A PROJECT REPORT

"HEARTBEAT SENSOR USING ARDUINO"

UNDER THE GUIDANCE OF

PROF. SHEETAL WAGHCHAWARE

SUBMITTED BY

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GEETA GUJAR

DEPARTMENT OF

ELECTRONICS AND TELECOMMUNICATION ENGINEERING

SHALAKA FOUNDATION

KEYSTONE SCHOOL OF ENGINEERING

(2021-2022)

Keystone School of Engineering

C E R T I F I C A T E

THIS IS TO CERTIFY THAT PROJECT ENTITIES

“HEATBEAT SENSOR BY USING ARDUINO”

SUBMITTED BY

BHAGYASHREE KAMBLE

AISHWARYA SUTAR

GEETA GUJAR

This is to certify that Bhagyashree Kamble, Aishwarya Sutar & Geeta Gujar has successfully completed the mini project work entitled as “Heartbeat Sensor Using Arduino” under my supervision, in the partial fulfillment of Third Year of Engineering – Electronics & Telecommunication Engineering, University of Pune.

Prof. Sheetal Waghchaware	**Prof. R. A. Barapate**	
Guide	**Head of Department**	**Principal**
Department of E&TC	**Department of E&TC**	

Place: - Pune

Date: -

ABSTRACT

This paper presents a prototype for the monitoring of Heartbeat rate. A Heart Beat (HB) sensor is being developed for acquainting the input signals using Light Dependent Resistance (LDR) and Light Emitting Diode (LED).

Sensor senses the heartbeat of a person and converts it in the form of electrical signals and pulses. The signals are amplified using a signal conditioning circuit and processed by a controller. The frequency of the signal depends on the heartbeat rate, this lays down the basic principle of the HB measuring system. The user needs to put his/her finger in the HB sensor for acquiring the input signals.

Although number of methods has been proposed and implemented in this domain yet the proposed system in this text provides a simpler and robust method for measuring the heart rate. The proposed system is being implemented on the hardware and also simulated in Proteus ISIS 7.10 to prove its effectiveness. The proposed model is much more precise, straightforward and cheaper than other heartbeat rate measuring systems. This work has tried to make an easy and stout system for the monitoring of heart beat.

ACKNOWLEDGMENT

Every orientation work has an imprint of many people and it becomes duty of author to express deep gratitude for the same.

We would like to take this opportunity to express true sense of gratitude towards our project

guide **Prof. Sheetal Waghchaware** for her valuable co-operation and guidance that gave us for this project.

We would also like to thank our head of the department **Prof. R. A. Barapate** for inspiring us and providing us all lab facilities with internet, which helped us with the project work.

We would also like to express our appreciation and thanks to all those who knowingly or unknowingly have assisted us & encouraged us for our project.

INDEX

CHAPTER NO. 1

INTRODUCTION

1. 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.

Monitoring heart rate is very important for athletes, patients as it determines the condition of the heart (just heart rate). There are many ways to measure heart rate and the most precise one is using an Electrocardiography

But the easier way to monitor the heart rate is to use a Heartbeat Sensor. It comes in different shapes and sizes and allows an instant way to measure the heartbeat.

Heartbeat Sensors are available in Wrist Watches (Smart Watches), Smart Phones, chest straps, etc. The heartbeat is measured in beats per minute or bpm, which indicates the number of times the heart is contracting or expanding in a minute.

CHAPTER NO. 2

LITERATURE SURVEY

2.LITERATURE SURVEY

- Heart Pulse Monitoring and Notification System using Arduino [1], Hari Kiran Pendurthi, Siva Sai Kanneganti, Jaswanth Godavarthi, Proceedings of the International Conference on Artificial Intelligence and Smart Systems (ICAIS-2021). In this research work has developed a system using Internet of Things to assist individuals and help them get immediate treatment. The proposed system uses a pulse sensor, which when a finger is placed on it calculates the heartbeat of the person. In this system there are two segments the hardware which is used to calculate heartbeat and the other is to continuously monitor heartbeat data which is collected in the previous step. This sensor is then interfaced to an Arduino UNO microcontroller that permits checking of the heartbeat value and communicating them to the internet by using Bolt Wi-Fi module. The data is sent an AWS server via bolt cloud which continuously monitors the heartbeat for any abnormalities. The client can set a limit whenever the client's heartbeat exceeds the threshold limit then by using online API services like Twilio to send SMS to the doctor/client stating the patient's current heartbeat. In this way, an efficient solution has been provided to monitor the heartbeat of a patient remotely and give an automated response according to the heartbeat.
- Arduino & IoT Based Health Surveillance Systems [2], Hanan Abed Alwally, Ruqayah A. Ulwali, Noor Abd allah Othman, Marwa Ibrahim Shamel, Mustansiriya University, College of Science, Department of Computer Science, Baghdad, Iraq (2021). This paper relates about the monitoring of signals by using the aortic blood vessels to take out organic signals from arterial waves. The sensor is fixed near to the heart valve that detects the blocks or any other problem arises in the human body. the other method is known as

catheter which is inserted into our human body to find any sort of health disorders in sequential time difference.

- Health Monitoring and Predicting System using Internet of Things & Machine Learning [3], Riyazulla Rahman. J Shridhar Sanshi, N. Nasurudeen Ahamed, 7th International Conference on Advanced Computing and Communication Systems (ICACCS - 2021). This paper Donates Health Monitoring and predicting framework utilizing IOT portrays the assortment and interoperation of Patient information gathered from the sensors, The collected sensor data will incorporate through micro controller Arduino board for processing and the processed data is sent to remote server Thing Speak using ESP8266 Wi-Fi module. Thing Speak server is an IoT analytics platform that empowers us to imagine, and investigate live data streams in the cloud. And it is predicted for best accuracy using Machine Learning algorithm.
- Secure and smart system for monitoring patients with critical cases [4], Hanan Abed Alwally Abed Allah, Rawsam Abduladheem Hasan, Indonesian Journal of Electrical Engineering and Computer Science, Iraq (2020). In this they have divided their system into four parts: transmitted part (Arduino, heat sensor, and hygrometer sensor), alarm part consists of lights and alarm bell, emergency part (doctors and nurses), and the medical application has been used as the last part. The application can be used only by authorized persons and through the accounts which are granted to them, in order to protect the data from sabotage and maintain the privacy and confidentiality of it.
- A Survey on Tracing Heart Attacks by Pulse Monitoring in IoT [5], C. Santhanakrishnan, N. Gayathri Poojitha, Jahnavi Reddy, International Conference on Physics and Photonics Processes in Nano Sciences (2019). In this system they have provided where

heart attacks can be detected early, heart beats of the patient are monitored using a pulse sensor and a temperature sensor, which is then interfaced with a microcontroller. This sensor will be installed in a wearable device. When the heartbeat of the patient exceeds a certain threshold value, an alert will be sent to the remote family, and the medical authorities with the help of the Internet. Sensor is used for sensing the heart beats. The microcontroller receives these beats and evaluates pulse. If the pulses are above or lower than the threshold value, the microcontroller initiates Wi-Fi module and sends out distress message to mobile contacts previously stored inside microcontroller.

CHAPTER NO. 3

PROBLEM STATEMENT

&

OBJECTIVE

3.1 PROBLEM STATEMENT

To implement Heartbeat Sensor by using Arduino UNO and Programming language.

3.2 OBJECTIVE

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

CHAPTER NO. 4

SPECIFICATIONS

4.SPECIFICATIONS

4.1 Hardware

1. Arduino UNO x 1
2. 16 x 2 LCD Display x 1
3. 10KΩ Potentiometer
4. 330Ω Resistor
5. Push Button
6. Heartbeat Sensor Module with Probe
7. Mini Breadboard
8. Connecting Wires

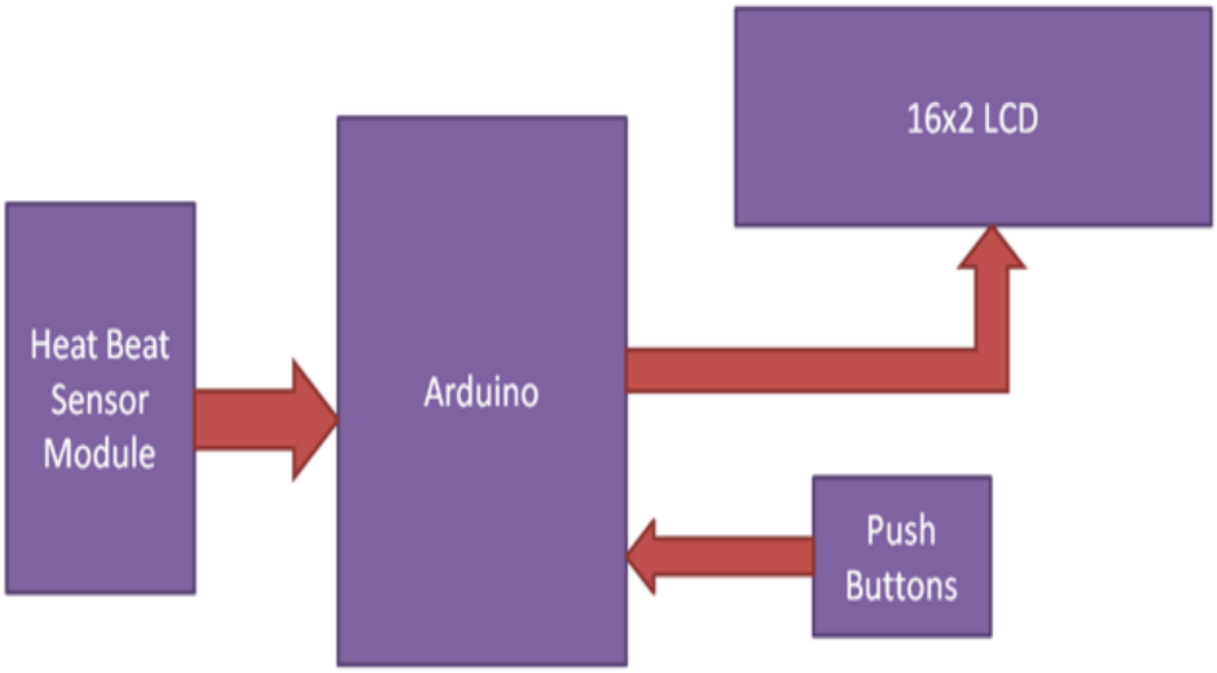
4.2 Software Specification

- Arduino Software (IDE)

CHAPTER NO. 5

BLOCK DIAGRAM & DESCRIPTION

5.1 BLOCK DIAGRAM



SPECIFICATIONS

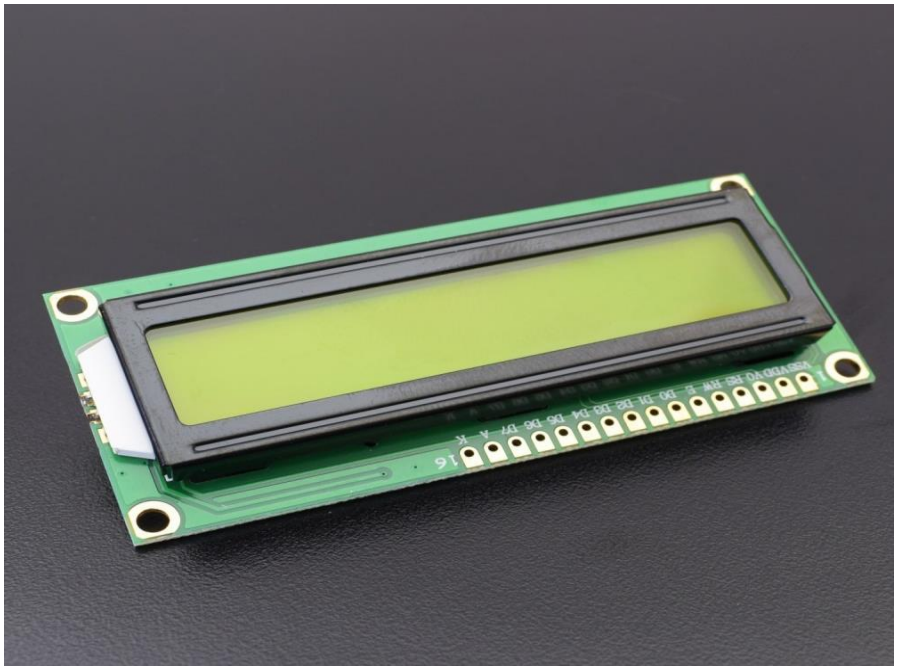
1.Arduino UNO R3

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts

2.16 x 2 LCD Display

The 16×2 LCD pinout is shown below.

- Pin1 (Ground/Source Pin): This is a GND pin of display, used to connect the GND terminal of the microcontroller unit or power source.
- Pin2 (VCC/Source Pin): This is the voltage supply pin of the display, used to connect the supply pin of the power source.
- Pin3 (V0/VEE/Control Pin): This pin regulates the difference of the display, used to connect a changeable POT that can supply 0 to 5V.
- Pin4 (Register Select/Control Pin): This pin toggles among command or data register, used to connect a microcontroller unit pin and obtains either 0 or 1(0 = data mode, and 1 = command mode).
- Pin5 (Read/Write/Control Pin): This pin toggles the display among the read or writes operation, and it is connected to a microcontroller unit pin to get either 0 or 1 (0 = Write Operation, and 1 = Read Operation).
- Pin 6 (Enable/Control Pin): This pin should be held high to execute Read/Write process, and it is connected to the microcontroller unit & constantly held high.
- Pins 7-14 (Data Pins): These pins are used to send data to the display. These pins are connected in two-wire modes like 4-wire mode and 8-wire mode. In 4-wire mode, only four pins are connected to the microcontroller unit like 0 to 3, whereas in 8-wire mode, 8-pins are connected to microcontroller unit like 0 to 7.
- Pin15 (+ve pin of the LED): This pin is connected to +5V
- Pin 16 (-ve pin of the LED): This pin is connected to GND.



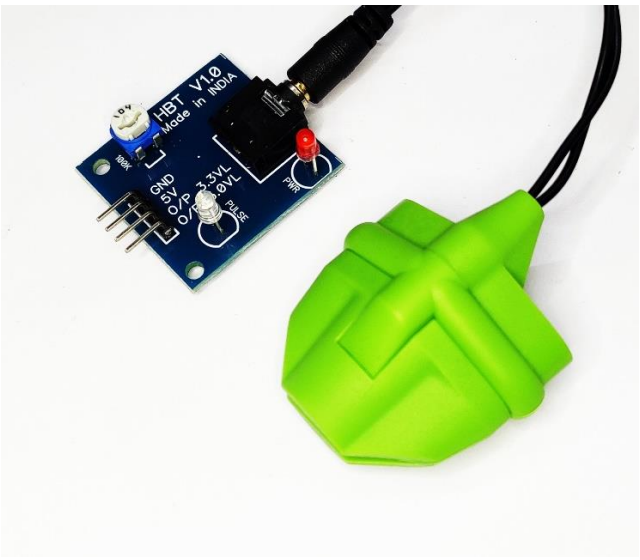
3. 10KΩ Potentiometer

- Type: Rotary a.k.a Radio POT
- Available in different resistance values like 500Ω, 1K, 2K, 5K, 10K, 22K, 47K, 50K, 100K, 220K, 470K, 500K, 1 M.
- Power Rating: 0.3W
- Maximum Input Voltage: 200Vdc
- Rotational Life: 2000K cycle

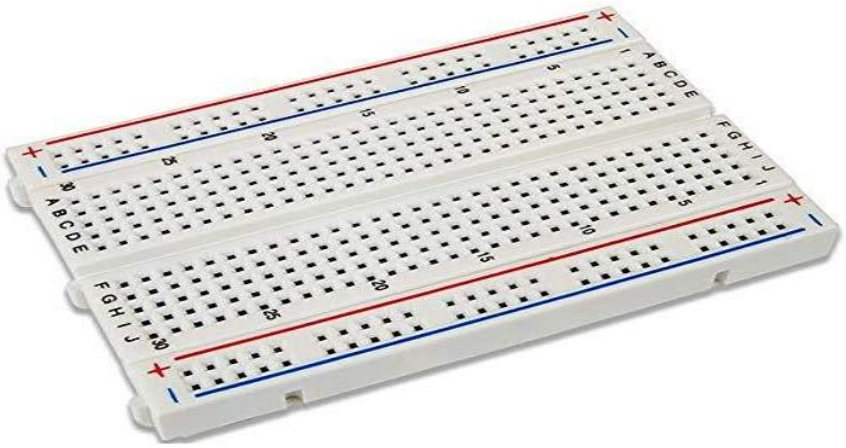
4.Push Button

- Mode of Operation: Tactile feedback.
- Power Rating: MAX 50mA 24V DC.
- Insulation Resistance: 100Mohm at 100v.
- Operating Force: 2.55±0.69 N.
- Contact Resistance: MAX 100mOhm.
- Operating Temperature Range: -20 to +70 ℃
- Storage Temperature Range: -20 to +70 ℃

5.Heartbeat Sensor Module with Probe



6.Mini Breadboard

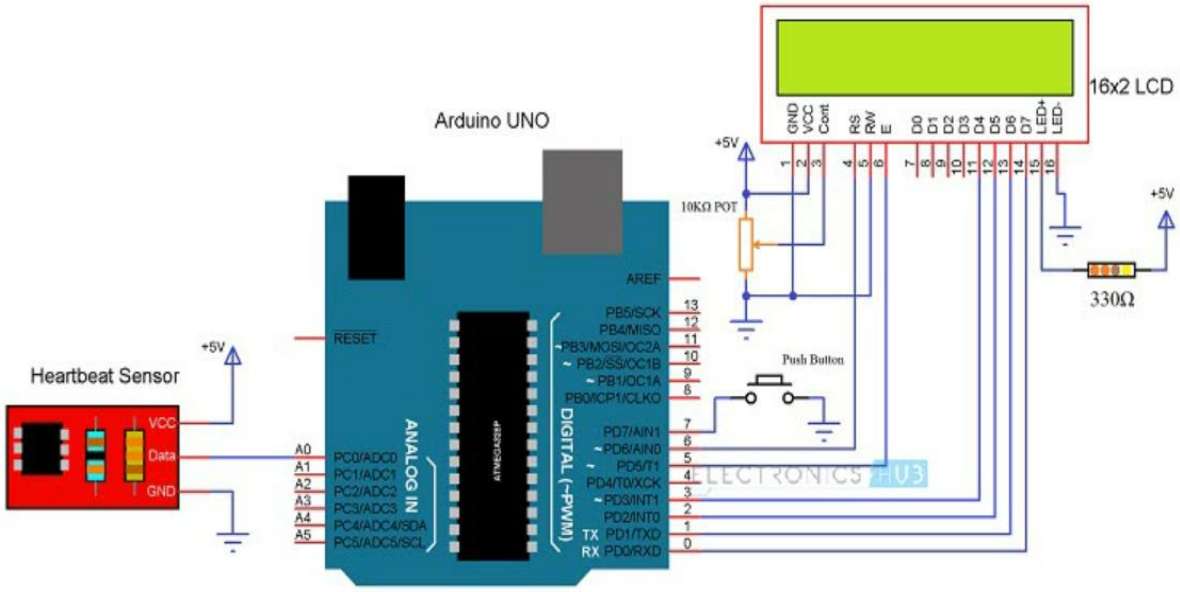


This is **a very small breadboard with self-adhesive backing** with 170 tie points there's just enough room to build and test simple circuits; They're also great for breaking out DIP package ICs to jumper wires! It has a peel and stick adhesive backing. This bread board is compatible with the Arduino Proto Shield.

7.Connecting Wires

It allows an electrical current to travel from one point on a circuit to another because electricity needs a medium through which it can move. Most of the connecting wires are made up of copper or aluminum.

5.2 CIRCUIT DIAGRAM



CHAPTER NO. 6

SOFTWARE IMPLEMENTATION

Code:

```
#include <LiquidCrystal.h>
LiquidCrystal lcd(6, 5, 3, 2, 1, 0);
int data=A0;
int start=7;
int count=0;
unsigned long temp=0;

byte customChar1[8] = {0b00000,0b00000,0b00011,0b00111,0b01111,0b01111,0b01111,0b01111};
byte customChar2[8] = {0b00000,0b11000,0b11100,0b11110,0b11111,0b11111,0b11111,0b11111};
byte customChar3[8] = {0b00000,0b00011,0b00111,0b01111,0b11111,0b11111,0b11111,0b11111};
byte customChar4[8] = {0b00000,0b10000,0b11000,0b11100,0b11110,0b11110,0b11110,0b11110};
byte customChar5[8] = {0b00111,0b00011,0b00001,0b00000,0b00000,0b00000,0b00000,0b00000};
byte customChar6[8] = {0b11111,0b11111,0b11111,0b11111,0b01111,0b00111,0b00011,0b00001};
byte customChar7[8] = {0b11111,0b11111,0b11111,0b11111,0b11110,0b11100,0b11000,0b10000};
byte customChar8[8] = {0b11100,0b11000,0b10000,0b00000,0b00000,0b00000,0b00000,0b00000};
void setup()
{
lcd.begin(16, 2);
lcd.createChar(1, customChar1);
lcd.createChar(2, customChar2);
lcd.createChar(3, customChar3);
lcd.createChar(4, customChar4);
lcd.createChar(5, customChar5);
lcd.createChar(6, customChar6);
lcd.createChar(7, customChar7);
lcd.createChar(8, customChar8);

pinMode(data,INPUT);
pinMode(start,INPUT_PULLUP);
}

void loop()
```

```
{
 lcd.setCursor(0, 0);
 lcd.print("Place The Finger");
 lcd.setCursor(0, 1);
 lcd.print("And Press Start");

  while(digitalRead(start)>0);

   lcd.clear();
   temp=millis();

   while(millis()<(temp+100))
   {
      if(analogRead(data)<100)
        {
         count=count+1;

          lcd.setCursor(6, 0);
          lcd.write(byte(1));
          lcd.setCursor(7, 0);
          lcd.write(byte(2));
          lcd.setCursor(8, 0);
          lcd.write(byte(3));
          lcd.setCursor(9, 0);
          lcd.write(byte(4));

          lcd.setCursor(6, 1);
          lcd.write(byte(5));
          lcd.setCursor(7, 1);
          lcd.write(byte(6));
          lcd.setCursor(8, 1);
          lcd.write(byte(7));
          lcd.setCursor(9, 1);
          lcd.write(byte(8));
```

```
      while(analogRead(data)<100);

      lcd.clear();
     }
 }

      lcd.clear();
      lcd.setCursor(0, 0);
      count=count*6;
      lcd.setCursor(2, 0);
      lcd.write(byte(1));
      lcd.setCursor(3, 0);
      lcd.write(byte(2));
      lcd.setCursor(4, 0);
      lcd.write(byte(3));
      lcd.setCursor(5, 0);
      lcd.write(byte(4));

      lcd.setCursor(2, 1);
      lcd.write(byte(5));
      lcd.setCursor(3, 1);
      lcd.write(byte(6));
      lcd.setCursor(4, 1);
      lcd.write(byte(7));
      lcd.setCursor(5, 1);
      lcd.write(byte(8));
      lcd.setCursor(7, 1);
lcd.print(count);
lcd.print(" BPM");
temp=0;
while(1);
                                                    }
```

Working Method

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.

CHAPTER NO. 7

ADVANTAGES AND APPLICATIONS

7.1 ADVANTAGES

- A heart beat sensor gives you clear indication and evaluation of the condition of your cardiovascular system during physical activity.
- Using heart beat sensor can be your personal coach.
- Easy to read has a clear screen and good scale.
- Quick response for any Heartbeat rate changes.
- Precision accuracy in heartbeat measurement.
- You can quickly check your heart rate or start a training session without having to put on a separate chest strap.

7.2 APPLICATION

- Have become a widely used training aid for a variety of sports.
- Hospitals / Dispensaries
- Better and accurate method of measuring heartbeat.
- At homes
- A set point can help in determining whether a person is healthy or not checking
- his/her heart beat and comparing with set point.

CHAPTER NO.8

CONCLUSION

8. CONCLUSION

In this paper, the design and development of a low-cost devices has been presented. This device is ergonomic, portable, durable and cost effective. The device is efficient and easy to use. Tests have shown excellent agreement with actual heartbeat rates. This device could be used in clinical and non-clinical environments.

It can also be easily used by individual users, e.g., athletes during sporting activities. The device could also be used as a monitoring instrument exploiting the SMS capabilities provided by this system.

CHAPTER NO. 9

FUTURE SCOPE

9. FUTURE SCOPE

- Monitoring device that could be used to detect the heart beat anomalies of physically challenged Individuals without hands.
- Also, a graphical LCD can be used to display a graph of the change of heart rate over time.

CHAPTER NO. 10

REFERENCE

10. REFERENCE

[1] S.M. Sabbir Ahamed, Md. Ashiqur Rahman Emu, Wardah Saleh, Heartbeat Sensor System for Remote Health Monitoring based on IOT, American International University, Bangladesh.

[2] R. Karthik, Shaik Aslam, Syed Abdul Afeez, T. Keerthi, Heartbeat Sensor using Arduino, Koneru Lakshmaiah Education Foundation Vaddeswaram.

[3] Reshma Sai Priya Talluri, Jai Surya Y, Sri Lakshmi Manchala, Heart Rate Monitoring System using Heart Rate Sensor and Arduino Uno with Web Application, Blue Eyes Intelligence Engineering & Science.

[4] R. Vinodhini, R. Puviarasi, Heart Rate Monitoring System using Pulse Sensor with Data Stored on Server, International Journal of Engineering and Advanced Technology (IJEAT)

[5] Mahima Chawla, Heartbeat and Body Temperature Monitoring Using Arduino.

[6] Riyazulla Rahman. J, Shridhar Sanshi, Nasurudeen Ahamed, Health Monitoring and Predicting System using Internet of Things & Machine Learning, Department of Computer Science and Engineering Presidency University.

[7] Hanan Abed Alwally Abed Allah, Rawsam Abduladheem Hasan, Secure and smart system for monitoring patients with critical cases, Department of Computer Science, College of Science, Mustansiriya University.

[8] Hanan Abed Alwally, Ruqayah A. Ulwali, Noor Abd allah Othman, Marwa Ibrahim Shamel, Arduino & IoT Based Health Surveillance Systems, Baghdad University, College of Science for Women.

CHAPTER NO. 10
COMPONENT LIST

SR.NO	COMPONENT NAME	QUANTITY	PRICE
1	Arduino UNO	1	850/-
2	LCD Display	1	150/-
3	Potentiometer	1	12/-
4	Resistor	2	6/-
5	Heartbeat Sensor	1	990/-
6	Push button	1	5/-
7	Connecting wires	40	60/-
		Total	**2,073/-**