ISSN (Online) 2394-6849

International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE)

Volume no 11 Issue 1 January 2024

Patient Health Monitoring System using Iot

[1] Ms.K.M.Priya, [2] Mr.A.Rohith

[1] Assistant professor, Department of ECE, Coimbatore Institute of Technology, Coimbatore, India
[2] Student, Department of ECE, Coimbatore Institute of Technology, Coimbatore, India
Corresponding Author Email: [1] kmpriya@cit.edu.in, [2] rohithasaithambi@gmail.com

***Abstract*— The term IoT abbreviates to Internet of Things. It refers to the collective network of connected devices and the technology that facilitates communication between the device and the cloud and the devices themselves. Health sector is the early adopter of new technology to offer a better surgical and patient experience. Internet of Things (IoT) is rapidly becoming increasingly available, accessible and importantly affordable, hence their application in healthcare to enhance the medical use of data is certain. we are going to implement IoT technology to monitor and acquire real-time data of patients using a Pulse sensor, temperature sensor, and ECG sensor and show them on a set of wearable glasses. This way we get real-time visualization of the patient's information without constantly looking at the information from the instrumentation**

***Keywords*— ESP8266, OLED display, Pulse sensor, Temperature sensor, ECG sensor, Arduino IDE, Blynk IoT.**

I. INTRODUCTION

Previously it is impossible to monitor the patient by doctor in remote areas during critical conditions. So we introduced a method which continuously monitors the patient condition and automatically sends the data to server, so the doctor can access the data continuously and we can intimate caretaker when patient is in critical condition. In previous methods, monitoring of patient can be done only by using different instruments for different parameters. So, we decided to monitor required conditions of patient by assembling different instruments in a single module. Nowadays IoT is the widely used technology. The growth of internet is tremendous and has been further extended to connecting things through internet. All devices are connected to one another with various smart technologies to create worldwide ubiquitous network called Internet of Things (IoT). We recorded the data of each sensor and uploaded the data into the server. We observed the data on many devices using internet with secured login and password. The system can be used to monitor physiological parameters, such as heart rate and temperature of a Pulse sensor, Temperature sensor and ECG sensor. The objective of this project is to design and implement a reliable, cheap, low powered, and accurate system The device detects if a person is medically distressed and receiver unit for monitored physiological parameters, of a human body. Centralized patient monitoring systems are in huge demand as they not only reduce the labour work and cost but also the time of the clinical hospitals. Earlier wired communication was used but which is a wireless mesh network is preferred as it reduces the cost. Infrared wireless communication because it is energy efficient, has low cost and long distance range. The emergence of the Internet of Things (IoT) has revolutionized the healthcare sector by enabling remote monitoring of patients' health. This has led to numerous benefits, including enhanced patient safety, improved care delivery, increased patient engagement, and reduced healthcare costs. IoT innovations can help enhance doctors and surgeons ability to diagnose, treat, and-perform surgery on their patients more accurately by giving them access to real-time data and patient information faster. It will be difficult to monitor the parameters of the patient undergoing surgery continuously for the doctor and may cause a serious case. So, there is a need for the doctor to monitor the parameters continuously. Hence proposed the doctor assistive system using IoT.

A. Overview of Patient health monitoring system using internet of things

The emergence of the Internet of Things (IoT) has revolutionized the healthcare sector by enabling remote monitoring of patients' health. This has led to numerous benefits, including enhanced patient safety, improved care delivery, increased patient engagement, and reduced healthcare costs. Prior to IoT, patient's interactions with doctors were limited to in-person visits, telecommunication, and text-based communication. Continuous monitoring of patient's health was not possible, and doctors lacked real-time data for making informed recommendations. However, IoT- enabled devices have changed this scenario, allowing for seamless remote monitoring of patients health metrics. This has empowered healthcare professionals to deliver

personalized care and intervene promptly when necessary. Consequently, patient satisfaction has increased as interactions with doctors have become easier and more efficient. Overall, IoT has transformed the healthcare landscape, enabling continuous monitoring, facilitating patient-doctor communication, and ultimately improving patient care.

ISSN (Online) 2394-6849

International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE)

Volume no 11 Issue 1 January 2024

B. Overview of Monitoring system

IoT innovations can help enhance doctors and surgeon's ability to diagnose, treat, and perform surgery on their patients more accurately by giving them access to real-time data and patient information faster. It will be difficult to monitor the parameters of the patients undergoing surgery continuously for the doctor and may cause a serious case. So, there is a need for the doctor to monitor the parameters continuously.

C. Outcome of Patients

It is important for medical professionals to stay vigilant and attentive in order to ensure that the patient's vital signs are stable. This includes regular check-ups by nurses and doctors, as well as closely monitoring the patient's heart rate and temperature. Internet of Things (IOT) is revolutionizing the medical field, offering unprecedented opportunities to enhance the ability of doctors and surgeons to diagnose, treat, and perform surgery on their patients more accurately. By providing them with real-time data and patient information, IoT can help them make quick, informed decisions that improve patient outcome.

II. Survey Details

This chapter gives an overview of research carried out related work on "Patient Health Monitoring System Using Internet of Things".

Prajoona Valsalan [1] "IoT Based Health Monitoring System". This paper discusses the IoT-based health monitoring system has been developed to address the challenges of remote value tracking, particularly in the field of health monitoring. This system offers several benefits, including the secure storage of individual health parameter data in the cloud, minimizing hospital visits for routine check-ups, and enabling doctors to remotely monitor and diagnose patients from any location.

Mohammad Monirujjaman Khan [2] "IoT-Based Health Monitoring System Development and Analysis". In this paper, study introduces a health monitoring system implemented through IoT technology. The IoT-based device empowers users to track their health parameters, enabling proactive health management. Patients can easily share their health data with doctors through a unified application.IoT technology is highly regarded in the field of health monitoring due to its secure cloud storage of parameter data and the ability to remotely monitor patients by doctors, regardless of distance.

Mehedi Masud [3] " A Detailed Research on Human Health Monitoring System Based on Internet of Things". In this paper, study of wireless sensor technology and IoT-based human health monitoring terminals are combined to assess health-related parameters. The analysis of test results reveals that the IoT-based health monitoring system is stable and offers features such as accurate collection of health data, real-time monitoring, alarming, and subject evaluation. Temperature assessment was conducted using a thermometer, which yielded temperature values of 36.4°C, 36.7°C, and 36.5°C for the subjects. These results demonstrate a relatively accurate and consistent measurement capability. Likewise, the pulse rate monitoring module, utilizing an ECG, observed pulse rates of 78 times/min, 78 times/min, and 79 times/min, respectively, which align closely with the results obtained from medical pulse meters. The study confirms the reliability and effectiveness of the IoT-based human health monitoring system in accurately collecting health data, providing real-time monitoring, and evaluating subjects.

Dr. D. Leela Rani [4] "A Health Monitoring System Based on IOT for Persons in Quarantine". In this paper the Internet of Things (IoT) has made significant strides in numerous industries, and healthcare is no exception. It has brought about transformative changes that benefit doctors, researchers, patients, and insurance providers. IoT enables seamless communication between patients and doctors, allowing for continuous monitoring of health conditions

Taisir Hasan Abdulameer [5] "Design of Health Care Monitoring System Based on Internet of Thing (IOT)". This paper introduces a remote healthcare system that leverages advanced information technology and remote physiological measuring technology. The system aims to provide comprehensive remote welfare services and long-term healthcare assistance through an integrated platform for remote healthcare data.

A. Hartono [6] "Design and Development Integrated Sensor System for Measuring Body Temperature and Heart Rate,"10th International Conference on Cyber and IT Service Management (CITSM), Yogyakarta, Indonesia, 2022. Authorized personnel can access this data through a smartphone equipped with an IoT platform. With the received values, doctors can diagnose diseases and evaluate the patient's overall health condition. By leveraging IoT technology, this health monitoring system improves accessibility and convenience for both patients and healthcare providers. However, it is crucial to prioritize privacy and security measures to protect sensitive medical information throughout the process.

A. V. Zinkevic [7] "ESP8266 Microcontroller Application in Wireless Synchronization Tasks," 2021 International Conference on Industrial Engineering, Applications and Manufacturing (ICIEAM),. The focus of this paper is on an IoT-based health monitoring system developed using Arduino. The system measures body temperature, heartbeat, and blood oxygen saturation levels (SpO2), transmitting the data to a mobile app via Bluetooth. The information is displayed on an LCD panel, providing patients with

ISSN (Online) 2394-6849

International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE)

Volume no 11 Issue 1 January 2024

immediate access to their current health status.The system proves beneficial for various individuals, including the elderly, asthma and COPD patients, those with chronic diseases, COVID-19 patients, and diabetic patients. By utilizing this system, individuals can effectively monitor their health over time.

A.B. Jani, R. Bagree [8] "Design of a low-power, low-cost ECG & EMG sensor for wearable biometric and medical application,". The system utilizes sensors to track body temperature, pulse rate, and room humidity and temperature. These sensor readings are displayed on an LCD and wirelessly transmitted to a medical server

M. Nagabushanam, [9] "AI based E-ATM Security and Surveillance System using BLYNK-loT Server," 2022 3rd International Conference on Communication, Computing and Industry 4.0 (C2I4), Bangalore, India,. . Doctors can track patients' well-being in real-time, while specialists and researchers can collaborate globally to address complex medical issues. Although IoT cannot reverse aging or cure chronic diseases, it greatly enhances healthcare accessibility and convenience .

A. R. Barai, [10] "Comparison between Noninvasive Heart Rate Monitoring Systems using GSM Module and ESP8266 Wi-Fi Module,". By utilizing terminal software and enhanced healthcare modules, real-time monitoring of elderly citizens and the healthcare system becomes feasible. The system collects data from various sensors, which is then stored on a local server. This enables seamless access to the relevant information for individuals, physicians, and practitioners, particularly during emergency situations.

III. PROPOSED SYSTEM

A. Sensor Working

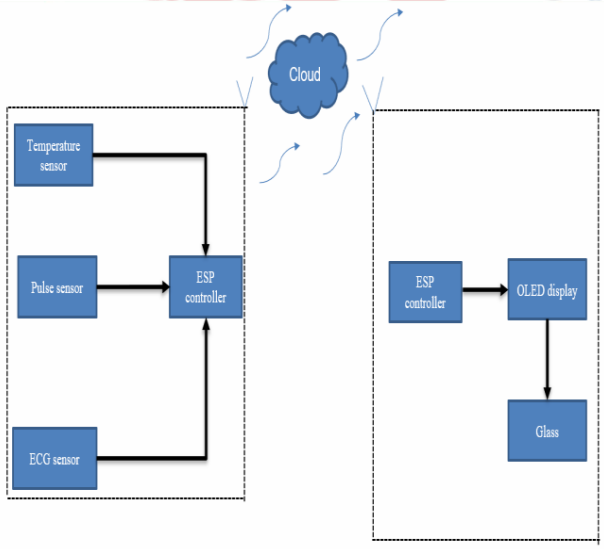

Figure 1. Sensors working

Figure.1 shows the pulse sensor working. It represents the flow of working.Three sensors detecting the value and transmit to the cloud. Cloud will transmit the sensor's value to the receiver (ESP controller). Then the values will get displayed and visible in glass.

B. Temperature sensor

Figure. 2. Temperature sensor

Figure.2 shows the temperature sensoe.Temperature sensor is used to measure the temperature value from the patient. The RTD's resistance increases linearly when the temperature increases. Many RTDs are called wire wound. They consist of fine wire wrapped around a glass or ceramic core. The wire is made of platinum. Another interestingthing is that the RTD elements are normally housed in a protective probe to protect them from the environment they are immersed in and to make them more robust. An electrical current is passed through the sensor, the resistance element is usedto measure the resistance of the current being passed through it. The electrical resistance is measured in Ohms. To test your RTD sensor set your multimeter to a resistance mode. After that, check the readings across the terminalsof the RTD. At room temperature (around 20°C) the reading should be around 110 ohms. Keep in mind that the reading value may be different, which depends on theroom temperature. patient.

C. Pulse sensor

Figure. 3. Pulse sensor

Figure.3 shows the pulse sensor.It works by detecting the pulsations of blood flow through the arteries, usually in the fingertip or earlobe. The most common type of pulse sensor is the photoplethysmography (PPG) sensor. PPG sensors use a light-emitting diode (LED) and a photodiode to measure changes in blood volume in the skin. When the heart beats, blood flow increases and the amount of light absorbed by the skin changes. The PPG sensor detects these changes and converts them into an electrical signal that can be used to

ISSN (Online) 2394-6849

International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE)

Volume no 11 Issue 1 January 2024

calculate the heart rate. Pulse sensors are commonly used in medical settings to monitor patients during surgery or other medical procedures, and also in fitness trackers and other wearable devices to track physical activity and monitor heart rate during exercise. The pulse rate is a measurement of the heart rate, or the number of times the heart beats per minute.

As the heart pushes blood through the arteries, the arteries expand and contract with the flow of the blood. Taking a pulse not only measures the heart rate, but also can indicate the following:

- Heart rhythm
- Strength of the pulse

The normal pulse for healthy adults ranges from 60 to 100 beats per minute. The pulse rate may fluctuate and increase with exercise, illness, injury, and emotions. Females ages 12 and older, in general, tend to have faster heart rates than do males. Athletes, such as runners, who do a lot of cardiovascular conditioning, may have heart rates near 40 beats per minute and experience no problems.

D. ECG sensor

Figure. 4 ECG sensor

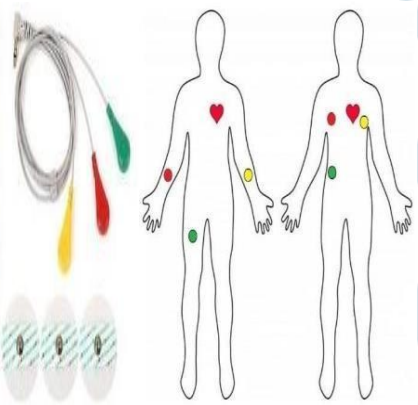

Figure. 4.1 Position of sensor

Figure 4&4.1 shows the ECG sensor and position sensor. The AD8232 is a single-lead, heart rate monitor front-end integrated circuit (IC) that is commonly used in wearable devices, medical monitors, and other applications that require monitoring of the electrical activity of the heart. The AD8232 works by amplifying and filtering the electrical signal from the heart, which is detected by a single electrode attached to the skin. The electrical signal is amplified using a programmable gain amplifier (PGA) and filtered using a high- pass filter to remove any baseline drift and noise. The filtered signal is then fed into a right leg drive circuit to reduce common-mode interference. The AD8232 also includes a Fast restore feature to recover the output from saturation caused by motion artifact. This feature helps to improve the quality of the heart rate signal, even in challenging conditions such as during physical activity. The output of the AD8232 is a clean, amplified, and filtered ECG signal that can be used by a microcontroller or other processing unit to calculate the heart rate and other relevant parameters. The AD8232 can be powered by a single supply voltage of 3.3V or 5V, making it suitable for use in battery-powered applications. Overall, the AD8232 is a highly integrated and low-power IC that provides a convenient and reliable solution for heart rate monitoring in a wide range of applications.

E. NodeMCU-ESP8266

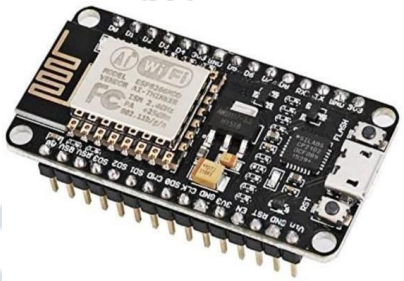

Figure . 5 NodeMCU-ESP8266

Figure.5 shows Node MCU .The ESP8266 is a low-cost, Wi- Fi-enabled microcontroller manufactured by Espressif Systems. It is widely used in Internet of Things (IoT) applications due to its low cost, low power consumption, and Wi-Fi connectivity. The ESP8266 contains a 32-bit Tensilica L106 RISC processor operating at 80 MHz, 80 KB of user-accessible RAM, 64 KB of instruction RAM, and 4 MB of flash memory for program storage. It supports 802.11 b/g/n Wi-Fi (2.4 GHz) with WPA/WPA2 support and has 17 GPIO pins, including 1 ADC pin, as well as interfaces for UART, I2C, SPI, and PWM. The ESP8266 can be programmed using the Arduino Integrated Development Environment (IDE), as well as other programming environments such as MicroPython and Lua. It is compatible with a wide range of sensors, actuators, and displays, making it a popular choice for IoT projects. In addition to its low cost and Wi-Fi connectivity, the ESP8266 is also known for its low power consumption. It can operate in a deep sleep mode with a current consumption of only 10µA, making it well-suited for battery-powered applications. Overall, the ESP8266 is a versatile and affordable microcontroller that is widely used in a variety of IoT applications, from home automation and smart devices to industrial automation and monitoring systems.

F. Blynk IoT

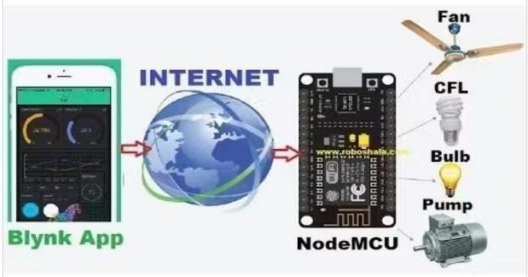

Figure. 6 Blynk IoT

ISSN (Online) 2394-6849

International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE)

Volume no 11 Issue 1 January 2024

Figure.6 shows the Blynk IoT details.Blynk is a popular Internet of Things (IoT) platform that allows users to create custom applications for controlling and monitoring their IoT devices. It is designed to be simple and easy to use, even for those without a background in programming. With Blynk, users can create custom interfaces for their IoT devices using a drag- and-drop interface. The platform provides a library of widgets such as buttons, sliders, and graphs, which can be added to the interface and programmed to control and display data from the connected devices.Blynk supports a wide range of IoT devices, including Arduino, Raspberry Pi, ESP8266, ESP32, Particle, and more. It also integrates with popular cloud platforms such as Amazon Web Services, Microsoft Azure, and Google Cloud Platform, allowing users to store and analyze data from their devices.One of the key features of Blynk is its support for remote access and control. Users can access and control their IoT devices from anywhere in the world using a mobile app or a web interface.Blynk also provides an API that allows developers to integrate the platform into their own applications and services. This makes it possible to create custom applications and services that can interact with Blynk-enabled devices. Overall, Blynk is a powerful and versatile IoT platform that makes it easy for anyone to create custom applications for controlling and monitoring their IoT devices. Its simplicity and ease of use make it a popular choice for hobbyists, makers, and professionals alike.

G. OLED display

Figure. 7 OLED display

Figure.7 shows the OLED display. The OLED display doesn't require backlight, which results in a very nice contrast in dark environments. Additionally, its pixels consume energy only when they are on, so the OLED display consumes less power when compared with other displays. The model we're using here has only four pins and communicates with the Arduino using I2C communication protocol. There are models that come with an extra RESET pin. There are also other OLED displays that communicate using SPI communication. The working of an OLED display sensor can be summarized in the following steps: The sensor detects the desired parameter, such as temperature or humidity, using a specific type of sensor. The sensor processes the data and sends it to a microcontroller, such as anArduino or a NodeMCU, for further processing. The microcontroller processes the data and sends it to the OLED display for visualization. The OLED display uses the received data generate the visual representation of the data, such as a graph or a number. These displays are available in various sizes and resolutions, ranging from small 0.96-inch displays to larger 1.3- inch and 1.5-inch displays.

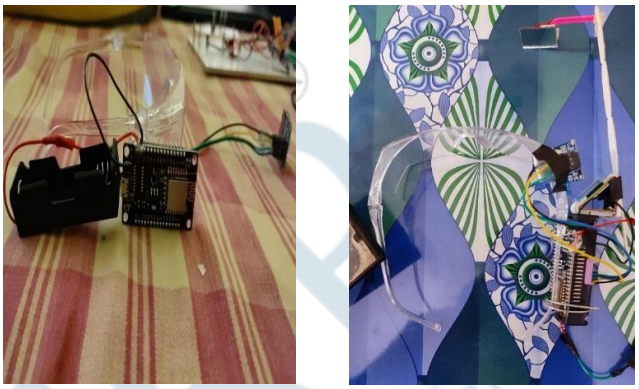

Figure . 8 Glass with mirror and controller

The glass with controller acts as a receiver when the data are sending to the cloud then the controller will receive and shows in the glass.

H. Flow of operation

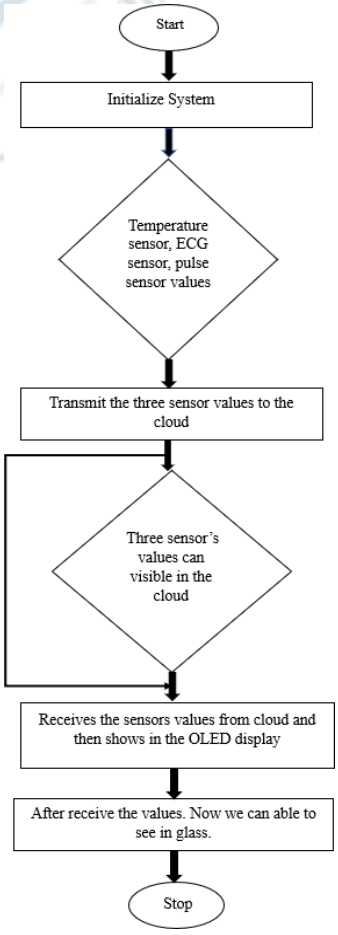

Figure. 9 Flow of operation

ISSN (Online) 2394-6849

International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE)

Volume no 11 Issue 1 January 2024

Figure.9 shows the flow cart for the proposed system. The proposed system flow of operation. Temperature sensor, Pulse sensor, ECG sensor values will transmit to the cloud with the help of ESP controller. Another ESP controller will receive the sensor's value from cloud and then show it in OLED display. It also directly connected among two controllers. Then the will shows in glass.

IV. HARDWARE AND SOFTWARE SETUPS

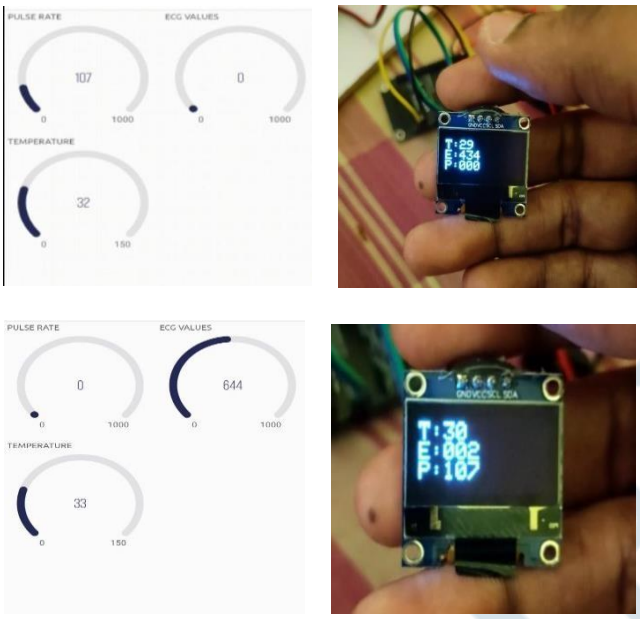

Figure .10 Shows the sensor values in Blynk IoT and OLED display

Figure.10 shows the sensor value displayed using Blynk IoT. When the inputs are given to the sensor, the value will shows in both the Blynk IoT and OLED display. By using this doctor can able to wear the glass and see the patient's condition. Hence doctors no need to come to the spot and check the patients.

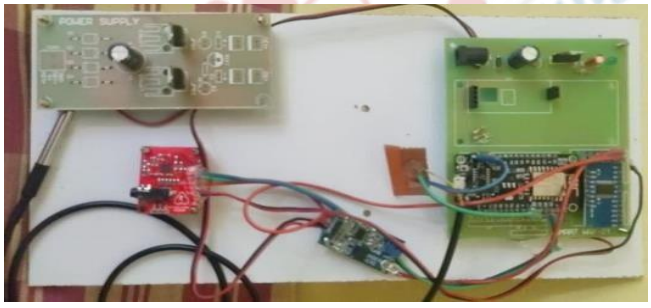

Figure .11 The hardware setup of ESP controller, Pulse sensor and Temperature sensor

Figure.11 shows the entire setup of hardware.The hardware setup of how ESP Controller, Pulse Sensor and Heart Rate sensors are connected. The connection for the sensors are quite similar,using the pinout of the ESP controller the GPIO pins are defined in the Arduino IDE and are wired accordingly (+5V, GND, 5v5, A0 etc.). The software setup for the sensor data and working of the controller was done in Arduino C and BLYNK IoT application displays the sensor outputs from the ESPControllers the same readings is been sent to the LED Display.

Figure .12 Values can be visible

Figure.12 shows the sensor values showed in the glass.In the glass ,the controller will receive the data from the cloud. Then it will shows in the OLED display and then it get reflected and shows in the mirror.

Figure.13 Values can be visible by wearing glass

Here we have the vitals (as the data) of the patient that are shown through a set of wearable glasses that make up the doctor's assistive system. Shows the sensors value in OLED display and it will visible in glass.

V. CONCLUSION AND FUTURE SCOPE

By using this technology, we can able to fetch the vitals of patient by using Pulse sensor, ECG sensor, Temperature sensor. This will improve how users visualize information and receive data. Doctors can now view patient vitals during a procedure without the need to look away and gather data to analysis. It acts as an upgrade to industrial revolution. The glass is used to either visually change natural environments in some way or to provide additional information to users. The primary benefit of this is that it manages to blend digital components with an individual's perception of the real world.

ISSN (Online) 2394-6849

International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE)

Volume no 11 Issue 1 January 2024

REFERENCES

[1] Pasquale Arpaia , Senior Member, Egidio De Benedetto , Senior Member, IEEE, Concetta Anna Dodaro, Luigi Duraccio , and Giuseppe Servillo "Metrology-Based Design of a Wearable Augmented Reality System for Monitoring Patient's Vitals in Real Time" IEEE SENSORS JOURNAL, VOL. 21, NO. 9, MAY 1, 2021

[2] Mohammad Monirujjaman Khan , Turki M. Alanazi , Amani Abdulrahman Albraikan and Faris A. Almalki "IoT-Based Health Monitoring System Development and Analysis ".Hindawi Security and Communication Networks Volume 2022, Article ID 9639195, Apr 21, 2022.

[3] Lei Ru , Bin Zhang , Jing Duan , Guo Ru , Ashutosh Sharma , Gaurav Dhiman, Gurjot Singh Gaba , Emad Sami Jaha, and Mehedi Masud " A Detailed Research on Human Health Monitoring System Based on Internet of Things". Hindawi Security and Communication Networks May 15 2021, Volume 2021, Article ID 5592454.

[4] M. Bharath , Dr. D. Leela Rani , Dr. N. Padmaja and Dr. M. Dharani "A Health Monitoring System Based on IOT for Persons in Quarantine" . Journal Of Algebraic Statistics January 2022 Volume 13, No. 3, p. 387 – 392.

[5] Taisir Hasan Abdulameer, Abdullahi Abdu Ibrahim and Alaa Hamid Mohammed "Design of Health Care Monitoring Systems Based on Internet of Thing(IoT)". IEEE Transaction, Instrumentation, Measurements November 22,2020.

[6] A. Hartono, R. G. Alfarizi, S. T. H. Putri and E. Sanjaya, "Design and Development Integrated Sensor System for Measuring Body Temperature and Heart Rate,"10th International Conference on Cyber and IT Service Management (CITSM), Yogyakarta, Indonesia, 2022.

[7] A. V. Zinkevich, "ESP8266 Microcontroller Application in Wireless Synchronization Tasks," 2021 International Conference on Industrial Engineering, Applications and Manufacturing (ICIEAM),21, May 2021.

[8] A. B. Jani, R. Bagree and A. K. Roy, "Design of a low-power, low-cost ECG & EMG sensor for wearable biometric and medical application," 2017 IEEE SENSORS 29 October 2017.

[9] M. Nagabushanam, S. Jeevanandham, S. Ramalingam, K. Baskaran and A. Maheshwari, "AI based E-ATM Security and Surveillance System using BLYNK-loT Server," 2022 3rd International Conference on Communication, Computing and Industry 4.0 (C2I4), Bangalore, India, 16 December 2022.

[10] A. R. Barai, M. Rysul Kibria Badhon, F. Zhora and M. R. Rahman, "Comparison between Noninvasive Heart Rate Monitoring Systems using GSM Module and ESP8266 Wi-Fi Module," 28 December 2019.