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COVID-19 TRACKING AND CONTROL AUTOMATION

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Abstract. This project suggests using automated methods to stop the virus from spreading. The goal of this project is to create a portable, precise, and economical device for tracking and monitoring a person's vital signs in order to find early indications of Covid- 19 infections. The system makes use of an Internet of Things (IoT) device that looks like an ID card and is furnished with a number of sensors, including a pulse sensor, blood pressure sensor, temperature sensor, and sound sensor. These sensors gather and process data, which is subsequently sent to an analytical server in the center. Also, the device features a mixed reality QR code that can be scanned to accurately and automatically check for Covid-19 infections. In a number of locations, including hospitals, airports, schools, and other public venues, the gadget can be utilized to check people for infections with Covid-19. The information gathered can be utilized to identify possible epidemics, facilitate successful contact tracing, and support quarantine procedures. By offering a dependable and precise method for monitoring and managing Covid-19 infections, the research also intends to increase public health and safety. Microcontrollers, sensors, and a central server were among the hardware and software elements that had to be integrated into the construction of the IoT device. To get reliable findings, the device's data is processed and analyzed utilizing cutting-edge machine learning techniques. Because the data is encrypted and stored safely on the server, the technology also guarantees the confidentiality and security of the information gathered. In conclusion, our initiative seeks to offer a workable and efficient way to monitor and manage Covid-19 infections. employing IoT hardware. The device is affordable, transportable, and dependable, which makes it an important weapon in the fight against the epidemic. The method has the potential to be used more widely and to slow the spread of Covid-19 worldwide with more testing and improvement.

Keywords: IoT device, microcontroller, pulse sensor, temperature sensor and respiratory sensor, central server, tracking & control of

covid19.

1 Introduction

Millions of individuals worldwide have been impacted by the enormous global disaster brought on by the Covid-19 pandemic. The virus is difficult to track and control since it is extremely contagious and spreads quickly. Many nations have adopted a variety of measures to halt the virus's transmission in reaction to this crisis, including lockdowns, social seclusion, and mask regulations. But, it has been difficult to put these precautions into place and enforce them, and the virusis still spreading. In order to overcome these difficulties, the goal of this research is to create a portable and precise system for tracking and monitoring people's vital signs in order to find early indications of Covid-19 infections. The system makes use of an Internet of Things (IoT) device that looks like an ID card and is furnished with a number of sensors, including a pulse sensor, blood pressure sensor, temperature sensor, and sound sensor. These sensors gather and process data, which issubsequently sent to an analytical server in the centre. Also, the device features a mixed reality QR code that can be scannedto accurately and automatically check for Covid-19 infections. The project's goals include enhancing public health and safety, identifying potential outbreaks, assisting with efficient contact tracking, and implementing quarantine procedures. The technology offers a reliable and affordable way to track and manage Covid-19 infections, and it may be applied in a number of locations, including schools, airlines, hospitals, and other public areas. Microcontrollers, sensors, and a central server were among the hardware and software elements that had to be integrated into the construction of the IoT device. Toget reliable findings, the device's data is processed and analysed utilising cutting-edge machine learning techniques. By encrypting and safely storing the collected data on the server, the technology also guarantees its privacy and security. Ultimately, this research has the potential to significantly advance efforts being made around the world to fight the Covid- 19 pandemic. The method can be expanded upon and used to assist stop the spread of the virus, saving lives and enhancing public health and safety with future testing and development. Connecting common things to the internet and allowing them to gather and exchange data is the basis of the Internet of Things (IoT), a rapidly expanding technological field. IoT devices can be anything from straightforward sensors to intricatesystems that combine numerous sensors, actuators, and other parts to carry out a variety of functions. IoT devices can be used in the healthcare industry to track and monitor a person's heart rate, blood pressure, temperature, and breathing rate, among other vital signs. Among other uses, these devices can facilitate remote patient monitoring, monitor chronic disorders, and assist in the early detection of diseases. In order to create a portable and precise system for identifying early indicators of disease, the Covid Tracking and Control Using IoT Device project makes use of the possibilities of IoT technology. The project's equipment integrates a number of sensors, including a sound sensor, temperature sensor, blood pressure sensor, and pulse sensor, to gather and process data from people's vital signs. The gathered data is then sent to a central server for advanced machine learning algorithms to analyse and process. The IoT device's capacity for real-time data collection and transmission enables prompt detection and Covid-19 outbreak prevention. Hardware and software integration is also a part of the project's IoT domain because the device needs a variety of hardware elements to function, including microcontrollers, sensors, and communication modules. Data processing, analysis, and storage technologies that guarantee the precision, dependability, and security of the gathered data are included in the project's software components. The Covid Tracking and Control Using IoT Device project protects the privacy and security of the collected data, which is essential for IoT technology. For the purpose of preventing unwanted access and adhering to applicable laws, the system encrypts and securely stores the data on the server. Overall, the Covid Tracking and Control Using IoT Device project domain combines several IoT technology elements, such as sensors, communication modules, data processing, and security, to create an original and efficient solution to find and stop the Covid-19 virus's propagation. The convergence of Internet of Things (IoT) technologies with healthcare is the project domain. The Covid-19 epidemic has brought attention to the need for creative approaches to stop the virus's transmission, and IoT technology has showed promise in overcoming these difficulties. The project's goal is to create a portable, precise, and economical device for tracking and monitoring people's vital signs in order to find early indications of Covid-19 infections. This system, which is more narrowly focused on illness diagnosis and prevention, belongs to the larger category of healthcare technology. The project's Internet of Things (IoT) gadget combines a number of hardware and software elements, including microcontrollers, sensors, and a centralized server, to gather and process data from the subjects' vital signs. The server receives this data, which is subsequently processed by cutting-edge machine learning algorithms to produce accurate results. Data security and privacy are also included in the system's domain because the information gathered is delicate and needs to be secured. To protect privacy and ensure compliance with applicable laws, the system encrypts and keeps the data securely on the server. The spread of illnesses can be stopped by recognizing patients who display symptoms and administering timely remedies (such self-isolation or medication).Additionally, remote healthcare is preferable due to the difficulty and infection risk of visiting the hospital during a pandemic epidemic. IoT technology enable symptom detection outside of clinical settings and data sharing with clinicians,enabling remote healthcare.

2 Related Works

According to the literature, several methods have been developed to use IoT devices to track a person's vital signs. The Internet of Things: A Survey by S. Li. Recent research has focused a lot of attention on the Internet of Things (IoT). IoT is considered a part of the Internet of Things, which will eventually consist of billions of intelligent, chatty "things." The Internet of the future will be a heterogeneously connected network of gadgets, greatly expanding the globe's limits with both actual and virtual components. The Internet of items (IoT) will give connected items new capabilities. This survey meticulously examines the definitions, architecture, underlying technology, and applications of IoT. IoT is initially introduced with different definitions. Creating IoT implementation strategies are then explained. The investigation of someopen IoT application-related issues follows. The primary research issues are finally examined. A health-IoT platform based on the combination of intelligent packaging, unobtrusive bio-sensors, and intelligent medication boxes was described by G. Yang in the IEEE Trans. In-home healthcare services powered by the Internet of Things (IoT) have a lot of financial potential, but a complete platform is currently lacking. In this study, the intelligent home-based platform known as i-Home Health-IoT is proposed and put into use.

V.Binach To address security issues, theBayesian network also employs a successful

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offloading strategy and improved deep architecture. The experimental resultsshow that a variety of epistemic and aleatoric sources of uncertainty, notably reliability and noise, can affect the data collected by wearable IoT sensors. In addition, IBCN's lab-scale experimental analysis on the classification accuracy of patient health data has significantly improved when compared to conventional design. This includes work on Cognitive radio learning, deep learning-based sensor activity recognition, and Smart Home. Almost every conversation about the Internet of Things right now centres around wearable technology. The need for preventive medicine and self-health monitoring is growing as a result of the expected sharp rise in the population of old persons until the year 2020. The entireexpenditures for preventive and monitoring might be significantly decreased thanks to developed technologies. This is made feasible by continuously tracking numerous health markers, and wearable technology in particular is thought to be able to do this.Y. Zhan, Identification of human activity from ambient background noise for wireless sensor networks The Mel Frequency Cepstral Coefficients and Vector Quantization categorization Linde-Buzo-Gray method algorithms are used to detect background noise in daily activities of people. On 20 sounds of typical daily activities, these algorithms may achievea recognition accuracy of 93.8%. These methods examine the effects of three factors on the workload and precision of the system: the number of Mel filters, the degree of frame-to-frame overlap, and the number of LBG codebook clusters. By adjusting these three parameters to an ideal configuration, the multiplication and addition computation loads can be reduced by 87.0% and 87.1%, respectively, while maintaining the system's average accuracy rate at 92.5%. This bodes well for the integration of wireless sensor networks (WSN) with additional sensor in the future to meet everyday activity recognition.

J. M. Sim, An article titled "Acoustic sensor-based detection of human activities in daily life for smart home service ,"A unique activity identification technique is proposed based on auditory data gathered from microphones in an unobtrusive and private manner. The possibility of privacy 7 breach exists even if behaviour detection technologies may be useful in context-aware domains in daily life. For instance, it can be difficult to employ vision-based behavioural recognition with cameras in a private location like a house, and poor user behaviour identification diminishes the device's acceptability. Additionally, employing wearable sensors for activity recognition in a professional situation is quite expensive and uncomfortable. An auditory-based behaviour detection system for use in private spaces is recommended in this research. This method classifies human activity using audio data. By combining similarity and removal algorithms, it develops newrules. The effectiveness of the suggested method was compared to that of other well-known classification methods using case-based reasoning, k-nearest neighbours, support vector machines, and multiple regression. "Electromagnetic radars have been demonstrated as having the potential to be employed for remote sensing of bio signals in a more pleasant and convenient manner than wearable and contact devices," write M. Alizadeh, G. Shaker, J. C. M. D. Almeida, P. P. Morita, and S. Safavi-Naeini. Although there is rising interest in employing radars to monitor health, their performance hasn't been assessed and reported in realistic scenarios or with faults that are acceptable .In reality, the proposed signal processing is unique due to the significant phase unwrapping manipulation. Additionally, the results are compared to those of a reliable reference sensor. Our results show that the correlations for breathing and heart rates between the radar estimations and thosefrom the reference sensor are 94% and 80%, respectively.

3 Existing Technology

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Some IoT-based systems already in existence try to deal with these difficulties. For instance, wearable technology like smartwatches may check vital signs like heart rate and body temperature, and some businesses have created gadgets specifically for tracking COVID-19. Additionally, several nations have put in place contact tracing applications that employ Bluetooth technology to find and record interactions between people. This enables speedy identification of possible COVID-19 exposures and the capability to alert people of their risk status. These apps have generated controversy due to worries about data security and privacy, but they have been used successfully in some locations to monitor and restrain thespread of the virus.

1. Contact tracing applications: Contact tracing applications use Bluetooth technology to identify and alert users who have had direct touch with a Covid-19-infected person. The program helps stop the virus from spreading by enabling instant detection of possibly infected people.

2. Thermal Scanning: To identify possible fever, a common indicator of Covid-19 infection, thermal scanning scanners are used to test a person's body temperature. A rapid and non-intrusive way to find possible cases is by thermal scanning.

3. PCR Tests: Individuals can be tested for the presence of the Covid-19 virus using polymerase chain reaction (PCR) assays. PCR testing are quite accurate and can find the virus in people who aren't showing any symptoms.

4. Rapid Antigen Tests: Individuals might also be tested for the Covid-19 virus using rapid antigen tests. These tests are less expensive than PCR testing and offer quick answers, but they are less precise.

5. Wearable Technology: Vital indicators, such heart rate and respiration rate, can be tracked with wearable technology, suchas smartwatches and fitness trackers. These tools are capable of identifying probable Covid-19 infection symptoms like shortness of breath and elevated heart rate.

With the incorporation of numerous sensors into a single portable device, the Covid Tracking and Control Utilizing IoT Device project advances these already-developed technologies. The initiative intends to improve public health and safety by offering a more precise and economical approach to diagnose and stop the spread of Covid-19 infection.

4 Motivation

Real-time health monitoring is made possible by IoT device and a centralized server. This includes the ability to track the user's pulse, blood pressure, body temperature, coughing, and breathing in real-time. Real-time COVID-19 infection detection is possible using this data. Automatic COVID-19 screening: A mobile application can scan the mixed reality QR code on the IoT device to analyze the health information it has collected and produce a report on the user's propensity to have COVID-19 infection. By automating the screening procedure, less manual testing will be required. Alerts and notifications: If specific health parameters surpass predetermined criteria, the central server can be set up to produce alertsand notifications. For instance, the central server may send out a warning if the user's body temperature rises beyond a particular threshold, suggesting that the user may be contagious and should be tested for COVID-19. Data analytics and reporting: To gain insights and provide reports on the spread of COVID-19, health data gathered from IoT devices can be analyzed using

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data analytics tools. This information can be used to monitor the disease's development and to discover hotspots and regions that require more attention. Better public health response: By automating the screening process and enabling real-time monitoring of health indicators, the outcomes and outputs of our study can contribute to an improved public health. This can assist in lowering the spread of the disease and save lives.

5 Proposed System

The goal of this project is to create a portable, precise technology for spotting early indications of Covid-19 infection. Thedevice has a number of sensors, including ones for sound, temperature, blood pressure, and pulse that gather and process information from users' vital signs. Advanced machine learning techniques are then used to process and analyse the obtained data on a central server. The device's capacity for real-time data collection and transmission enables prompt detection andCovid-19 outbreak prevention. The Covid Tracking and Control Using IoT Device project's overall goal is to improve public health and safety by offering a more precise and affordable method of detecting and preventing the spread of the Covid-19 illness. A viable strategy for tracking and managing Covid-19 outbreaks involves the combination of numerous sensors with cutting-edge data processing and analysis methods in a single portable device. An innovative method that attempts to provide precise and real-time tracking and control of Covid-19 infection is the Covid Tracking and Control Using IoT Device initiative. Since the proposed system is portable, simple to operate, and reasonably priced, it is perfect for usage in public settings like airports, schools, and hospitals. The gadget is made up of a number of parts that work together to gather, process, and analyse information from people's vital signs.

6 Implementation

The following sensors are required to monitor the individuals' vital sign :

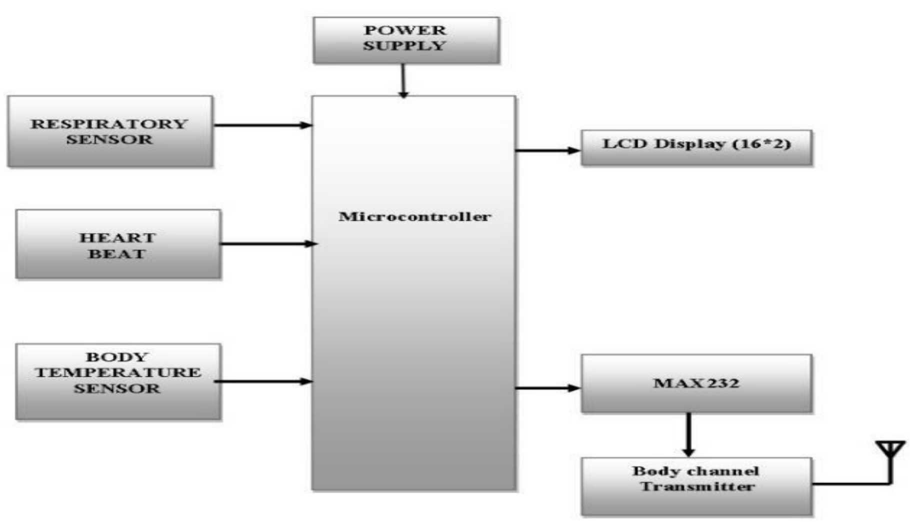

Fig 1. Wearable sensor unit architecture

Pulse Sensor: This sensor is used to determine the user's heart rate. To determine variations in blood volume caused by each heartbeat in the fingertip or earlobe, it frequently uses a photoplethysmography (PPG) approach. This analogue signal is subsequently converted by the sensor into a digital signal that the microcontroller may utilize to process. Pulse Sensor isa great heart-rate sensor for Arduino that is plug-and-play. It can be used by all types of people, including scholars, sportsmen, makers, and game and mobile app developers, to easily incorporate current heart rate data into their creations. The sensor attaches to an earlobe or fingertip and communicates directly with Arduino. It also includes a free monitoring app that shows a graph of your pulse in real-time. The user's blood pressure is measured using this sensor. To measure the pressure changes brought on by blood flow in an artery, normally a piezoelectric or strain gauge approach is utilized. The sensor then transforms thisanalogue signal into a digital signal that the microcontroller can use for processing.

Temperature Sensor: The user's body temperature is measured using this sensor. The temperature variations in the user's skin or ear canal are measured by a thermistor, thermocouple, or infrared sensor. The sensor then transforms this analogue signal into a digital signal that the microcontroller can use for processing. The device's temperature is indicated by the digital thermometer's 9–12-bit temperature readings.

Breathing monitor sensor unit: This sensor is used to listen for the user's breathing and coughing sounds. The sound waves are often recorded and converted into an electrical signal by a microphone so that the microcontroller can process them. To determine if the machine or piece of equipment is vibrating or not, a vibration sensor is needed. If the right sensor is used to detect the vibration, identifying the object that is vibrating continually is not a difficult task.

PIC microcontroller : The IoT device you constructed is controlled by a PIC microcontroller. It gathers information from various sensors, processes it, and then delivers it to the server for archival and analysis.

The following are the functions of the PIC microcontroller in our project:

1. Data Acquisition: The PIC microprocessor reads data from many sensors, including the sound, pressure, temperature, andpulse sensors.

2. Data Processing: Data from the sensors is processed by the PIC microcontroller. It executes calculations to produce precise measurements of heart rate, blood pressure, temperature, cough, and breathing sounds. It also converts analogue signals into digital signals.

3. Communication with the server: The PIC microcontroller uses the internet to transmit the data it has gathered to the server. A wireless communication protocol like WiFi is used to establish communication with the server.

4. Real-time tracking: The PIC microcontroller provides the new data to the server for analysis while continuously monitoringthe person's health.

5. Alert Notification: When a person's health status exceeds the allowed threshold, the PIC microcontroller alerts the user or a healthcare provider, signaling a possible risk of infection.

The PIC microcontroller is essential to your project because it gathers data from various sensors, processes it, and communicates with the server so that the data can be stored and analyzed. Real-time patient health status monitoring ishelpful in preventing the COVID-19 virus from spreading.

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Communication module: the communication module plays a critical role in connecting the PIC microcontroller to the server and transferring data between them. The communication module is responsible for establishing wireless communication between the IoT device and the server, and for ensuring that data is transmitted accurately and securely. The following are the key components of the communication module:

Wireless Transceiver: The wireless transceiver is a critical component of the communication module, which enables wireless communication between the PIC microcontroller and the server. In our project, we use wireless communication protocols like WiFi, depending on the range and requirements of our project.

Network Protocol: The network protocol is a set of rules and standards that govern the transfer of data between the IoT device and the server. It ensures that data is transmitted accurately and efficiently over the wireless network. In your project, you may use protocols like HTTP for communication.

Data Packetization: Data packetization involves breaking the data into smaller packets before transmitting it over the network. This helps to ensure that the data is transmitted accurately and efficiently, and also makes it easier to detect and correct errors if they occur during transmission.

Server: The central server is essential to your project because it manages the storage and analysis of the health information gathered from the IoT devices. All of the data gathered from the devices is stored on the central server, which also offers a platform for data analysis and, if necessary, alert generation.

QR code Scanner: The QR code scanner is a crucial part of this project since it enables you to access and handle the data the IoT device has gathered. Every ID card has a unique mixed reality QR code that carries details about the cardholder, including their name, age, medical history, and other pertinent data. The data in the QR code is sent to the server for processing when it is scanned with a QR code reader. The server then downloads the information gathered by the IoT device and determines the risk of COVID-19 infection using the information gathered. this project can use a standalone QR codescanner or one that is built inside a mobile app. It decodes the information from

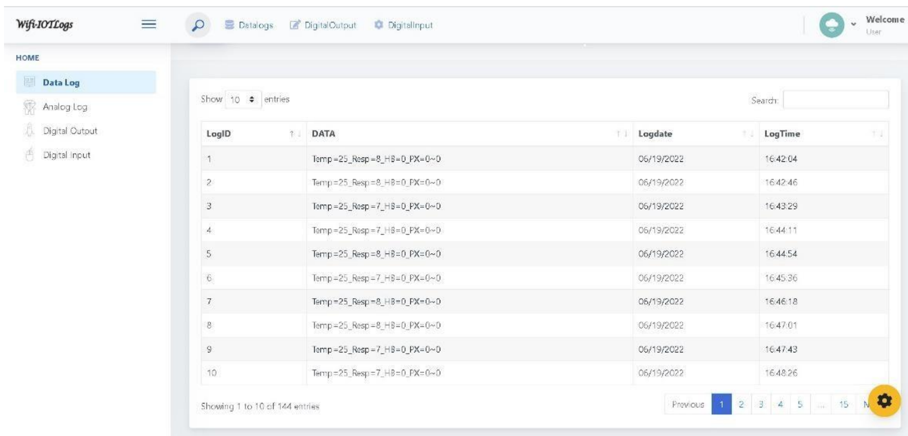
the QR code after scanning it with a camera. Other forms of QR codes, such as mixed reality codes, which are more secure and challenging to duplicate, can be constructed to interact with the scanner. Overall, the QR code scanner is a crucial part of the project since it gives us a reliable and effective means to access and handle the information gathered by the IoT device as well as enables us to automate the checking of COVID-19 infection with greater precision.

Fig 2. Qr Scanner

Software components: PIC microcontroller firmware is the computer program that controls the microcontroller and is in charge of gathering data from the sensors, processing it, and transmitting it to the main server. The firmware should be created with efficiency, dependability, and memory and power efficiency in mind.

web application: The software that runs on a device and is used to scan the mixed reality QR code on the IoT device is known as a mobile application. The application should be created with ease of use and intuitiveness in mind, and it shouldbe tuned for quick and precise QR code scanning.

Cloud-based platform: The database and central server are hosted by the cloud-based platform, which is the software infrastructure. The platform ought to be built with dependability, scalability, and security in mind, and it ought to be optimized for quick and effective data storage and retrieval.



LogID	DATA	Logdate	LogTime
1	Temp=25_Resp=8_HB=0_PX=0~0	06/19/2022	16:42:04
2	Temp=25_Resp=8_HB=0_PX=0~0	06/19/2022	16:42:46
3	Temp=25_Resp=7_HB=0_PX=0~0	06/19/2022	16:43:29
4	Temp=25_Resp=7_HB=0_PX=0~0	06/19/2022	16:44:11
5	Temp=25_Resp=8_HB=0_PX=0~0	06/19/2022	16:44:54
6	Temp=25_Resp=7_HB=0_PX=0~0	06/19/2022	16:45:36
7	Temp=25_Resp=8_HB=0_PX=0~0	06/19/2022	16:46:18
8	Temp=25_Resp=8_HB=0_PX=0~0	06/19/2022	16:47:01
9	Temp=25_Resp=7_HB=0_PX=0~0	06/19/2022	16:47:43
10	Temp=25_Resp=7_HB=0_PX=0~0	06/19/2022	16:48:26

Fig 3.Data log in cloud server

Communication protocols: Wireless communication between the IoT device and the central server is made possible by the usage of communication protocols. Cellular or WiFi communication protocols may be among the protocols.

Architecture: The project architecture consists of a number of parts that work together to accomplish the project's objectives. The IoT device layer, the data gathering and processing layer, the data analytics and visualization layer, and the user interface layer are the four key layers that make up the architecture.

The actual gadget that a person wears is included in the IoT device layer. It has a number of sensors, including a temperature sensor, a sound sensor, a pressure sensor, and a pulse sensor. These sensors gather information from the user, which the device's microcontroller unit subsequently processes.

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Receiving, processing, and transmitting data from IoT devices fall under the purview of the data acquisition and processinglayer. It is made up of a number of parts, including a wireless communication module, such Bluetooth or Wi-Fi, that enables the devices to send data to the main server. A database management system that holds the information obtained from the IoT devices is also part of the layer.

Data analytics and visualization layer: This layer is in charge of employing cutting-edge machine learning methods to analyze the data that is received from IoT devices. The layer also has a visualization element, which displays the studied data as graphs, charts, and tables.

User interface layer: To access the data that has been analyzed, health practitioners can use this layer's user-friendly interface. It contains a web application that enables medical practitioners to access the data that has been analyzed, spot possible Covid-19 outbreaks, and take the necessary action to stop the virus's transmission.

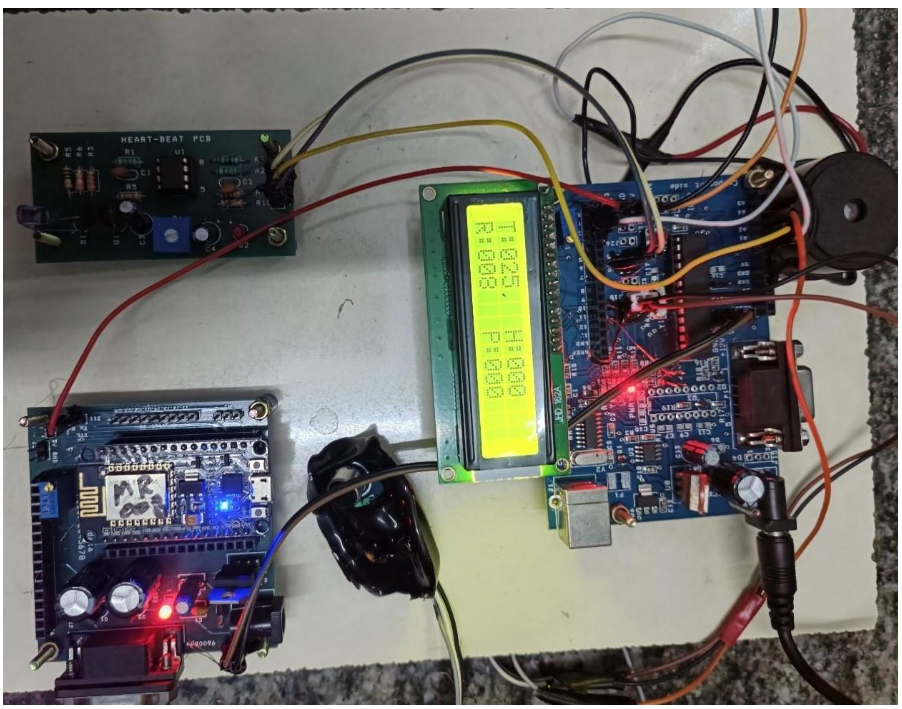

Fig 4.Wearable Iot unit

In conclusion, the Covid Tracking and Control Using IoT Device project architecture consists of a number of parts that interact to carry out the project's objectives. Individuals provide the data for the IoT device layer to collect, the data acquisition and processing layer receives, processes, and transmits the data to the central server, the data analytics and visualization layer analyses the data using cutting-edge machine learning algorithms and presents the analyzed data, and the user interface layer offers a user-friendly interface for accessing the analyzed data for health professionals.

7 Future works

Further work on this topic might entail using more sophisticated machine learning algorithms to analyze the information gathered from the sensors, increasing the device's accuracy in spotting potential Covid-19 signs. Using less expensive components would lower the device's price without compromising precision and dependability. In order to better track and manage Covid-19 outbreaks, the gadget might also be combined with contact tracing technology. A more complete and integrated approach to monitoring and managing infectious diseases in public areas would be possible with the usage of thedevice for other infectious diseases as well. An accessible and affordable method for Covid-19 tracking and control should be made available by the project. In conclusion, the project's performance indicators can be assessed in terms of cost- effectiveness, correctness, dependability, speed, and scalability. The project should offer Covid-19 tracking and control solutions that are precise, dependable, swift, scalable, easy to use, and affordable.

8 Conclusion

This research offers a promising means of keeping an eye on and reining in the distribution of Covid-19 in public areas. The project creates a small gadget that combines a number of sensors and communication modules. It collect realtime data from users and send it to a central server for analysis. The experiment performed on the device yielded encouraging findings for identifying prospective Covid-19 symptoms in people, and the real-time data transfer to the central computer enables rapid and precise analysis of potential Covid-19 outbreaks. The project still has certain drawbacks, such as the device's price and the requirement for a wireless network, which may restrict its application in some contexts. To guarantee the device's accuracy and dependability in identifying Covid-19 outbreaks in bigger populations, additional development and testing are required.

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