CHAPTER 1
INTRODUCTION

1.1 Background and Context:

Science and technology by way of inventions and innovations has made life easier for everybody in all spheres of life. One of such is in medical sciences where medical personnel are now able to acquire vital medical data from patients. Two of the most important are the measurement of heartbeat rate. The Human Heart Rate Monitors (HRM) are devices that allow the user to gain a real time measurement of their heart beat. They consist of a transmitter which detects the heartbeat by measuring the number of times the heart beats per minute and a receiver that determines the heart rate on receiving signals from the transmitter. This project detects the live heart rate of a person and transfer it live to the doctors mobile or laptop for continuous monitoring. It also stores the heart rate on a cloud storage for further analysis.

1.2 Objectives:

- Build a system or device that will measure the rate of heart beat of human body.
- Detect heart attack.
- To monitor all the heart rate in a continuous interval length of time.
- Display the information regarding the heart rate to the patient on some monitoring device.
- Design web page for monitoring patient heart beat remotely.

1.3 Relevance:

Nowadays, health care sensors are playing an essential role in hospitals. The patient monitoring system is one of the major developments because of its innovative technology. An automatic wireless health monitoring system is used to measure a patient's body temperature and heartbeat by using embedded technology.

1.4 Literature Survey:

In [1] , Ultra-wideband (UWB) radio detection and ranging is used in almost all the major sensing signals works. It is widely used in wireless networking process which consumes only low power with more number of bandwidths can be formed in it. UWB remote sensing can also helps in detecting the problems arising in respiratory functions as well as the cardiac counts occurs.In [2] , This paper relates about the monitoring of signals by using the aortic blood vessesls 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. In [3] , Sleep observance is used to observe the sleep timings in a whole day of human's life span. In this paper, respiratory and cardiac problems can be noted. Especially, during the night time there is a emergency purpose, the watch monitor is found to measure the patients health. This is also known as sleep monitoring using the wearable watch type.In [4], In this paper, they have used a pressure mask with ECG device for the better application. The signal can be measured using the oximeter which is used to find the amount of oxygen flow in the blood. The viscous observation is the fluid resistance flow in the blood. The viscous observation is the fluid resistance flow in the blood. The pressure therapy helps to cures any type of disorder in the human body.

There are two types of pressure of airways which is negative and positive.In [5] , In this project, smart chair monitoring is used with the advanced features used here is telemonitoring with additional sytem is implemented. This can be urged to use because of the emergency health problems. The patients can be monitored by keeping them in smart chair very comfortably for the aged people. This can also be connected by using GSM, blutooth,wi-fi and other network connections.

1.5 Motivation:

Many people don’t go for regular body checkups due to which the health problem increases.
We aim to develop this system so as everyone can take care of his/her heart rate. This can decrease the death rate due to heart attack by knowing the increase and decrease in the heart rate. In the early period in order to find the heart beat, there is a conductor medium which can be placed in the chest. But nowadays, by using the fingers we can be able to find the heart rate of a person within a fraction of second.

1.6 Aim of the Project:

The aim of the project is to integrate heart rate sensor the NodeMCU in order to measure the live heart rate of a person. This project also upload the live heart rate to the cloud storage and transfer it to doctor and patients mobile it self. This helps doctors and patient as well to have continuous monitoring on the heart rate.

CHAPTER 2
BLOCK DIAGRAM

2.1Theoretical Background:

2.1.1 Significance Of Heart:

The heart is the most essential organ among the whole parts of the human body. Thus, without heart no humans can survive. Nowadays, heart transplantation is more common in today's world. It can be easily transplanted. The heart acts as a supplier, which pumps blood to all parts of the body, Not only in humans but also in each and every species on the planet earth. The heart supplies oxygen to our body and takes out carbon dioxide and other wastes substances. It also contains the three major vessels like arteries,veins and capillaries with the blood cells like red blood cells,white blood cells and platelets.

2.1.2 Pulse Sensor:

Pulse Sensor is a simple sensor which is used in many places. The basic sensor has three pins namely, ground,Vcc and the input signal(which is also known as A0 signal). The term pulse sensor represents that in order to find the heart beat rate. Thus, the sensor is in heart shape in its nature. The pin is constructed in such a way to indicate the heart rate. It can be used either in the breadboard or in the printed circuit board(PCB). When it is connected with the Arduino or with the ESP8266 Wi-Fi module, the LED is in ON condition. It works either in 3v or 5v with the help of internet connection.

Arduino Pin	Pulse Sensor Cable Color
RED	5V or 3V
BLACK	GND(Ground)
PURPLE	ANALOG 0(Zero)

Table 2.1.1: Pin Description

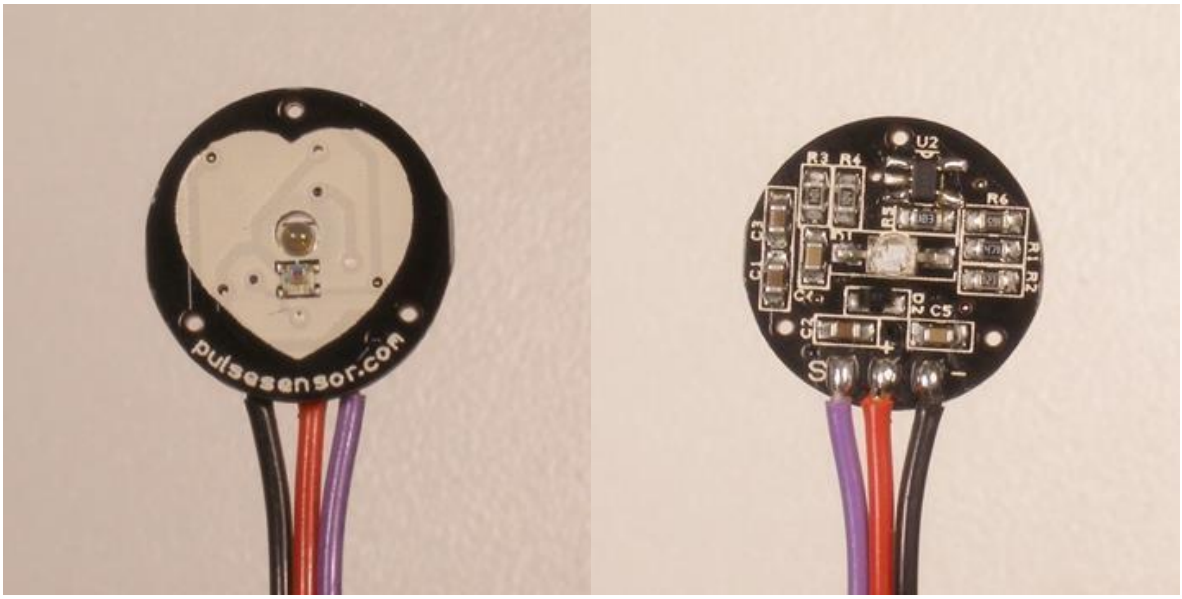

Figure 2.1.1: Pulse sensor

2.1.3 NodeMCU:

NodeMCU is a low-cost open source IoT platform. It initially included firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which was based on the ESP-12 module. Later, support for the ESP32 32-bit MCU was added.

Figure 2.1.2: NodeMCU

2.1.4 Thingspeak Cloud:

According to its developers, Thingspeak is an open-source Internet of Things (IoT) application and API to store and retrieve data from things using the HTTP and MQTT protocol over the Internet or via a Local Area Network. ThingSpeak enables the creation of sensor logging applications, location tracking applications, and a social network of things with status updates.

ThingSpeak was originally launched by ioBridge in 2010 as a service in support of IoT applications.

ThingSpeak has integrated support from the numerical computing software MATLAB from MathWorks, allowing ThingSpeak users to analyze and visualize uploaded data using Matlab without requiring the purchase of a Matlab license from Mathworks.

ThingSpeak has a close relationship with Mathworks, Inc. In fact, all of the ThingSpeak documentation is incorporated into the Mathworks' Matlab documentation site and even enabling registered Mathworks user accounts as valid login credentials on the ThingSpeak website. The terms of service and privacy policy of ThingSpeak.com are between the agreeing user and Mathworks, Inc.

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2.2 Block Diagram:

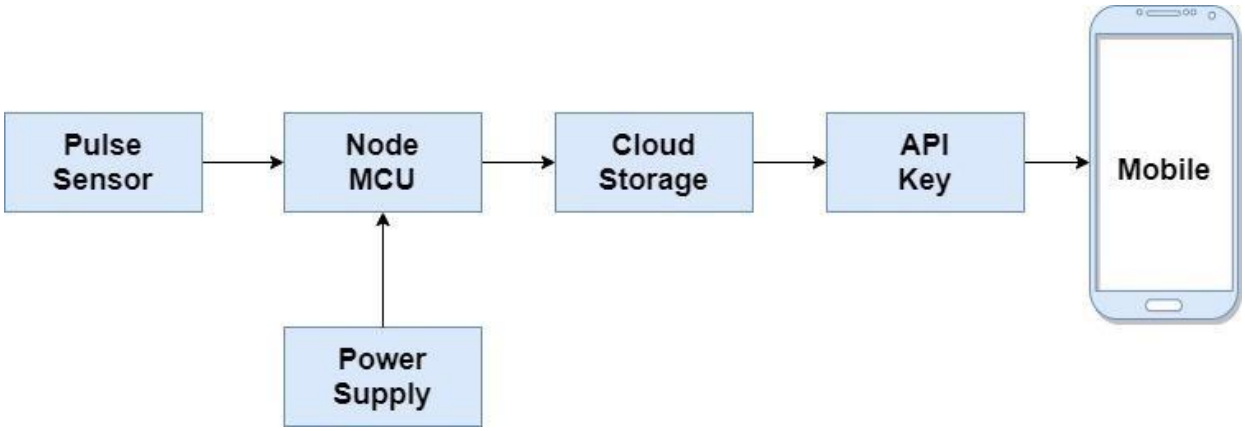

Figure 2.2.1: Block Diagram

Pulse sensor is connected with ESP8266 WIFI module(NodeMCU), the Vcc of pulse sensor is connected to 3.3 v of WIFI module, ground pin is connected to ground of WIFI module, the signal pin is connected to analog pin of WIFI module. NodeMCU pins are connected to the suitable pulse sensor pin out. After giving the connections, the program is uploaded to the ESP8266 using to UART communication. The program is written by using Arduino IDE software. Here, the NodeMCU acts as a station point, where it is connected to specific WIFI network with internet enable. The data from the ESP is stored into the cloud storage, the database is created using Thingspeak platform. Here, the API(Application program interface) acts as a interface between hardware and software. These, pulse sensor and esp8266 WIFI module are connected in breadboard. Pulse sensor finds the heart rate of the person within a fraction of second. The heart rate can be detected by using any finger of human. The heart rate can be seen by LIVE ie., the cloud platform detects the accurate value of heart beat which is ranges from 70 to 80 beats per minute. This data ithen transferred live to doctor or relatives using the API key and webpage.

2.3. Required Hardware:

- NodeMCU
- Heart Rate Sensor
- Connecting Wires
- Power Supply

2.4. Required software:

- Arduino IDE
- Circuito.io
- Thingspeak Cloud

CHAPTER 3
SYSTEM DESIGN

3.1 Simulation Circuit:

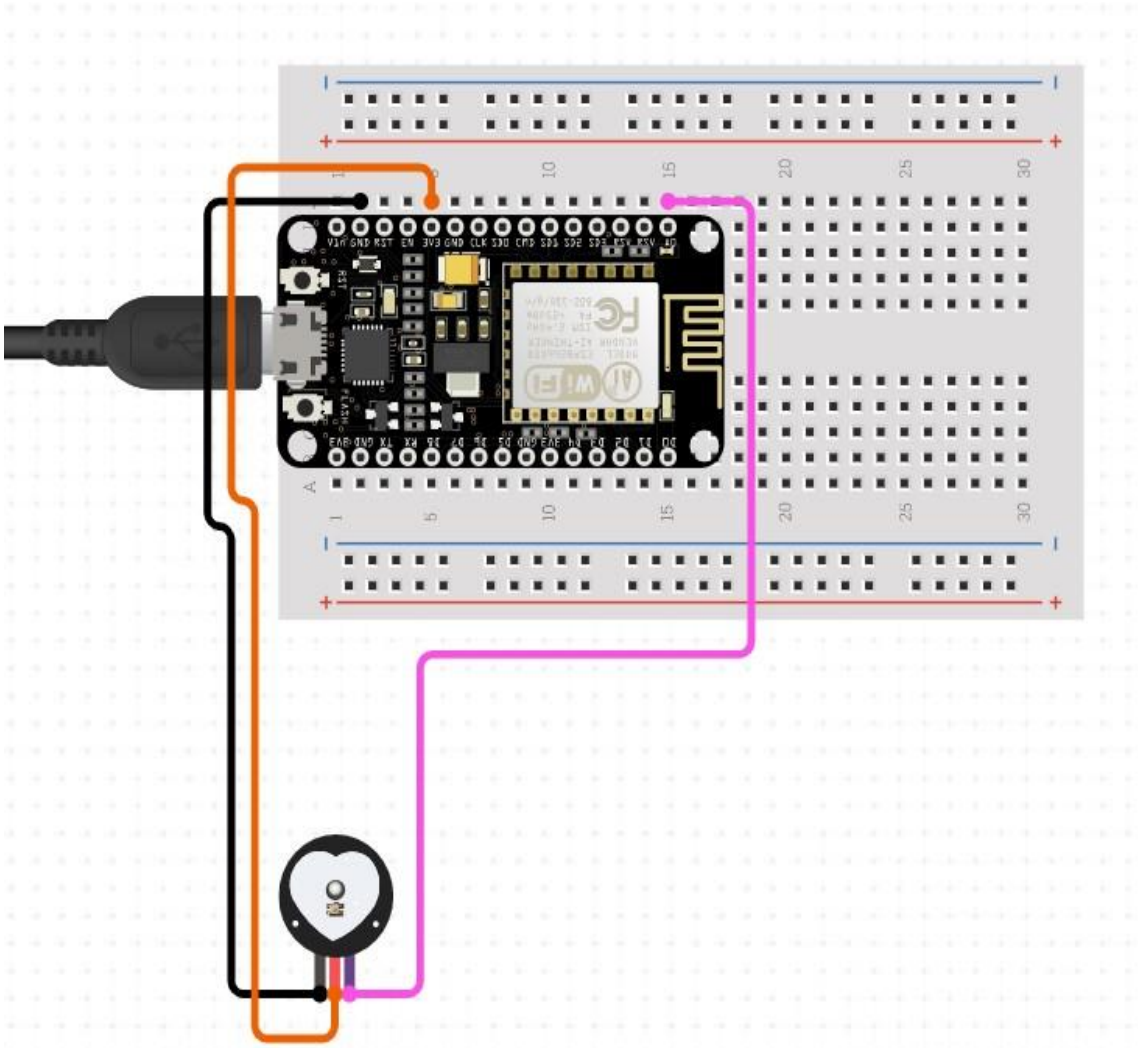

Figure 3.1.1: Simulation Circuit

3.2 Breadboard Testing:

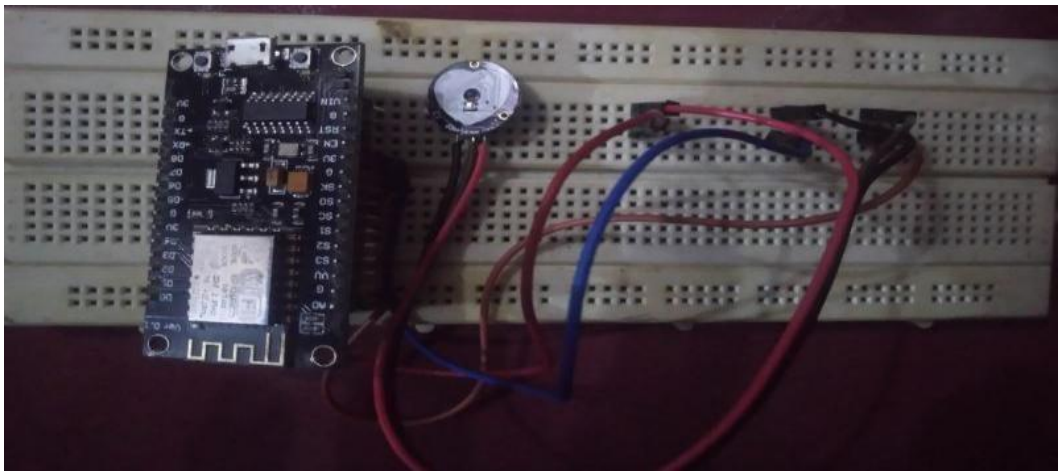

Figure 3.2.1: Breadboard testing

3.3 Codes:

3.3.1 Upload Data to Cloud

```
#include <ESP8266WiFi.h>;
#include <WiFiClient.h>;
#include <ThingSpeak.h>;

const char* ssid = "varun"; //Your Network SSID
const char* password = "varun@123"; //Your Network Password

int val;
int LDRpin = A0; //LDR Pin Connected at A0 Pin

WiFiClient client;

unsigned long myChannelNumber = 1001241; //Your Channel Number (Without Brackets)

const char * myWriteAPIKey = "TN4JLV0W4HUFEGF2"; //Your Write API Key
```

```
void setup()
{
Serial.begin(9600);
delay(10);
// Connect to WiFi network
WiFi.begin(ssid, password);
ThingSpeak.begin(client);
}

void loop()
{
val = analogRead(LDRpin); //Read Analog values and Store in val variable
Serial.print(val); //Print on Serial Monitor
delay(1000);
ThingSpeak.writeField(myChannelNumber, 1,val, myWriteAPIKey); //Update
in ThingSpeak
delay(100);

}
```

3.3.2 Webpage for monitoring data

```
<html>
<head>
<meta http-equiv="refresh" content="15">
<title>Data Collection Dashboard</title>
</head>
<body>
<table border=2 bordercolor="#0000FF">
<tr><td colspan="2">
<h1 align="center" color="#00FFFF">Data Collection Dashboard</h1>
</td></tr>
<tr><td>
<iframe width="450" height="260" style="border: 1px solid #cccccc;"
src="https://thingspeak.com/channels/1001241/charts/1?bgcolor=%23ffffff&color
=%23d62040&dynamic=true&results=60&type=step"></iframe>
```

```
</td>
<td><iframe width="450" height="260" style="border: 1px solid #cccccc;"
src="https://thingspeak.com/apps/matlab_visualizations/166526?color=%23FFFFFF&dynamic=true"></iframe>
</td></tr>
<tr><td>
<iframe width="450" height="260" style="border: 1px solid #cccccc;"
src="https://api.thingspeak.com/channels/1001241/fields/1.json?api_key=YSDWHAYT78TBYDTK&results=2"></iframe>
</td>
<td>
<iframe width="300" style="border: 1px solid #cccccc;"
src="https://thingspeak.com/apps/matlab_visualizations/171403"></iframe>
<h3>Links</h3>
<a href="https://www.google.com">Google</a><br>
<a href="https://www.Mathworks.com">Mathworks</a><br>
<a href="https://en.wikipedia.org/wiki/Cleve_Moler">Wikipedia</a>
</td>
</html>
```

CHAPTER 5
CONCLUSION AND FUTURE SCOPE

5.1 Conclusion:

The design and development of a low cost Heart Rate Monitoring(HRM) device has been presented. The device is ergonomic, portable, durable, and cost effective. The HRM device is efficient and easy to use. Tests have shown excellent agreement with actual heartbeat rates. This device could be used in clinical and nonclinical 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 live heart rate transmission. By using my heart beat rate monitor machine I get the heart beat counting in a fraction of seconds. In doing so variation of reading may be observed in a person's beat counted if I take the reading at different places of different fingers. So for most appropriate reading the LED should be placed just beside the upper portion of the nail. The more the finger contacts with LED the more accurate the reading becomes. The counted beat varies from person to person so no need to worry or think about the accuracy of the device

5.2 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.
- Using this concept, the future work is we can remotely control/move the things around the physically abled persons.
- Whenever there is a rise in the heart rate, we can connect this module to the emergency alert to the nearby hospital ambulance.
- This can be later upgraded to other module like microcontroller, vlsi and advanced types of integrated boards.

CHAPTER 6
ADVANTAGES, PRECAUTION

6.1 Advantages:

- Portable system
- Save risk of heart attack as you can check it in home
- Affordable system
- Temperature and Heart beat monitoring by single device • All Patient monitored by single person seating in Server room.
- This system also helps for Hospital monitoring system.

6.1 Precaution:

- During placing the finger in touch of LED care should be taken so that it remains in proper place of the finger
- Continuous power supply should be ensured so that we can get proper heart beat counting.
- During making the PCB circuit care should be taken so that in times of ironing the circuit is not shorted.
- Web page should be refreshed every 16 seconds.

Bill Of Material

Sr. No.	Component	Quantity	Price(Rs.)
1	Pulse Sensor	1	350
2	NodeMCU	1	350
3	Breadboard	1	60
4	Connecting wires	3	20
5	USB Cable	1	50
		TOTAL	**830**

References

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2. . Naoki Hagiyama , Akihisa Mito , Harutoyo Hirano , Zu Soh , Etsunori Fujita, Yumi Ogura , Ryuichi Uchikawa , Shigehiko Kaneko, “Unconstrained Monitoring of Biological Signals Using an Aortic Pulse Wave Sensor”, IEEE 2018.
3. Philippe Renevey, Ricard Delgado-Gonzalo, Alia Lemkaddem”,“Respiratory system and cardiac system can be evaluated at night using a wearable watch viewing system”, IEEE 2018.
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5. “Raja Lavanya, M.Nivetha, K. Revasree, K.Sandhiya” “Smart Chair-A Telemedicine Based Health Monitoring Systems using pulse sensor”, IEEE , 2018.