iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** V **Month of publication:** May 2021

DOI: https://doi.org/10.22214/ijraset.2021.34597

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue V May 2021- Available at www.ijraset.com

IOT based Patient Health Monitoring using Sensor Technology

Dr. Amit Gangopadhyay
Professor, Department of ECE, TKR College of Engineering and Technology, Hyderabad, India

Abstract: Nowadays Health-care Environment has developed science and knowledge based on Wireless-Sensing node Technology oriented. Patients are facing a problematic situation of unforeseen demise due to the specific reason of heart problems and attack which is because of nonexistence of good medical maintenance to patients at the needed time. This is for specially monitoring the old age patients and informing doctors and loved ones. So we are proposing an innovative project to dodge such sudden death rates by using Patient Health Monitoring that uses sensor technology and uses internet to communicate to the loved ones in case of problems. This system uses Temperature and heartbeat sensor for tracking patient's health. Both the sensors are connected to the Nuvoton IC. To track the patient health micro-controller is in turn interfaced to a LCD display and WIFI connection to send the data to the web-server (wireless sensing node). In case of any abrupt changes in patient heart-rate or body temperature alert is sent about the patient using IoT. This system also shows patients temperature and heartbeat tracked live data with timestamps over the Internetwork. Thus Patient health monitoring system based on IoT uses internet to effectively monitor patient health and helps the user monitoring their loved ones from work and saves lives.
Keywords: Sensor Technology, IOT, Patient health monitoring, WIFI Connection, Heartbeat Sensor, ECG

I. INTRODUCTION

With an improvement in technology and miniaturization of sensors, there have been attempts to utilize the new technology in various areas to improve the quality of human life. In the recent years wireless technology has increasing for the need of upholding various sectors In these recent years IoT grape the most of industrial area specially automation and control. Internet of Things (IoT) is a growing present concept which has an effect of many aspect of human life. Various processes of different concepts including data acquisition, data transmission and data analytics enables IoT based system to support smart solutions especially for health care [1].

In traditional method, doctors play an important role in health check-up. For this process requires a lot of time for registration, appointment and then check-up. Also reports are generated later. Due to this lengthy process working people tend to ignore the check-ups or postpone it. In IoT based system, the work progress depends on 3 system which are sensor work, get away and cloud. Firstly, talk about sensor network which is the first step for monitoring patients as well as data collection. Secondly, the gateway system which is a continuous connection networks between sensors and cloud system. The death rate of 55.3 million people dying each year or 1,51,600 people dying each day or 6316 people dying each hour is a big issue for all over the world [2].

In rural hospitals, the facilities for health caring are limited. The poor quality of health management enables issues in health care system Everyone should get the knowledge of own health as easy and as early as possible. Latest report of The India Spend analysis of data says that there is 500,000 doctors shortage in India. WHO defines the doctor patient ratio will be 1:1000 which has been failed in India.

In developing countries there is lack of resources and management to reach out the problems of individuals. A common man cannot afford the expensive and daily check up for his health. For this purpose various systems which give easy and assured caring unit has been developed. Theses system reduces time with safely handled equipment. Few of doctor's facilities are deficiently prepared where very less number of specialists are available. The basic diagnostic equipment for the diagnosis of life threatening diseases is absent.

II. BACKGROUND

Modern health care system introduces new technologies like wearable devices or cloud of things. It provides flexibility in terms of recording patients monitored data and send it remotely via IOT. For this connection, there is need of secure data transmission .To transmit the data with privacy is the one of the important aspects of this system. The proposed system introduces security of health care and cloud of things.

In IoT based system, the work progress depends on 3 system which are sensor work, get away and cloud. Firstly, talk about sensor network which is the first step for monitoring patients as well as data collection. Secondly, the gateway system which is a continuous connection networks between sensors and cloud system.

In the year 1991, Y. Iyriboz et al.[3] had studied the non-invasive measurement of heart rate accurately at rest and during exercise. But during heavy exercise, this methodshows some error about 9% **.**

In the year 1992, Joseph M. Schmitt et al.[4] had proposed a non-invasive method that can measure hemoglobin concentration and oxygen saturation continuously.

In the year 2008, Fezari et al.[5] had developed a real-time heart rate monitoring system by using microcontroller (µC). Doctor can access patient's pulse rate file sent through email every 24 h. Athletic persons can use this system which can read, write, and analyze the pulse rate**.**

Telemonitoring system via WBAN is evolving for the need for home based mobile health and personalized medicine. WBAN can able to collect the data acquired from sensor and record the output. This output results sent to controller wirelessly to health monitoring system. In this paper, Zigbee is used to in WBAN technology due to its guaranteed delay requirement for health telemonitoring system. ZigBee used in the communication **[6].**

Afef Mdhaffar et.al [7] has explained low power WAN network to perform analysis of monitored data in health caring system. They have established WAN network for communication up to the range of 33m2 at around 12 m altitude. Also they have demonstrated that power consumed by LoRaWAN network is ten times less than the GPRS/3G/4G.The IOT architecture has been given for step wise working for understanding of IOT .The main purpose of Lora WAN is the energy consumption. The power consumption in idle mode for LoRaWAN is 2.8mA while in GPRS is 20mA.Hardware cost in Lora WAN is10doller while in GPRS is 50 dollar. Maximum data rate in Lora WAN is 50kbps (uplink), 50 kbps downlink while in GPRS is 86.5 kbps(uplink ,14kbps(downlink).These results gives the overall efficiency of Lora WAN in the demonstration of IOT for health monitoring system.

Mohammad M. Masud et.al [8] had given the measurement of ECG signals at various intervals and at different situations. They have considered energy aware, limited computing resources and lose network continuity challenges .For these challenges; mathematical model has been developed to execute each task sequentially. There are three approaches designed to work out the process .One is mobile based monitoring approach, data mining and third is machine learning approach **.**

III. DESIGN

The core objectives of this project is to design and implementation of smart health tracking system. The implementation of this work is divided in two parts: one is hardware Implementation and another is software Implementation

A. Hardware Implementation

To run the system first we need to connect LPC2148 microcontroller with the power supply as it is the main control unit. In input side, we have heartbeat sensor, temperature sensor . On the other hand, output is shown in the LCD display. Moreover, WIFI Module helps to send data in the cloud and when the data gets uploaded, we can check the output by using Laptop or Computer by log in to the host site.Fig.1shows the block diagram of the system and Fig.2shows power supply implementation to all components.

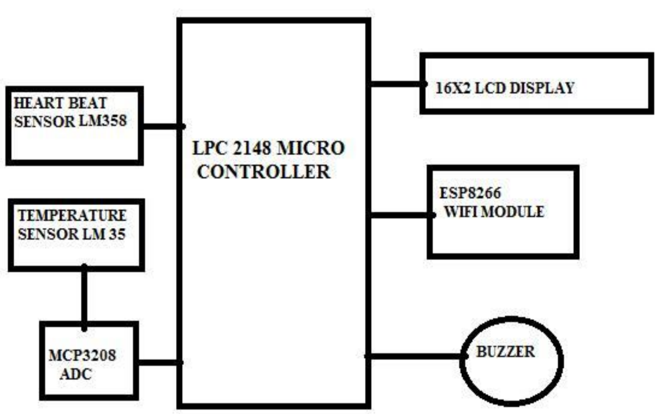


Fig.1:Block Diagram

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue V May 2021- Available at www.ijraset.com

Initially, a finger is placed on the heartbeat sensor. So that the sensor can monitor the patient's heartbeat. Similar process is done with the ECG sensor but instead of placing a finger, but holding the sensor within the fingers. After that it shows the results of heartbeat and temperature on the LCD. Now it connects to the website and starts dumping the data. First it uploads the heartbeat value to the site and updates it with previous value. Then it does the same with the temperature value.

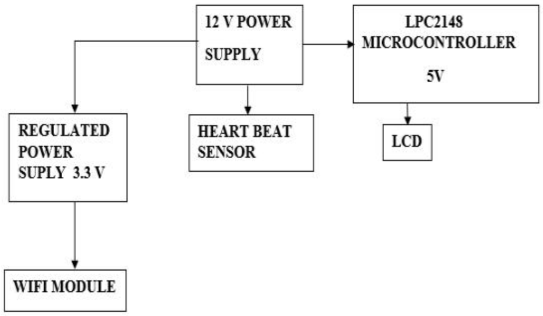


Fig.2:Power Supply Implementation to all components

1) *Components Used*
a) *LPC2148 MICROCONTROLLER:* TheLPC2141/2/4/6/8 microcontroller as shown in fig.3 are based on a 32/16 bit ARM7TDMI-SCPU with real-time emulation and embedded trace support, that combines the microcontroller with embedded high speed flash memory ranging from 32 kB to 512 kB. A 128-bit wide memory interface and a unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty.

Fig: 3 LPC2148 Microcontroller

b) *Heartbeat Sensor:* The heart sensor as shown in Fig.4 consists of a super bright red LED and light detector. The LED needs to be super bright as the maximum light must pass spread in finger and detected by detector. Now, when the heart pumps a pulse of blood through the blood vessels, the finger becomes slightly more opaque and so less light reached the detector. With each heart pulse the detector signal varies. This variation is converted to electrical pulse. This signal is amplified through an amplifier which outputs analog voltage between 0 to +5V logic level signal.

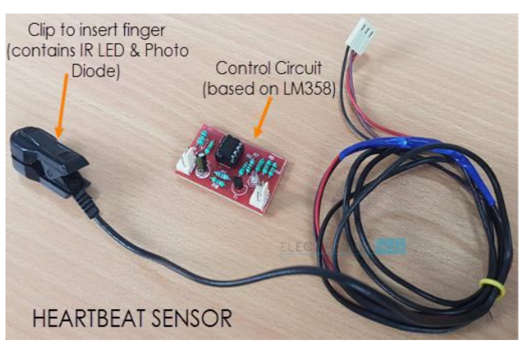


Fig.4:Heartbeat Sensor

c) *Temperature Sensor:* LM35 sensor working principle involves the ambient temperature in the detection using the IC part temperature sensitive The ambient temperature is converted into electrical voltage by a circuit in the IC, where the temperature change is proportional to the output voltage changes. In the series LM35 every change of 1 ° C would produce a change in output voltage of 10mV s ebesar Vout is a scalable sensor output voltage linearly with the measured temperature, which is 10 milli volts per 1 degree Celsius. The schematic diagram as shown in fig.5.

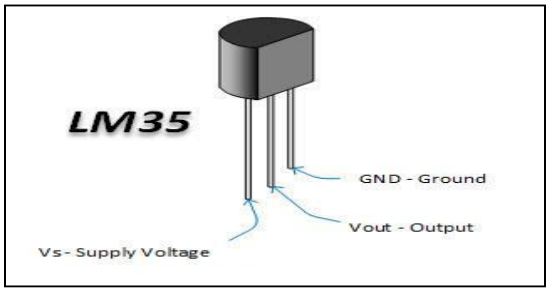


Fig.5:LM35 Temperature Sensor

d) *WI-FI Module:* The ESP8266 Wi-Fi Module as shown in fig.6 is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much Wi-Fi -ability as a Wi-Fi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

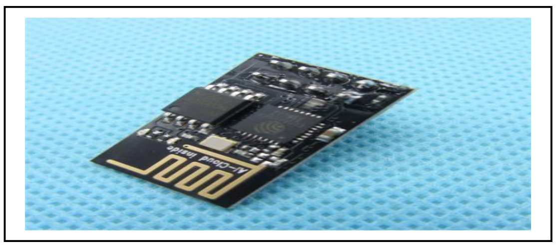


Fig.6: ESP8266 Wi-Fi Module

B. *Software Implementation*

1) *Keil Micro Vision IDE:* Keil Micro Vision is a free software which solves many of the pain points for an Embedded program developer. This software is an integrated development environment (IDE), which integrated a text editor to write programs, a compiler and it will convert your source code to hex files too .Fig.7 shows the sample window version

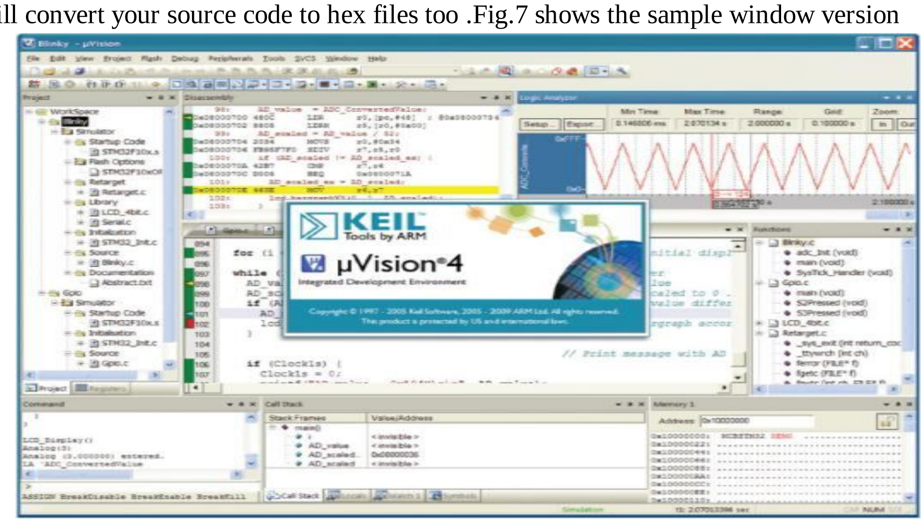


Fig.7: Keil Micro Vision Sample Window

2) *Proteus Professional IDE:* The Proteus Design Suite as shown in fig.8 is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards.

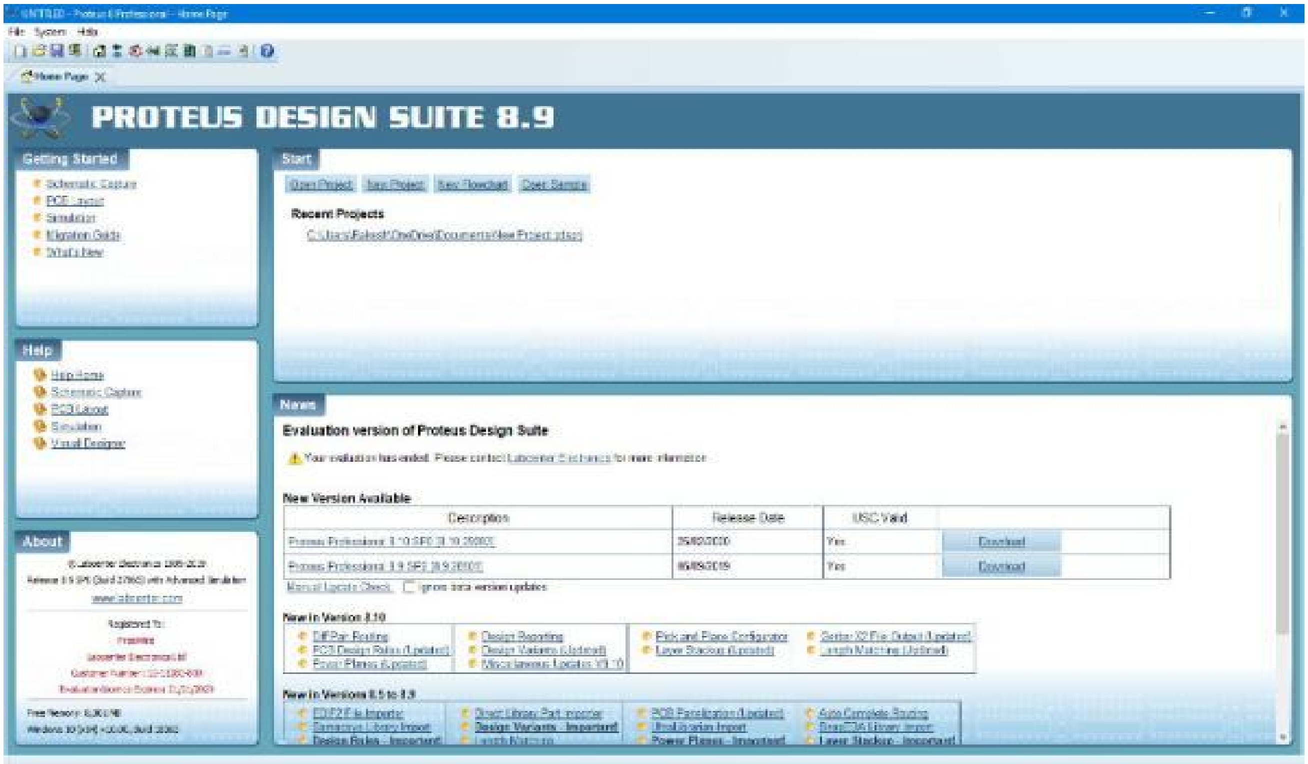


Fig.8: Proteus Design Suite 8.9

3) *IOT Platform (UBIDOTS):* Ubidots is an IoT Platform empowering innovators and industries to prototype and scale IoT projects to production. Use the Ubidots platform to send data to the cloud from any Internet-enabled device. You can then configure actions and alerts based on your real-time data and unlock the value of your data through visual tools. Ubidots offers a REST API that allows you to read and write data to the resources available: data sources, variables, values, events and insights. The API supports both HTTP and HTTPS and an API Key is required. An overview as shown in fig.9.

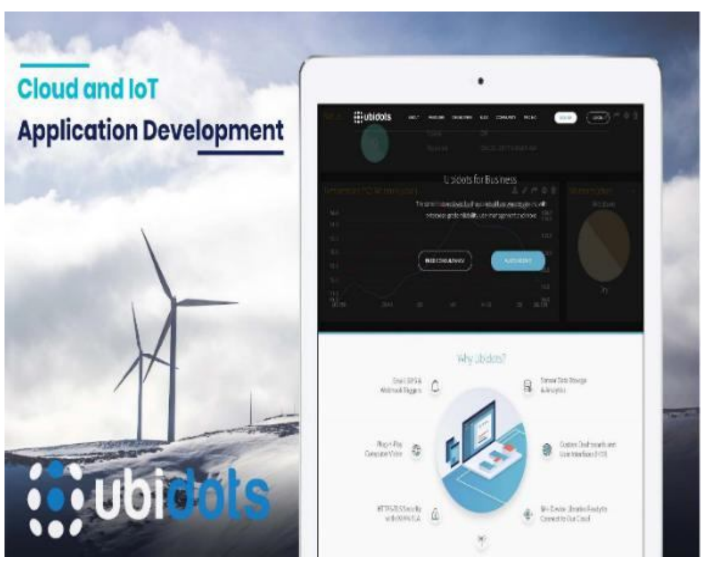


Fig. 9: Ubidots Overview

4) *Flash Magic:* Flash Magic is Windows software from the Embedded Systems Academy that allows easy access to all the ISP features provided by the devices. These features include: Erasing the Flash memory (individual blocks or the whole device) . Programming the Flash memory . Modifying the Boot Vector and Status Byte . Reading Flash memory . Performing a blank check on a section of Flash memory . Reading the signature bytes. Reading and writing the security bits. Fig.10 shows the schematics of flash magic main window.

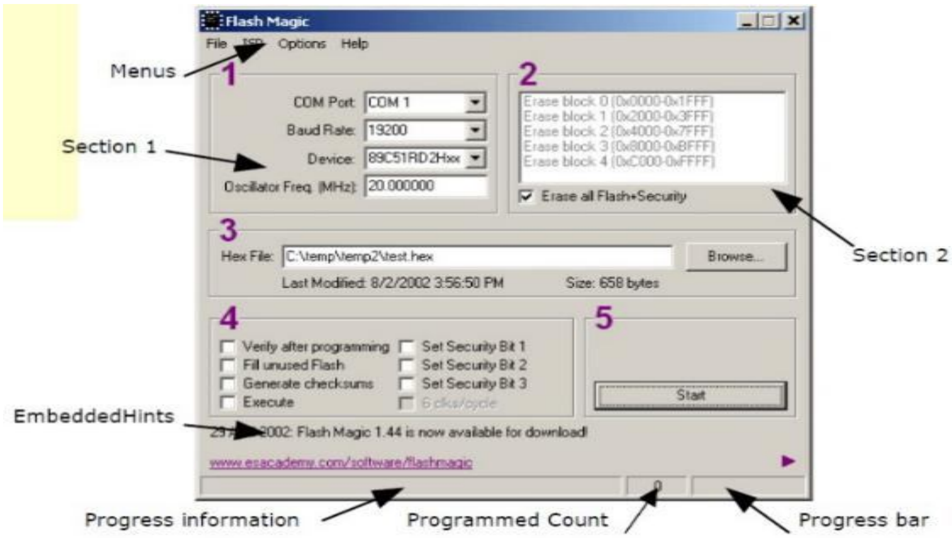


Fig..10: Flash Magic Main Window

IV. FLOWCHART OF THE PROPOSED SYSTEM

IoT based patient health monitoring system is a generic term given to any medical equipment that has internet capability and can measure one or more health data of a patient who is connected to the device such as heartbeat, body temperature, blood pressure, ECG, steps etc. The equipment can record, transmit and alert if there is any abrupt change in the patient's health. Fig.11 shows the flowchart of the proposed system

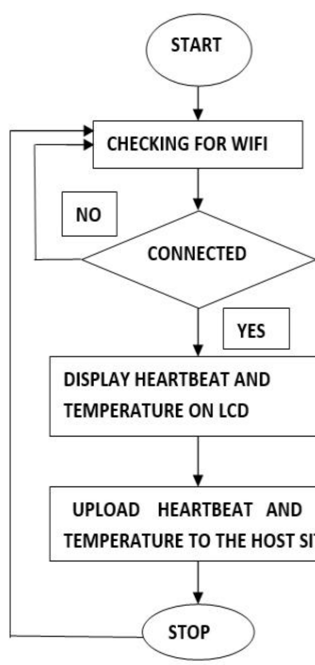


Fig.11:Flow Chart of the Proposed System

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue V May 2021- Available at www.ijraset.com

V. RESULTS & DISCUSSION

When the user places his finger in the cable the sensor starts checking the heartbeat, and it is indicated by the led on the sensor which starts blinking whenever the sensor is checking the heartbeat as shown in fig12.

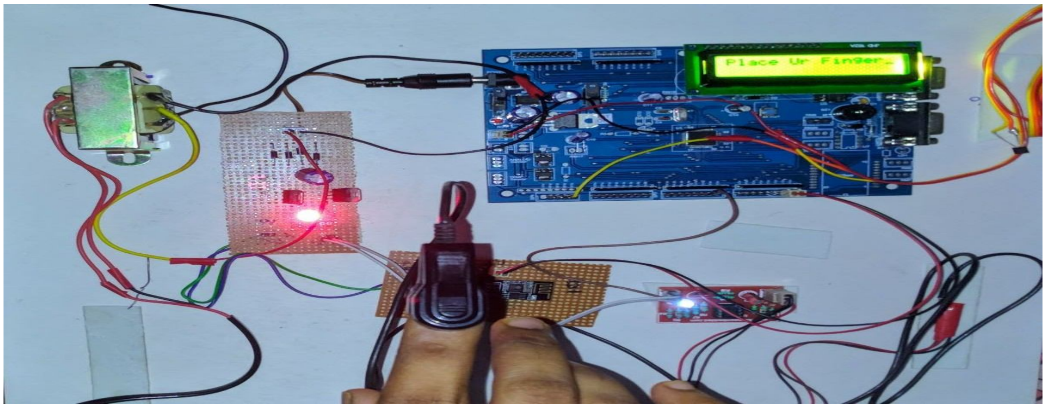


Fig.12:Heart beat sensor checking the heartbeat

After checking heartbeat the temperature sensor (LM35) measures the body temperature of the patient. Connection diagram as shown in fig.13 which checks the body temperature of the patient. After monitoring the body temperature and heartbeat of the patient, the LCD display shows these value as shown in fig.14.

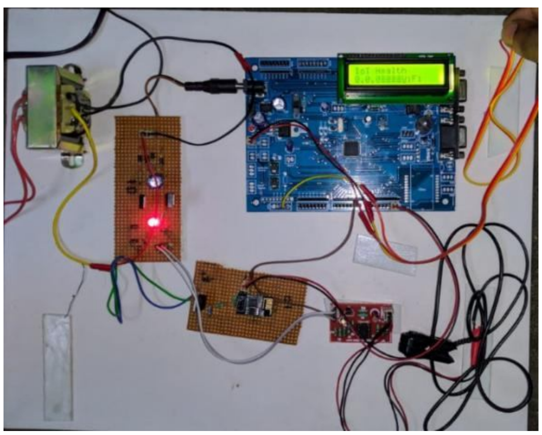


Fig.13: LM 35sensor checking body temperature

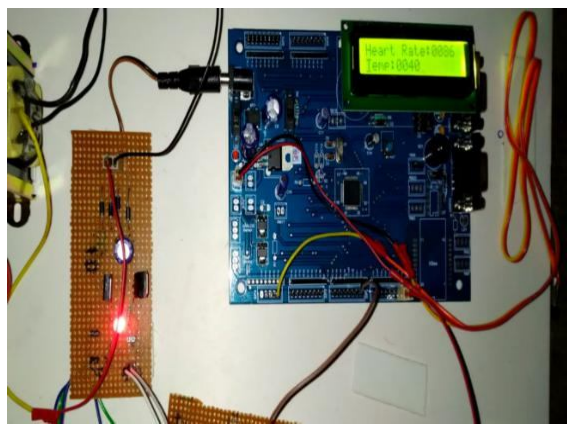


Fig.14: LCD display showing the value of heartbeat rate and temperature simultaneously

After checking and displaying the heart rate and body temperature of the patient,we need to check whether these value uploaded to our Host site or not. Fig.15 shows how it verifying the values uploaded to Ubidots sites.

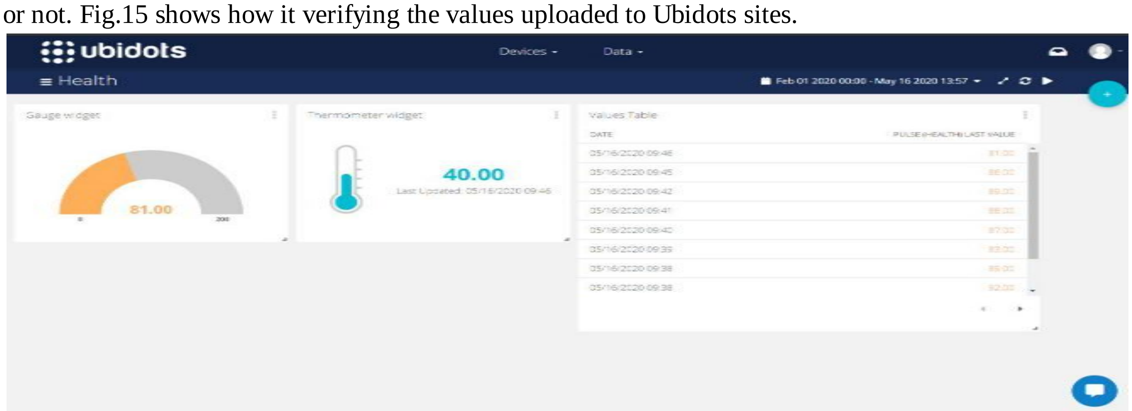


Fig.15: Verifying the values uploaded to Ubidots Site

VI. TESTING

A. ECG Findings

The IR Sensor is used to measure the pulse rate in the error of ±6. Table 1shows the heart beat result analysis of four different aged people. Comparing the values of heartbeat obtained while monitoring and the values of heartbeat obtained from a BP machine as shown in fig.16, we have seen that the results are almost similar.

TABLE 1:Heart Beat Result Analysis

Testing's	Age	Normal Value	ObservedValue	Error
Person 1	20	60-67	72	+5
Person 2	25	60-67	59	-1
Person 3	58	72-75	66	-6
Person 4	54	74-77	81	+4

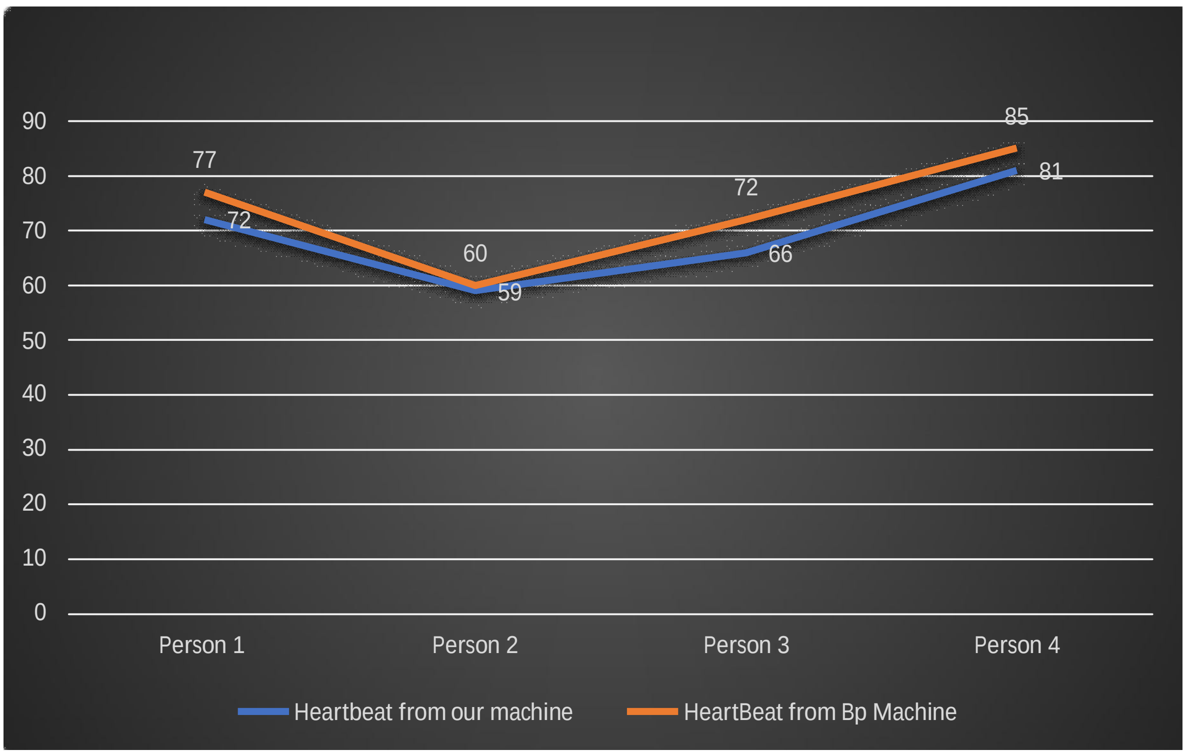


Fig16: Comparison Graph for Heartbeat Values

B. Temperature Findings

The NC type thermistor used is programmed to display the value at room temperature for demo purposes with minimal error of± 5.Temperature analysis of different person are listed in table2. We have compared the values of temperature obtained while monitoring with LM35 temperature sensor from this work with the values of temperature obtained from t hermometer. The comparison graph is shown in fig.17

Table 2: Temperature Result Analysis

Testing's	Normal Value	Observed Value	Error Rate
Person 1	40	42	+2
Person 2	40	43	+3
Person 3	40	45	+5
Person 4	40	41	+1

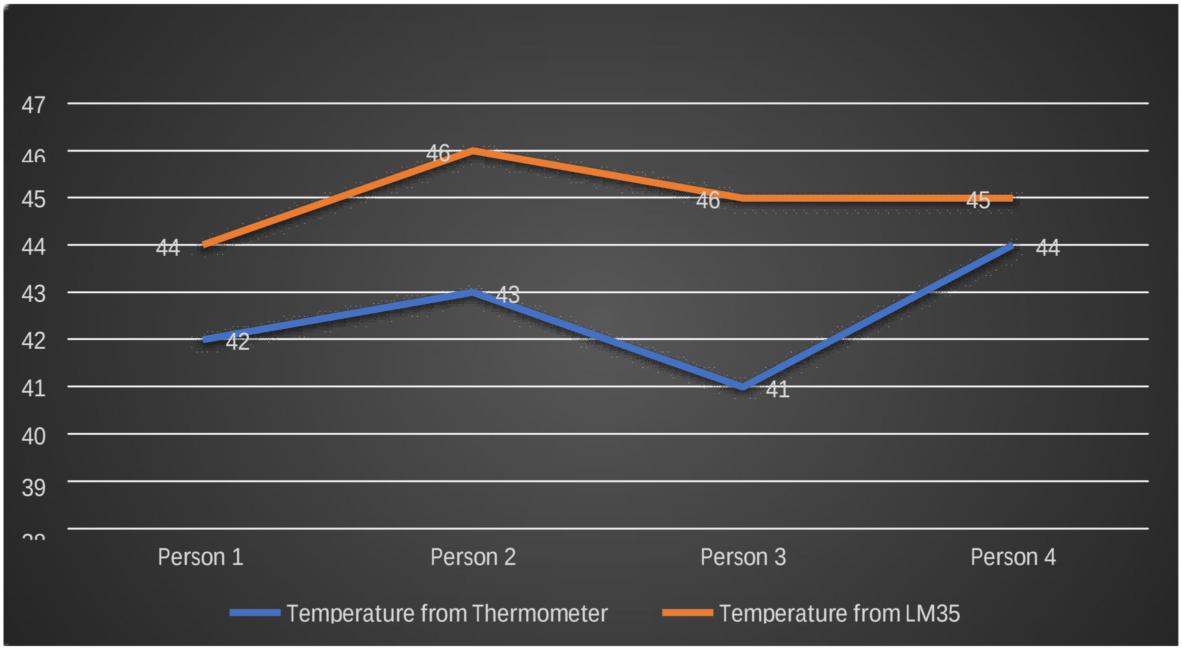


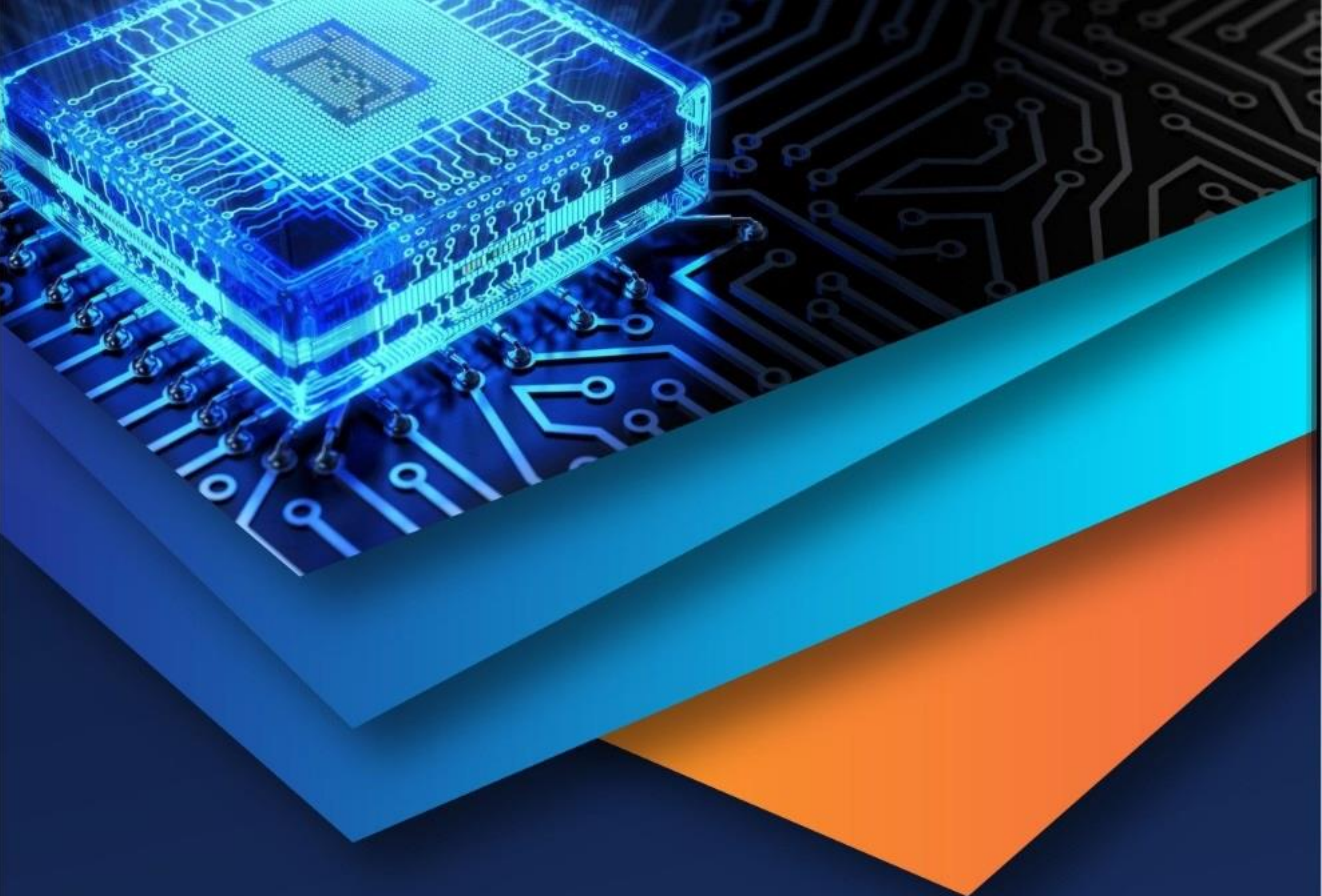
Fig.17: Comparison Graph of Temperature Values

VII. CONCLUSION

As health care services are important part of our society, automating these services less burden on humans and the measuring process. The IOT technology helps the server to update the patient data on website. The IOT device can be combined with the cloud computing so that the database can be shared in all the hospitals for the intensive care and treatment.

REFERENCES

[1] Iman Azimi, Arman Anzanpour, Amir M. Rahmani, Pasi Liljeberg, Tapio Salakoski, "Medical Warning System Based on Internet of Things Using Fog Computing". IEEE International Workshop on Big Data and Information Security (IWBIS),18-19 oct,2016
[2] Vivek Pardeshi, Saurabh Sagar, Swapnil Murmurwar, Pankaj Hage, "Health Monitoring Systems using IoT and Raspberry Pi – A Review". International Conference on Innovative Mechanisms for Industry Applications (ICIMIA),2017
[3] Ebrahim Al Alkeem1, Dina Shehada1, Chan Yeob Yeun1,M. Jamal Zemerly ,Jiankun Hu "New secure healthcare system using cloud of things", Springer Science+Business Media New York vol20.no.3,2017
[4] Yena Kim, SeungSeob Lee and SuKyoung Lee "Coexistence of ZigBee-based WBAN and WiFi for Health Telemonitoring Systems" , IEEE Journal of Biomedical and Health Informatics,pp-1-9,2014
[5] Afef Mdhaffar, Tarak Chaari , Kaouthar Larbi, Mohamed Jmaiel and Bernd Freisleben "IoT-based Health Monitoring via LoRaWAN", IEEE EUROCON 2017 -17th International Conference on Smart Technologies
[6] Mohammad M. Masud, Mohamed Adel Serhani, and Alramzana Nujum Navaz"Resource-Aware Mobile-Based Health. Monitoring", 2168-2194 (c) 2015 IEEE
[7] Iyriboz Y, Powers S, Morrow J, Ayers D, Landry G (1991) Accuracy of pulse oximeters inestimating heart rate at rest and during exercise. Br J Sports Med 25:162–164
[8] Schmitt JM, Xiong ZG, Miller J Measurement of blood hematocrit by dual-wavelengthnear-IR photoplethysomography. SPIE Proc 1641,1992



10.22214/IJRASET

INDEX COPERNICUS 45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY