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Implementation of Smart Health Monitoring System Using Egde Computing

Mrs. R. Kiruthikaa[1], Mrs. V. Pavithra[2], Mrs. G. S. Deepika[3], Sangeethapriya. B[4]

Assistant Professor, Karpagam Institute of Technology SNS College of Engineering, Tamil Nadu, India.
Assistant Professor, Karpagam Institute of Technology SNS College of Engineering, Tamil Nadu, India.
Assistant Professor, Karpagam Institute of Technology SNS College of Engineering, Tamil Nadu, India.
II Year M.E, Karpagam Institute of Technology SNS College of Engineering, Tamil Nadu, India.

Abstract:
The last ten years have seen a shift in the healthcare monitoring systems, making them one of the most important systems. Because of a lack of timely medical attention for individuals suffering from various illnesses, humans are struggling with the issue of untimely mortality. The main objective was to create a dependable IoT-based patient monitoring system that would enable healthcare providers to keep track of their patients, whether they are in a hospital or at home, in order to provide better treatment. Sensors, a data collecting unit, and a microprocessor make up the majority of a mobile device-based wireless healthcare monitoring system that was built in order to offer real-time online information about a patient's physiological status. The Internet of Things (IoT), edge computing, cloud computing, and other emerging information technologies have all contributed to the development of smart healthcare. The Internet of Things (IoT) concepts have been widely applied to connect the available medical resources and provide patients with intelligent, dependable, and efficient healthcare. One of the paradigms that can harness the benefits of the IoT to improve the patient's lifestyle is health monitoring for active and supported living. We have introduced an IoT architecture that has been specially designed for healthcare applications in this project. Hence the proposed architecture collects the sensor data through Node MCU microcontroller

Keywords: Edge Computing, Internet of Things(IoT), Raspberry Pi.

1. Introduction

The interconnection of gadgets, software, sensors, and network connectivity known as the "Internet of Things" improves the ability of these items to collect and share data. A patient is continuously monitored by examining numerous parameters, and the Internet of Things in the healthcare system also extrapolates a positive outcome from the past of such continuous monitoring. In today's ICUs, there are several of these gadgets with medical sensors. There could be instances where the doctor couldn't be alerted in time when there is an emergency, despite of 24 hours of monitoring. Sharing the knowledge with the concerned family members and relatives as well as the specialized specialists may also provide challenges. Although the technology to improve these aspects is currently available, most individuals in underdeveloped nations like India do not have access to it or can't afford it. Therefore, the solutions to these issues could be as simple as adding these features to the existing devices. This paper illustrates a microcontroller-driven remote health monitoring system.

Challenges

Currently, Raspberry Pi is being used.Through the Raspberry Pi, we measure the patient's and the parameters' health. These protocols can convey data over short distances of communication.The doctor cannot receive health parameters at any time.

Proposed Approach

The suggested solution uses IoT to alert the appropriate duty doctors during an emergency in addition to carrying out the work of health monitoring. The doctors then gather the information and take additional steps to save the patient. The different tracking characteristics of the patient are broadcast via Wi-Fi module, so when the GSM receives the message from the base station, it may access the patient's current state utilizing IOT. These records will be kept in the cloud and accessible on the hospital PC as and when needed. The doctors can take quick action based on this information. The health parameters of a patient are monitored using a variety of biomedical sensors, including glucose, flow, pressure, temperature, and cardiac sensors. The PIC Microcontroller is a low-cost, widely accessible device with adaptable interface abilities. Thus, PIC16F877A is a superior processor to others. Using the IOT module (ESP8266), all sensor data may be viewed on the Thingspeak website. The collected health metrics in this paper are delivered to the doctor via IoT using edge computing. This method can be used to give stakeholders secure online access to patient data as well as the ability to share the data in an encrypted manner for their own reasons. The suggested authentication method for the Internet of Things can fend off any network assaults and is simple to use. As a result, the suggested architecture uses a NodeMCU microcontroller to gather sensor data.

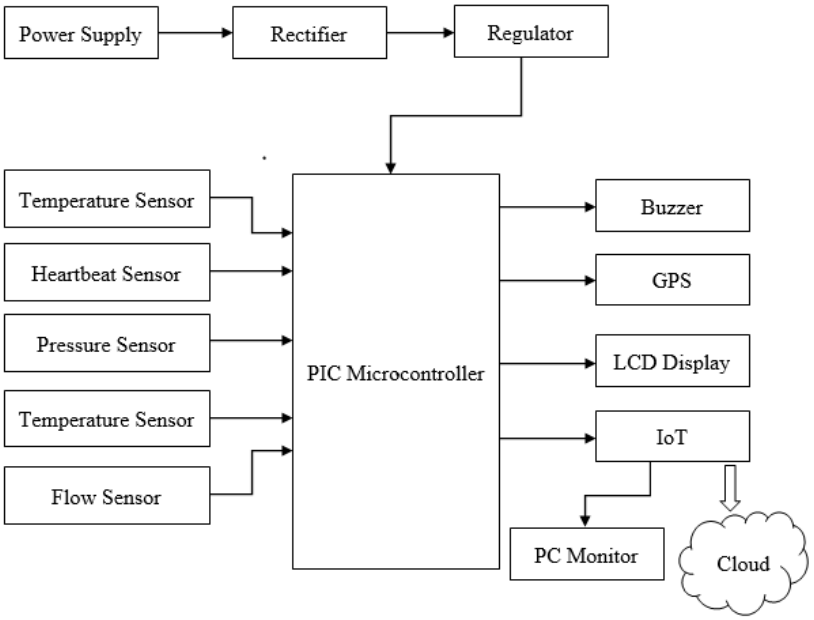
Working

The PIC16F877A microcontroller is used in a patient monitoring system to monitor the patient's health parameters. The PIC16F877A microcontroller is connected to a cloud database system, which serves as a server, after connecting to the internet.

The server then immediately transmits data to the receiver system. As a result, it makes it possible for the doctor to continuously monitor the patient's health metrics.

The doctor can start the essential medications right once if there is any sudden increase or reduction in the values of these parameters**.**

Block Diagram



Evaluation

The oxygen sensor monitors the patient's oxygen level, and if it drops, the O2 pump activates and an automatic alarm is sent to the doctor and nurse. The measured heealth parameters are sent to the cloud and with the help of internet the Doctor will receive a call during emergency.

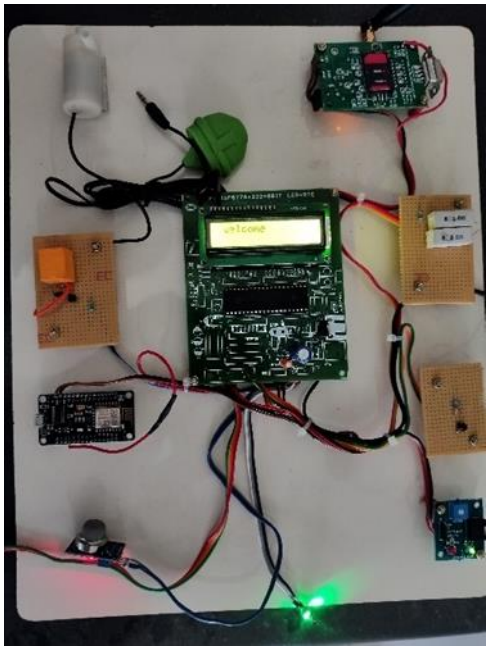


Figure 5.1 Project setup

A heartbeat sensor calculates the patient's heart rate. Children's heartbeats often range from 100 to 150 beats per minute, while adults' heartbeats typically range from 60 to 100.

Figure 5.2 Heartbeat sensor

An alert will be sent to the doctor in the form of a call and message if the patient's heart rate rises to 70. The heartbeat sensor is depicted in Fig.5.2.

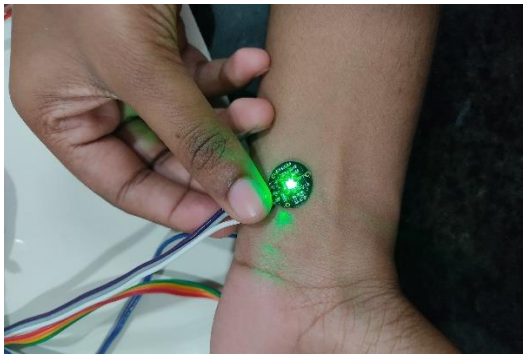


Figure 5.3 Pressure sensor

Figure 5.4 Emergency alert sent to the Doctor

We may measure the patient's health parameters, such as pressure, heartbeat, position in bed, glucose level, and temperature, using sensors for pressure, heartbeat, gyro, glucose, and temperature.

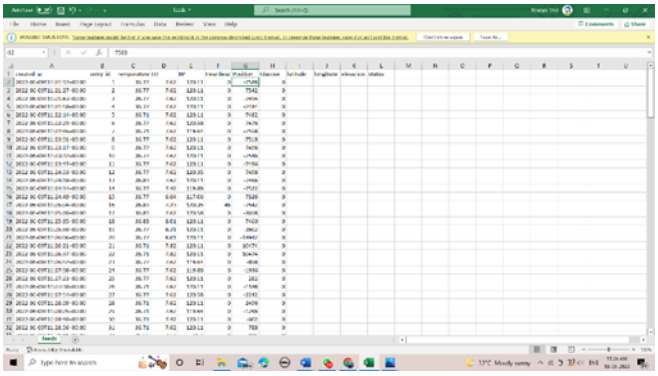


Figure 5.5 Patient's health parameters in excel format

The doctor can view the patient's results in both excel and graphical formats by logging into the thingspeak server. Figure 5.5 displays the patient's medical information in Excel format.

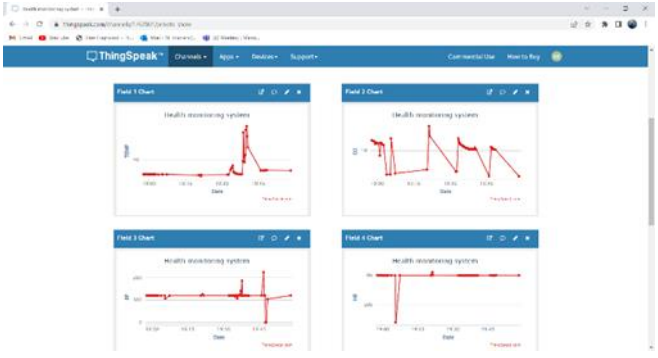


Figure 5.6 displays the patient's health parameters in a graphical style.Fig.5.6 Shows the patient's health indicator s graphically

2. Conclusion

New possibilities for changing the conventional health care system have emerged as a result of the development of information and communication technology. These problems should be resolved through cooperation between engineers and medical professionals. Through this research, a straightforward yet creative wireless health monitoring system with wireless sensors has been created for critical patients. These monitoring systems

are ideal for patients in rural or disaster-affected areas as well as for critically ill patients who require constant monitoring, according to the practical results. The patient's family can profit from this method in terms of time and effort spent caring for and monitoring the patient's health. Physicians may save time and check on the patient's condition at any time and from any location by using this dependable health monitoring system.

Future Scope

In-home physiological data can be beneficial from remote health monitoring. Patients who want to avoid a lengthy hospital stay and are old or chronically unwell can benefit from this monitoring. An automated system that ensures ongoing monitoring of several health indicators and the foretelling of any sickness or disorder spares the patient the discomfort of making frequent hospital visits. The proposed technology can be installed in hospitals, allowing for the collection and online database storage of vast amounts of data. Through an application, even the findings can be made accessible from a mobile device. By including artificial intelligence system components, the system can be further enhanced to help the patients and the doctors. Using data mining, it is possible to look for recurring patterns and logical connections in the disease by looking at the parameters and results of the medical histories of many individuals.

For instance, the effects can be predicted if a patient's health metrics are changing in a manner similar to another patient's in the database.
It would be simpler for doctors and medical researchers to identify a solution if the same patterns were discover ed frequently.

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