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Advanced Critical Care Monitoring with Alert and Auto Intelligence System

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Abstract: With great advancements in lifestyle and practices along with pandemic outbreaks such as COVID 19, the number of patients in hospitals is increasing which is a major concern globally. To overcome this situation, an IoT platform likely to provide the scalability required for this challenge is support the continuous monitoring of patients on a global scale. The technical specifications used are Arduino IDE, ThingSpeak Cloud, Max 30100, Temperature sensor, and ESP8266. Arduino kit is an open source platform that has an easy to use software and hardware. It can read inputs from any device. ThingSpeak is an IOT analytics service that allows the collection of data, picturing, and examine live data streams in the cloud. ESP8266 is a Wi-Fi Module that gives the microcontroller access to the Wi-Fi network. LM35 is a series of devices used for measuring temperature with accurate precision. Its output voltage is linearly proportional to the temperature in Centigrade units. Hence, this project paper is focused to analyse the vitals of patients by using wearable, safe, and modern sensors to observe various patients who are affected by cardiovascular disease.
Keywords: Healthcare monitoring, Internet of Things, Cardiovascular Disease, Remote Monitoring Platform.

I. INTRODUCTION

In the field of Patient Monitoring, the most effective and best application of IOT is Telemedicine because it is useful to patients who are affected by cardiovascular disease. Applications of Telemedicine can be seen in the field of cardiology with micro and macro sensors in a great range. These techniques are adopted, with different ideas for working with telemedicine in the monitoring system. This adoption is made by the IOT platform, so that information can be uploaded or downloaded in Webserver. This helps make telecommunication technologies for medical information and services. The sensor is used with a biological parameter monitoring device and is connected to the cloud for parallel access of information by mass patients spontaneously. It is elevated to the sum of the process of medication. In case, there are huge numbers of patients it becomes difficult for the doctor to monitor them every time. The doctors in such cases, schedule a specific time slot and each patient is visited after a certain time interval. Still, people found this method to be time-wasting and restless. The hospital management and the patients felt helpless as it is more bothering. The software components developed are led by the Reference Architecture for an IOT-based Healthcare monitoring system that is mentioned in the Engineering process and also in the deployment of the application. Hence, this paper focuses to stick the platform, which is beginning to demonstrate the patients de hospitalization .

II. RELATED WORK

Xiao-Rong Ding and yet all describe the use of portable sensing devices and telemedicine technology with practical applications in the pandemic situations[1]. It is used for monitoring patients via IoT and Cloud computing techniques [2]. Enables integration of mobile communications with wearable devices [3]. Enables integration of IOT-based ICU Patient Health Monitoring System[4]. It is useful in integrating IOT[5]. It gives research directions on remote patient monitoring and describes the play of AI in RPM systems[6].

It provides answers to similar problems and fighting against the COVID situation [7]. It describes the whole event recognition in-house [8]. It explains wearable photo plethysmography sensor systems with PSOC microcontroller[9]It eases the integration of mobile communication technology with sensing devices to enable remote monitoring of patients[10]. It enables IOT interoperability through opportunistic Smartphone-based mobile gateways[11]. It uses BSN to support real-time decision-making and treatments[12]. It uses IoT for efficient handling of medical records, sampling, connecting devices across locations, and causes of disease [13]. IoT is used for easily detecting fluctuations and changes in the critical conditions of the patients[14]. It reduces hospital readmissions and improves the quality of care for patients with severe conditions when combined with tele monitoring by a provider [15].

III. METHODOLOGY

Its main objective is to issue remote monitoring, of people in difficult conditions. By wearable devices, we can monitor one's condition regularly, by collecting Heartbeat, pressure, and temperature than the information (data) is sent to the cloud. In emergencies, a prescription will be sent to the patient through the application data set containing the medical characteristics compared with hardware data through machine learning, so that AI gives the accurate status in the web application. The advantages of using it increase various properties like interoperability, security, performance, and availability.

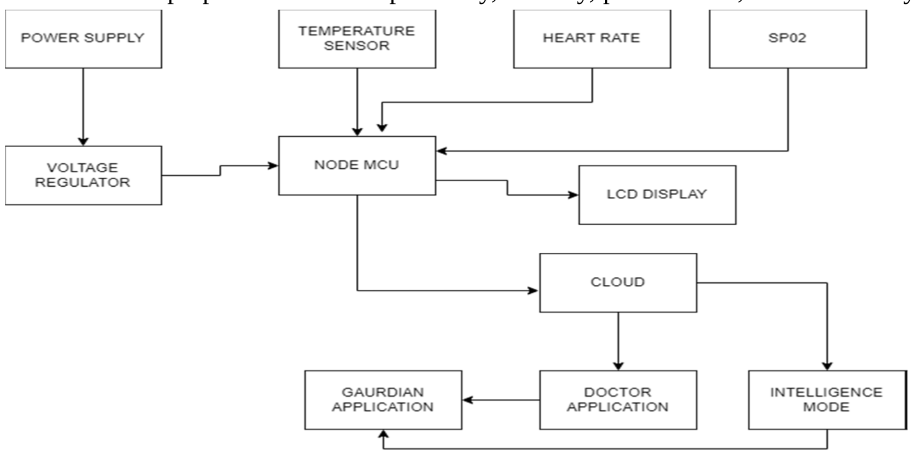

Fig. 3.1 Flow Diagram of Advanced Critical Care Monitoring

Connect the microcontroller to all the biosensors (heart rate, temperature, SP02). The necessary sensors are gathered and connected to the Arduino, a microcontroller used in electronics projects. In order to create and upload the computer code to the actual processing board, Arduino contains a part of software called IDE (Integrated Development Environment) which executes and runs on the system. The photo plethysmographic principle is based on the heartbeat sensor (PPG). It gauges how much blood flows through any organ in the body. The duration of heart pulses is more difficult when the heart rate of the patients has to be detected. The pace of the heartbeat controls the flow of blood since light is absorbed by blood as heartbeat pulses are compared with signal pulses. A temperature Sensor is a device that senses how hot or cold data is converted into an electrical signal. Oxygen saturation can be determined with a pulse oximeter (SP02). The inbuilt WIFI module should be used to send the sensor data to the cloud after it has been gathered completely. Wi Fi modules, commonly referred to as WLAN modules (wireless local area network), are electronic parts used in a variety of goods to establish a wireless internet connection. Patients' real-time data is gathered and sent to the ThingSpeak cloud, where it may be aggregated, visualized, and analysed in real-time. Android devices can provide data to ThingSpeak, which can then instantly visualize live data and give notifications. The measured values and statistics are shown on an LCD, which is utilized to keep patients in life-threatening situations. The final product and sensor data will be sent to the guardian and doctor application through the use of artificial intelligence on the data that has been collected. The doctor application shows the bio-parameter values, and the guardian application shows the data if the doctor provides a prescription. The guardian can keep an eye on the patient's critical condition with the help of a doctor's prescriptions.

IV. WORKING OF CRITICAL CARE MONITORING

The bodily parameters of patients can be monitored in real time utilizing this system design employing a variety of sensors. The MAX30100 temperature sensor is the one that is in use. The MAX30100 is integrated with a pulse oximeter and heart rate monitoring system. To detect the pulse of patients and heartbeat rate signs, it contains two Light Emitting Diodes (LED) which are combined with a photodetector and processing analog signals via low-noise conditions. A temperature sensor is used to convert a physical value into an electrical signal. On an LCD screens parameters like temperature, heart rate, and pulse rate will be shown. These sensors are linked to the open-source Arduino IDE, an electronics platform with user-friendly hardware and software. A ray of light falling on a sensor, a finger placed over a button, or a pulse of tweet are all examples of inputs that Arduino boards may read input which may be in form of the sensor with light, pressing a button, or a message that is converted into outputs. In order to aggregate and collect, visualize and tabulate, and analyse real-time data streaming in the cloud, the collected information will be delivered to the think speak cloud. The ESP8266 Wi-Fi Module will enable real-time access to the data. The doctors will use an auto-intelligence system to monitor the accessed real-time data.

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The machine learning- generated output and the doctor's prescription will be transmitted to the guardian application if the patient's heart rate or temperature changes at all. The machine learning result will be automatically transmitted to the doctor and guardian applications if the doctor is not accessible. Advanced critical care monitoring system analyses patients' vitals in real-time via the sensors connected with the cloud. The doctor or physician in charge can view these data without latency through the web application created. The doctor's webpage displays the signs as medical charts with the relevant data. The patients' caretaker web application is designed to receive

information from both the auto intelligence system and the doctor. To ease the task of understanding medical terms and keeping track of patients' health needs, the caretakers' webpage receives a prescription from the doctor himself rather than depending on the complicated vital signs. This helps the caretaker to be more updated about the needs and conditions of the patient. Advanced critical care monitoring is designed to enable personal monitoring from remote locations thus reducing practical difficulties such as on-road traffic, long distances, and doctor availability during peak hours. Intensive Care Unit (ICU) patients must be kept in isolated and safe circumstances such that the chances of infection or complications can be avoided.

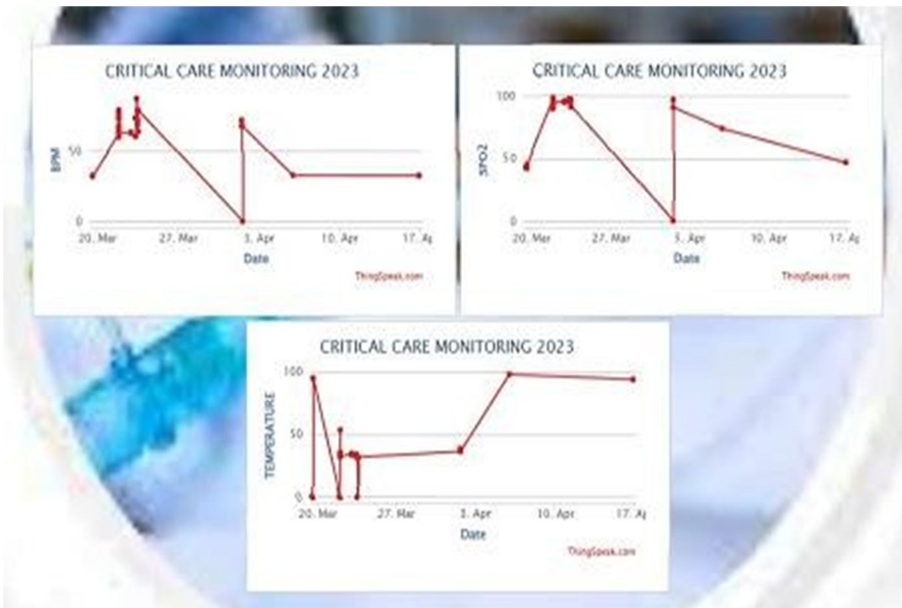

Fig. 4.1 Displaying Patients Graph in Web Application.

Fig 4.2 Doctor Web Application

V. CONCLUSION

This paper is hold forth work of the previously proposed healthcare platform devoted to monitoring and analysing patients based on IOT in their critical condition. Advanced critical care monitoring and alert with an auto intelligence system is an approach to address the shortcomings of the existing system thus providing the means of creating a more user-friendly interface for the care takers, who are close to the patients. The use of portable and compact sensors enables a better circumstance for personal remote monitoring that can transmit data seamlessly reducing latency and lags in communication. The project will develop continuously to adapt to the new technological advancements and bridge the gap between limitations and feasibility. As a part of future work, we anticipate the integration of advanced algorithms such as Machine Learning to predict unstable conditions before reaching the critical stage that increases the effectiveness of the treatment. At present, the approach is cloud oriented. This cloud-based project can be extended as a fog computing approach to increase the proactive ability and increase the rates of data transmission.

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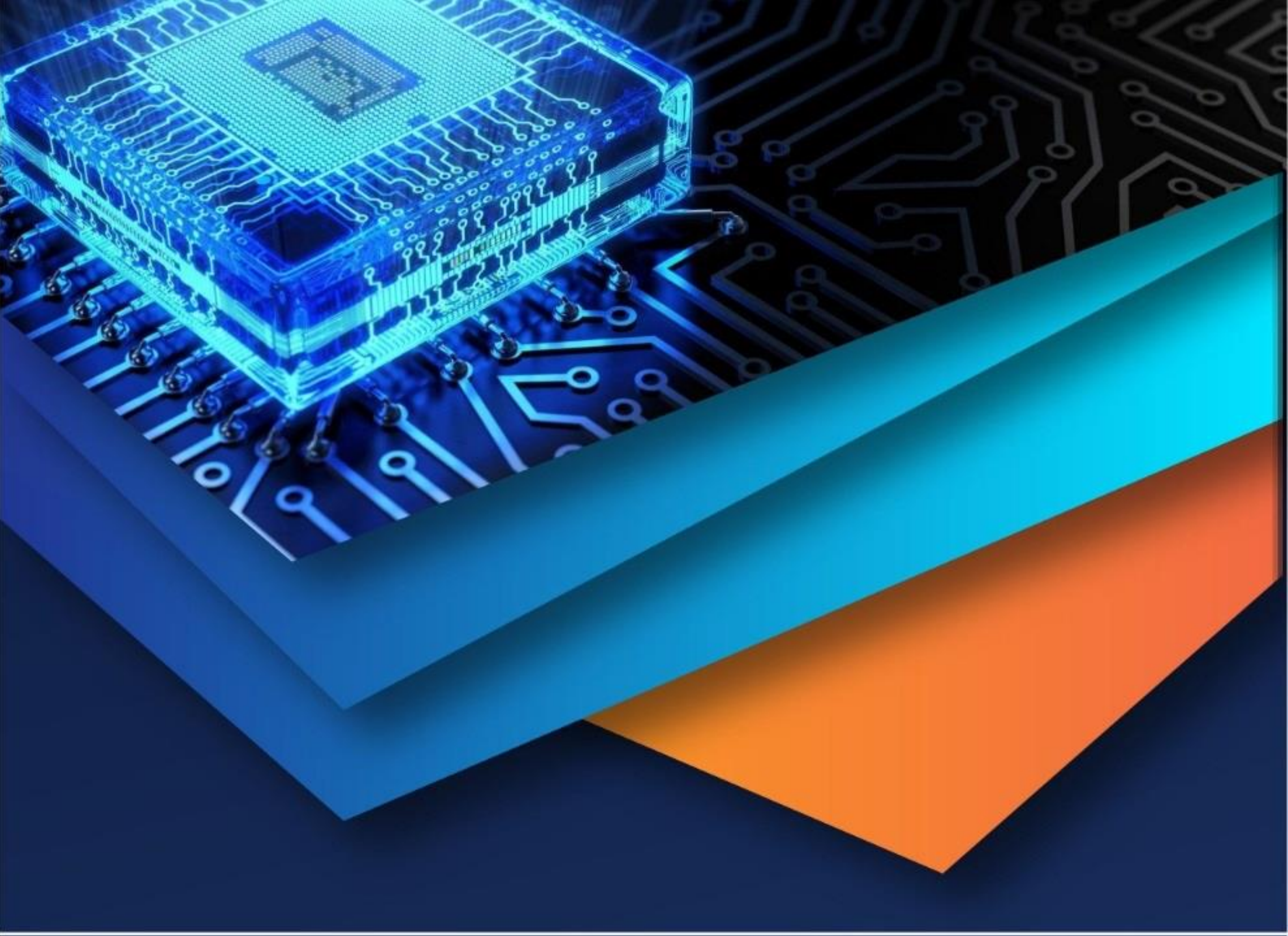

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