IOT PATIENT HEALTH MONITORING SYSTEM

INTRODUCTION:

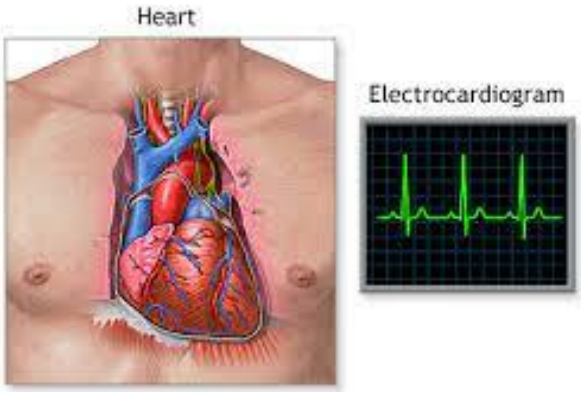
An IoT health monitoring system is a system that uses the Internet of Things (IoT) to collect and monitor health data from users. IoT health monitoring systems can be used to monitor a wide range of health data, including blood pressure, heart rate, respiratory rate, blood sugar levels, and air quality. IoT health monitoring systems can be used by people with chronic health conditions, such as heart disease, diabetes, or asthma, to monitor their health and identify any potential problems early on. It can also be used by healthy people to track their fitness and overall health. Overall, IoT health monitoring systems have the potential to revolutionize the way we monitor and manage our health.

IoT Health Monitoring Systems are designed to provide real-time, continuous, and personalized healthcare solutions to individuals, patients, and healthcare providers. These systems integrate a variety of wearable devices, sensors, and IoT-enabled instruments that collect an array of health-related data, ranging from vital signs like heart rate, blood pressure, and body temperature to more complex metrics such as blood glucose levels, sleep patterns, and even environmental factors like air quality

As IoT technology continues to evolve and become more sophisticated, IoT Health Monitoring Systems are poised to revolutionize healthcare by providing a more patient-centric, data-driven, and efficient approach to healthcare management. This introduction only scratches the surface of this rapidly advancing field, and as we delve deeper into the subject, we'll explore the technology, benefits, challenges, and future prospects of IoT Health Monitoring Systems.

OBJECTIVES:

- Heart rate monitoring
- Record of electrocardiogram [ECG]



- Monitoring of blood oxygen level [Sp02]
- Air quality check
- Overall health monitoring and fitness detector

The overall objective of this project is to design and develop an IoT health monitoring system that can be used to collect and monitor SpO2, heart rate, ECG, and air quality data. The system will use the Node MCU microcontroller to collect

the data from the sensors and the Think speak cloud dashboard to display the data to the user and send alerts if the user's vital signs go outside of a predefined range.

This system could be used by doctors as well as patients, for doctors there is no need to monitor the patients from their ICU as doctors will get the live details of the units the device measures.

Here are some specific examples of how the system could be used:

- A person with heart disease could use the system to monitor their heart rate and ECG to detect any signs of an arrhythmia or heart attack.
- A person with diabetes could use the system to monitor their blood oxygen level to ensure that it is not dropping too low.
- A person with asthma could use the system to monitor the air quality around them to avoid exposure to pollutants that could trigger an asthma attack.
- A healthy person could use the system to track their fitness progress and monitor their overall health.
- Early Detection and Prevention: To identify health issues and abnormalities at an early stage, enabling timely intervention and preventing the progression of diseases.
- Personalized Healthcare: To deliver tailored healthcare solutions and treatment plans based on an individual's unique health data, optimizing care and improving patient outcomes.
- Scalability: To create systems that can accommodate a growing number of users and devices, ensuring that the health monitoring system remains effective as it expands

This project has the potential to make a significant positive impact on people's health and well-being. By making it easier for people to monitor their health data, the system could help to detect potential health problems early on and prevent serious complications.

WORKING OF THE PROJECT:

SPO_2 SENSOR(MAX10300):The MAX30100 is a highly integrated optical sensor module designed for measuring blood oxygen saturation (SpO2) levels and heart rate. It combines two LEDs (an IR LED and a red LED) with a photodetector and signal processing components in a compact package. The MAX30100 sensor utilizes the principle of photoplethysmography (PPG)

to non-invasively measure SpO2 and heart rate.

Key features of the MAX30100 sensor include its small size, low power consumption, and ease of integration with microcontrollers and development platforms. It is commonly used in wearable fitness and health monitoring devices, including smartwatches and fitness trackers, to provide users with real-time information about their SpO2 levels and heart rate. This data can be valuable for tracking overall health, especially during physical activity or sleep monitoring.

The table below shows the specifications of this sensor:

Operating Voltage	1.8V to 3.3V
Input Current	20mA
Temperature Range	-40˚C to +85˚C
Temperature Accuracy	±1˚C
ADC Resolution	14 bits
IR LED peak wavelength	870-900nm
Red LED peak wavelength	650-670nm

ECG SENSOR(AD8232):

The AD8232 is a specialized integrated circuit (IC) designed for ECG (Electrocardiogram) signal conditioning and monitoring. It is manufactured by Analog Devices, Inc., a prominent semiconductor company. The AD8232 ECG front-end module is commonly used in medical devices and DIY electronics projects for monitoring the electrical activity of the heart. Here are some key features and information about the AD8232

An ECG (Electrocardiogram) sensor, also known as an EKG (Electrocardiograph) sensor, is a medical device used to monitor and record the electrical activity of the heart over a period of time. It is a key tool in diagnosing and evaluating various heart conditions, such as arrhythmias, myocardial infarctions (heart attacks), and other cardiac abnormalities. Here are some key points about ECG sensors

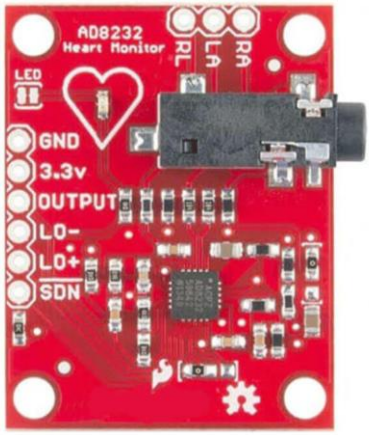
the AD8232 is a versatile and widely used ECG front-end module designed for reliable and accurate ECG signal processing. Its integration of various components simplifies the task of designing ECG monitoring devices, making it a valuable tool in the field of healthcare and electronics.

The applications of the AD8232 ECG sensor include the following

Monitoring of heart and fitness activity

- Handy ECG
- Monitoring of remote health
- Used in gaming devices
- Acquisition of biopotential signal
- Biometrics
- Physiology studies
- Prototyping of biomedical instruments

•Variability of heart rate



A GSR (Galvanic Skin Response) sensor, also known as a skin conductance or electrodermal activity sensor, measures the electrical conductance of the skin. The skin's conductance is influenced by the activity of sweat glands, which in turn is controlled by the sympathetic nervous system. The sympathetic nervous system becomes more active in response to stimuli such as stress, excitement, or arousal, leading to an increase in sweat gland activity and a corresponding change in skin conductance.

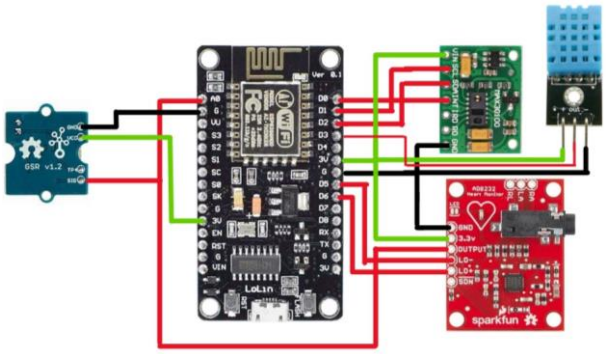
DHT11/22:

The **DHT11** is a commonly used **Temperature and humidity sensor.** The sensor comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. The sensor is also factory-calibrated and hence easy to interface with other microcontrollers.

The sensor can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of ±1°C and ±1%. So if you are looking to measure in this range then this sensor might be the right choice for you.

GSR Sensor:

CIRCUIT DESIGN:



Ubidots:

Ubidots is a cloud-based Internet of Things (IoT) platform that enables users to collect, analyze, and visualize data from connected devices in real-time. The platform provides tools for building applications and dashboards to monitor and control IoT devices, sensors, and data streams. Ubidots support a wide range of industries and applications, including smart cities, agriculture, industrial automation, healthcare, and more.

Key features of Ubidots include:

Device Management: Users can easily connect and manage their IoT devices on the platform, allowing for seamless communication and data exchange.

Data Visualization: Ubidots offers customizable dashboards and visualizations, making it easy for users to interpret and analyze data generated by their connected devices.

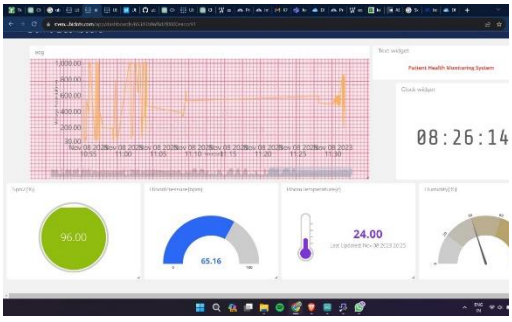
Alerts and Notifications: Users can set up alerts based on predefined conditions, enabling them to receive notifications when specific events or thresholds are reached.

Integration: Ubidots supports integration with various hardware platforms, communication protocols, and third-party services, providing flexibility in building and scaling IoT solutions.

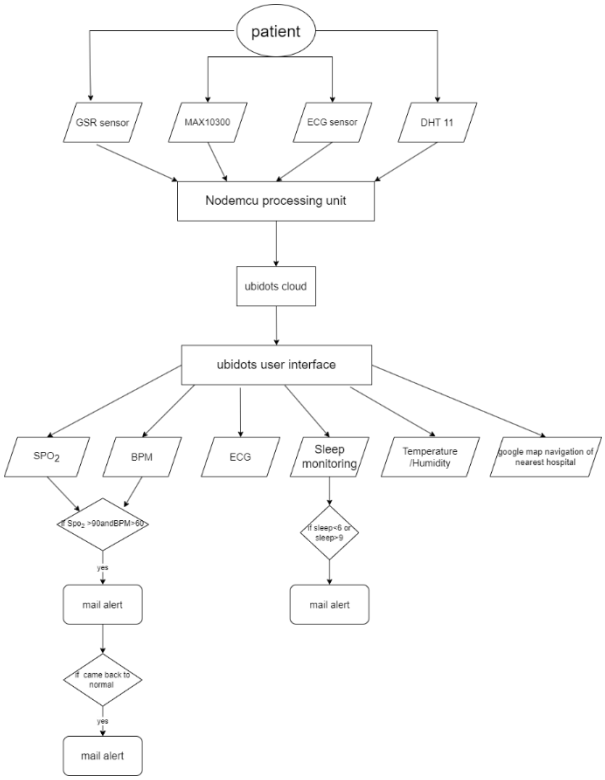
Analytics: The platform includes analytics tools to help users derive insights from the collected data, facilitating informed decision-making.

APIs and SDKs: Ubidots provides APIs (Application Programming Interfaces) and SDKs (Software Development Kits) to facilitate integration with custom applications and services.

Overall, Ubidots simplifies the process of building and managing IoT applications, making it accessible for both individuals and organizations to harness the power of connected devices and data.



BLOCK DIAGRAM:



METHODOLOGY:

An IoT health monitoring system that can collect data related to blood oxygen level (SpO2), heart rate, ECG, and air quality using Node MCU as a microcontroller and Blynk as a mobile application can be designed using the following components:

1. The user connects the sensors to the Node MCU board.

2. The user programs the Node MCU board to read the data from the sensors at regular intervals and send it to the Blynk cloud platform.

3. The user creates a Blynk project and configures it to receive data from the Node MCU board.

4. The user installs the Blynk mobile application on their smartphone.

5. The user connects the Blynk mobile application to their Blynk project

6. There will be an emergency alert feature in the app to save one's life by knowing uncertainties in time.

EXISTING SYSTEM DRAWBACKS:

- Diagnosing with the help of a doctor
- Conventional devices that can only-measure a particular parameter
- Devices that have to be connected invasively to get measurements
- No automated system exists
- Smart watches are expensive and not specifically for healthcare
- The patients or the family members of patients can't be able to understand the analog signals
- Systems are not portable

PROPOSED SYSTEM:

- In this project, a system for 24×7 human health monitoring is designed and implemented In this system
- The NODE MCU board is used for collecting and processing all data
- Different sensors are used for measuring different parameters
- All this data is uploaded to Blynk mobile application for remote analysis
- The data which has been generated, can be sent to the Blynk cloud for analysis, evaluation, and storage.

APPLICATIONS:

It can be used in ICUs, operation theatres, etc for monitoring the health condition of the patient

It can be also used in old age homes to monitor the various parameters of an old sick person

It can be used in daily life to maintain a healthy lifestyle

Advantages:

- Bridging the gap between doctor and patient
- Best to be used in rural areas
- Compared with compact sensors it gives better results
- Easy to operate
- Low cost
- Portable

FUTURE SCOPE:

- Multiple parameters like blood pressure, retinal size, age and weight, and mental health can be included as controlling parameters in the future.
- the whole health monitoring system, which we have proposed can be integrated into a small compact unit as small as a cell phone.
- This will help the patient to carry the device in handy.

CONCLUSION:

This system is very effective in monitoring a person's health continuously because it is fully automated. It can be tested very easily by any person. This system is a very good example of remote health monitoring and it is portable to use.