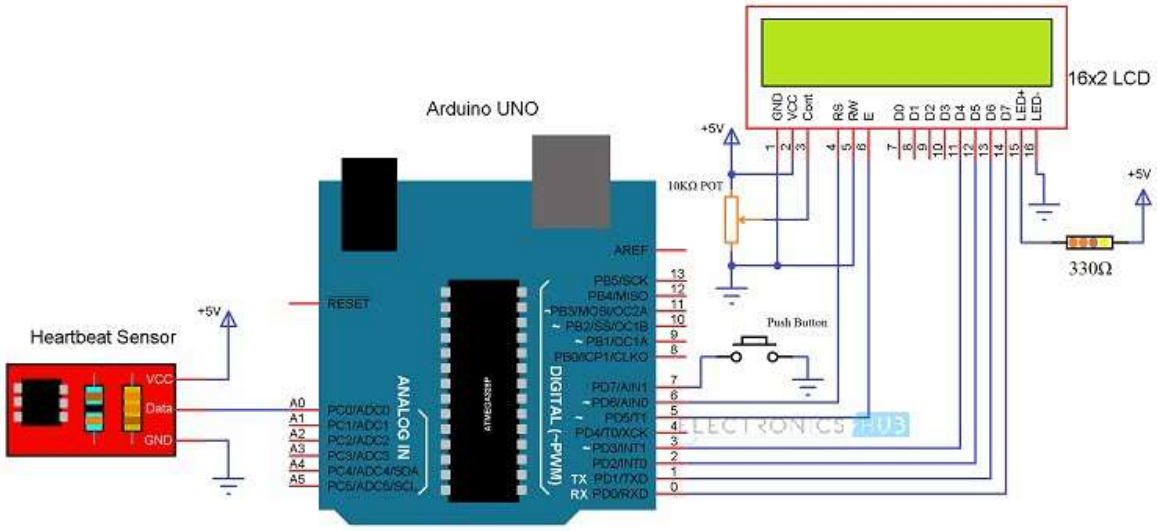

Fig. Circuit of Arduino based Heart Rate Monitor using Heartbeat Sensor

Conclusion:

A simple project involving Arduino UNO, 16×2 LCD and Heartbeat Sensor Module is designed here which can calculate the heart rate of a person.This project can be used as an inexpensive alternative to Smart Watches and other expensive Heart Rate Monitors.